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Predicting Internet and Mobile Shopping Behaviour of Millennial in Malaysia

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1. INTRODUCTION

Mobile devices has so much infiltrated the essential dynamics of the human life especially in the 21st century to the point that, more than ten hours are spent in a day on mobile devices by humans (Cao and Lin, 2017). Deloitte reports that almost 76 percent (developed) and 81 percent (emerging economies) of consumers are smart phone users, with messaging making 37 percent in developed economies; 35 percent in emerging economies and emails (19 percent in developed; 11 percent in emerging) being the primary use purposes. The adoption of smartphone across the globe is also fuelled by the emergence of mobile applications known as "Apps" (Geffet and Blau, 2016). In a recent publication, Statista (2017) showed an increase in the number of mobile applications released in Google Play Store (the official application store for Android driven mobile application market) from more than a million in July 2013 to approximately 2.8 million in March 2017. More than 65 million downloads were recorded as of May 2016. In the context of Apple brand, a total of 2.2 million mobile applications have been registered with Apple store as of March 2017 with the accumulated downloads of 140 billion up to September 2016. In terms of mobile shopping, PwC (2016) reports, that 46% of the world's global population are mobile shopping patrons. In a related report, the U.S. Department of Commerce (2016) highlighted the sharp rise of e-commerce growth of 15.6 percent year on year in the

United States, in 2016 amounting to USD350 billion of total global retail sales in the same year. From the view point of industry as per the earlier discussions above, it is not difficult for one to notice that, Internet and mobile shopping has now become a growing global phenomenon. In the realm of academia, studies by Poushter (2016), Chiu et al. (2016), and Peddle et al. (2017) provide empirical evidences of strategic use of the Internet for e-commerce, online banking, e-government and others. Zeroing into the peculiar context of Malaysia, studies by Wok and Mohamad (2017) for instance sheds light on the extent of Internet and mobile consumption penetration in the Malaysian economy. Despite the extensive literature in the context of Malaysia, there has not been a robust methodological examination of the dynamics of Internet users' profile as well as mobile shoppers' profile. While a pure description of the users and shoppers are useful, a detailed analytics on how people behave given different alternatives would provide insights into what clicks and what does not. It is also observed that, the use of predictive analytics has not been done in the context of internet and mobile shoppers' profiling and this provide a basis for the current research. The behaviours will be captured by modelling different paths of alternatives especially in terms of who are the core users of internet and the interactions between such users' demographics for internet use and mobile shopping events. Knowing which user will take which path when it comes to internet and mobile shopping would be able to assist different stakeholders especially marketers. For instance, a predictive analysis driven knowledge on the device a user uses to access Internet could foster "device" specific marketing such as In-App advertisement to that particular user. Profiling using common analysis may not "tell" such stories. It can only be done by using advanced analytics. This study intends to fill such a research gap. To this extent, the aim of this study is to undertake a predictive analysis of millennials' internet and mobile shoppers' behaviour.

2. RELATED LITERATURE

Internet Use

Internet is a global system of connections between computers that allows almost instant access to and dissemination of information. The World Wide Web has become a huge source of knowledge repository and activities bank with significant influence on people's daily life owing to the emergence of the internet (Oskuoei and Chaudhary, 2010). There are a total of 3.8 billion internet users across the globe as of March 2017 (www.internetworldstats.com), with the Asian region accounting for 50 percent of the total users. Advancement such as the wireless networking or WiFi and mobile connectivity (e.g. 3G or 4G) has given high speed access to Internet. Deloitte (2016) reports that WiFi is the most preferred method to Internet connectivity in the Americas region, while 4G remains a preferred mode for European and Asia Pacific consumers. Factors such as age, gender, income level, average level of education and competition among Internet service providers have been quoted as being the primary factors of growth of Internet usage (e.g. Li and Kirfkup, 2007; Coneus and Scheife , 2010; Johnson et al. 2011; Penard et.al, 2015. Akman and Mishra (2010) demonstrated the positive association between gender, age and information search via the Internet in Turkey. In terms of hours spent online, Ozkisi and Topaloglu (2014) revealed that most students tend to spend 3-4 hours per day on the Internet and as the students age increase, the numbers of hour they spend online also grows. The authors also found that the sample students use the Internet for social media purposes namely Facebook and Twitter as well as shopping online. In the peculiar case of Malaysia, the rise of internet penetration began with the

government's initiatives which saw the launch of TM Net in 1995 (Munusamy and Ismail, 2009). The launch of the Multimedia Super Corridor (MSC) in the early 1990s also paved way for the adoption of Internet and its technologies in the country (Lean and et,al, 2009). Sipalan (2013) highlighted the notion of Malaysia being ranked as the fourth-highest proportion of "digital natives" in the world with 13 percent of the population reported to be on the 'net' as of 2012. Recent statistics show that the users have increased dramatically and stood at 21 million users as of 2016 (Miniwatts Marketing Group, 2016).

Records in the 2016 Malaysia Digital Landscape published by the Malaysian Digital Association (2016) show that Malaysians are spending an average of 5.1 hours a day on internet with nearly 3 hours for social networking. In terms of socio demographics, there are more male Internet users than female. For example, in a recent survey, the Malaysian Communications and Multimedia Commission outlined that for every 5 Internet users, there are at least 3 men (59 percent) accessing the Internet for an average 19 hours weekly. In terms of age range, Malaysians in the age range "22-25 years old" are the dominant group with an average of 30 minutes spent online (Malaysians Digital Association 2016). Regarding internet use by the domain of education, it was found that, internet users were largely from the educated group spanning across tertiary students through to the upper secondary level (Malaysian Communications and Multimedia Commission, 2016). Interestingly, the frequency of average hours spent online increased alongside the level of educational attainment among individuals who received formal education. In terms of the devices used to access Internet, it has been reported that the most preferred device for Malaysians are smartphone (89 percent). This coincides with the rising level of smartphone ownership among Internet users from 74 percent in year 2014 to 90 percent in 2015. Among the online activities, communications applications were the leading services used (i.e. 93 percent).

Mobile Shopping

Mobile shopping offers increased degree of convenience to shoppers since browsing and purchasing products and services have been made easier due to the mobility of smartphones (Yang and Kim, 2012) (Gupta and Arora, 2016). Online players like Amazon and eBay, Lazada and Zalora strategically launched their mobile applications to offer better shopping experience for their users via mobile phone. As reported in the China Internet Watch (2016), approximately half the number of consumers across Asia Pacific are mobile shoppers. In the context of the United States, a total of 125 million smartphone users have made online purchase using their mobile device as of 2015 (Smith, 2017). Meola (2016) forecasted that mobile commerce will reach $284 billion or 45 percent of the total U.S e-commerce market

Despite the hike in mobile commence in countries like U.S, China and India, mobile shopping in Malaysia is still at an infant stage (Chong et al., 2012). The evolution in telecommunication service has also paved way for such a growth in Malaysia. The strategic partnership between Maxis and Lazada for instance has created a new wave of mobile commerce adoption (Goi, 2016). This has triggered a significant number of e-payment processing with PayPal recording a USD4.9 billion payment processing as of end of 2015 (Leng, 2016). Some of the top categories of mobile

commerce purchasing in Malaysia are electrical goods, fashion and accessories, food and beverage, health and beauty products and home products (Leng, 2016).

3. METHODS AND TECHNIQUES

The research adopted the quantitative method which involves numerical data collection using techniques such as questionnaire (Sekaran and Bougie, 2011). This approach was deemed appropriate as regards the objectives of the research as which considers predictive analysis on Internet use and mobile shopping behaviours. Predictive analysis entails numerical data driven extrapolation, thus use of textual data (qualitative driven) would not fit. From the viewpoint of the design of the research, both descriptive and explanatory research approaches were used as the study focuses its lenses on the behavioral pattern of internet use and mobile shopping of millennials in Malaysia. Basically, the Exploratory Approach becomes useful when the researcher wishes to understand an issue, problem or phenomenon from a broader perspective, which will then be narrowed as the research progresses. In addition, the Explanatory research aims to establish a causal relationship between variables of interest. This approach emphasises establishing a fundamental relationship between variables before conducting further analysis to obtain a clearer view of the relationships – be it in a regressive form or any other. A descriptive research on the other hand, is generally selected to gain an accurate profile of events, persons or situations. This approach could be an extension of an exploratory research or a forerunner to an explanatory research. Data evaluation and synthesising ideas are required for the researcher to proceed further proceed in establishing the relationships between variables of interest (Saunders and et.al, 2016).

To aid a more convenient mode of data collection, a sample of millennials in Malaysia was collected from a private university located within the Klang Valley. The total population of millennials in the private university was 11,600. Using the probability sampling approach, a minimum sample size of 372 was determined using the Raosoft sample size calculator (with a 5 percent margin error of and a 95 percent confidence level). In extracting the needed information, participants were presented with a five-segment questionnaire comprising 29 questions. The first section informed on the title and purpose of the survey along with ethical requirements. The next section probed on the demographic profile of the respondents. All the questions must be answered by the respondents (i.e. compulsory). The third section comprised questions geared towards identifying the Internet behaviour of the respondents. The final section consisted of questions designed to identify the mobile shopping behaviour of the respondents.

Application of Data Mining

The data collected in this study was mined using the classification technique. Predictive analysts prefer this technique due to its capability of learning a generalized relationship between the predicted target variable with all other input attributes from a known data set. The Decision Tree algorithm was employed within this parameter. This tool partitions the given data into “purer” subsets as per the values of input attributes (Kotu and Deshpande, 2015). This implies that the dataset is separated into classes belonging to the response variable and influence the chosen dependent variable. If the response has more than two categories, then variants of the decision tree algorithm will be developed (Quinlan, 1986). This is equivalent to a decision flowchart with attributes test in each node. At end of the

decision tree path is a leaf node – where a prediction is made about the target variable based on conditions predetermined by the decision path. The key issue here is to separate the data set based on homogeneity of data.

In this study, the Random Forest Decision Tree technique (Breiman, 2001) was chosen via the RapidMiner software (version 7.5). The random forest technique was selected as it considers a random subset of all the attributes in the training set when it comes to splitting the nodes. Further, two levels of randomisation will be undertaken to minimise generalisation error. The following steps are applicable:

When there are *n* training data with *m* attributes, and with *k* being the number of trees in the forest, then for each tree (extracted from Kotu and Deshpande, 2015, p.160):

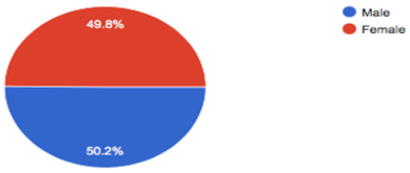
1. An *n* random sample will be selected with replacement
2. A number *D* is selected, where *D* <<*m*. *D* determines the number of attributes to be considered for node splitting.
3. A decision tree is started. For each node, instead of considering all m attributes for the best split, a random number *D* attributes are considered. This step is repeated for every node.
4. As in any ensemble, the greater the diversity of the base trees, the lower the error of the ensemble.
5. Once all the trees in the forest are built, for every new record, all the trees predict a class and vote for the class with equal weights. The most predicted class by the base trees is the prediction of the forest.

4. FINDINGS AND DISCUSSIONS

Respondents Demographics

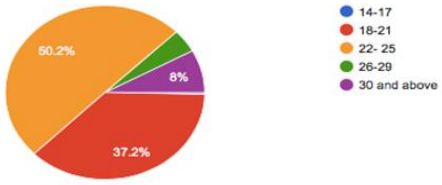
The demographic profile of the participants comprised of gender, age range, education level, education status, course of study, residential postcode, smartphone brand and system, telecommunication provider subscribed and the monthly data package subscribed to.

Gender



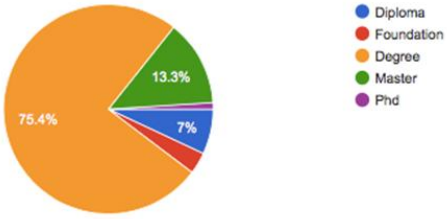
A balanced gender view has been obtained with 50.2% male and 49.8% female respondents. This gives the confidence that the study will be able to undertake a balanced predictive analysis of Internet use and mobile shopping behaviours.

Age



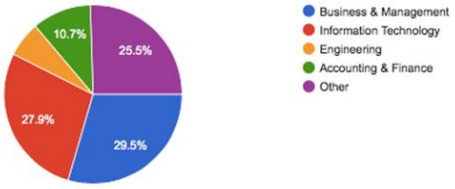
Differences in age group are clearly seen. Nearly half of the respondents (50.2%) were from the "22-25" age group while the "18-21" age group comprised of 37.2%. The remaining 8% were in the "30 and above" and only 4.6% were in the "14-17" age group. This infer that majority of the respondents are probably matured enough to make informed decisions when it comes Internet use and mobile shopping.

Educational Level



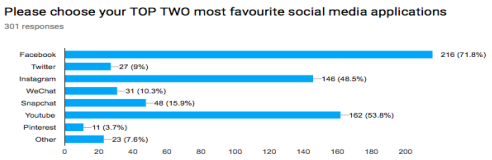
The result shows that majority of the respondents were those pursuing undergraduate degree programmes (75.4%). A small percentage of them are Master's degree students (13.3%) while the rest of them are studying Diploma (7%), Foundation programme (3.3%) and PhD (1%).

Program Enrolled



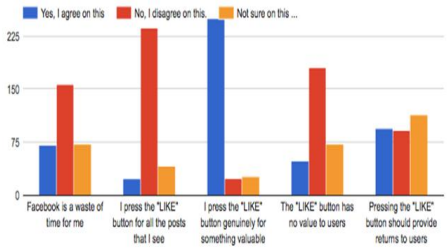
When it comes to the courses that the respondents' were enrolled to, 29.5% were from Business & Management programme, while 27.9% of them were from the Information Technology courses. The number of respondents' enrolled in Accounting & Finance and Engineering is 10.7% and 6.4%, respectively. There were also 25.5% of respondents who choose "other" programmes. There seem to be a balanced view here – as size variation in the courses enrolled seem to be marginal in most contexts.

Favourite Social Media Applications



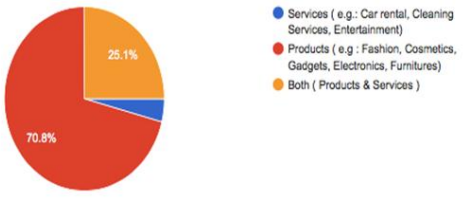
This question asked respondents to suggest their top two favourite social media applications. The respondents are mostly into Facebook (N = 216, 71.8%), followed by YouTube (N = 162, 53.8%) and Instagram (N = 146, 48.5%). Applications such as Twitter (N = 27, 9%), Pinterest (N = 11, 3.7%) and Others (N = 23, 7.6%) seem to be are the least preferred.

Facebook Use Pattern



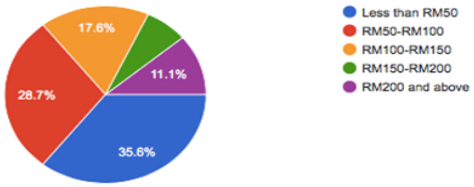
Since Facebook was selected as the top preferred social media application by most respondents, further enquiry was made on Facebook use pattern exclusively. The respondents were asked if they agree, disagree or unsure on a series of five questions. About 157 of the respondents felt that Facebook is a waste of time while 71 respondents disagree with that assertion. 73 of the respondents were however unsure about the statement. The subsequent questions experimented on the "Like" button feature available within Facebook. Most of the respondents (N = 236) disagreed on the statement "I press the LIKE button for all the posts that I see". In contrast, 250 respondents agreed on the statement "I press the LIKE button genuinely for something valuable". Majority of them (N = 160) disagreed that the "The Like button has no value to users". Finally there is a balanced view on the statement "Pressing the Like button should provide returns to users" with 78 of them agreeing, 76 disagreeing and 83 being uncertain. In sum, most the respondents are really fans of Facebook with a strong believe that using Facebook is not a waste of time and that the "Like" button is a preferred component in Facebook and used geneuinely rather than in a "viral" form. This infers that the respondents do not press the Like button just because it is there – but rather for a real purpose. Lastly respondents are divided almost equally when it comes to Liking something provides a return. Three traits of behaviour are observed here: (i) genuine Likers; (ii) genuine Likers with a hint of anticipating returns for liking something; and (iii) the fence-sitters, that is those who are not sure on the *Like-Returns* phenomenon.

Preferred Shopping Categories



This question probed on the respondents preferred shopping categories such as car rental (service category), fashion (product category) or a combination of both categories. It was found that 70.8% of the respondents patronized products more than services (i.e. 4.1%). The remaining 25.1% of the respondents prefer to buy both products and services.

Mobile Shopping Spending Power



This aspect probed into the spending power of the respondents. As shown in the chart above, 35.6% of the respondents actually spent less than RM50 a month to buy online. Another 28.7% of them seem to be spending RM50-RM100 a month, while 17.6% of them spend in the range of RM100-RM150 per month. A small percentage of the respondents (6.9%) indicated spending around RM150-RM200 per month. Lastly, 11.1% of the respondents said that they spent RM200 and above on mobile shopping in a month.

Millennials' Internet Use and Mobile Shopping Behaviours

The third objective of this study is to use data mining technique to model Generation Y's Internet use and mobile shopping behaviours' decision matrix. This was done using the Rapid Miner software. The intention here is to track connection between the demographic variables with Internet use behaviour and mobile shopping behaviour.

Online activities by hours

Respondents' behaviour related to their hours spent on different digital activities including social media applications, communication applications, gaming and YouTube were mined with a prediction accuracy of 66.35%.

Decision Tree Model (Online Activities Spending Hour)

The analysis informs the following behavioural pattern. The data shows that respondents in general spend more than 3 hours for social media based purposes than general Internet surfing exclusively. In this context, the analysis breaks the behaviour into two paths: 1 – 3 hours and less than 1 hour. First, respondents spending less than hour for social media seem to have spent it for ***communication*** based applications such as WhatsApp, WeChat and so on and so forth. Within this path, the analysis shows subsequent behavioural paths driven by the hours spent, that are the hours respondents actually spend for within communication behaviour. It is observed that the respondents who spend 1 – 3 hours for communication purpose tend to spend 1-3 hours for Internet surfing exclusively (denoted in blue coloured box). Those who spend less than 1 hour a day within communication framework tend to spend more than 3 hours for communication purpose with a small percentage for other purposes. Lastly those spending more than 3 hours within communication actually tend to spend more than 3 hours just for this purpose without any other activities in between. This implies the following behaviours:

- Respondents spending 1 – 3 hours for communication activities using the Internet tend to deviate for other subsequent purposes.
- Respondents spending less than an hour are focused largely for communication exclusively with minimal side-lined purposes.
- Respondents spending more than 3 hours for communication in a day are for it exclusively without any form of interferences.

In another context, respondents behaviour path were also analysed on the hours spent for gaming. The system classified gaming behaviour into three main paths and one subsequent path. It seems that respondents spending 1-3 hours per day for gaming are spending more than 3 hours for gaming exclusively and another smaller percentage for other purposes. For Generation Y who indicated spending more than 3 hours for gaming are actually spending between 1-3 hours only for gaming, while the rest is for other reasons. Respondents who do not play online games at all (not applicable) seem to be spending 1-3 hours for Internet in general and very marginal percentage for online games, probably some form of indirect or unintentional game playing mode. Along this path, respondents who play online games are also associated with YouTube time spent behaviour. Those who access YouTube for more than 3 hours are into it throughout this duration. Those with less than 1 hour path are spending 1 – 3 hours for YouTube in addition to some hours for other purposes. Lastly those with 1-3 hours behaviour are spending 1-3 hours in a day for YouTube purpose exclusively.

CONCLUSION

In this paper, using 305 responses from diversify respondents from Asia Pacific University, Malaysia, the relationship and interrelationship between demographic profiles and Internet use behaviour were discovered. This study has provided insightful overview of the Internet use and Mobile shopping behaviours in Malaysia, which could also be applicable to other developing countries in similar region. This study further analyses the connections between the Internet use behaviour with the mobile shopping behaviour in terms of adoption, frequency and spending power on mobile shopping. Findings obtained revealed that there are significant connections between Internet spending

hours and mobile shopping behaviour. Meanwhile, the researcher develops predictive analysis using data mining classification techniques on the preferences of users on connecting with merchant using their preferences and use of Facebook "like" features. Results show that their Facebook "like" feature behaviour and their preferences can predict their preferences to receive real rewards from merchant by "liking" something on social media especially Facebook.

In terms of mobile shopping, an attempt is made to correlate internet spending hours and mobile shopping adoption of the users. The decision tree confirms that the Internet spending hours were related with the mobile shopping adoption of the users. The model also discovers that data packages subscribed by the users play important role influencing those who spend 1-3 hours online. This results will be helpful for the organization for their future plans and strategies in enhancing their online shopping platforms. In order to win consumer's mobile attention, the online platforms need to deliver an integrated advertising channel through the most common online activities platform. As the online activities spending hour breakdown is provided, the marketers could utilize the findings in deciding on the investment of each platforms. For example, as social media sites is the most common online activities utilized and accessed by the users, marketers who wish to enhance their online shopping platform could develop an effective online marketing and advertisement strategies on social media sites.

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