



FOOD BUYING BEHAVIOUR OF STUDENTS AT APU CAFETERIA

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DECLARATION OF ORIGINALITY AND EXCLUSIVENESS

We declare that this assignment report entitled
FOOD BUYING BEHAVIOUR OF STUDENTS AT APU CAFETERIA
is the result of our own research work except as cited in the references.

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1. Introduction

Behavioral science can play a vital role in discovering the underlying issues of a business that aren't appearing on the surface either with the customers or the organization itself and delayed discovery of them can abruptly trigger catastrophic effects to the business. Consumer behavioral study can also facilitate in understanding rapid changes in trends of the industry along with insight into the buying / consumption pattern. Several experimental studies also show that food choice is recognized as a cognitive process which is highly influenced by consumers' socio-demographic and characteristics along with ethnicity.

The main purpose or domain of this study is to observe and explore product buying behavior of any conventional or e commerce business and to come up with report that can highlight the issues, suggestions and ideas that can benefit to the business and at the same time providing a more pleasant experience to the customers. It can also help in examining how personal factors such as lifestyle, personality, and economic situations affect the consumer behavior.

2. Problem Statement

Dining in Malaysia can be an unending adventure due to various ethnic in the country with likes and dislikes based on various cuisines and students in a university also has a very diverse demographics which varies widely from age group, countries / regions, race, accommodation, financial etc. etc. and all these factors plays a key role in their decisions to buy a product. Dining in Malaysia can be an unending adventure due to various ethnic students in the country with likes and dislikes based on various cuisines.

Some of the research in recent past has shown a growing trend in economy along with the shift of rural to urbanization, due to these factors the expectation of high value and quality food products is increasing. As part of our research we have opted to explore the buying behavior of the students during their stay in the university with precise focus on the cafeteria as most the demographics mentioned above are very much influential and have a behavioral aspect i.e. what factors lead students decide to eat and why they select that specific pattern.

For this purpose, we have opted to observe Asia Pacific University (APU) Main Campus Cafeteria as there are approximately **11,600** students with varied diversities i.e. from **116** countries and with gender ratio of **Male** students as **61%** and **Female** as **39%**.

3. Aims & Objective

This research aims to explore food buying behavior of students of APU. We seek to understand likes and dislikes of students in terms of food and environment at APU and to come up with report that can highlight the issues, suggestions and ideas that can benefit to the business and at the same time providing a more pleasant experience to the customers.

4. Research Methodology

As the university have some diversified ethnic students spread and to collect the samples from different groups of students we have opted to gather Data for our research through survey (online as well as paper based) where only APU students were asked to participate in an anonymous survey to help the cafeteria evaluate their level of service and its efficiency.

The survey was having age, gender, country, accommodation, works status towards the questions related to their experience in the cafeteria and their expectations with improvement ideas, complete survey the attached as Appendix A.

4.1 Why survey?

Surveys are a powerful tool that market researchers use to gather data in the forms as online, or paper based surveys. It helps in collecting, analyzing, and using data efficiently and to formulate strategies for a more effective business model. Some of the benefits of survey are listed below.

- **Cost** - Surveys are relatively inexpensive. Online surveys and paper surveys have a very small cost per respondent.
- **Extensive** - Surveys are useful in describing the characteristics of a large population and ensures a more accurate sample to gather targeted results in which to draw conclusions and make important decisions.
- **Flexible** - Surveys can be administered in many modes, including: online surveys, email surveys, social media surveys, paper surveys, mobile surveys,
- **Dependable** - The anonymity of surveys allows respondents to answer with more candid and valid answers. To get the most accurate data, you need respondents to be as open and honest as possible with their answers.

The term data mining is generally known as the process of analyzing data from many different perspectives to correctly organize the data. Sometimes data mining is also called knowledge discovery. Although Data Mining is not a new technology but today's buzz word "Big Data" has remarkably impacted the digital market and can be labeled as a game changer for the whole

industry. In past most applications of data mining and analysis have been, at their hearts, attempts to get better at prediction.

Simple statistical analysis such as descriptive statistical analysis, frequency distribution, cross tabulation, analysis of variance, and factor analysis will be performed to assess the student's preferences for buying food.

Decision-makers want to understand the patterns in the past and the present to anticipate what is most likely to happen in the future. The only change is that Big data offers unprecedented awareness of phenomena — particularly of consumers' actions and attitudes (Piatetsky-Shapiro, 2012)

Association rule mining is a methodology that is used to discover unknown relationships hidden in large data set. The uncovered relationships can be represented in the form of association rules or sets of frequent items. There are two key issues that need to be addressed when applying association analysis to data. First, discovering patterns from a large transaction data set can be computationally expensive. Second, some of the discovered patterns are potentially spurious because they may happen simply by chance.

4.2 Fieldwork

In December 2016, we undertook a food attitudes and behavior survey among university Students targeting specifically Main Campus Cafeteria. We also circulated the survey through social media and chats groups along with visits to some of the classroom for paper based feedback. This survey was restricted to APU students only.

4.3 Response rate

In total, there were approximately 11600 university students registered in Asia Pacific University at the end of Nov 2016. We have referred Raosoft for sample size calculation and the minimum recommended size of our survey was 372 keeping in view the 5 % - Margin of Error, 95 % - Confidence Level and 50 % - Response Distribution.

“If you create a sample of this many people and get responses from everyone, you're more likely to get a correct answer than you would from a large sample where only a small percentage of the sample responds to your survey”. (“Raosoft, Inc.,” n.d.)

In 3 weeks' time, we have been able to gather 418 respondents to the survey using online and paper based mode, and the respondents were from 51 countries. This represents an overall response rate of 3.6 % slightly above the required response rate that was 3.2%.

4.4 Analysis

The data derived from the online and paper based surveys were reformatted and transformed using SAS for further analysis. Further in order to incorporate a qualitative element to the survey, respondents were asked to input 3 words they would use to describe Food, Environment and price if they wanted to add any comments relating to their experience. Many students took this opportunity. Their suggestions and recommendation are summarized in section 5.12, for comments on Food is summarized in 5.13, for Price 5.14 and environment is 5.15. Appendix contains the full list of responses.

5. Data Analysis

For Data Analysis, we will be using some of the Big Data Techniques among which one of the most important is Factor Analysis. It is an Explorative Analysis to form a hypothesis about a relationship between variables and it's also groups similar variables into dimensions to identify Latent Variables. It can help in simplifying data by reducing the number of variables in predictive models by ensuring that the factors are orthogonal. SPSS is one of the tool that have the capabilities to perform this sort of analysis.

However, we were unable utilize factor analysis to reduce data due to a major constraint where one of our group member who had some medical issues and was hospitalized and he was only person in our group who already completed SPSS course in the past modules. For any future similar studies, we can use those tools to perform analysis in better manner.

5.1 Gender and age

59% of the respondents were male whereas the female ratio was 41%. As Table 1 shows, there was a slight under representation of males in the survey compared to the figures supplied for student count by Asia Pacific University.

Table 1: Gender of Respondents and Actual Population in A.P.U Malaysia

Gender	Respondents	Actual Population
Male	59 %	61 %
Female	41 %	39 %

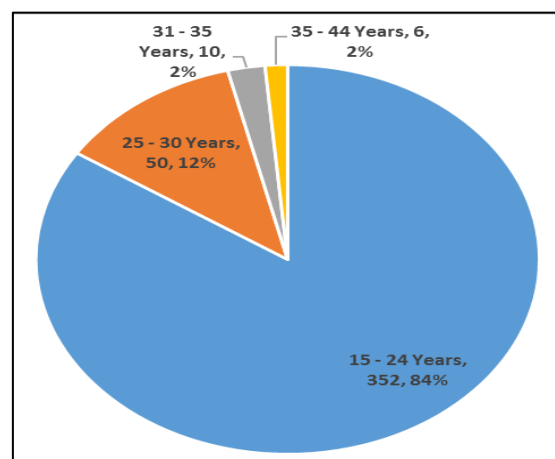


Figure 1: Spread of respondents according to Age Group

Figure 1 illustrates the overall spread of students according to their age group where majority of students 84% are from age group 15-24 Years. As illustrated in Table 2 the Age group pf 15-24 years was the highest to participate in the survey with nearly equal proportion for male and female respondents.

Table 2: Gender of Respondents in Age wise

Gender / Age	15 - 24 Years	25 - 30 Years	31 - 35 Years	35 - 44 Years
Female	82.35%	14.12%	1.76%	1.76%
Male	85.48%	10.48%	2.82%	1.21%

5.2 Geographical spread

As illustrated in Figure 2 A total of 62% respondents were Foreigners whereas the local respondent's ratio was 38 %.

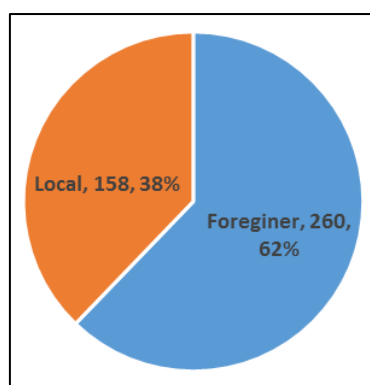


Figure 2: Geographical Spread

Table 3 illustrates spread of local and foreigner respondents based on their age group and the highest value is shared among the respondents from age group 15-25 Years.

Table 3: Distribution of Nationality across age

Nationality / Age	15 - 24 Years	25 - 30 Years	31 - 35 Years	35 - 44 Years
Foreigner	78.46%	16.92%	3.46%	1.15%
Local	93.67%	3.80%	0.63%	1.90%

Malaysian students share largest portion of respondents with 38 % and for foreigner's respondent's Pakistani students hold the largest share with 12 % which is followed by Yemeni Students with 7.6 % whereas China, Indonesia & Tanzania equally shares 6 % respondents.

5.3 Education Level and type of study

The clear majority of respondents 97% were studying full-time with 3% studying as Part time. Table 4 illustrates actual percentages of respondents studying full time and part time according to their education level where the full time under graduate students share the highest value at 60% which is followed by full time graduate students at 15%.

Table 4: Level of study by type of study

Education Level	Certificate Course	Foundation	Diploma	Under Graduate	Graduate	Post Graduate	ALL
Full Time	2.9 %	4.8 %	12.9 %	60 %	15.1 %	1.2 %	97 %
Part Time	1 %	-	0.2 %	0.5 %	1.2 %	0.2 %	3 %

Under Graduate students were the highest to participate in the survey with the total value as 61 % and the total spread of all the respondent's education level is illustrated below in Figure 3

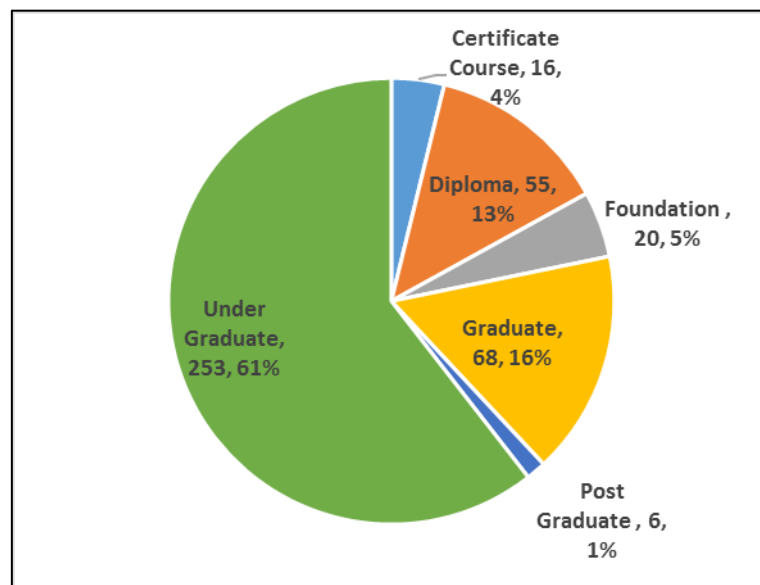


Figure 3: Spread of Respondent by Education Level

5.4 Type of accommodation

Upon survey of the accommodation type the highest percentage 47% of respondents are staying at private accommodation whereas 30% of respondents live in university provided accommodation which is illustrated in Figure 4

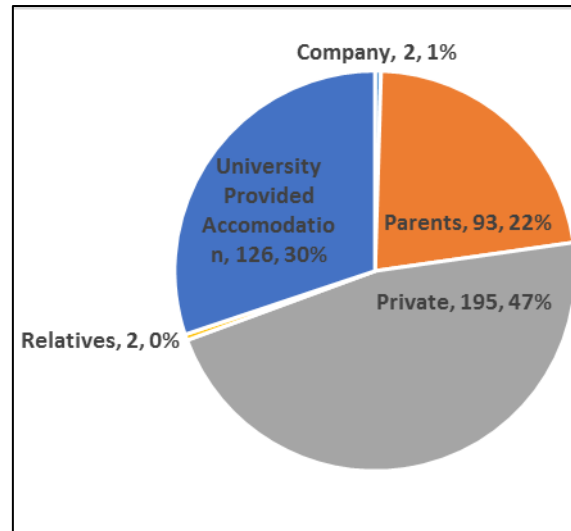


Figure 4: Spread of Respondent by Accommodation Type

Table 5 shows the respondents accommodation based on their education level. Certificate Course and Foundation equally share University Provided Accommodation around 45% which is followed by Diploma students. 50% of Respondents from graduate and under graduate live privately whereas mostly 84 % post graduate respondents prefer to live privately.

Table 5: Level of Education by Accommodation Type

Education / Accommodation	Company	Parents	Private	Relative	UPA
Certificate Course	12.50%	6.25%	31.25%	6.25%	43.75%
Foundation	-	25.00%	30.00%	-	45.00%
Diploma	-	30.91%	38.18%	-	30.91%
Under Graduate	-	24.51%	48.22%	0.40%	26.88%
Graduate	-	11.76%	52.94%	-	35.29%
Post Graduate	-	-	83.33%	-	16.67%

5.5 Buy food at APU Cafeteria

Figure 5 illustrates that 83% of the respondents do buy food while their stay in the university whereas only 17 % are those who don't prefer to buy or eat.

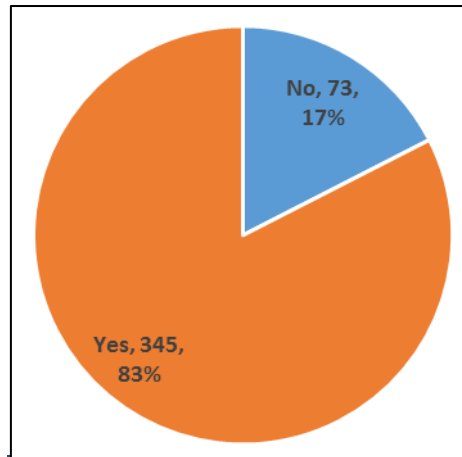


Figure 5: Food Buying Behavior in A.P.U

As illustrated in Table 6 it can be clearly seen that 47% of Students who live in Private accommodation buy food while their stay at APU which is Followed by 32% of Students who live in University Provided Accommodation.

Table 6: Number of Respondent by year Wise

Company	Parents	Private	Relative	UPA
12.50%	21.45%	46.67%	0.29%	31.59%

Table 7: Number of Respondent by Accommodation Type

15 - 24 Years	25 - 30 Years	31 - 35 Years	35 - 44 Years
83%	86%	60%	67%

As Table 7 shows the mostly students with the age bracket of 15-30 Years are the one who tend to but food while their stay in university.

5.6 Prepare Food at Accommodation

As illustrated in Figure 6 71% of the respondents prepare food at accommodation where as only 29% are those who done prepare.

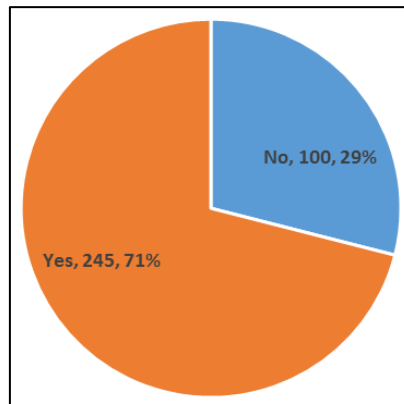


Figure 6: Spread of Respondents who prepare food and who dont

As shown in Table 8 Male respondents from the age group of 15-25 Years shares highest value with at 48.5 % Among Female students age group of 25-30 Years shares highest value with at 42 %

Table 8: Respondent according to Age and gender who prepare food

Female	15 - 24 Years	25 - 30 Years	31 - 35 Years	35 - 44 Years
Yes	34.38%	42.00%	30.00%	16.67%
No	5.40%	6.00%	-	33.33%
Male	15 - 24 Years	25 - 30 Years	31 - 35 Years	35 - 44 Years
Yes	48.58%	44.00%	30.00%	50.00%
No	11.65%	8.00%	40.00%	-

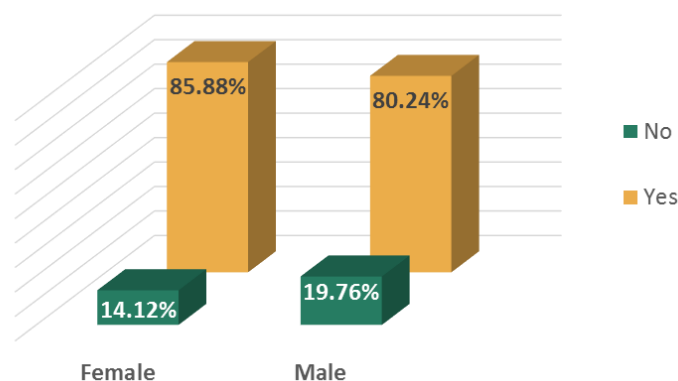


Figure 7: Preparing Food in Accommodation by gender

An interesting factor that is highlighted that Male and Female who prepare food shares nearly equal proposition which is shows in Figure 7.

5.7 Daily Spending Pattern

Figure 8 shows the average daily spending of respondents where **71%** of overall students spend within the range of **5 – 10 RM**

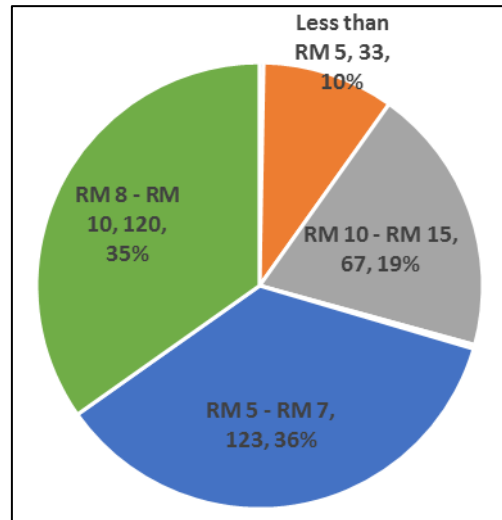


Figure 8: Respondent spread according to spending amount

Table 9 illustrates daily spending of students in APU according to their age group. The age group of 25-30 years share 44% spending in the range of 8-10 RM. Furthermore, the age group of 31-35 years share 50% spending in the range of 5-7 RM and 33% in the range of 8-10RM.

Table 9: Type of Age Group by Spending Amount Range

Age / Spending	Less than Rm 5	Rm 5- Rm 7	Rm 8- Rm 10	Rm 10- Rm 15	Rm 20+
15-24 years	10.62%	37.67%	33.56%	17.47%	0.34%
25-30 years	4.65%	20.93%	44.19%	30.23%	
31-53 years	-	50.00%	33.33%	16.67%	
35-44 years	-	25.00%	25.00%	50.00%	

5.8 Number of Days Spent

The Figure 9 shows that majority of the respondents tend to use cafeteria across the week with the highest value for 1-2 days as 51% followed by 3-4 days at 41%.

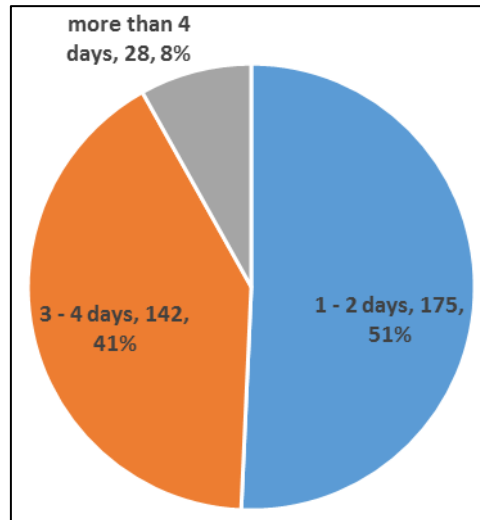


Figure 9: Spread respondents according to number of days eat in APU Cafeteria

As illustrated in the table 10, it shows the number of days spent at the APU cafeteria categorized according to the age group. The results shows that a high number of students at the age group of 15-24 years eat for 1-2 days (52%) at the cafeteria. Followed by 41% of students at the age group of 15-24 years that eat for 3-4 days and 6.5% of students eat for more than 4 days. Furthermore, 66% of students in the age group of 31-35 years eat for 3-4 days.

Table 10: Age group and number of days

	1-2 days	3-4 days	4+ days
15-24 years	52.74%	40.75%	6.51%
25-30 years	46.51%	39.53%	13.95%
31-35 years	16.67%	66.67%	16.67%
35-44 years		50.00%	50.00%

5.9 Preferred Time to Eat

As illustrated from the Figure 10 below, it shows the preferred time to eat at APU cafeteria. The results show that 64% of students prefer to eat lunch, followed by snacks with 19% and then breakfast with 17%.

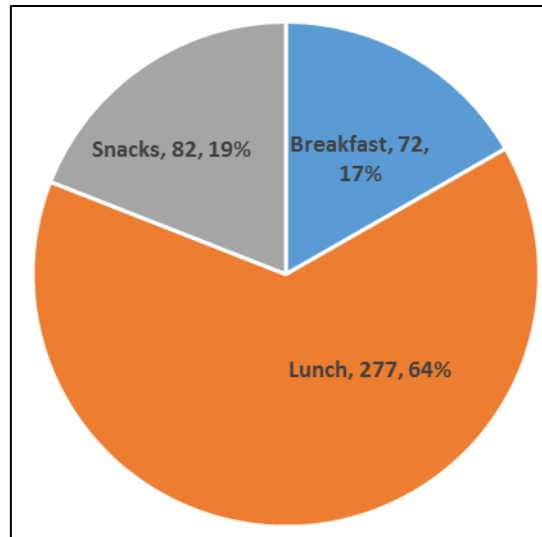


Figure 10: respondents prefer time to eat

We further wanted to identify the preferred time to eat with gender and age group. The results are illustrated in the Table 11 as follows.

Table 11: Prefer time eat according to gender and age group

Female	Breakfast	Snacks	Lunch
15 - 24 Years	15%	17%	68%
25 - 30 Years	13%	20%	67%
31 - 35 Years	-	-	100%
35 - 44 Years	50%	-	50%
Male	Breakfast	Snacks	Lunch
15 - 24 Years	18%	20%	62%
25 - 30 Years	16%	19%	66%
31 - 35 Years	20%	20%	60%
35 - 44 Years	25%	38%	38%

From the above results, it can be seen that irrespective of the age group both genders had a high preference of eating lunch at APU cafeteria followed by breakfast then snacks.

5.10 Places to buy food

Figure 11 illustrates the location from where the respondents prefer to buy and among them APU Cafeteria shares highest value at 63% which is followed by 39% respondents who bring their own food from home.

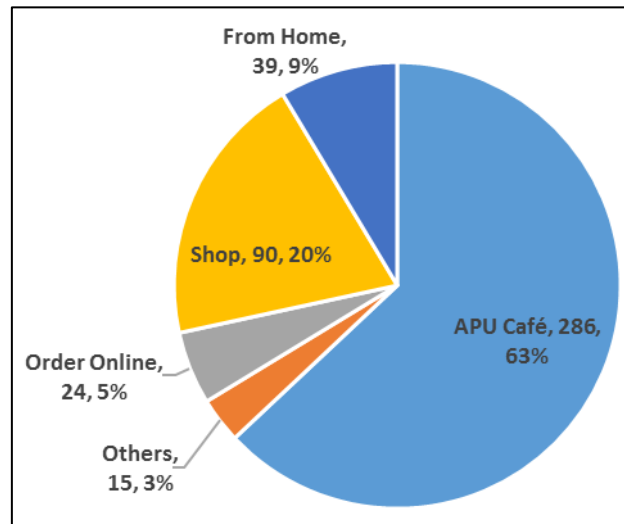


Figure 11: Spread of Location to buy food

As illustrated from the table 12 below, it shows the places of where APU students buy food from. The objective of this question was to study the buying preferences based on location of APU students. The results show that the majority of the students eat at APU cafeteria irrespective of the age group. 25% of students in the age group of 35-44 years bring their food from home. Furthermore, based on the results it was identified that very few students would like to order online or go to other places.

Table 12: places to buy according to age group

Age	APU Cafe	Others	Order Online	Con. Shop	From Home
15 - 24 Years	63%	3%	5%	20%	9%
25 - 30 Years	63%	2%	8%	23%	5%
31 - 35 Years	86%	-	-	-	14%
35 - 44 Years	50%	13%	-	13%	25%

5.11 Feedback

Table 13: Price review based on nationality and age group

	Price					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
	44%	33%	23%	23%	32%	45%
15 - 24 Years	41%	35%	24%	20%	33%	47%
25 - 30 Years	49%	31%	21%	75%	25%	-
31 - 35 Years	100%	-	-	100%	-	-
35 - 44 Years	100%	-	-	33%	33%	33%

Table 14: Food review based on nationality and age group

	Food					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
	42%	35%	21%	37%	40%	22%
15 - 24 Years	42%	38%	18%	36%	39%	24%
25 - 30 Years	46%	17%	35%	75%	25%	-
31 - 35 Years	40%	60%	-	100%	-	-
35 - 44 Years		100%	-	-	100%	-

Table 15: Menu review based on nationality and age group

	Menu					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
	29%	34%	35%	35%	34%	30%
15 - 24 Years	30%	36%	33%	35%	33%	31%
25 - 30 Years	25%	25%	48%	75%	25%	-
31 - 35 Years	60%	40%	-	-	100%	-
35 - 44 Years	-	100%	-	-	66%	33%

Table 16: Serving Size review based on nationality and age group

	Serving Size					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
15 - 24 Years	44%	40%	15%	40%	40%	18%
25 - 30 Years	53%	28%	17%	100%	-	-
31 - 35 Years	100%	-	-	100%	-	-
35 - 44 Years	100%	-	-	33%	66%	-

Table 17: Environment review based on nationality and age group

	Environment					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
15 - 24 Years	44%	33%	22%	40%	40%	19%
25 - 30 Years	30%	51%	17%	25%	75%	-
31 - 35 Years	60%	40%	-	-	100%	-
35 - 44 Years	-	-	100%	33%	33%	33%

Table 18: Service review based on nationality and age group

	Service					
	Foreigner			Local		
	Satisfied	Natural	Dissatisfied	Satisfied	Natural	Dissatisfied
15 - 24 Years	43%	41%	15%	27%	46%	25%
25 - 30 Years	43%	35%	20%	100%	-	-
31 - 35 Years	80%	20. %	-	100%	-	-
35 - 44 Years	-	100 %	-	33%	-	66%

5.14 Price Word Cloud

The Figure 14 below shows the word cloud for the price comments from APU students. The results show that the highest weightage **Positive** words were “**AVERGAE**” and “**AFFORADABLE**” while the highest weightage **Negative** word was “**EXPENSIVE**”



Figure 14: Word Cloud base on comments on Price

5.15 Environment Word Cloud

The figure 15 below shows the word cloud for the environment comments from APU students. The results show that the highest weightage **positive** words were “**GOOD**”, “**CLEAN**,” “**SATISFIED**” and “**OKAY**” while the highest weightage **negative** words were “**IMPROVEMENT**”, “**CROWDED**”, “**BAD**” and “**HOT**”

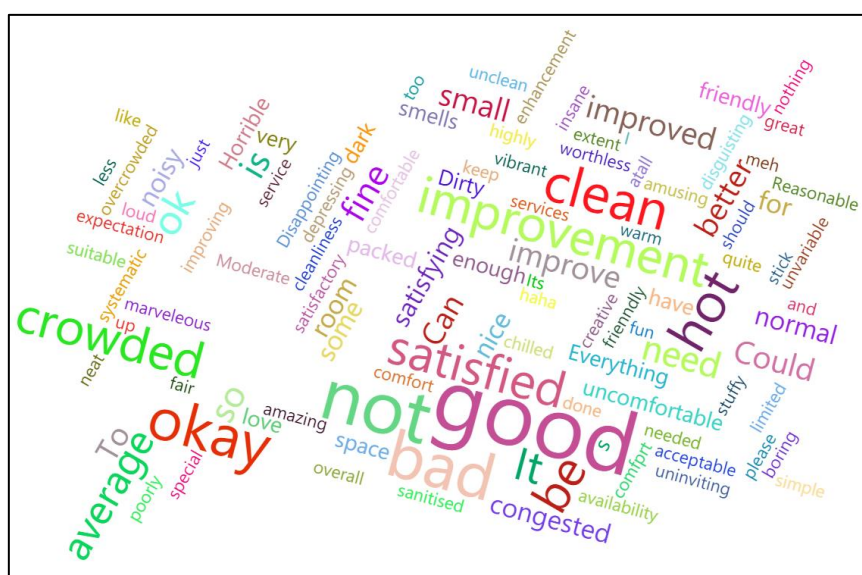


Figure 15 Word Cloud base on comments on Environment

5.16 Concern Factor

As per the Figure 16 where the respondents were asked to give their feedback based on their experience in APU Cafeteria. The result shows that most of the students are Satisfied with the overall experience at the cafeteria however the highest identified concern factors are Price and Menu (Variety) which is in general Neither Satisfied or Dissatisfied.

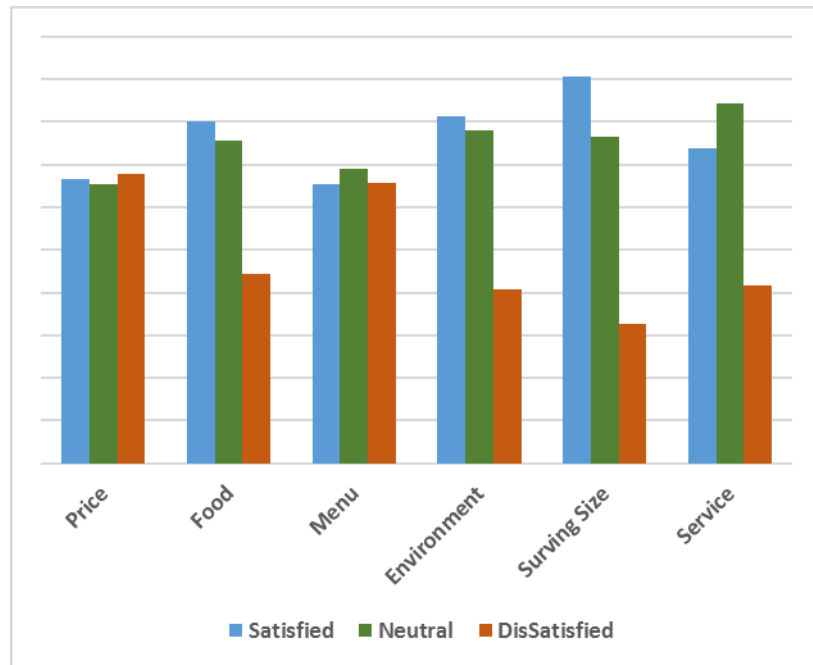


Figure 16: Overall Feedback of respondents

As illustrated in Figure 17 **Food**, **Menu** and **Environment** is relatively **Neutral** which displays potential areas of improvement and level of Satisfaction for **Price**, **Serving Size** and **Service** is **High** towards **Foreigner** than Local students

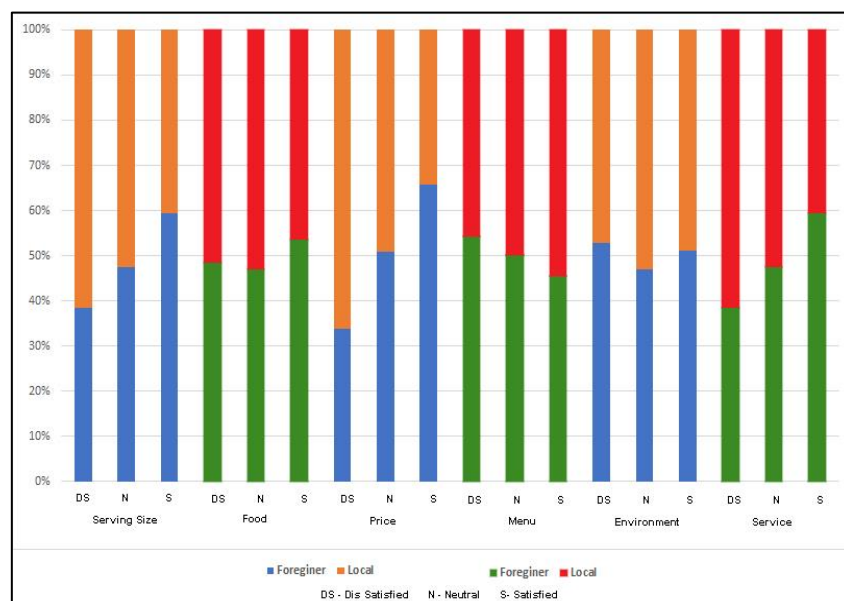


Figure 17: Overall feedback according to nationality

6. Tools & Technology

Key component in big data strategy are the tools and technology that will be used as the insight to data or the analysis of data, is an umbrella term that not only refers to a software it is equally a methodology that is made up of several activities like information discovery (data mining), analysis and reporting. For the purpose of our research we have used SAS for data cleaning, transformation and integration and for analysis and visualization of data we have used Microsoft Power BI.

SAS

In this project we have used SAS tool for data cleaning part, the APU cafeteria data collected by survey (online and hard copies). The data cleaning is to enhance the quality of the data. Besides, the data will be constructed into new attributes and integrate related tables that have different information about the same objects.

The collected data needs to perform the cleaning process to filter the junk data, such as the empty fills and not relevant data to perform the data mining process. In order to demonstrate data cleaning techniques, we have constructed a raw data file called cafeteria survey.csv

The data file cafeteria survey.csv contains both character and numeric variables. A number of data errors, duplications and missing values were included in the file. For instance the students were wrote country names in different formats like some are capital, small or short form. Such as Pakistan written in three formats: “PK, PAKISTAN, Pakistan,”. To remove these type of junk data, we used sas tool to filter all data for better analysis.

Power BI

As we have some good volume and variety of data we have incorporate Microsoft Power BI to have a visual presentation of data we have gathered and the presentation of our analysis in better form. It simplifies the process of decision making at all levels of an organization by allowing easy accessibility, drill down visualization, collaboration of data from many sources.

Regardless of the tools and technology to be used for the research there are some principles that should be consider while designing the architecture. These principles help the basic architecture to be robust in use and to align with the business requirements and will result in success of the solution.

7. Conclusion

Food is very important to human's health. Every activity that any human being performs requires food as source of energy to carry out that task or responsibilities. Especially in an academic organization it is very important to have Good quality of food to carry out academic activities.

This report has highlighted the attitudes and behaviors of university students across Asia Pacific University in relation to food buying and the detailed analysis of survey results has depicted that the overall experience of the respondents can be termed as "Satisfied".

In terms of demographic characteristics, the largest population of respondents relate to Under Graduate Students at 61% and the age group 15-24 Years at 84%. In particular, under graduate students and the age group 15-24 Years are the group who will be influencing all the factors of the survey due to their wide spread.

The respondents were from 51 countries among them 38% were local with respect to foreigners which are at 62%. Highest number of foreigner's respondents were from Pakistan with 12 % which is followed by Yemeni Students with 7.6 % whereas China, Indonesia & Tanzania equally shares 6 % respondents.

The most striking points to emerge relate to cooking habits at their accommodation where 71% respondents do prepare food at their locations although they buy food while their stay in university. Approximately 17% of respondents prefer breakfast followed by 19% of respondents who prefer to have snacks. The highest number of respondents i.e. 64 % of respondents prefer Lunch.

There are few concern factors that are highlighted among the survey which are Price, Menu and Environment where the results show an equal distribution of satisfied and dissatisfied which can be termed as "Neutral" and comparing them with the comments and suggestion it clearly shows that there is an issue with the environment, pricing and variety of food that has

to be addressed. Given the importance of price for university students' food choices, this might even be a more effective strategy in this population.

However, as the university is moving into new campus where already a chain of cafeteria is operational, we have observed and compared the highlighted concern factors from our survey there and found that the factor we have highlighted in existing cafeteria is already addressed. The new campus café is already having a good quality and variety of food and the environment is extremely pleasant and the seating capacity issue is also resolved. For the pricing, there is food ranging from low to high and depends on the type of food being consumed i.e. Local, western, Indian etc. etc.

Further with the use of Business Intelligence Methodology along with data visualization tools an interactive and multidimensional reporting dashboard has been designed to review the feedback of respondents. The reports are capable to be filtered or sliced with others related tables and also can be drill down to the next level in the hierarchy. These interactive and detailed reports have significantly improved and speed up the analysis process.

References

- Getting started with Power BI Desktop | Microsoft Power BI [WWW Document], n.d. URL <https://powerbi.microsoft.com/en-us/documentation/powerbi-desktop-getting-started/> (accessed 1.7.17).
- Microsoft Power BI Community [WWW Document], n.d. URL <https://community.powerbi.com/> (accessed 1.7.17).
- Piatetsky-Shapiro, G., 2012. Big Data Hype (and Reality) [WWW Document]. Harv. Bus. Rev. URL <https://hbr.org/2012/10/big-data-hype-and-reality> (accessed 1.8.17).
- Web survey software, online surveys, email surveys from Raosoft, Inc. [WWW Document], n.d. URL <http://www.raosoft.com/> (accessed 1.31.17).

APPENDIX

Work Breakdown Structure

Work Breakdown Structure

The outcome of this assignment is a collaborative effort from every group members where each member has contributed towards the understanding of the domain and share valuable thoughts through brainstorming sessions in various group meetings right from the start till the final compilation of report except one of the member who was unable to join us regularly due to some medical reasons.

However, as per the requirement of the assignment following is the WBS of the assignments areas where the input by individuals members are marked.

Group Members / Assignment Tasks		TP030294 Ismael Youssef Ladieh	TP032166 Aliasghar Muhdhar	TP042831 Nadir Khan	TP043357 Ameer Ali Khoso	TP043519 Muhammad Aseem ur Rehman
Project Proposal						✓
Survey	Data Collection		✓	✓	✓	✓
	Data Cleansing		✓		✓	✓
Final Report	Data Mining					✓
	Analysis	✓	✓	✓	✓	✓
	Conclusion			✓		✓
	Compilation		✓	✓	✓	✓
Presentation	Slides		✓	✓	✓	✓
	Presenter		✓	✓	✓	✓
Data Visualization (Power BI Dashboard)					✓	✓

Survey Questions

Food Buying Behavior of Students at APU

This research aims to explore the food buying behavior of students of APU. We seek to understand your likes and dislikes of the food and environment at APU. This is an academic research so your input will be anonymous.

What is your gender?

☐ Male ☐ Female

What is your age?

☐ 15 - 24 Years ☐ 25 - 30 Years ☐ 31 - 35 Years
☐ 35 - 44 Years ☐ 45 Years and above

What is your Nationality? (if foreigner please specify)

☐ Malaysian - (Local) ☐ Other: _____

Which level are you in?

☐ Certificate Course ☐ Diploma
☐ Under Graduate ☐ Graduate
☐ Other: _____

Are you a Part Time or Full Time Student?

☐ Full Time ☐ Part Time

What type of Accommodation do you live in?

☐ University Accommodation ☐ Private
☐ Parents ☐ Other: _____

Whom do you live with?

☐ Family / Parents ☐ With Students
☐ With Working Professionals ☐ Alone
☐ Other: _____

Do you buy food at APU?

☐ Yes ☐ No

Please help us to understand the reasons for you to not buying food from APU

	Most Likely	Likely	Least Likely
Quality of Food	1	2	3
Food Price	1	2	3
Serving Size	1	2	3
Food Variety	1	2	3
Cafeteria Environment	1	2	3

Do you prepare food at accommodation?

☐ Sometime ☐ Yes ☐ No

What time do you prefer eating at the cafeteria?

☐ Breakfast ☐ Lunch ☐ Tea/Snacks

Please turn overleaf

Food Buying Behavior of Students at APU

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☐ 35 - 44 Years ☐ 45 Years and above

What is your Nationality? (if foreigner please specify)

☐ Malaysian - (Local) ☐ Other: _____

Which level are you in?

☐ Certificate Course ☐ Diploma
☐ Under Graduate ☐ Graduate
☐ Other: _____

Are you a Part Time or Full Time Student?

☐ Full Time ☐ Part Time

What type of Accommodation do you live in?

☐ University Accommodation ☐ Private
☐ Parents ☐ Other: _____

Whom do you live with?

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☐ With Working Professionals ☐ Alone
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Quality of Food	1	2	3
Food Price	1	2	3
Serving Size	1	2	3
Food Variety	1	2	3
Cafeteria Environment	1	2	3

Do you prepare food at accommodation?

☐ Sometime ☐ Yes ☐ No

What time do you prefer eating at the cafeteria?

☐ Breakfast ☐ Lunch ☐ Tea/Snacks

Please turn overleaf

Where do you normally get lunch while at University?

- ☐ APU Cafeteria ☐ From Home ☐ Order Online
☐ Don't Take Lunch at APU ☐ Other: _____

How many days do you eat at APU cafeteria?

- ☐ 1 - 2 days ☐ 3 - 4 days
☐ more than 4 days

How much do you spend daily on food/drinks at cafeteria?

- ☐ Less than RM 5 ☐ RM 5 - RM 7 ☐ RM 8 - RM 10
☐ RM 10 - RM 15 ☐ Other: _____

Please rate the following based on your experience

On the scale of 1 to 5 where 1 is Highly satisfied and 5 is Highly dissatisfied

Food	1	2	3	4	5
Food Price	1	2	3	4	5
Serving Size	1	2	3	4	5
Food Variety	1	2	3	4	5
Beverages Price	1	2	3	4	5
Beverages Variety	1	2	3	4	5

Please rate the ambience of Cafeteria

On the scale of 1 to 5 where 1 is Highly satisfied and 5 is Highly dissatisfied

Environment	1	2	3	4	5
Ordering System	1	2	3	4	5
Seat Availability	1	2	3	4	5

Based on your experience answer following?

	Yes	No	May be
Do you know Name of item you have ordered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Do you know price of the item ordered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What type ordering do you prefer?

- ☐ Buffet system ☐ Off the Menu

List three words you would use to describe food, environment and pricing

Anything else you would like to tell us?

Thank you for your feedback

Where do you normally get lunch while at University?

- ☐ APU Cafeteria ☐ From Home ☐ Order Online
☐ Don't take Lunch at APU ☐ Other: _____

How many days do you eat at APU cafeteria?

- ☐ 1 - 2 days ☐ 3 - 4 days
☐ more than 4 days

How much do you spend daily on food/drinks at cafeteria?

- ☐ Less than RM 5 ☐ RM 5 - RM 7 ☐ RM 8 - RM 10
☐ RM 10 - RM 15 ☐ Other: _____

Please rate the following based on your experience

On the scale of 1 to 5 where 1 is Highly satisfied and 5 is Highly dissatisfied

Food	1	2	3	4	5
Food Price	1	2	3	4	5
Serving Size	1	2	3	4	5
Food Variety	1	2	3	4	5
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Do you know price of the item ordered	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What type ordering do you prefer?

- ☐ Buffet system ☐ Off the Menu

List three words you would use to describe food, environment and pricing

Anything else you would like to tell us?

Thank you for your feedback

Comments on Food

acceptable	great	not good enough	small portio
acceptable could be better	haha	not hot	so so
All dishes have similar taste	have to improve	not satisfied	standard
alright	healthier	Not satisfying enough	stomache
always local food	healthy	not so good	tast
average	Horrible	not taste good	taste bad
bad	I love it	not tasty	taste can be improved
Basic	It's good atall	not tasty; less variety	taste fine
boring	Its not bad	not that delicious	Tasteless
Can be better	It's ok	Not very good	tastey
chilly	its okay	not very nice	tastless
clean	just ok	not worth	tasty
cold; same dish	lack of variety	ok	tasty but low quanitty
common	less choice	okay	tasty but no variety
could be better	less variety	overall Not satisfied	tasty, fresh, healthy
Delicious	little	please improve everything	To be improve
delicious but normal	low quality	plenty	unexpected
dislike	manageable	poor variety	unhealthy
dissatisfying	mediocre	quality	Unhygienic; limited range
diversified	milk tea	quality not good	unsatisfactory
Everything is okay	Moderate	quite good	unsatisfied
excellent	more vegetable food	salty	unsatisfying
fair	nice	Same food everyday	warm
fat	no taste	same taste	worst
fine	normal	satisfactory	worst in TPM
food	not bad	satisfied	
good	not delicious	satisfying	
good; yummy	Not delicious but okay to kill hunger	should be improved	
Good-ish	not enough	small	

Comments on Price

a little high price	It's good at all	satisfying
acceptable	It's not bad	should be improved
affordable	It's ok	so so
appropriate	just ok	so-so
available	little bit expensive	To be improve
average	little expensive	unconstant
Bad	Medium range	unreasonable
better	Moderate	unsatisfied
Can be better	normal	unstable
Cheap	not affordable	unworthy
confusing	not bad	value for money
convinient	not satisfied	valueless
decent	Not satisfying enough	well
economical	Not very good	worse
Everything is okay	not worth it	
expensive	ok	
expensive expensive & expensive	okay	
extremely high	okay as student	
fair	overall Not satisfied	
good	overpriced	
great	please improve everything	
haha	pricey	
high	pricy	
high price for such cafÃ©	quite cheap	
Horrible	quite expensive	
I love it	reasonabale	
illogical	reasonable	
inconsistent	satisfactory	
insane	satisfied	

Comments on Environment

-Reasonable to some extent	fair	marveleous	room for improvement
acceptable	fine	meh	satisfactory
amazing	friendly	Moderate	satisfied
amusing	frienndly	neat	satisfying
availability	fun	need enhancement	should be improved
average	good	need improvement	simple
bad	good	need some improvement	small
boring	good services	nice	small and hot
Can be better	great	noisy	smells bad
can be improved	haha	normal	smells so bad
can improve service	Have room for improvement	not bad	so so
chilled	highly satisfied	not clean	space to improve
clean	Horrible	Not creative enough	stick
cleanliness	hot	not quite like it	stuffy
comfort	I love it	not satisfied	suitable
comfortable	Improvement is needed	Not satisfying enough	To be improve
comfprt	insane	not systematic	too small
congested	It is good	Not up to expectation	unclean
Could be better	it is okay	Not very good	uncomfortable
could be improved	It's good atall	nothing very special	uninviting;
could have done better	Its not bad	ok	unvariable
crowded	It's ok	ok	warm
dark	just ok	okay	worthless
depressing	keep improving	overall Not satisfied	
Dirty	less vibrant	overcrowded	
Disappointing	limited space	packed	
disguisting	loud	please improve everything	
Everything is okay	love	poorly sanitised	

Feedback and Suggestions

Positive Comments

- 1 Actually I preffer about our sitting space.i think if this space are more big we feel more comfortable
- 2 Add more cuisines
- 3 add the variety food and place
- 4 add variety of food
- 5 An enlargement of place and decreasing the price will make it better
- 6 Anybody has his own choice of food
- 7 Apu cafe need to improve
- 8 Can improve more
- 9 Change catering
- 10 concentrate on low price with taste
- 11 Could be more hygienic.
- 12 Decrease the food price
- 13 employees are friendly
- 14 Enhance the spaces of cafeteria
- 15 Good job; just help us to move to new campus
- 16 Got the Waiters to want the food.
- 17 I am wondering the food at new campus
- 18 I hope get more restaurants in TPM and ENT3
- 19 I think the food price should be lower than before; especially in the main campus coz we're just student here
- 20 I want to give suggestion to university that make a good cashier system and fix the prices of food.
- 21 i want to open arab restourant
- 22 I want various kind of foods.
- 23 if the food is tasty;fresh and healthy i dont mind paying high price than normal
- 24 If they could ever make changes for the foods; pricing and environment
- 25 Improve
- 26 Improve food quality
- 27 improve service; price and foods
- 28 improve spicy food
- 29 Improve taste of ur food
- 30 Improve the cafeteria seats availability
- 31 improve the food variety
- 32 improve the taste of food

33 Keep going

34 Lower the cafeteria price

35 May be the taste of food can be improvde

36 More healthy food

37 more variety needed for food on menu

38 More varities

39 must improve the environment; increase the food quality and lower the food price

40 Need more improvement

41 new campus

42 occupying seats other than food should not be allowed

43 please avail more variety of food

44 please do overcome this

45 please improve

46 please lower the price and increase the variety of food

47 Plz do something atleast acceptable in new campus

48 Plzz change the cafeteria management

49 Prefer right price for some foods

50 put more varieties of food and quality of food

51 quantity with prices are fixed and stated in menu

52 reduce the price

53 Reduce the price of the food and increase the quality of food.

54 Room for improvement

55 Something new every week atleast

56 Spicy food please.

57 Taste; acceptable serving size and price

58 thank you have a nice day.

59 Thanks for your consideration about changing the food menu.

60 The environmmet of the cafeteria can be better

61 The food and service is well worth it

62 The food here is always sweet and I like solt and spicey

63 there needs to be more food prepared during lunch time as the food often finished fast

64 They should have grilled chicken or good salad

65 Time to open new campus for more space.

66 Try different menu everyday

- 67 Variety of food and drinks can be added and the environment can be more lively and able to accomodate more people to eat
- 68 We need more space
- 69 Western style should also be survey
- 70 You should introduce pakistani foods too atleast Africans are familiar with some of them

Negative Comments

- 1 APU Cafeteria is too crowded and once the food is finished they don't refill.
- 2 apu needs to start serving decent food
- 3 APU system is too good but tpm campus canteen not good and all Malay dishes so you focus the forieghner dishes and introduce
- 4 Cafeteria service needs a serious makeover..It's terrible. Not for for a world class university. Not at all
- 5 Change menu frequently
- 6 Chef need to be fired
- 7 Chose less
- 8 Chose less
- 9 Chose less
- 10 environment is good but pricing is bad; please change the cafeteria
- 11 Everything in the cafeteria just sucks; no matter food quality or the price; especially Alia.
- 12 Food below expectation; pricing is not worth; environment is good
- 13 Good poisoning
- 14 I wish the food can be more nutritious in terms of ingredients. eg brown; wholemeal rice
- 15 if possible to let all the cafe to give more variety of food and keep the place clean and tidy
- 16 include more choices
- 17 It will be great if the cafeteria improve their foods as well as environment
- 18 It's so bad
- 19 lack of variety on the menu
- 20 Need International food like Arabic
- 21 Need to have a variety of food choice; with good taste ; and affordable
- 22 Noisy
- 23 not really good
- 24 Nothing have healthy food n boost drinks
- 25 please take action on that cafeteria and the workers there
- 26 Prefer different menu instead of having same mamak hotel menu like everywhere
- 27 serve other type of food not only for malaysians
- 28 Sometimes the food doesn't taste good and it takes long
- 29 sometimes the food taste bad sometimes average but never okay
- 30 The AC is not really working.It's a bit warm at the cafeteria
- 31 The Cafeteria smells terrible.
- 32 The food available in the cafeteria is satisfactory however they lack variety of food to cater to foreign students

- 33 the food is always finished by 2pm
- 34 The food portion sometimes are too little; the meat they give is little
- 35 The food should not be exposed to flies or flying insects ; it should be covered even to keep up the heat of the food
- 36 The food's expensive for the quality we get
- 37 The place requires attitude adjustment. That's the core of the issue
- 38 The price at the cafeteria is a bit high
- 39 The price is unstable and high
- 40 The pricing needs some fixing
- 41 the taste is not good
- 42 there are a lot of insects in cafeterias
- 43 There are no words to describe it. Change food
- 44 they hell expensive
- 45 University need to put more investment on Cafeteria
- 46 variety food
- 47 you should consider food variety for internationals too not only locals