Spending Profiles of Sultan Idris Education University Undergraduates: A CHAID-Based Segmentation

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Abstract

Issues on college students spending behaviour have been studied numerous times due to improper use of education funds. Various studies examined determinant factors for this misbehaviour in order to understand, identify and recommend ways to educate these future generations. Some documented relationships between financial behaviours and financial literacy, money beliefs and socialization agents. This study walks the same path but focuses on spending behaviour rather than financial behaviour and examines its association with determinant factors by means segmentation analysis. The aim of the study is to profile Sultan Idris Education University undergraduates' according to their spending using a decision tree analysis procedure called Chi-squared Automatic Interaction Detector (CHAID). CHAID generates predictive tree models by segmenting based on predictor variables which include demographic characteristics, program of study related traits and funding aspects that were utilized to profiles students' spending. Spending in this study excludes most incurred expenditures namely living and subsistence costs. Spending profiles were determined based on 751 feedbacks received from business students of Sultan Idris Education University. It was found that, top five most incurred non-subsistence expenses were personal hygiene products, study materials, telecommunications services, clothing and health products. Interestingly, all these five types of spending can be segmented according to only one predictor variable namely, faculty. It can be assumed from this results that, spending profiles are shared within the same faculty. Since spending profiles can be differentiated between faculties, it can be recommended that education programs directed at influencing spending behaviour should be tailor-made according to faculties.

Keywords:
Spending behaviour, undergraduates, Sultan Idris Education University, Chi-squared Automatic Interaction Detector, decision tree analysis

INTRODUCTION

The idea of having full authority over own expenses is a gateway to freedom and one of indicators of becoming an adult. Previously under the care of parents/guardians, these college students were entrusted to manage various matters on their own especially financial affairs. Majority of these students were funded by education loans, whilst those with academic achievements and other fields may have been offered scholarships and others sponsored by parents (Norhaslinda Daud, Norlia Mat Norwani, Rohaila Yusof, 2018). Issues on whether these funding were spent appropriately may have been brought into the spotlights several times (Beale & Cude, 2017; eMarketer, 2014; Paul, Nolan, & Smith-Hunter, 2017; Sorooshian & Teck, 2014; Wang & Xiao, 2009). Concerns in regards to the sufficiency of these financial aids and how it was utilized, were given many attentions (Abdullah & Ibrahim, 2007; Avery & Turner, 2012; Beale & Cude, 2017; Ismail & Zainal, 2004; Lynch, Best, Gutierrez, & Daily, 2018). However, interpreting the word 'need' itself may have been diverse due to varying lifestyles and perceptions on money. What the students believed they need may not necessarily accompanied by rational justifications.

Therefore, the study investigates types and amount of spending on non-subsistence expenses and whether these spending can be segmented according to specific characteristics.

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Thus, objectives of the study include identifying types and determining amount of spending by means of ranking top ten most incurred expenses. Second objective is to segment these spending according to predictor variables by generating CHAID decision tree. It is important to note that Objective 1 excludes spending on subsistence such as food & beverages, accommodations and transportations. The reason for this is that, these expenses are within the category of 'must incurred' and therefore could not be used as indicator for types of expenditures the students *choose* to spend on. Constructively, it is hope that the study will set the path for university top management and other authoritative organisations to understand students' spending in regards to students' needs and factors influencing this behaviour. The results could assist in developing modules for training, seminars or counselling in regards to financial management for their current and future endeavours.

LITERATURE REVIEW

There are numerous studies that documented college students' spending behaviour. These include examining from various angles such as trend of spending (Desrochers & Hurlburt, 2014, 2016; eMarketer, 2014; Jorgensen, Foster, Jensen, & Vieira, 2017), determinant factors (Ching, Tang, Wu, & Yan, 2016; Muniady, Al-Mamun, Permarupan, & Zainol, 2014; Serido et al., 2015) and relationship between money beliefs and spending (Gentina, Shrum, Lowrey, Vitell, & Rose, 2018; Harnish, Bridges, & Karelitz, 2017; Lemrová, Reiterová, Fatěnová, Lemr, & Tang, 2014; Masuo, Malroutu, Hanashiro, & Kim, 2004). There are also ample of studies on the misused of credit cards by college students (Anderson & Card, 2015; Paul et al., 2017; Singh, Rylander, & Mims, 2018). In one of the findings, it was found that geographical factor plays a role in the types of spending incurred by college students (Jorgensen et al., 2017). While another survey, found that top five spending of US College students are restaurants, trips/travel, beauty, bars and fashion (eMarketer, 2014). Whilst, Malaysian college students exhibited top spending on fast food, telecommunication services, entertainment, clothing and shoes (Sorooshian & Teck, 2014).

As for spending behaviour in regards to the use of credit cards, Hayhoe, Leach, Allen, and Edwards (2005) found that those without credit card did not feel financially dependent nor felt that they need to feel better or impress others with money. These type of behaviours is what can be considered as money beliefs, or how one perceived and behaved towards money (Lemrová et al., 2014; Masuo et al., 2004). Simultaneously, the study (Hayhoe et al., 2005) documented higher cognitive credit results for those who did not owned a credit card. This outcome indicated that students with higher score have better understanding on the functionality of credit card and thus decided not to own a credit card. Interestingly, even though the study was conducted more than a decade ago, the findings however seems to be supported by recent studies. For example Paul et al. (2017), concluded that if students were satisfied with their intelectual life in college, they are less likely to fall under financially at risk category which then would lead to credit card misused.

There are also various studies conducted in Malaysia within the context of spending behaviour. Zendehdel, Paim, and Osman (2015) found that online shopping is widespread among university student in Klang Valley area. Meanwhile, Sorooshian and Teck (2014) documented phone expenses as significant spending for Taylor University students. Other studies include examining factors influencing spending behaviour, (Muniady et al., 2014), luxury product purchasing (Ayupp, Ling, & Tudin, 2013), criteria for mobile phone purchasing (Mokhlis & Yaakop, 2012) and overall use of education fund (Abdullah &

Ibrahim, 2007; Ismail & Zainal, 2004). There is also a study that documented overspending by Malaysian students (Jalil, Yusof, Rambeli, Samsudin, & Zakariya, 2015).

These finding were mostly conducted through survey and analyzed using descriptive and inferential analysis. Taking a different approach, this study utilized the segmentation analysis through a decision tree procedure called Chi-squared Automatic, Interaction Detector (CHAID). The CHAID algorithm has specific advantages over statistical inferential analysis such as it does not need to fulfil several assumptions (Baran & Kihç, 2015), for e.g. normality, linearity, additivity and homogeneity (Karakaya, Mehmet, Corbaci, & Cetin, 2018), it automatically select predictor variables that could be used to define a subgroups, detects nonlinear association (Kalender, 2017) and the detection includes the association between categorical dependent variable and multiple independent variables which can be categorical and/or metric (Milanović & Stamenković, 2016). Decision tree analysis especially CHAID have been found to be the most robust against changes in data accuracy within the context of customer market segmentation (Coussement, Van den Bossche, & De Bock, 2014), or in this study university students' spending behavior. Therefore, this study presented predictive decision tree models for spending profiles of university students.

METHODOLOGY

The study employs survey method through distribution of guided-questionnaires and interviews to gather information in regards to students' expenditure. There were eleven questions that acted as predictor variables which include demographic traits such as gender, age, ethnic, marital status, number of dependant, household income and residential. Other questions include faculty, semester, and types and levels of financing. To determine type of expenditure, there were 16 expenditure types listed and respondents were asked to tick as many types of expenditures they incurred. The types of expenditures were gathered from various sources (Deloitte, 2019; Moody, 2018; OnCampus Research, 2018; Singh et al., 2018; Sorooshian & Teck, 2014). To obtain accurate information in regards to amount of expenses, the questions were designed as open ended.

Data gathering occurred between April and May, at various spots in Sultan Idris Education University (UPSI) namely cafeteria, gymnasium, lecture room/halls and other places. The University currently has 9 faculties namely Faculty of Languages and Communication, Faculty of Music and Performing Arts, Faculty of Education and Human Development, Faculty of Science and Mathematics, Faculty of Art, Computing and Creative Industry, Faculty of Management and Economics, Faculty of Sport Science and Coaching, Faculty of Human Sciences and Faculty of Technical and Vocational Education.

Data were analysed using SPSS version 22.0. To serve the first objective, which is to identify five most incurred spending categories by students, frequencies for each category were generated and ten categories with the most tick (√), were selected. Next, the ten expenditures were ranked in ascending order. Minimum, maximum and average spending amounts for each category were determined through descriptive analysis. Meanwhile, to determine spending profiles for top five expenditure types, two-stage decision tree analysis were conducted on the data by employing CHAID procedure in SPSS. The first stage involved running continuous scale expenditure data against CHAID to generate regression tree. The outputs from regression were then, run again in CHAID to produce classification tree models along with predictive power indicator of the models. In this study, the trees were pruned until the predictive power reached 100% correct classification. The classification tree

models were used to test hypotheses of the study in order to determine segmented average spending.

When employing CHAID, the average spending may be segmented using more than one predictor variables. As a result, each categories may have more than one average spending and each average spending may be represented by more than one segments. This is because, the algorithm will split the nodes for average spending according to segmentation when $p<0.05$. More splits meaning more segments and each segment will generate an average spending. The resulting nodes were further divided into various nodes with smaller sample size by other descriptors. Each nodes represent mean spending for each classification according to predictor variables with significant relationships. The splitting stopped if there was no significant different between the variables. Average spending with less than 100% predicted correct classifications were omitted from the analysis and thus yielding final version of spending profiles for respondents.

FINDINGS

Out of nine faculties, adequate completed feedbacks were received from only 6 faculties. Faculties that were excluded from this study were Faculty of Languages and Communication, Faculty of Music and Performing Art and Faculty of Arts, Computing and Creative Industry. However, out of 799 questionnaires, only 751 were deemed usable for analysis. Table 1 illustrates number of respondents according to faculty and from this point forth, the faculties were abbreviated as in Table 1.

Table 1: Respondents according to Faculty

Faculty	Abbreviation	Frequency	Percentage
Education & Human Development	FPPM	109	14.5
Human Sciences	FSK	150	20.0
Management & Economics	FPE	106	14.1
Science & Mathematics	FSM	114	15.2
Sports Science & Coaching	FSSKj	122	16.2
Technical and Vocational Education	FPTV	150	20.0
	Total respondents	751	100.0

Demographic traits of the respondents showed that majority of them were females (62.9%); aged between 21 and 23 (65.8%), largest ethnic is Malay (83.5%), most were single (97.6%), with household income less than RM2000 (58.1%) and between RM2000 and RM4000 (25.6%). Numbers of dependant were distributed quite evenly between 2 and 6 persons per household, with remaining 15% of having more than 6 persons. Other traits such as residential revealed that respondents mostly stay on campus (68.2%); financed mostly by PTPTN (87.4%) and 85.2% of the respondents were fully sponsored by their education loan/scholarship. In regards to semester of study, since the distribution was disproportionate, the data was transformed to be grouped according to year of study. Therefore, the respondents comprised of 268 (35.7%), 192 (25.6%), 131 (17.4%) and 160 (21.3%) of first, second, third and final year students respectively.

The data were further analysed to list out top ten spending categories. Table 2 illustrates ranking of ten most incurred expenses by students in ascending order. It is important to note that, subsistence expenses such as food and beverages, transportations and accommodations were excluded from the studies. However, from the average spending viewpoint, the ranking differs. For example, the highest average spending amount is from study materials with RM67.80. This is followed by clothing/apparel category (RM56.20), personal hygiene (RM49.00), telecommunication (RM44.30) and sports equipment (RM37.75).

Table 2: Top Ten Incurred Expenses other than Subsistence (Per Semester)

Ranking	Type of product/ services purchased	% incurred	Minimum (RM)	Maximum (RM)	Average spending (RM)
1	Personal hygiene	91.2	0	700	49.00
2	Study Materials	87.2	0	600	67.80
3	Telecommunication	76.3	0	1000	44.30
4	Clothing/Apparel	73.4	0	650	56.20
5	Health	51.9	0	500	24.60
6	Entertainment	43.5	0	400	22.60
7	Cosmetic	41.4	0	500	20.45
8	Sports equipment	33.2	0	4500	37.75
9	Travel & Sight seeing	30.5	0	800	25.67
10	Electrical/Electronic	30.0	0	500	17.90

However, normality tests showed that the data was not normally distributed and therefore, parametric measurements were not appropriate to be used. Data distribution of open ended financial responses such as income and spending were commonly found to be non-normal (Banerjee, Yakovenko, & Di Matteo, 2006; Gelman, Kariv, Shapiro, Silverman, & Tadelis, 2014; Souma, 2001). This may due to the fact that, the amount of spending between individuals may incurred at any point of values which caused a wide-ranging interval. For example, the smallest spending gap was Entertainment which was between non-spending (RM0) and RM400.00. Whereas, spending on sports equipment has the biggest interval which range between 0 to RM4,500.00. These types of responses would cause extreme outliers, however they were not omitted from data analysis of the study. To overcome this and following other studies with non-normal data, the study utilises non-parametric technique for further analysis.

Out of ten expenditures, top five most incurred expenses which were hygiene products, study materials, telecommunication products/services, clothing/apparels and health products were further analysed to identify spending profiles of each category. The first step to determine spending profiles was by filtering any RM0 spending data. This was conducted accordingly in respect of each category in ensuring that only those incurred spending in that category would be included in the analysis. To do this each metric spending data were run against CHAID to generate predictive model. Example of this model is illustrated in Figure 1. The selected mean were Node 1 (RM 8.24), Node 3 (RM35.43), Node 4 (RM61.05) and Node 5 (RM87.61).
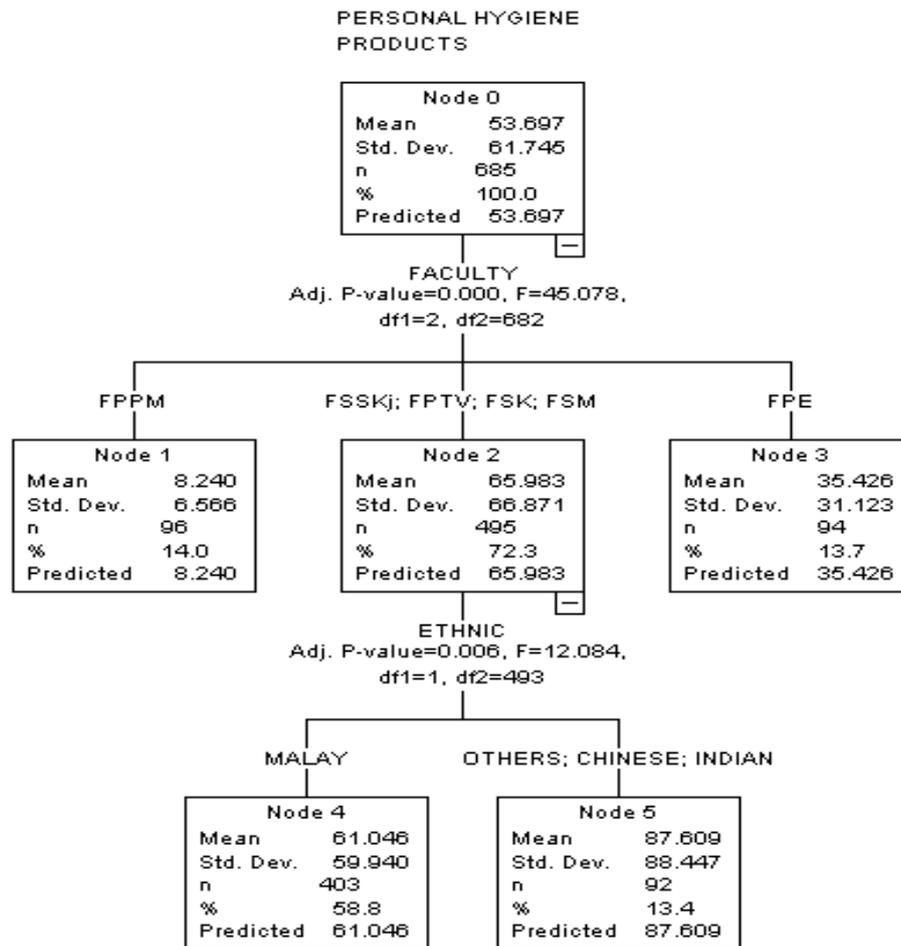
Figure 1: CHAID regression tree

This data was later transformed into categorical form in order to determined predicted power of correct classifications. As mentioned earlier, only mean spending with 100% predicted correct classifications were chosen to build the final model. The final version of the model was demonstrated in Figure 2. Figure 2 illustrated the profiles of spending on hygiene products. It showed the spending could be predicted according to two predictor variables which were faculty at level 1 and ethnic at level 2. FPPM students could be predicted to spend an average of RM8.24 per semester on hygiene product, whilst FPE students spent an average of RM35.43. Those at FSSKj, FPTV, FSK and FSM were further profiled according to ethnicity, where Malays from these faculties spent an average of RM61.05, meanwhile other than Malay spent an average of RM87.61.
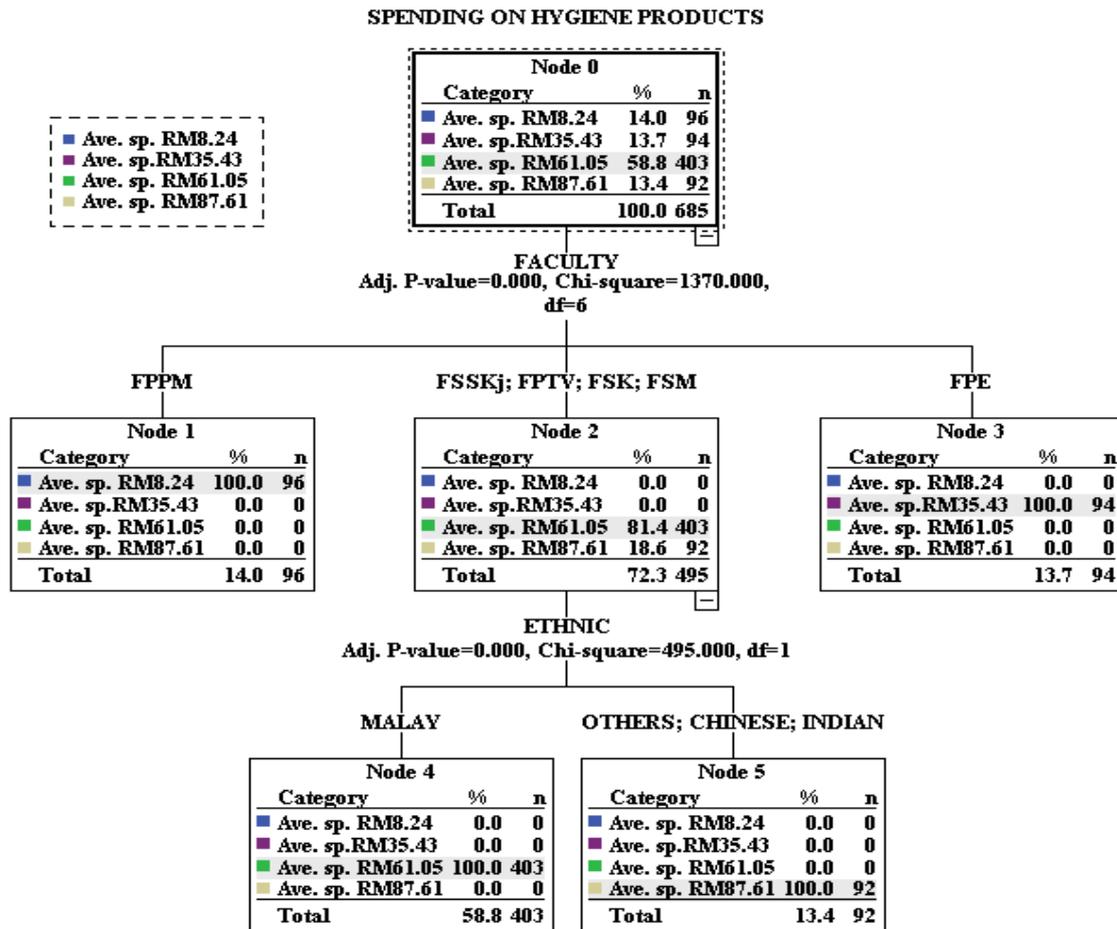
SPENDING ON HYGIENE PRODUCTS

Figure 2: CHAID tree: Personal Hygiene

Figure 3, 4, 5 and 6 were the predictive models' final version of the other four spending profiles categories with 100% predicted correct classifications. Figure 3 illustrated spending profiles for study materials category. The decision tree for metric data version produced five average spending. However, in Figure 3 there were only three average spending classifications: RM10.35, RM72.53 and RM104.15. Two additional spending average classifications were RM79.16 and RM126.69 were omitted in the final version due to having less than 100% predicted correct classifications. As shown in the figure, spending on study materials could also be profiled according to faculty with FSSKj, FSM, FPTV and FPE clustered into one group. Using education sponsorship to purchase study materials by students from FPPM yielding the lowest spending average with RM10.35 per semester, followed by the clustered group with RM72.53 and finally the biggest spender in this category was FSK with RM104.15.
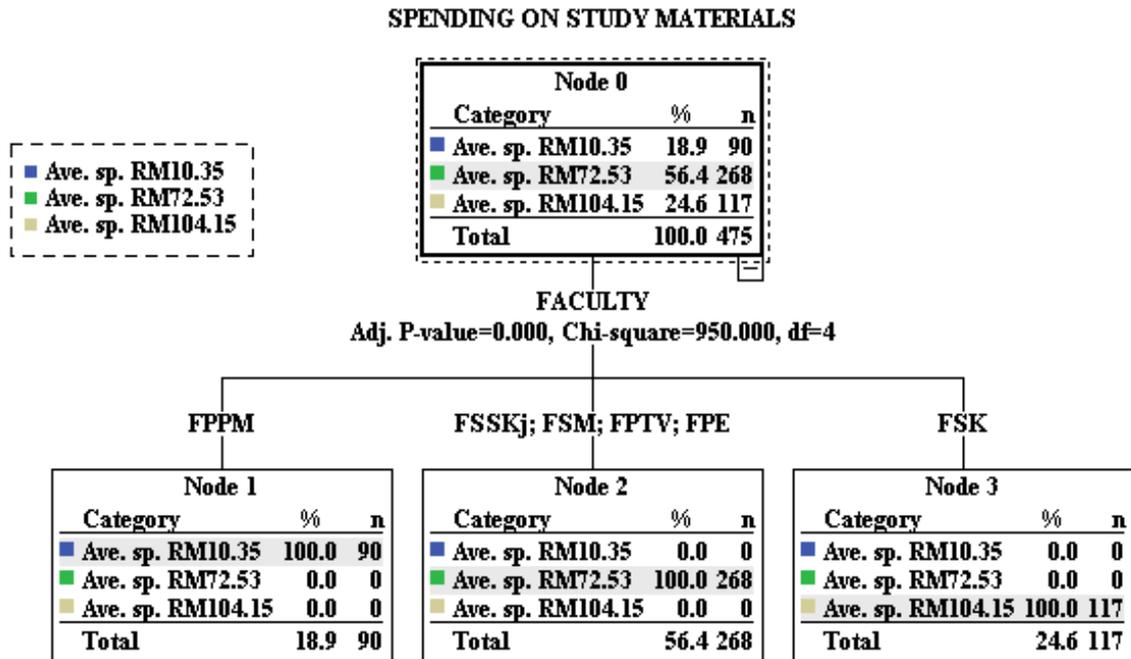
SPENDING ON STUDY MATERIALS

Node 0		
Category	%	n
■ Ave. sp. RM10.35	18.9	90
■ Ave. sp. RM72.53	56.4	268
■ Ave. sp. RM104.15	24.6	117
Total	100.0	475

Legend:
■ Ave. sp. RM10.35
■ Ave. sp. RM72.53
■ Ave. sp. RM104.15

FACULTY
Adj. P-value=0.000, Chi-square=950.000, df=4

FPPM

Node 1		
Category	%	n
■ Ave. sp. RM10.35	100.0	90
■ Ave. sp. RM72.53	0.0	0
■ Ave. sp. RM104.15	0.0	0
Total	18.9	90

FSSKj; FSM; FPTV; FPE

Node 2		
Category	%	n
■ Ave. sp. RM10.35	0.0	0
■ Ave. sp. RM72.53	100.0	268
■ Ave. sp. RM104.15	0.0	0
Total	56.4	268

FSK

Node 3		
Category	%	n
■ Ave. sp. RM10.35	0.0	0
■ Ave. sp. RM72.53	0.0	0
■ Ave. sp. RM104.15	100.0	117
Total	24.6	117

Figure 3: CHAID tree: Study Materials

Spending on telecommunication product and services were also characterised by faculty as shown in Figure 4. None of the spending average classifications were omitted in generating the final version. This type of spending demonstrated four average spending classifications with the smallest amount being RM6.85 from FPPM and the most expensive was RM104.94 per semester from FSK, FSSKj and FSM. Average spending from FPE and FPTV were RM38.67 and RM56.79 respectively.
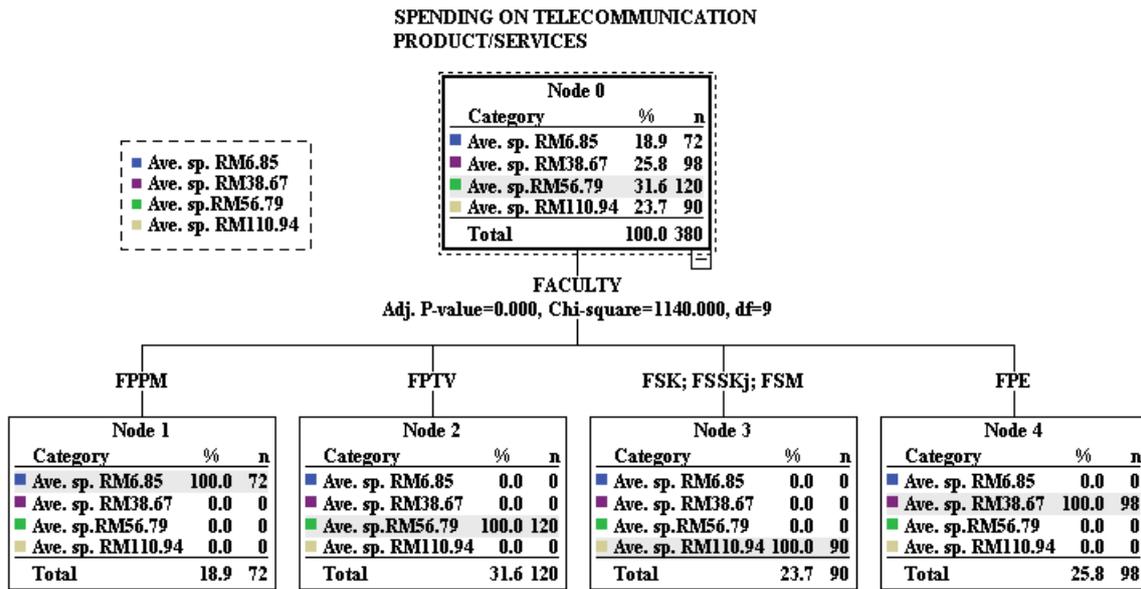
SPENDING ON TELECOMMUNICATION PRODUCT/SERVICES

Node 0		
Category	%	n
■ Ave. sp. RM6.85	18.9	72
■ Ave. sp. RM38.67	25.8	98
■ Ave. sp.RM56.79	31.6	120
■ Ave. sp. RM110.94	23.7	90
Total	100.0	380

Legend:
- ■ Ave. sp. RM6.85
- ■ Ave. sp. RM38.67
- ■ Ave. sp.RM56.79
- ■ Ave. sp. RM110.94

FACULTY
Adj. P-value=0.000, Chi-square=1140.000, df=9

FPPM

Node 1		
Category	%	n
■ Ave. sp. RM6.85	100.0	72
■ Ave. sp. RM38.67	0.0	0
■ Ave. sp.RM56.79	0.0	0
■ Ave. sp. RM110.94	0.0	0
Total	18.9	72

FPTV

Node 2		
Category	%	n
■ Ave. sp. RM6.85	0.0	0
■ Ave. sp. RM38.67	0.0	0
■ Ave. sp.RM56.79	100.0	120
■ Ave. sp. RM110.94	0.0	0
Total	31.6	120

FSK; FSSKj; FSM

Node 3		
Category	%	n
■ Ave. sp. RM6.85	0.0	0
■ Ave. sp. RM38.67	0.0	0
■ Ave. sp.RM56.79	0.0	0
■ Ave. sp. RM110.94	100.0	90
Total	23.7	90

FPE

Node 4		
Category	%	n
■ Ave. sp. RM6.85	0.0	0
■ Ave. sp. RM38.67	100.0	98
■ Ave. sp.RM56.79	0.0	0
■ Ave. sp. RM110.94	0.0	0
Total	25.8	98

Figure 4: CHAID tree: Communication Products/Services

Finally, Figure 5 illustrated spending on clothing and apparels, whilst Figure 6 showed spending on health products which ranked at number four and five respectively for top five spending using their using education sponsorship. Again, as in the other spending categories, these two categories also could be profiled according to faculty. As shown in Figure 5, there were 3 average spending classifications: RM9.10, RM79.26 and RM92.97. However, in order to produce decision tree model with 100% predicted correct classifications, two other amount were omitted. They were RM34.27 and RM159.78. FPPM students spent an average of RM9.10, FPTV, FSK and FPE RM79.26 and both FSSKj and FSM spent an average of RM92.97
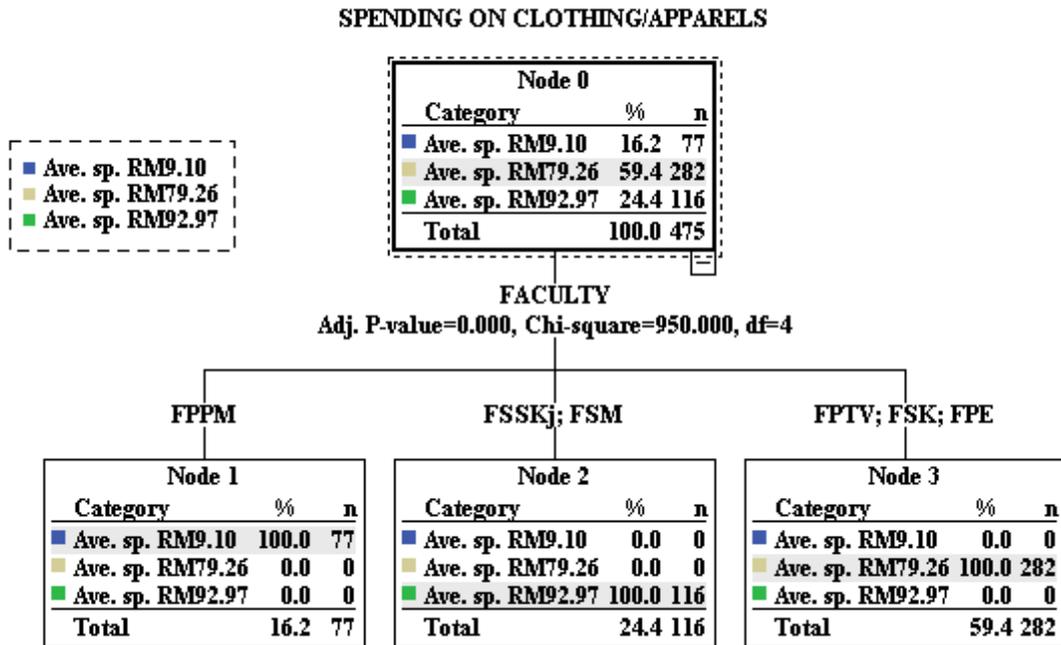
SPENDING ON CLOTHING/APPARELS

Figure 5: CHAID tree: Clothing/Apparels

There was no omission of average spending classifications for spending on health products. The final version for this type of category was depicted in Figure 6. Three average spending amounts were RM7.54, RM37.30 and RM62.82. Students from FPPM spent the lowest with an average of RM7.54. This was followed by FSK and FPE with RM37.30 and finally FSSKj, FPTV and FSM were yielding the biggest amount of RM62.82.
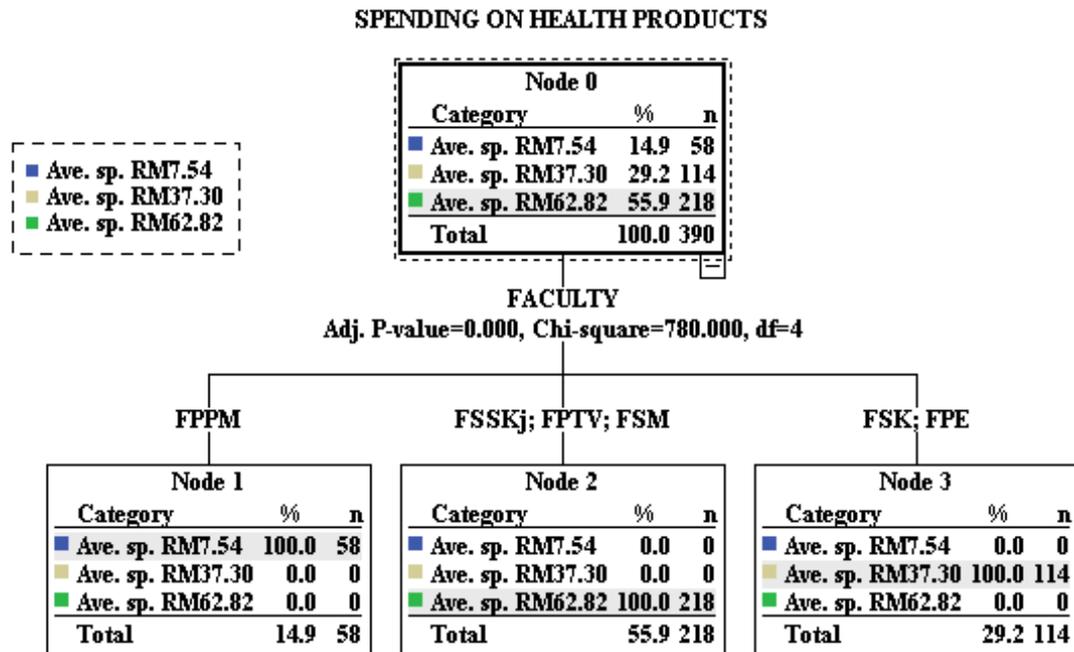
SPENDING ON HEALTH PRODUCTS

Figure 6: CHAID tree: Health Products

DISCUSSION AND CONCLUSION

This study was conducted at Sultan Idris Education University with main purpose to examine undergraduates spending behaviour using a decision tree analysis called exhaustive Chi-squared Automatic Interaction Detector (CHAID) procedure. The study also aims to rank ten most incurred spending categories by students from six faculties. Results indicated that five most incurred expenses were for hygiene products, study materials, telecommunications products and services, clothing and health products which aligned with Sorooshian and Teck (2014). Using CHAID, several average spending amounts were generated according to classifications that were based on eleven predictor variables. However, it was found that only two out of eleven could be used to predict spending behaviour. Predictive models generated by CHAID demonstrated that all five spending categories were influenced by faculties. One additional predictor variable which was ethnic could be used to further predict spending on hygiene products.

Summarizing the average spending results, there were four average spending classifications for spending on hygiene product, three for study material (after omitting two classifications), four for purchase on telecommunication products and service, three for spending on clothing (omitting two classifications) and finally three average spending classifications for health products. Since the result demonstrated the relationship between faculty and spending on these categories, it could be argued purchases by students could probably due to influence by peers. Therefore, further study is recommended to investigate whether this is true and students are influenced by the friend in making purchases. Finally, it was also proposed for this type of study to be conducted at other universities so as to make

comparison between universities and to investigate whether these purchases can be profiled according to faculty as well for all university students in Malaysia.

It is quite interesting that, out of eleven predictor variables, only one variable, faculty, was able to predict students spending. The results indicated that, spending behaviour may be influenced by peers (Gordon and Pemberton, 2018) or, spending may be profiled based on related program of studies. If personality studies tend to flocked individuals' personality according to their type of jobs, therefore it is not so far off if it is assumed that spending profiles may be flocked according to their program of studies. The implication of this finding was that, if there were any programs developed to educate and nurture college students to become more financially responsible in regards to their spending, the content of these courses or modules should be tailor or custom made according to their program of studies. This may assist in ensuring the effectiveness of these types of courses.

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