

Investigating the Distinguishing Characteristics of Users with a Landline Preference vs. a Smartphone Preference in Taiwan: Using the Technology Adoption and Innovation Resistance Perspectives for Studying Phone Users

Mavis Tsai

Shih Hsin University, Radio, Television and Film Dept., WenShan District, Taipei - Taiwan

Abstract--Taiwan is a country with fairly high mobile phone or smart phone penetration. By 2009, Taiwan's mobile phone penetration was hovering near 110%. By 2014, more than 70% of Taiwanese over age 15 owned a smart phone. However, some Taiwanese are not yet accepting of this new technology, the smart phone, for diverse reasons. Some prefer using only landline telephones; some use a traditional mobile phone but prefer landline for contacting their family and friends. Some Taiwanese use both a landline and a smartphone but still prefer the landline. In addition, cell phone-only consumers are increasing in Taiwan, especially among the younger generation. Rogers' "Diffusion of innovations" is a theory that seeks to explain how, why, and at what rate new technology or new ideas spread through societies. The technology acceptance model (TAM) is another information systems theory which investigates how users accept and use a technology. In the technology acceptance model, some factors like Perceived usefulness (PU) and Perceived ease-of-use (PEOU) influences attitudes, intention to use and actual use of a new technology. Nonetheless, not all change is necessarily healthy for all consumers. The innovation resistance of a consumer can be viewed as another perspective for studying how and why a society or some consumers accept or refuse a new technology. Based on TAM and innovations resistance perspectives, the researcher studied what are the distinguishing characteristics of those preferring a landline vs. the smartphone? How can these different consumers be reached? What is their usage of internet, landline and smartphones? Thus in this study, the researcher launched two phone surveys, one sample via landline and another sample via mobile phone, interacting with more than 1,000 respondents in each sample. The population in Taiwan exceeds 23,000,000. The researcher used a CATI (Computer-Assisted Telephone Interviewing) system to get RDD (Random Digital Dial) phone numbers for both samples and made them representative of the population. In addition, the researcher used the participant observation records by auditing the survey process to further investigate the

characteristics of Taiwanese who prefer landlines or prefer cell phones and smartphones.

I. RESEARCH PURPOSE

Based on the Pew Research Center's study, in 2013 the cell phone ownership among adults in the U.S. had exceeded 90%. Cell phones are being used by 91% of adults, according to the survey conducted of 2,252 adults [1] (See Figure 1-1). In addition, many consumers are cutting their landline services voluntarily following the high penetration of cell phone usage. According to a survey conducted by the Centers for Disease Control and Prevention, two in every five American households relied only on cell service in the second half of 2013. Among the younger generation, ages 25 to 29, nearly two-thirds had no landline of any kind. Some keep a landline but had switched to a fiber system such as FiOS or a VoIP, which uses the Internet to relay calls [2].

Many American consumers have adopted cell phones and gave up their landline, users come to accept smart phones and use them as new technology products. Based on the Pew Research Center's research, now there are more than four in ten Americans (47% of all adults) have a cell phone but no landline telephone service. For certain subgroups, such as young adults, the cell-only rate is even higher. 71% of those young Americans, ages 25 to 29, are a cell-only population. Furthermore, research has shown that as the numbers in the cell-only generation have grown, the potential for bias in applying landline surveys for marketing or public opinion surveys that do not include cell phone interviews is likewise growing [3] (See Figure 1-2)

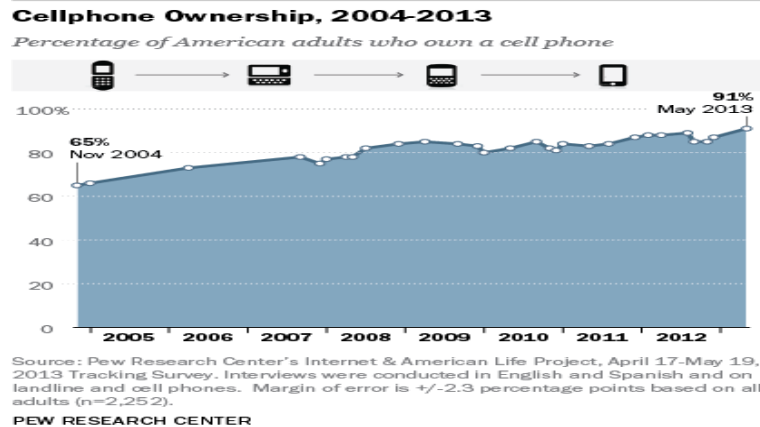


Figure 1-1: Cellphone ownership from 2004-2013 in the U.S. [4]

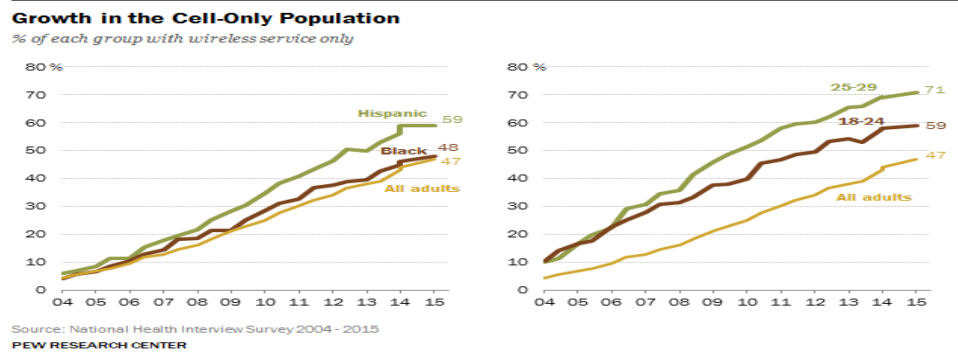


Figure 1-2: Growth in the Cell-only Population [5]

People used to use only landline before cell phones become popular; many marketing or public opinion surveys also have traditionally been conducted only by landline telephone. Nonetheless, if we see cell phones or smart phones as a new adopted technology, then those who accept cell phones and cut their landlines vs. those who are resistant to change or still rely primarily on their landlines should have different attitudes or consumer behaviors regarding their phones and related usage. In addition, smart phones usage is related to mobile internet usage which makes more internet heavy users dependent more on mobile multimedia internet device (MMID), such as smartphones and tablets.

Based on Rogers' Innovation Diffusion approach, individuals who are more risk takers or otherwise innovative will adopt an innovation earlier in the continuum of diffusion [6]. In addition, the technology acceptance model (TAM) is one of the most influential perspectives for studying new technology adoptions. The TAM model suggests that when users are presented with a new technology, there is some evidence of relationships that exist between usefulness, ease of use and new technology adoption [7] [8]. On the other hand, as Ram [9] mentioned, innovations impose change on the consumer and resistance to change is a normal consumer response. Not all change is necessarily healthy and resistance on its own merits may be desirable and useful. Based on past literature, the innovation resistance of a consumer can be viewed as dependent upon three sets of factors: perceived innovation characteristics, consumer characteristics, and characteristics of propagation mechanisms.

Therefore, a number of factors influence users' decisions about how and when they will use new technology products; to investigate the distinguishing characteristics of users with a landline preference vs. one for smartphones is important for knowing who tended to accept smartphones (new technology adopters) and who still rely heavily on landline use (those resistant to accept new technology).

Some studies already noticed that landline users had different preferences vs. those with a cell phone. The NBC News/Marist Poll showed that cell phone users prefer Obama and landline users favor Romney [10] from their polling in Florida, Ohio and Virginia. Besides, although 47% of American adults are in the cell-only population, a study

showed that landline phones are essential to many Americans at work. The Pew Research Center found that 35 percent of more than 1,000 American workers polled said landlines are "very important" at work [11]. These may actually reflect that there are some distinguishing characteristics or backgrounds between users preferring landlines or cell-phones.

There is a similar trend of the cell phone-only users compared with the rate shown in Figure 1-2 for the U.S. The home users of fixed phones decreased and the rate of users of 3G service increased rapidly in 2009 and Taiwan. By early 2002, Taiwan had reached one mobile service for every person on the island. At that time this was the highest penetration of any mobile market in the world. By 2009, Taiwan's mobile phone penetration was sitting at around 110%, with fixed line at a steady 55%. Total mobile sector revenues reached US\$7.2 billion in 2008 [12]. Conversely, Taiwan's fixed line telecommunication network penetration rate dropped in 2009 to become the lowest among the four little dragons in Asia -- South Korea, Singapore, Hong Kong and Taiwan [13].

In 2015, the researcher Tsai published a paper to investigate how the diffusion of smart phones will change marketing research and public opinion industries in Taiwan due to there being a greater cell-only population, plus more landline owners who seldom use a landline. In that paper, Tsai found 11.5% of Taiwanese may be the possible cell-only population. Besides, Tsai found that nearly 50% of interviewees of both samples seldom or rarely use a landline. In Taiwan, even using a landline still can reach more than 85% households but 50% of users seldom use those landlines. Also, 71.6% of interviewees of the landline sample own smart phones. 80.3% of interviewees of the cellphone sample own smartphones [14]. This study showed us that most Taiwanese are adopting smartphones and gradually give up landline phone use.

Therefore in this study, the researcher launched two larger-scaled phone surveys, one sample via landline and another sample via mobile phone, interacting with more than 1,000 respondents in each sample. The population in Taiwan is about 23,460,000. The researcher used a CATI (Computer-Assisted Telephone Interviewing) system to get RDD (Random Digital Dial) phone numbers for both samples

and made them able to represent the population in Taiwan. The aim of this study is to confirm what the researcher had found in the past pre-tests and investigate the distinguishing characteristics or backgrounds of landline-preference vs. smartphone-preference users in Taiwan to be able to offer more information from technology adoption and innovation resistance perspectives for studying smartphone users, cell phone-preference users vs. landline-preference users.

In sum, the purpose of this research is to (1) Confirm the past research results regarding cell-only, cell-preference, landline-only and landline-preference users and, for example, finding what percentage of the cell-only population in Taiwan is included via these large-scaled surveys. (2) Investigate the distinguishing characteristics or backgrounds of landline-preference vs. smartphone-preference users. Particularly for those smartphone users and cell-only users vs. landline-prefer users, what differences exist in their internet usage and personal characters? (3) Use the participant observation records by auditing the phone survey process to further investigate the characteristics of Taiwanese who prefer landlines or prefer smartphones and add some qualitative data for this research.

II. LITERATURE REVIEW AND BACKGROUNDS

Based on research from the Pew Research Center in 2013 regarding the innovations diffusion, the cell phone might be the most quickly adopted consumer technology in the history of the world, however there are some demographic groups whose embrace of the cell phone is somewhat less enthusiastic than others. Those groups are: people ages 65 and older; those with lower education; those who have households earning less than \$30,000; and those in rural areas. In this survey, women are, with statistical significance, less likely to own cell phones than men [15] (See Table 2-1).

Taiwan is among the top 25 countries in the world in Internet connectivity. Mobile phone penetration is likewise, at virtually 100%, extremely high while land-line penetration is slowly descending though still exceeding 55%. As a result, public opinion and market researchers have some advantages in conducting Internet and phone surveys for marketing, consumer research and political polling. Sixteen firms in Taiwan are qualified and sufficiently established to be members of ESOMAR (the European Society for Opinion and Marketing Research), the leading international organization in the field [16]. Nonetheless, the adoption of mobile phones or smartphones brings a challenge to marketing, consumer and opinion research due to the fast adoption of smartphones usage which also changes people's lifestyle or phone usage habits.

TABLE 2-1: CELL PHONE OWNERSHIP BY DEMOGRAPHIC GROUP IN THE USA [17]

Cell phone ownership by demographic group		Own a cell phone
% within each group who own a cell phone		
All adults (n=2,252)		91%
Gender		
a	Men (n=1,029)	93 ^b
b	Women (n=1,223)	88
Age		
a	18-24 (n=243)	97 ^{def}
b	25-34 (n=284)	97 ^{def}
c	35-44 (n=292)	96 ^{def}
d	45-54 (n=377)	92 ^{ef}
e	55-64 (n=426)	87 ^f
f	65+ (n=570)	76
Race/ethnicity		
a	White, Non-Hispanic (n=1,571)	90
b	Black, Non-Hispanic (n=252)	93
c	Hispanic (n=249)	88
Education attainment		
a	Less than high school (n=168)	83
b	High school grad (n=630)	88
c	Some College (n=588)	92 ^{ab}
d	College + (n=834)	95 ^{abc}
Household income		
a	Less than \$30,000/yr (n=580)	86
b	\$30,000-\$49,999 (n=374)	90 ^a
c	\$50,000-\$74,999 (n=298)	96 ^{ab}
d	\$75,000+ (n=582)	98 ^{abc}
Urbanity		
a	Urban (n=763)	92 ^c
b	Suburban (n=1,037)	91 ^c
c	Rural (n=450)	85

Source: Pew Research Center's Internet & American Life Project, April 17-May 19, 2013 Tracking Survey. Interviews were conducted in English and Spanish and on landline and cell phones. Margin of error is +/-2.3 percentage points based on all adults (n=2,252).

Note: Percentages marked with a superscript letter (e.g., ^a) indicate a statistically significant difference between that row and the row designated by that superscript letter, among categories of each demographic characteristic (e.g. age).

Compared with some of the important research in the U.S. regarding smartphone or cellphone ownership demographics or how the diffusion of cell phones would change the marketing or polling surveys, very little research in Taiwan has focused on investigating how these issues affect Taiwanese.

A. The TAM perspective and the “mobile phone-only” group

Rogers [18] presented some factors which affect innovation diffusion, such as individual innovativeness and perceived attributes. Based on Rogers’ innovation adoption/diffusion theory, individuals who are greater risk takers will adopt an innovation earlier in the continuum of innovation diffusion. And there are five attributes upon which an innovation is judged: relative advantage, compatibility, less complexity, trialability, and observability. Similarly, based on the theory of reasoned action, Davis [19] developed the Technology Acceptance Model (TAM) which deals more to predict the acceptability of the system in order to make it able to be adopted by users. The TAM model indicates that the acceptability of a new technology is determined by two main factors: perceived usefulness and perceived ease of use (See Figure 2-1). Dillon and Morris [20] indicated that TAM hypothesizes a direct link between perceived usefulness, perceived ease of use, attitude toward using and actual system use. With two systems or technologies offering the same features, a user will find more useful the one that he finds easier to use.

Based on the literature review from innovation adoption/diffusion or the TAM, users’ individual innovativeness and perceived attributes of new technologies will affect considerably their adoption and acceptance of a new innovation, technology or information system. As the Pew Research Center’s study pointed out, 47% of Americans have a cell phone but no landline [23]; more surveys thus need to be interviewing people on their cell phones. For certain subgroups, such as young adults, Hispanics and African Americans, the cell-only rate is even higher. Research has shown that as the number of adults who are cell-only has grown, the potential for bias in landline surveys that do not include cell phone interviews also grows [24][25]. The percentage of households having only mobile phones will decrease the representativeness of landline surveys if researchers ignore those who can only be contacted by mobile phones and if their characteristics are different from the general population.

Lau [26] found the characteristics of the ‘mobile only’ group in Hong Kong are similar to, though not quite the same

as, those found in Europe and the U.S. who were more often younger, students, the unemployed, living in one-person households, and had a low income level. Lau also found students to be a “mobile only” group in western countries but not in Hong Kong, an eastern metropolis. In short, there was a cultural difference among the “mobile phone only” group. The younger generation usually tends to be a cell-only population: a study showed that 71% of young people, of ages 25 to 29, are cell-only and 59% of the youth of ages 18 to 24 in American are cell-only population [27].

B. The Innovation Resistance Perspective and the “landline-only or landline-preference” group

The innovation diffusion of smartphones inevitably raises a critical issue to be discussed from the perspectives of both new technology adoption and innovation resistance. Diffusion of innovations is a theory that seeks to explain how, why, and at what rate new technology or new ideas spread through societies. The technology acceptance model (TAM) is an information systems theory that models how users come to accept and use a technology. The vast literature on innovations has predominantly restricted itself to the adoption and diffusion perspectives. One criticism given later by some researchers was that many innovation diffusion studies have the “pro-innovation bias” of researchers and their tendency to classify late adopters as “laggards.” This is based on the premise that all innovations are good for the consumer and are surefire improvements over existing product substitutes [28] [29]. As Ram [30] mentioned, innovations impose change on the consumer and resistance to change is a normal consumer response. Not all change is necessarily healthy and resistance on its own merits may be desirable and useful. Based on past literature, the innovation resistance of a consumer can be viewed as dependent upon three sets of factors: perceived innovation characteristics, consumer characteristics, and characteristics of propagation mechanisms.

According to Loudon & Bitta [31], certain consumer features have an effect on the consumers’ will to adopt or to resist an innovation. Hoyer & MacInnis [32] indicated that consumers may lack confidence in the new technology or innovation and hence avoid the financial as well as the safety risks. The different choices of innovation adoption or resistance are considered by the consumers and they can be categorized by observed risks, perceived worth and the benefits over the other alternatives available in the market, as well as the simplicity and the ease of utilization.

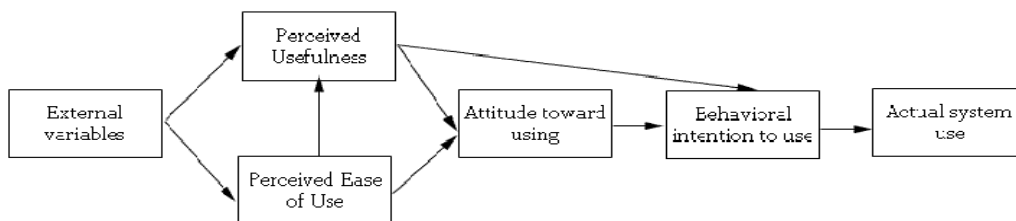


Figure 2-1: The Technology Acceptance Model (Davis, Bagozzi & Warshaw 1989) [21] [22]

From the perspective of researchers who study innovation resistance, not all change is necessarily healthy and resistance on its own merits may be desirable and useful. [33] Consumers who refuse to adopt a new idea or product in society should not be just viewed as “laggards” or be blamed as persons who are out-of-fashion or anachronistic without understanding their reasons for resistance first. “Some scholars have thus suggested that studying the process of innovation resistance must be given attention Therefore, it is about time we [give] respect to individuals who resist change ..., understand their psychology of resistance and utilize this knowledge in the development and promotion of innovations rather than thrust upon them preconceived innovations....” [34]. “Resistance to change may be defined as any conduct that serves to maintain status quo in the face of pressure to alter the status quo.” [35] Innovation resistance is the resistance offered by consumers to changes imposed by innovations.

Innovation resistance is a special version of resistance to change which relates to psychological equilibrium; since any change imposed on their behavior has the potential to disturb this equilibrium, the consumer thus more often opts for resisting the change than being disturbed [36]. As mentioned above in a Pew Research Center study, although the cell phone or smart phone is a very successful product of innovation diffusion, there are still some groups who adopt the cell phone or smart phone later or less than other groups. These groups are: female, people ages 65 and older; those with lower levels of education and lower household incomes; and those in rural areas [37]. Research in the U.S. also found that teens and young adults ages 18 to 29 are the most important new media users. Based on a Pew Research, three-quarters (75%) of teens and 93% of young adults now have cell phones. 93% of teens ages 12 to 17 go online as do 93% of young adults ages 18 to 29. Roughly half of 18-to-29 year olds have accessed the internet wirelessly on a laptop (55%) or on a cellphone (55%), and about one quarter of 18-to-29-year-olds (28%) have accessed the internet wirelessly on another device. Young adults and teens also prefer using social media, microblogging, Twitter and Facebook [38]. In addition, the context might also affect whether people would prefer to use landlines: for example, if the context is in the office or contacts for work, 35% interviewees prefer using a landline at work [39].

Based on the literature review regarding those who adopt cell-phones later or to a lesser degree, or regarding those who prefer to use landlines in some contexts or environments, as well as research regarding innovation resistance, it is as important to be acquainted with the “landline-only or landline preference” group as it is to learn about the cell-only group.

In sum, with the simultaneous penetration of mobile phones and the rapid drop in fixed line subscriptions in Taiwan, there are greater numbers of people reachable only by mobile phone. However the related research regarding the

impact of mobile phone adoption, investigating the distinguishing characteristics of landline preferences (innovation resistance perspective) vs. cell-only or smartphone preferences (technology adoption perspective), and the feasibility of mobile phone marketing or opinion research methods is lacking in both academic and professional fields. Thus in this paper the researcher launched landline and cellphone phone surveys to investigate the related issues.

III. RESEARCH METHOD

The purpose of this research is to further understand what the distinguishing characteristics of those preferring landline vs. cell phones or the smartphone are. How can these different consumers be reached? What is their usage of internet, landline, cell phones and smartphones? Thus in this study the researcher launched two phone surveys in September 2015, one via landline to gather a sample of more than 1000 respondents and one via mobile phone to acquire another sample more than 1000 respondents. The population in Taiwan surpassed 23,400,000 by Sep, 2015. The researcher used a CATI (Computer-Assisted Telephone Interviewing) system to get RDD (Random Digital Dial) phone numbers for both samples which made them able to representatively sample the population in Taiwan. Both landline phone numbers and cell-phone numbers contain 10 digitals. The first 6 numbers for landlines are area and district codes, so the researcher applied RDD for the last 4 numbers for the landline phone survey. Also the first 5 numbers for a cell-phone number are service providers’ codes; the researcher used RDD for the last 5 numbers for the cell-phone survey.

At the same time as these surveys were conducted at Shan-Shui marketing and polling research centers, the researcher performed the participant observation there and recorded what the researcher audited during the survey process and then used the participant observation records to further investigate the characteristics of Taiwanese who prefer landlines or prefer cell phones and smartphones.

IV. ANALYSIS

A. *The cell-only users*

The researcher used the last five digits random method (10 digits make up a cell phone number in Taiwan) to get a national cell-phone sample with 1005 respondents. Among these 1005 interviewees, there were 215 of them who did not have a landline at home. This study analyzed these 215 cell-only interviewees and found: 72.1% of them are under 39 years old and 41.2% of them are under 29 years of age. Only 6% of them are over 60 years of age. 60% of them are male and 40% of them are female. 68% of them use their cell phone frequently. 88% of them use smartphones. For 74.7%

of the cell-only group, the number of their family members is under four. 83.3% of them usually use the internet. 40% of them use the internet more than 3 hours every day. 15% of them support the act to abolish death penalty which may be an indication that they are more liberal. 20% of them are students and only 6% of them are housewives. 54% of them have college or graduate school degrees.

In sum, these cell-only users who adopted new technology product and gave up their landline tend to be younger, using smartphone, rely a lot on internet usage, are well-educated and many of them are heavy internet users. The researcher presumes that cell-only users perceived smartphones as products easier for them to log on the internet via mobile internet; smartphones are especially useful for heavy internet users.

B. The landline-only users

The researcher used last four digit random method (10 digits make up a landline phone number in Taiwan: the first 5 digits are area and district codes) to get a national landline sample with 1,033 respondents. Among these 1,033 interviewees, 68 of them did not have a cell phone. This study analyzed these 68 interviewees who rejected adopting cell phones and discovered who the landline-only users are: Only 22% of them are below age 39; 16% of them are under 29 years of age. 60% of them are older than 55 years old. 50% of them are male and 50% of them are female. More than 55% of them frequently or sometimes use a landline telephone. For 54% of the landline-only group, the number of their family members is under four. 80% of them did not use the internet. Only 3% of them use the internet more than 3 hours every day. Only 6 % of them support the act to abolish death penalty which may indicate that they are more conservative. 11% of them are students and more than 29% of them are housewives. Only 7 % of them have college or graduate school degrees.

In sum, these landline-only users who are resistant to adopting a new technology product tend to be female, older, most are not internet users, as well as being more conservative. The researcher presumes that landline-only users did not need a mobile internet or the internet so they did not perceived the relative advantage, usefulness or ease of use of smartphones.

C. The profile of cell-only users vs. landline-only users

Comparing the cell-only users vs. the landline-only users, the cell-only population are: much younger and tend to be under 39 years old, with many of them younger than 29 years of age. They tend to be male, use their cell phone frequently and 88% of them use a smartphone, and they not only log on

the internet but also spend longer time on internet usage and rely greatly on mobile internet usage. They likewise tend to live in smaller families. They are more liberal and most of them are students or professional workers; few of them are housewives. They also tend to have higher education levels.

On the contrary, the landline-only users tend to be over 55 years of age, use their landline frequently and tend to live in a larger family. Few of them use the internet and they spend less time online, they don't rely on mobile internet usage. They tend to be more conservative, have lower education and many of them are housewives.

D. The comparison of cell-preference vs. the landline-preference users from the cell-phone sample

In comparing the difference between those who prefer to use cell-phone vs. those who use landline more frequently, the researcher divided those interviewees from the cell-phone user sample into four groups: 1. Those who prefer using both cellphone and landline, i.e., they use both frequently; 2. Those who use cell phones less and prefer a landline, i.e., they use their landline more frequently; 3. Those who prefer a cellphone and use the landline less (they are frequent cellphone users and rarely landline user); 4. Those who seldom use either a cell or landline.

From there, the researcher employed a Pearson's chi-squared test using these four types of cellphone usage with other variables. Below are some of the results: The group who prefer using cellphones more and use landline less tend to be younger, with most of them being ages 22 to 44 years of age. The group who prefers using cellphones less and prefer using landlines more frequently tend to be older and over 50 years old (chi-square=143.396, df=36, p<.001).

The group who prefers using cellphones more and landlines less frequently tend to have smartphones. 94.6% of this group have a smartphone. The group who prefers to use both their cellphone and landline frequently tends to also have smartphones. 89.6% of them use smartphones. The ownership of smartphones of these two groups is much higher than the other two groups who use cellphones less frequently (See Table 4-1) (chi-square=148.508, df=6, p<.001)

The group who prefers using a cellphone more and landline less frequently tend to be an internet user. 93.3% of this group usually uses the internet. The group who prefers to use both a cellphone and a landline frequently also tends to connect to the internet. 90.3% of them use the internet. The percentage of these two groups' internet usage is much higher than the other two groups (see Table 4-2) (chi-square=95.686, df=3, p<.001).

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TABLE 4-1: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES AND SMARTPHONE USAGE

		Cell phone sample			Seldom Use both cell & landline
		Prefer both cell & landline	Use cell phone less & prefer landline	Prefer cellphone & use less landline	
Are you using a smartphone?	Yes	277	73	521	73
		89.6%	65.2%	94.6%	65.2%
	no	32	39	30	39
		10.4%	34.8%	5.4%	34.8%
	Refuse to answer	0	0	0	0
		.0%	.0%	.0%	.0%
Total		309	37	551	112
		100.0%	100.0%	100.0%	100.0%

(chi-square=148.508, df=6, p<.001)

TABLE 4-2: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES & INTERNET USAGE

		Cellphone sample			Seldom Use both cell & landline
		Prefer both cell & landline	Use less cellphone & prefer landline	Prefer cellphone & use less landline	
Do you use internet?	No	30	12	37	41
		9.7%	32.4%	6.7%	36.6%
	Yes	279	25	514	71
		90.3%	67.6%	93.3%	63.4%
Total		309	37	551	112
		100.0%	100.0%	100.0%	100.0%

(chi-square=95.686, df=3, p<.001)

TABLE 4-3: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES & EDUCATION LEVELS

		Cell-phone sample			Seldom Use both cell & landline
		Prefer both cell & landline	Use less cellphone & prefer landline	Prefer cellphone & use less landline	
Education	Didn't go to school	1	1	3	2
		.3%	2.7%	.5%	1.8%
	Elementary school	17	5	18	8
		5.5%	13.5%	3.3%	7.1%
	Junior high school	16	4	30	14
		5.2%	10.8%	5.4%	12.5%
	High school	80	12	129	42
		25.9%	32.4%	23.4%	37.5%
	Vocational college	45	4	66	13
		14.6%	10.8%	12.0%	11.6%
University	109	8	239	25	
	35.3%	21.6%	43.4%	22.3%	
Graduate school	41	3	65	8	
	13.3%	8.1%	11.8%	7.1%	
Refuse to answer	0	0	1	0	
	.0%	.0%	.2%	.0%	
Total		309	37	551	112
		100.0%	100.0%	100.0%	100.0%

(chi-square=51.916, df=21, p<.001)

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The group who prefers using a cellphone more and landline less frequently tends to have a post-university education. 43.4% of this group was accepted for a university education. The group who prefers using both a cellphone and a landline frequently also tends to have higher education level. 35.3% of them were accepted for a university education. The percentage of these two groups' education is higher than the other two groups (see Table 4-3) (chi-square=51.916, df=21, p<.001). In addition, a significant difference exists regarding the occupations between these two groups (chi-square=98.585, df=42, p<.001). There are higher percentages of retired people (13.4%) in the fourth group who seldom use either a cell-phone or a landline.

E. The comparison of cell-preference vs. the landline-preference users from the landline sample

Based on the landline sample, the researcher also divided interviewees into four groups: 1. Interviewees who prefer using a landline and use a cellphone less; 2. The group who seldom uses either a landline or cellphone; 3. Interviewees who prefer using both a landline and a cellphone; 4. The group who prefers using a cellphone more and a landline less.

The researcher found similar results here as compared to

what this study found in the cellphone sample. Those who prefer using a cellphone more and use a landline less tend to be younger, most of them ages 20 to 49. The group who prefers using a landline more frequently and a cellphone less tend to be older, that is, over 50 years old (chi-square=206.812, df=36, p<.001).

The group who prefers using a cellphone more and a landline less frequently tend to have smartphones. 93.5% of this group has a smartphone. The group who prefers using both a cellphone and a landline frequently also tends to have smartphones. 87.1% of them use smartphones. The ownership of a smartphone of these two groups is much higher than the other two groups who use cellphone less frequently (See Table 4-4) (chi-square=83.399, df=6, p<.001).

Members in the group who prefer using a cellphone more and a landline less frequently tend to be internet users. 93.7% of this group usually use the internet. The group who prefers using both a cellphone and a landline frequently also tends to connect to the internet. 83% of them use the internet. The percentage of these two groups' internet usage is considerably higher than the other two groups (see Table 4-5) (chi-square=203.061, df=3, p<.001).

TABLE 4-4: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES & SMARTPHONE USAGE

		Landline telephone sample			Prefer use cell more & landline less
		Prefer landline & use cellphone less	Seldom use both landline and cellphone	Prefer both landline & cellphone	
Are you using a smartphone?	Yes	31 67.4%	63 63.6%	297 87.1%	448 93.5%
	No	15 32.6%	35 35.4%	42 12.3%	31 6.5%
	Refuse to answer	0 .0%	1 1.0%	2 .6%	0 .0%
Total		46 100.0%	99 100.0%	341 100.0%	479 100.0%

(chi-square=83.399, df=6, p<.001)

TABLE 4-5: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES & INTERNET USAGE

		Landline telephone sample			Prefer use cell more & landline less
		Prefer landline & use cellphone less	Seldom use both landline and cellphone	Prefer both landline & cellphone	
Do you use internet ?	No	50 59.5%	60 46.5%	58 17.0%	30 6.3%
	Yes	34 40.5%	69 53.5%	283 83.0%	449 93.7%
Total		84 100.0%	129 100.0%	341 100.0%	479 100.0%

(chi-square=203.061, df=3, p<.001)

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TABLE 4-6: PEARSON'S CHI-SQUARED TEST OF FOUR CELL-PHONE USAGE TYPES & EDUCATION LEVELS

		Landline telephone sample			Prefer use cell more & landline less
		Prefer landline & use cellphone less	Seldom use both landline and cellphone	Prefer both landline & cellphone	
Education	Didn't go to school	3 3.6%	3 2.3%	2 .6%	.2%
	Elementary school	18 21.4%	19 14.7%	26 7.6%	12 2.5%
	Journal high school	19 22.6%	23 17.8%	31 9.1%	7.3%
	High school	25 29.8%	41 31.8%	102 29.9%	32.6%
	Vocational College	10 11.9%	13 10.1%	54 15.8%	63 13.2%
	University	7 8.3%	25 19.4%	97 28.4%	177 37.0%
	Graduate school	1 1.2%	5 3.9%	29 8.5%	35 7.3%
	Refuse to answer	1 1.2%	0 .0%	0 .0%	0 .0%
	Total	84 100.0%	129 100.0%	341 100.0%	479 100.0%

(chi-square=132.7, df=21, p<.001)

The group who prefers using a cellphone more and landline less frequently tends to have a post-university education. 37% of this group were accepted for university education. The group who prefers to use both a cellphone and a landline frequently also tends to have a higher education level. 28.4% of them were accepted for university education. The percentage of these two groups' education is higher than the other two groups (see Table 4-6) (chi-square=132.7, df=21, p<.001). Also there's a significant difference regarding their occupations when contrasting these two groups (chi-square=161.105, df=42, p<.001); there are higher percentages of retired people (25.6%) in the fourth group who seldom use both a cell-phone and a landline.

F. The participant observation to audit cellphone vs. landline surveys

The researcher's observation record basically supports the quantitative analysis results. During the auditing of the telephone survey processes, the researcher found that the cellphone survey can reach more young and male interviewees and they tend to be from different ages and different occupations. However, those who quickly answered the landline phone calls usually were older and many of them are retired; it was very difficult to find younger interviewees

via landline. Many of the interviewees who replied to landline phone calls were female and housewives. Even based on the qualitative data, the researcher could get the similar profile as what she got from the survey data analysis.

V. CONCLUSION

The main purpose of this research is to investigate the distinguishing characteristics or backgrounds of landline preference (who are resistant to accept cell phones) vs. cellphone or smartphone-preference users (who are new technology adopters) to get useful information for future marketing research or consumer studies. Also, the researcher sought to confirm the research results regarding the percentage of cell-only, cell-preference, landline-only and landline-preference users in Taiwan. Below are the main findings from this paper:

- A. Based on these two larger-scaled cellphone samples and the landline sample, both of which contain over 1000 responses, the researcher arrived at the percentage of landline-only, both landline and cellphone users, and cellphone-only users in Taiwan. This confirmed the research results from Tsai's 2015 pretest surveys.

- 1) Data from this paper:
 $1/2 * 7.9\%$ (The percentage of landline-only users)
 $+1/2*(92.1\%+77.3\%)$ (Persons who own both landline and cellphone from both sample) $+1/2*22.7\%$ (the percentage of cell-only users)
=3.95% (landline-only) + 84.7% (both landline and cellphone users) + 11.35% (cell-only users)

After the calculation, it showed us that the researcher can presume 3.95% Taiwanese are landline-only users who are still resistant to adopting cell-phone use, and 11.35% Taiwanese are cell-only users who not only adopt new technology products but also have discontinued their old landline. This result is similar to the researcher Tsai's study in 2015; in that paper, Tsai used smaller-scaled pretest samples to calculate the percentage of landline-only, both landline and cellphone users, and cell-only users in Taiwan. Tsai's 2015 research is listed below [40]:

- 2) Data from 2015 Tsai's pretest:
 $1/2 * 6.4\%+1/2*(93.6\%+77\%) + 1/2*23\%=3.2\%$
 (landline only users) + 85.3% (both landline and cellphone users) + 11.5% (cell-only users)

B. The distinguishing characteristics of landline preference vs. smartphone preference users:

The researcher found, comparing the cell-only users to the landline-only users, the cell-only population are: much younger, tend to be male, use their cellphone frequently and 88% of them use a smartphone. They not only connect to the internet more frequently but also spend a much longer time on internet usage. They also tend to be from smaller families. They are more liberal and most of them are students or professional workers, and few of them are housewives. They also tend to have higher education levels.

Furthermore, the researcher divided the interviewees from two samples into four groups: (1). The group who prefers using a landline more and a cellphone less, (2). The group who seldom uses both a landline and cellphone, (3). The group who prefers using both a landline and a cellphone frequently, (4). The group who prefers using a cellphone more and a landline less.

The researcher found the similar results from both samples. The group who prefers using cellphones more frequently and seldom use a landline tend to be younger and well-educated. Most of them use smartphones and most of them use the internet. They tend to be heavy internet users and rely on mobile internet. The researcher presumes for those cell-only or cell-preference users that they tend to think smartphones are useful, easy to use for their internet usage and brought them relative advantages compared with landline. The qualitative data from the researcher's participant observation record from auditing the survey process at the telephone polling centers in September 2015 matched the quantitative data from cellphone and landline surveys. Also,

the researcher found there are a higher percentage of retired persons among the group who seldom use both landline and cellphone.

Furthermore, the researcher suggested that the future studies should launch other surveys employing greater numbers and more diverse sets of variables to further understand the distinguishing characteristics or backgrounds of those with a landline preference vs. users with a preference of cellphones or smartphone. For those landline-only or landline-preference users, they should not be viewed merely as "laggards"; researchers should further investigate in future studies why they refused to adopt cell phones. For those smartphone-only or cell-preference users, they may be called new technology adopters. Researchers should further investigate ways in which these users perceived the relative advantages or usefulness brought by smartphones and why they now reject using landlines.

Additionally, while some papers indicated that the cellphone surveys cost considerably more than the landline telephone surveys, this however showed that now the cell-phone surveys can reach a greater number of younger persons with diversified occupations. So the question remaining is that of how to lower the cellphone survey cost to allow increased marketing research and surveys using the cellphone samples. That would be another valuable topic worthy of investigation.

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