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Analysis of Mobile Services and Their Impact on Economic Development

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ANALYSIS OF MOBILE SERVICES AND THEIR IMPACT ON ECONOMIC DEVELOPMENT

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ABSTRACT

The primary aim of this paper is to analyze user's adoption of mobile data services under various circumstances. The data for this paper has been obtained from the Worldwide Mobile Data Services (MDS) Survey (Sharma et al, 2014). This research paper also characterizes devices, usually identified as smart phones. Smart phones are sophisticated tools (devices), which can be used for I/O (input/output), processing, storage and for broadband connectivity. The features and functionality of these devices range widely, facilitating browsing the internet as well as applications that utilize authentication, location detection and multitasking.

Such features that MDS provides us have become an inexorable part of our lives. These devices offer us so much that all forms of work and leisure activities that are routine in our day-to-day deeds progressively depend more on them. As a result, the providers of MDS[14] nowadays offer a superfluity of both products and services, which empower patrons to perform a range of work and leisure tasks that are correlated with commercial transactions, networking and communication, information access and content downloading (Garbacz and Thompson, 2007). This is an integral part of the era of ubiquity.

Keywords: Mobile services, IT for development, user survey.

LITERATURE REVIEW

Thaler (1985) examined customer value perceptions from the utilitarian perspective and proposed a hybrid model to evaluate customers' values from two aspects: acquisition value and transaction value. Similarly, Grewal, Monroe, and Krishnan (1998) studied the effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions. In addition, Sheth et al. (1991) extended the value into five aspects, including functional value, social value, emotional value, epistemic value, and conditional value. As an alternative, Holbrook (1999) proposed eight types of value: convenience, quality, success, reputation, fun, beauty, virtue, and faith.

However, these studies neglected the role of economic factors such as cost in consumers' value system. It has been suggested that mobile users assess the perceived value of a product under an overall scheme by taking into account both the benefits and sacrifices (Chang, Wildt& Price, 1994; Dodds, Monroe & Grewal, 1991; Grewal, Monroe & Krishnan, 1998; Monroe,1990). They make decisions based on the premise of maximizing the monetary value. Specifically, the portion of perceived benefits to perceived sacrifices, which indicates an overall assessment of a product value (Zeithaml, 1988).

Research on technology adoption from the value perspective is a longstanding area of scholarly interest. Generally, scholarship in technology adoption has emphasized consumers 'perceived value from an early stage. In Davis' study [1] of perceived usefulness, perceived ease of use, and user acceptance of information technology (i.e., TAM model), he pointed out that an individual's choice of information technology was a cognitive trade-off between the effort to use the technology (i.e., ease of use) and the quality (i.e., usefulness) of the information technology. Building on this, Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) model, in which they examined perceived value trade-off from multiple dimensions such as perceived usefulness, extrinsic motivation, and job fit. With regard to MDS adoption, few studies have applied the concept of values with the notable exception of Kim and Han (2009), who examined the impact of utilitarian, hedonic, and social values on MDS adoption. In the paper by Sharma R.S., Li, E.Y. and Govindraj (ibid), users were measured on three critical factors – social benefits, hedonic benefits as well as utilitarian benefits. And it was analyzed as to how these benefits influence user's perception on various mobile device attributes. This particular research paper also discusses how all these factors work together. The current study focuses on perceived consumer's behavior in the Singapore market. In addition, it also brings to light what kind of wireless services people in Singapore tend to use when they are in different places – namely, Home, On the Go and In Public. It also makes an assessment of how users strike a balance with their monthly data plan and the benefits they enjoy.

THEORITICAL FRAMEWORK

The research implies that the concrete attributes of mobile data services adoption would definitely guide consumers to extort assured benefits for themselves which will lead them to concrete action in decision to purchase and adopt to the services provided by the internet providers (Sharma et al, ibid). Earlier research in the area suggests that technology adoption has favored a sequential chain such as attitudes, beliefs, intentions and behavior (c.f., Adams et al., 1992; Chang and Wildt, 1994; Chiu, 2005; [2]; Marco and Frenkel, 2000; Massoud and Gupta, 2003; Turel et al., 2007; Venkatesh and Davis, 2000).

The classic perceived value paradigm (PVP) from behavioral decision sciences presumes that there exists a cognitive trade-off between perceived cost (quality of effort) and perceived benefits (quality of outcome) in decision-making process (Beach and Mitchell, 1978; Payne, 1982; Johnson and Payne, 1985). It posits that if consumers predict that they could obtain more benefits from the usage of a product or service, they would consequently be more willing to pay for them and use them. This is exactly

what has been measured in this paper in addition to other aspects.

Marco and Frenkel (2000) suggest that product attributes refer not only to observable characteristics like color, shape, size and weight, but also to intangible qualities like brand reputation and product image. They also classify some of these outcomes as functional and psychological benefits. Functional benefits are directly generated when users adopt the product, while psychological benefits are related to social outcomes and satisfactions (i.e., social image, better personal relation and self-advancement). This simple classification has been expanded in the IS and technology management literature. There is considerable agreement in the IS literature that technology benefit may be expressed as utilitarian, hedonic or social (Brown and Venkatesh, 2005; Heijden, 2004; Kim and Han, 2009; Sweeney and Soutar, 2001). Utilitarian benefits are those associated with functionalities of MIDS pertaining to commercial transactions, communications and content downloads; hedonic benefits are the pleasure and fun users experience when using MIDS; and social benefits include self-image and relationship enhancement consequences. Hence, perceived value, which is the net outcome that the consumer obtains after both benefits and costs (product price) are evaluated (Chang and Wildt, 1994; Chen and Dubinsky, 2003; Sweeney andSoutar, 2001; Zeithaml, 1988), determines the consumption action or decision to purchase. Other recent IS studies that have attempted to use the PVP in explaining mobile adoption behaviour include [13] and, Kim and Han (2009). Both studies have reported a positive correlation between perceived value and the adoption intention of consumers.

Drawing on the above theoretical constructs, a research model for MIDS adoption is proposed.

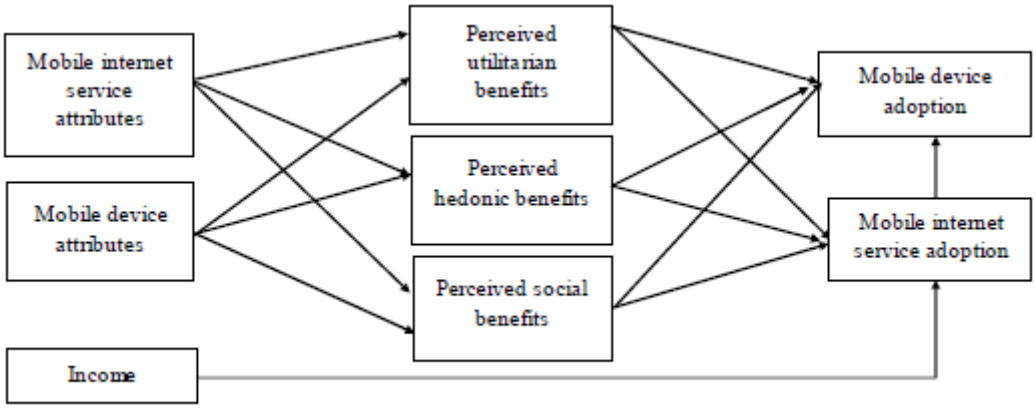

Figure 1: Theoretical Model depicting user's perception of Mobile Wireless Services

Figure 1 shows the model that derives the hypotheses for the analysis. The result tells us the behavior of the Consumers and the correlation between the perceived value and the adoption intention. The model suggests the relationship between consumers' expectation of MIDS attributes and adaptations that results in perceived benefits (Sharma et al, ibid). The model also holds income as one of the main control variables, given the empirical evidence that the people with different incomes may have difference in cost benefit equilibrium. The benefits those are associated with functionalities of MIDS that pertain to commercial transactions, communications and content download, pleasure and fun; self-image and relationship enhancements (Sharma et al, ibid). The adaptive structuration theory (AST) proposed by Anthony Giddens (1984) and perceived value paradigm (PVP) (Beach and Mitchell, 1978; Payne, 1982; Johnson and Payne, 1985) in the model are used to examine the consumer's decision on what determined the adoption of new mobile and services.

In the next section, the hypotheses derived from this model relating to perceived benefits and those relating to willingness to pay are set out in detail.

RESEARCH SCOPE

This paper primarily focuses on the following aspects as to how various users from Singapore are inclined towards mobile wireless services.

- ✓ Visualization of User's perception to various mobile wireless services in different walks of life, such as; personal, on the go, and at home.
- ✓ An analysis and visualization of wireless services that are most commonly used.
- ✓ Visualization between Paying for Applications and Content and the purpose for which people pay for the same - Work, Personal or 50/50 Work and Personal.
- ✓ An assessment of the *Cost of current data plan* versus *Benefits.*

- ✓ Identifying the relationship between the motivation to buy a smartphone and the value a user places on various mobile wireless services and examining whether the relationship is statistically significant?

- ✓ Regression Analysis between both *Internet Access as the Motivation to buy a smartphone* as well as the *Maximum Monthly fee payable for wireless services* against several other variables that describe users' inclination towards mobile wireless services

- ✓ Developing a Structured Equation Model between *Maximum Monthly fee payable for wireless services* against several other variables that describe users' inclination towards mobile wireless services.

The paper aims to present a right mix of the users' buying preferences while purchasing a smartphone and how various wireless services are perceived by users in different scenarios and in varying circumstances.

Furthermore, this paper also addresses the purpose for which mobile wireless services are often used. The purpose has been divided into two – Work and Personal. An assessment is also made to understand how happy users are with their current data plan and whether the cost strikes a balance with the benefits they enjoy.

DATA COLLECTION

The data was collected as part of the Worldwide Mobile Data Services Survey. Both paper-and-pen and web-enabled versions of data collection instruments were used to collect data in Singapore for the pilot run before collecting data from the other countries. The online questionnaire adopted from [16] was posted during the 2009-2010 period using a professional version of the SurveyMonkey tool. Only users with prior MIDS experience were asked to participate, and their user profiles were subsequently used as a check of their internet experience. After the pilot run, more data were collected in Finland, the USA, Korea and Taiwan with paper-and-pen questionnaires and almost a full response rate was achieved in each country, perhaps due to the attraction of receiving pre-paid mobile services cards.

However, the entire procedure of data gathering and questionnaire preparation is beyond the scope of this project. All this work had already been carried out by Sharma, Li and Govindraj as part of their paper "Adoption of mobile internet devices and services: A multinational study" [15]. So, the existing data set for Singapore were used throughout the course of this research.

DATA MINING AND ANALYSIS

Tools/Software used

To get reliable results in terms of both statistical analysis and visualization, a mixture of tools has been used. Data Clexansing, Correlations and Linear Regression have been carried out in *SPSS Statistics*. For the purpose of visualizations, *Tableau* has been used. Structured Equation Modeling has been implemented in *R programming*.

Data Cleansing

Given that the study involved survey data, there were a lot of missing values in the data set. The missing values may be due to respondents dropping out in the middle of the survey or deliberately not answering a specific set of questions. So, data cleansing and the very process of going about this facilitated reliable and statistically significant results.

Substituting null and missing values with the mean and median will not practically make sense with this kind of data set because, firstly, this is a survey data with a wide number of data points and, secondly, the missing data per variable was found to be 22%. Hence the end result will not be accurate enough so as to be measured and to give recommendations. So, missing data in this case, has been dealt with by putting into effect the concept of *Multiple Imputation* by means of *Linear Regression* in SPSS. According to Little RJA & Rubin DB (2002), Multiple Imputation is the most powerful and accurate method to be dealing with incomplete data in a survey data set. Application of the technique requires three steps: imputation, analysis and pooling (Stevfan Burren, 2011).

1. **Imputation**: Impute (=fill in) the missing entries of the incomplete data sets, not once, but *m* times (*m*=5 in our case). Imputed values are drawn for a distribution (that can be different for each missing entry). This step results is m complete data sets.
2. **Analysis**: Analyze each of the *m* completed data sets. This step results in m analyses.
3. **Pooling**: Integrate the *m* analysis results into a final result. Simple rules exist for combining the m analyses.

In this case, the number of iterations was set to 5 and the type of multiple imputation was set to Linear Regression. This way, each missing variable selected was iterated 5 times. While doing an analysis, we get an option called 'Pooled Data' which conglomerates the results of all five (5) iterations and give the average values.

Before going about the process of multiple imputations, there were two other aspects that had to be considered. Firstly, the

Little's MCAR test was conducted on the data set to observe whether the missing data was a random phenomenon or it followed a pattern. The results revealed that the missing data was not at all random and that it did follow a pattern. For example, a certain specific set of questions was completely unanswered, and this was repetitive for many users. Secondly, random numbers needed to be generated, so that they could be used for substituting values. The *Mersenne Twister* Random Number Generator algorithm was used to facilitate the process.

VISUALIZATIONS

The following (Figure 2) is the visualization that depicts various wireless services that people tend to use at home, in public, as well as on the go.

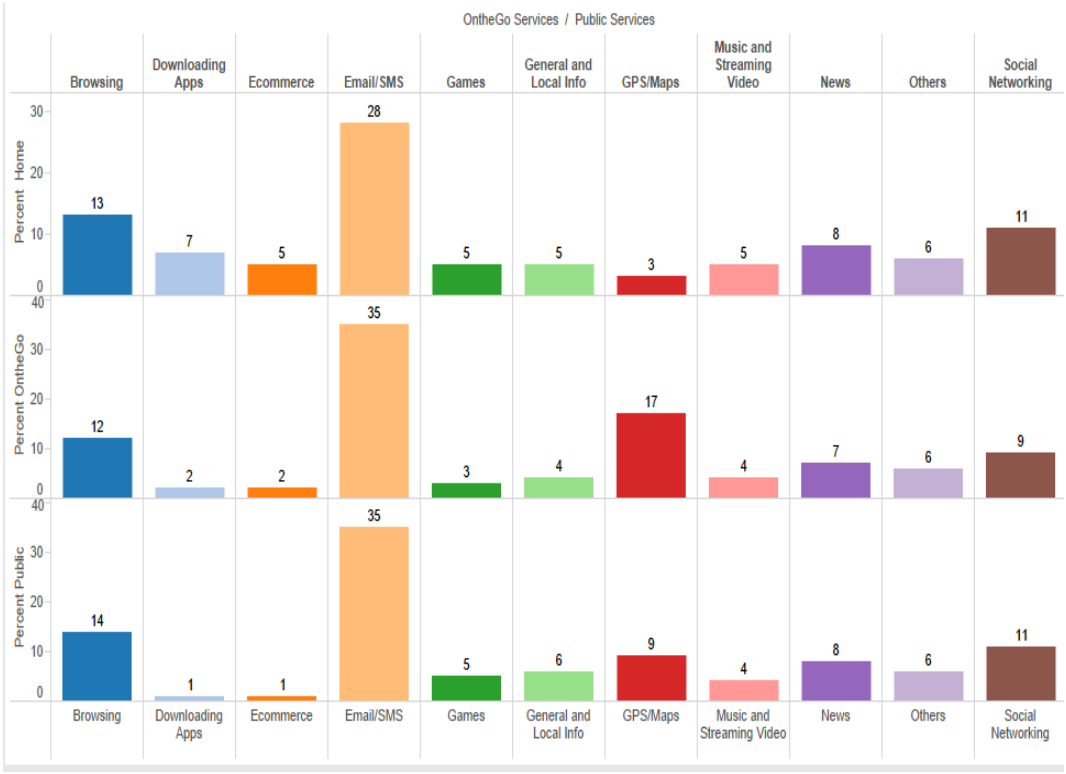

Figure 2: Visualization of various Home, On the Go and Personal services

This figure reveals that Emails/SMS are the most heavily used services that are used in all places. They constitute 28 – 35 % of the usage. It is closely followed by Browsing as well as Social Networking that range from 11 – 13 % of usage. The usage of GPS and Maps accounts for 17% when people are 'On the Go. This indicates the possibility of a considerable number of people using maps and GPS for navigation during transit

The following visulization (Figure 3) depicsts how often (measured in percentage) various mobile wireless services are used by people. These results can, in fact, act as a catalyst to the previous visulization result that details various services used by prople at different places. The following is more generalized in its approach.

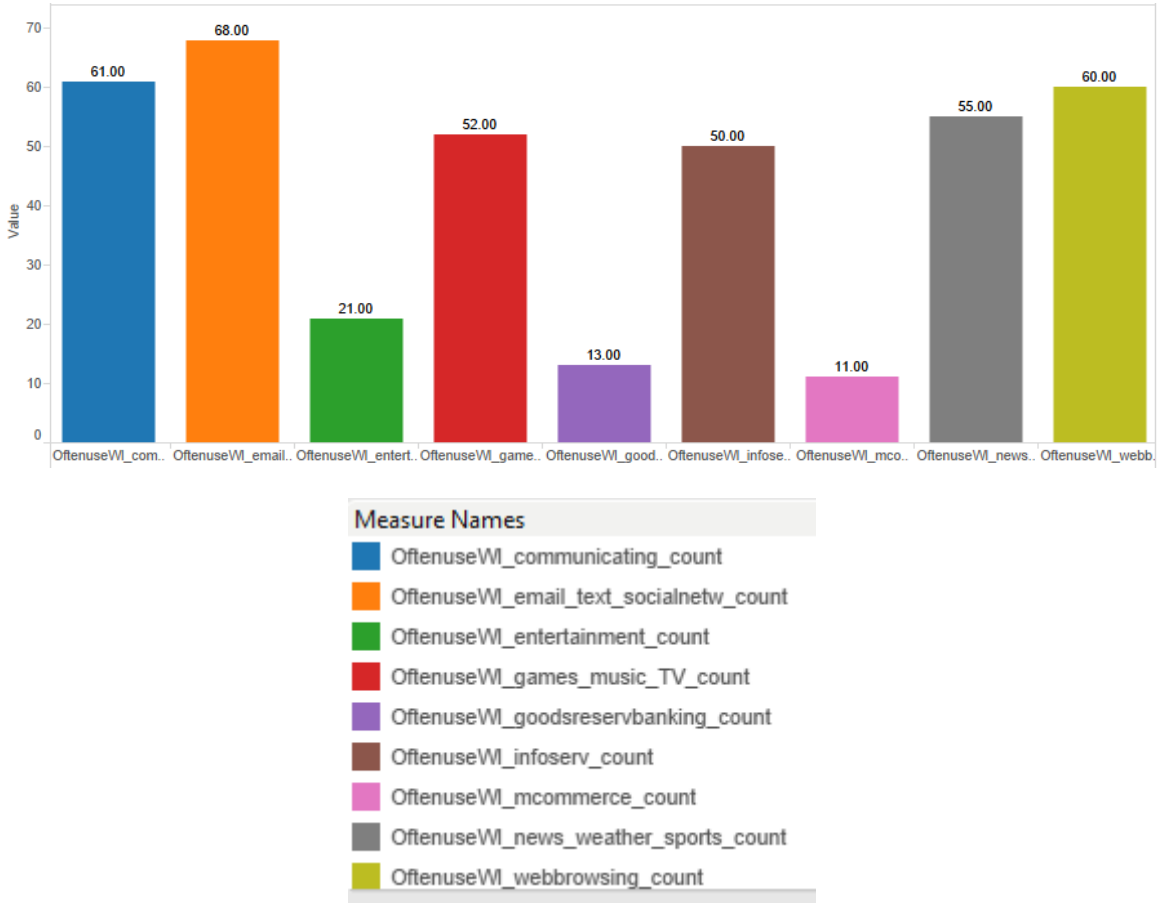

Figure 3: Visualization of wireless services that are often used

Results reveal that Email and social networking services are the most often used and they constitute about 68%. It is closely followed by communication as well as web browsing that add up to 61% and 60% each respectively.

Singaporeans seem to be ardent news readers, and statistics reveal that they use mobile internet services more for gaining access to News services. This figure comes to 55%. Games and information services fall next in line and they constitute 52% and 50% respectively. All these visuals reveal that Singaporeans rely heavily on using mobile wireless to access major day to day services such as Emails, Social Networking, News and Games form.

An assessment was made between the Cost of the current data plan and the benefits. Users were asked if they were able to strike a balance between the data plan costs as well as the benefits they gained. Figure 4 represents this assessment.

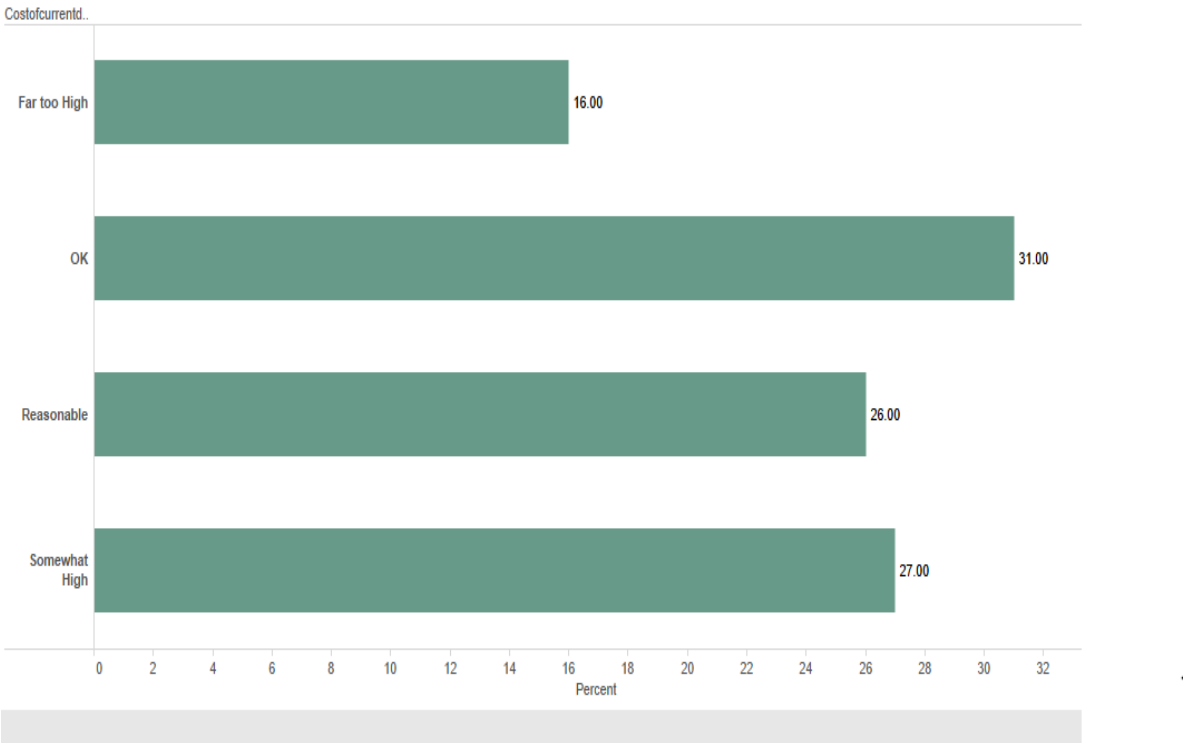

Figure 4: Visualization of Cost of Current Data Plan versus Benefits

Users were asked to answer on a scale of 5 ranging from Very Reasonable, Reasonable, Ok to very high. For the purpose of ease, both Reasonable and Very Reasonable have been added together, and it has been put under the variable 'Reasonable'. The visual reveals that more than half the users were happy, though not great, when they compared the cost with the benefits. Both Ok and Reasonable put together comes to 57%, which is the total number of people are who say that there is a decent balance between the cost of their data plan and the benefits they enjoy.

However 16% of the respondents think that their data plan cost is way too high when compared with the benefits they enjoy. And 27% of people think that the cost is somewhat high, though not very high in comparison to the benefits. It is possible that these segments of people have different data providers, and the varying costs can be attributed to this factor.

Having observed the various commonly used wireless services and also how users perceive costs of their data plan to the benefits, it would be apt to analyze if users pay for applications and content on their smart phones and, if they do pay, the purpose for which they primarily pay for getting applications and content. Purpose in this case is – Work, Personal and 50/50 Work and Personal. The following visual (Figure 5) plots the purpose/type (Work, Personal) of the wireless service and the amount.

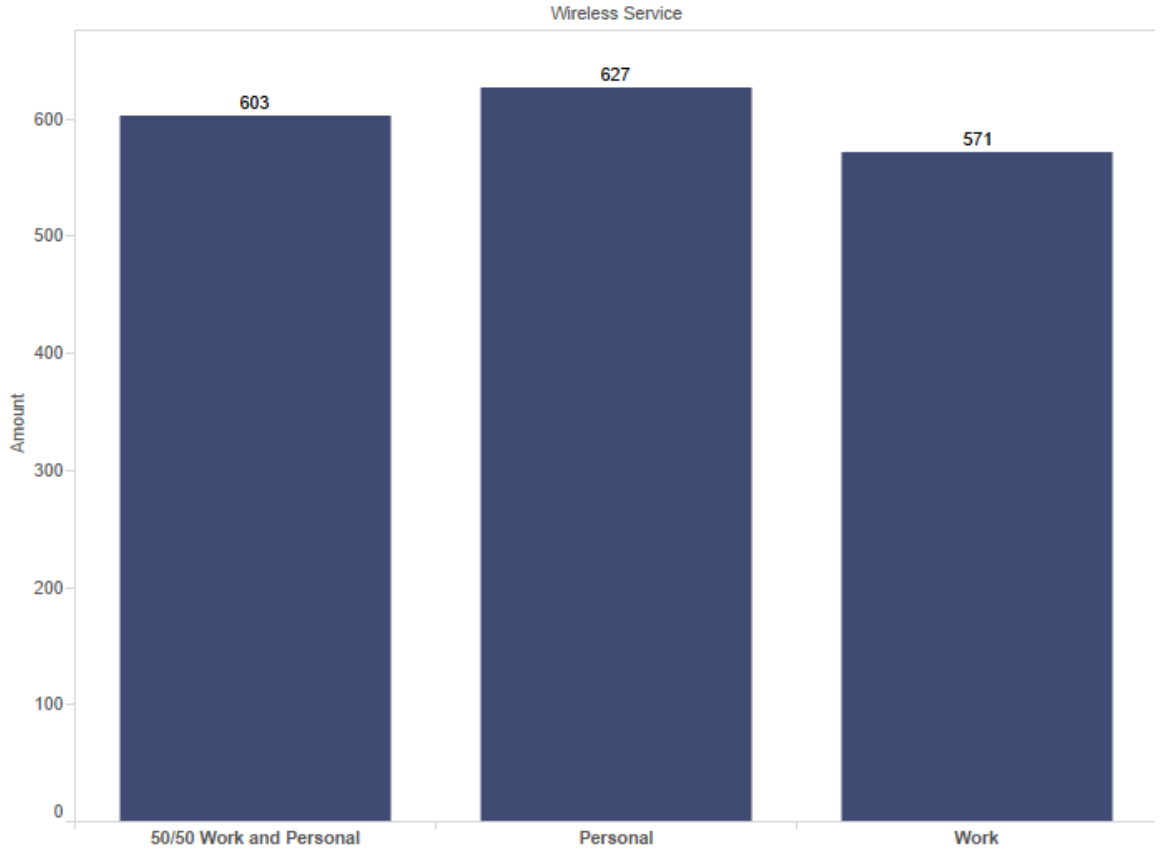

Figure 5: Visualization of purpose/type of wireless service and the amount

It is observed from Figure 5 that people end up buying applications and content on their phones more for Personal reasons than for Work. However, the difference in the amount spent between the two is not so high. The difference is $56.

On the other hand, it seems like people do keep both Personal as well as Work at an equal level. This is because the amount spent for both Personal as well as Work reasons is $603.

STATISTICAL DATA ANALYSIS

Correlation Analysis

A correlation analysis was carried out between the motivation to buy a smartphone, which can be related to mobile device adoption and the various utilitarian and hedonic and social as well as mobile device attributes. The main purpose of this analysis was to find out if users in Singapore placed any value on a specific wireless service before they actually bought a smartphone, and whether any of the attributes played a major role for users in Singapore towards adopting a mobile device. The correlation results are in *Appendix 1(a)*

I have used *Spearman's Rho* correlation in this case instead of the usual Pearson correlation. It is a widely accepted fact that Spearman's Rho is the correlation that has to be used while dealing with date that has been extracted through surveys.

The results explain that there is no correlation between social, hedonic and utilitarian attributes and mobile device adoption. However, there is just variable that is correlated to the motivation to buy a smart phone. The variable, *MotSp_wifienabled*, which is a mobile device attribute, is correlated to the *value placed on buying mobile apps*. The correlation is significant at the 0.05 level. This can be attributed to the fact that customers in Singapore do not place any value on a wireless service when they purchase a smartphone. The only important criterion for them is to buy mobile applications and for that reason, the smartphone has to be Wi-Fi enabled.

Linear Regression

A linear regression analysis was performed with a mobile device attribute being the dependent variable - MotSp_Internetaccess (Motivation to buy a smartphone with internet access). The independent variables used were how users perceived various wireless services on the basis of circumstances; how often they are likely to use it and how valuable they find these services. The circumstances they use are mainly social attributes, and the other variables can be related to the hedonic and utilitarian attributes of the customer. The main aim of this analysis was to find out those variables that are significantly related to the target variable. In this case, the primary aim was to identify what variables are significantly related to the user's motivation to

buy a smartphone on the basis of Internet Connection. There were 8 models generated in the process. The results are in *Appendix 2(a).*

The 'F' statistic for entry was set to 0.05 and for removal was 0.10. The adjusted R Square of the model was 38%. So this explains that the model is 38% accurate. All the variables in the final model were significantly related to the target variable since the 'Sig' value for all variables was less than 0.05 and, in fact, less than 0.01. Two social attributes and two hedonic attributes were found to be positively correlated to the target. So, in total, four variables were positively correlated to the dependent variable – *Circumstances likely to use wireless in family situations, Circumstances likely to use wireless during a vacation, Often use wireless for entertainment, Sports.* Table 1 summarizes positively-related variables and the 'B' values in the final model.

Variables	**Unstandardized Coef ('B' Value)**
CircumstanceslikelyuseWl_familySitu	0.184
ImpWlServ_Sports	0.144
CircumstanceslikelyuseWl_vacation	0.144
OftenUseWl_entertainment	0.179

Table 1: Table summarizing positively related variables and the 'B' values in the final model

Another linear regression analysis was performed with the dependent variable being Maxmonthlyfee_Wlserv (Maximum monthly fee for wireless services). The independent variables used were how users perceived various wireless services on the basis of circumstances; how often they are likely to use it and how valuable they find these services. The main aim of this analysis was to find out those variables that are significantly related to the target variable. In this case, the primary aim was to identify what variables are significantly related to the user's monthly fee for wireless services. There were 11 models generated in the process. The results are in *Appendix 2(b).*

The 'F' statistic for entry was set to 0.05 and for removal was 0.10. The adjusted R Square of the model was 40%. So this explains that the model is 40% accurate. All the variables in the final model were significantly related to the target variable since the 'Sig' value for all variables was less than 0.05 and, in fact, less than 0.01. In this instance, hedonic, social as well as utilitarian attributed were found to be significantly correlated to the target. So, in total four variables were positively correlated to the dependent variable – *Use Web browsing for personal or work, Circumstances likely to use wireless while driving, Likely to use wireless services to manage finances, Games.* Table 2 summarizes positively-related variables and the 'B' values in the final model.

Variables	**Unstandardized Coef ('B' Value)**
UseWlPersorWork_Webbrowsing	2.299
CircumstanceslikelyuseWl_driving	3.646
LikelyUseWl_managefinances_pers	2.812
ImpWlServ_Games	2.130

Table 2: Table summarizing positively related variables and the 'B' values in the final model

For example for every 1 unit increase in the UseWlPersorWork_Webbrowsing, there will be a 2.299 increase in the max monthly fee for wireless services. Similarly, in the previous linear regression analysis, for every 1 unit increase in the usage of wireless services for entertainment, there will be a 0.179 increase in the motivation to buy a smartphone.

Structural Equation Modeling

A Structural Equation Model was constructed in 'R' with Maxmonthlyfee_Wlserv (Maximum monthly fee for wireless services as the dependent variable). The lavaan () package was used for the same. *Lavaan* is the latest and powerful package in 'R' for structural equation modeling. All the variables that figured in the final equation in the linear regression analysis were used as the independent variables in this case. The analysis results are in *Appendix 3(a).* The 'P' value (Chi Square) obtained is 0.000, which means that the model is statistically significant in explaining the target variable.

It is significant that no variable in the model were significantly correlated with the dependent variable in the SEM analysis. This means that no one variable was found to be statistically significant to the target. (No variable has *Sig* value of less than 0.05). This can be related to the fact that there is no user perceived wireless service that influences the monthly fee that they are willing to pay for wireless services.

However, according to Gefen et al, the SEM model contains two inter-related models – the measurement model and the structural model. The measurement model defines the constructs (latent variables) that the model will use, and assigns observed variables to each. The structural models then define the causal relationship among these latent variables. In this research paper, there are no well-defined constructs or latent variables that can be effective enough in the SEM model so as to put them in and examine causal relationships among the variables. In this case, both the linear regression models will suffice, and they stand to explain how mobile adoption rates with how users perceive various social, hedonic as well as utilitarian attributes.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions may be drawn from the above analysis:

This research establishes that users in Singapore do not place any value on a wireless service while purchasing a smartphone, while they place value on social benefits primarily, and a few hedonic as well as utilitarian benefits. However, the larger picture reveals that purchasing a smartphone only depends on the purchasing power which in turns depends on the annual household income. Similarly, the ability to pay for wireless services does not depend on a number of significant variables that can be attributed to user's perception of wireless services. The fact that emerges, therefore, is that Singaporeans do not place any value on wireless services either when they purchase a smart phone or when they pay their wireless bill every month.

Secondly, M-commerce and E-commerce services do not even figure among the top 5 most often used wireless services on the mobile, and they are not preferred services that people use in different walks of life. Moreover, considering the fact that Singapore leads Asia in Mobile Commerce, these statistics are rather surprising. The low percentage in usage of E-commerce and M-commerce may be due to the survey having been conducted in 2010 when the market did not have a wide variety of players who catered to customers' personalized needs in the e-commerce space.

However, since purchasing power is what matters most when it comes to Singapore users, this aspect can take the GDP of the country to the next step. A survey conducted by Deloitte in 2012 states that Singapore's overall mobile telephone penetration had passed the 150% mark and was close to 8 million subscribers by 2013. The country's 3G market continues to be the strongest component of the mobile sector with around two-thirds of all mobile subscribers being 3G (Deloitte, 2012)

The findings of this research are considered to be extremely useful in rapidly developing economies such as India. According to a survey analysis conducted by GSMA on the mobile economy in India, India's citizens rely on mobile technology and mobile-enabled services to a significant degree that few would have predicted just a few years ago. With nearly 900 million mobile connections across the country, India represents a quarter of all mobile connections in Asia Pacific, and this figure is expected to rise to 1.16 billion by 2017. By 2020, mobile connections could contribute almost $400 billion to India's GDP, creating 4.1 million additional jobs, and generating significant contribution through infrastructure investment (US $9 billion) and public funding (US $34 billion).

Nevertheless, India still lags behind the world's major economies in mobile maturity and penetration. Network investment by mobile operators is held back by low tariffs due to the market conditions, an unusually high level of competition, and the financial burden caused by government policies that channel funds away from the sector, such as the high cost of access to spectrum. Indian operators are amongst countries that have the highest debt and lowest profitability ratios in the Asia Pacific region. This affects their ability to upgrade consumer services, meet demand in highly populated urban areas and expand networks to provide coverage to people living in rural areas (GSMA Mobile Economy: India 2013). With such statistics that reveal development of the Indian economy alongside mobile wireless services at such a staggering rate, it is always important to measure customers and how they perceive mobile wireless services in different scenarios. And to assist in the measurement purpose, a research study such as this can help in differentiating the development of the country's economy and how usage of mobile wireless services influence the same.

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APPENDIX

1(a)

Correlations

			ValuableWI Comm_ buyinggoodsoninternet	ValuableWI Comm_ buyinggoodsswipingphn	ValuableWI Comm_ buymobapps	ValuableWI Comm_ downloadapps	ValuableWI Comm_ banking	ValuableWI Comm_ reservations	ValuableWI Comm_emails	ValuableWI Comm_texting	ValuableWI Comm_MMS	ValuableWI Comm_ microblogging
Spearman's rho	MotSp_betterapps	Correlation Coefficient	.161	.138	.181	.146	.135	.158	.046	.085	.005	-.057
		Sig. (2-tailed)	.116	.179	.078	.155	.190	.123	.656	.412	.964	.581
		N	96	96	96	96	96	96	96	96	96	96
	MotSp_internetaccess	Correlation Coefficient	.155	.059	.169	.045	.065	.088	-.034	-.041	.030	-.030
		Sig. (2-tailed)	.133	.566	.100	.662	.531	.393	.746	.694	.770	.771
		N	96	96	96	96	96	96	96	96	96	96
	MotSp_ workandpersonalsuited	Correlation Coefficient	.039	-.089	.035	.005	.087	.112	-.008	.049	.151	-.007
		Sig. (2-tailed)	.707	.388	.734	.962	.401	.276	.937	.635	.142	.948
		N	96	96	96	96	96	96	96	96	96	96
	MotSp_wifienabled	Correlation Coefficient	.174	-.058	.201*	.098	.131	.105	-.042	-.061	.122	.027
		Sig. (2-tailed)	.089	.576	.050	.344	.204	.308	.684	.554	.236	.790
		N	96	96	96	96	96	96	96	96	96	96

2(a)

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
	AccessWI_fileharingofdata	-.209	.069	-.221	-3.050	.003
	OftenuseWI_ entertainment	.146	.061	.173	2.373	.019
7	(Constant)	1.581	.333		4.746	.000
	Circumstanceslikelyuse WL_familysitu	.163	.050	.229	3.249	.001
	ImpWIServ_sports	.142	.043	.237	3.319	.001
	LikelyUseWL_senddocs_ personal	-.162	.053	-.217	-3.069	.002
	Circumstanceslikelyuse WL_vacation	.136	.047	.193	2.864	.005
	AccessWI_fileharingofdata	-.213	.068	-.226	-3.149	.002
	OftenuseWI_ entertainment	.161	.061	.191	2.639	.009
	Circumstanceslikelyuse WL_walking	-.116	.048	-.165	-2.431	.016
8	(Constant)	1.713	.335		5.120	.000
	Circumstanceslikelyuse WL_familysitu	.184	.051	.258	3.647	.000
	ImpWIServ_sports	.144	.042	.240	3.405	.001
	LikelyUseWL_senddocs_ personal	-.146	.053	-.196	-2.767	.006
	Circumstanceslikelyuse WL_vacation	.144	.047	.204	3.064	.002
	AccessWI_fileharingofdata	-.217	.067	-.230	-3.239	.001
	OftenuseWI_ entertainment	.179	.061	.213	2.947	.004
	Circumstanceslikelyuse WL_walking	-.123	.047	-.176	-2.608	.010
	LikelyUseWL_ lookupinfo_casual	-.114	.050	-.156	-2.276	.024

a. Dependent Variable: MotSp_internetaccess

2(b)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	easycomm					
	UseWIPersorWork_ webbrosing	2.389	1.042	.145	2.292	.023
	ValuableWIComm_ socialnetworking	-3.186	1.305	-.154	-2.441	.016
	AccessWI_remoteaccess	-3.318	1.303	-.162	-2.546	.012
	Circumstanceslikelyuse WL_driving	3.657	1.271	.187	2.878	.004
	Circumstanceslikelyuse WL_walking	-3.123	1.155	-.177	-2.704	.007
	LikelyUseWL_ managefinances_ personal	3.052	1.346	.172	2.268	.024
	ImpWIServ_vidclips	-2.258	1.116	-.132	-2.024	.044
11	(Constant)	66.975	9.688		6.913	.000
	ImpWIServ_weatherinfo	-3.239	1.210	-.171	-2.678	.008
	LikelyUseWL_ managefinances_official	-4.174	1.459	-.219	-2.861	.005
	WLImpintermsofVal_ easycomm	-5.200	1.516	-.211	-3.430	.001
	UseWIPersorWork_ webbrosing	2.299	1.035	.139	2.222	.027
	ValuableWIComm_ socialnetworking	-3.654	1.314	-.177	-2.780	.006
	AccessWI_remoteaccess	-3.617	1.301	-.177	-2.781	.006
	Circumstanceslikelyuse WL_driving	3.646	1.260	.186	2.893	.004
	Circumstanceslikelyuse WL_walking	-3.000	1.147	-.170	-2.616	.010
	LikelyUseWL_ managefinances_ personal	2.812	1.340	.158	2.099	.037
	ImpWIServ_vidclips	-3.038	1.170	-.178	-2.596	.010
	ImpWIServ_games	2.130	1.042	.140	2.044	.042

a. Dependent Variable: Maxmonthlyfee_WIserv

3(a)

```
>summary(fitmodel,standardized = TRUE,fit.measures=TRUE)
lavaan (0.5-16) converged normally after 102 iterations

  Number of observations                           200

  Estimator                                         ML
  Minimum Function Test Statistic               105.146
  Degrees of freedom                                44
  P-value (Chi-square)                           0.000

Model test baseline model:

  Minimum Function Test Statistic               211.289
  Degrees of freedom                                55
```

P-value 0.000

User model versus baseline model:

Comparative Fit Index (CFI) 0.609
Tucker-Lewis Index (TLI) 0.511

Loglikelihood and Information Criteria:

Loglikelihood user model (H0) -3555.806
Loglikelihood unrestricted model (H1) -3503.233

Number of free parameters 22
Akaike (AIC) 7155.613
Bayesian (BIC) 7228.176
Sample-size adjusted Bayesian (BIC) 7158.478

Root Mean Square Error of Approximation:

RMSEA 0.083
90 Percent Confidence Interval 0.063 0.104
P-value RMSEA <= 0.05 0.005

Standardized Root Mean Square Residual:

SRMR 0.087

Parameter estimates:

Information Expected
Standard Errors Standard

	Estimate	Std.err	Z-value	P(>|z|)	Std.lv	Std.all
Latent variables:						
Maxmonthlyfee_Wlserv =~						
ImpWlSrv_wthr	1.000				0.146	0.118
LklyUsWL_mng_	6.820	4.766	1.431	0.152	0.996	0.820
WLImpntrmsfV_	0.253	0.559	0.452	0.651	0.037	0.039
UsWlPrsrWrk_w	-0.562	0.877	-0.641	0.522	-0.082	-0.058
VlblWlCmm_scl	0.732	0.806	0.909	0.364	0.107	0.094
AccssWl_rmtcc	1.203	1.035	1.162	0.245	0.176	0.154
CrcmstncslWL_	0.417	0.730	0.571	0.568	0.061	0.050
CrcmstncslWL_	2.103	1.608	1.308	0.191	0.307	0.233
LklyUsWL_mng_	5.970	4.135	1.444	0.149	0.872	0.662
ImpWlSrv_vdcl	2.518	1.874	1.344	0.179	0.368	0.269
ImpWlServ_gms	2.484	1.888	1.316	0.188	0.363	0.240