Report on

WiFi Adoption and Security Survey 2014

Hong Kong

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July 2014

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Report on

Wi-Fi Adoption and Security Survey 2014

Hong Kong

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Introduction

In the 2008 Digital 21 Strategy, the HKSAR Government set out the vision of developing Hong Kong into the Asia's leading digital city (Digital 21 Strategy, 2014). By this it means the Government, in collaboration with the ICT industry, aspires not only to improve digital infrastructure by way of broadband and WiFi access, to make real-time information available to the people via an integrated set of online tools, and to make data accessible to all through apps and mobile systems, but also to provide a safe and reliable ICT infrastructure that is seamless, secure and always-on.

Remarkable progress has been made since the Digital 21 Strategy rolled out 6 years ago. In March 2014, the Financial Secretary announced the "Smarter Hong Kong, Smarter Living" programme (HKSAR Budget, 2014). Under which, the number of WiFi hotspots will be doubled so that WiFi can be made available for all throughout the city.

In the recent fourth update of the Digital 21 Strategy, we have proposed a series of initiatives under the theme of "Smarter Hong Kong, Smarter Living"

Progress is evident not only in the breath-taking pace of growth we experienced in wireless and mobile technologies but also the city's growing reliance of the Internet to run our business, even our lives. This heavy reliance means that protecting the integrity, security and reliability of our cyber backbone, especially the WiFi network, has become more important and pressing than ever.

As an addition to the annual "Wireless LAN War Driving Survey" jointly conducted by WTIA and PISA since 2003 through War Driving, this report, which is the 3rd in a series of research complied by WTIA, investigates the awareness and knowledge level of WiFi Security of local citizens with respect to WiFi usage, WiFi accessibility, WiFi security, and their use of smartphones / tablets through WiFi connection. Data collected from the research will help stakeholders to understand more about the user experience, awareness and perceptions of WiFi service and security in Hong Kong. By way of critical data analysis, it is hoped that the findings of the research will assist both government and commercial WiFi network providers to identify gaps in the current service and help shed light on areas of improvement and future directions.

Conventional paper-and-pen self-administered questionnaire were used to collect data from a total of 207 respondents.

This report is divided into 6 parts: Part 1 is this introduction which sets the scene for the research and outlines the aims of the research. Part 2 is a descriptive summary of the demographic profiles of respondents. Part 3 is about WiFi usage in Hong Kong, covering essential details such as the types of WiFi network for Internet access, user profiles of the five main types of WiFi Internet access, how respondents use WiFi network, the devices used and WiFi tethering. Part 4 addresses the issue of WiFi security, including respondent perception and knowledge on WiFi security and the types of WiFi security settings they used. Part 5 details the respondent assessment of WiFi Internet access provided by both private and government service providers. Part 6 concludes the report with a detailed discussion of the research findings. A comparison of this year's findings with those found in 2013 and the insights drawn from the comparison are also presented. Recommendations on how to fix the problems as well as on how to protect the integrity and improve the security and reliability of our WiFi connection are also discussed.

Profiles of Respondents

A total of 207 respondents filled out the questionnaire. Among them, 8 respondents did not answer the question concerning their gender. Of the remaining 199 respondents who answered the question, 156 (78.4%) of them were male and 43 (21.6%) were female (Table 1).

Table 1: Gender of Respondents				
	Sample		Valid Response	
	No.	%	No.	%
Male	156	75.4	157	78.4
Female	43	20.8	43	21.6
No response	8	3.9		
Base	207	100.0	199	100.0

A total of 8 (3.9%) of the respondents did not answer the question concerning their marital status. Of the remaining 199 respondents who answered the question, 85 (41.1%) of them were single and 114 (55.1%) were married (Table 2).

Table 2: Marital Status of Respondents				
	Sample		**Valid Response**	
	No.	**%**	**No.**	**%**
Single	85	41.1	85	42.7
Married	114	55.1	114	57.3
No response	8	3.9		
Base	207	100.0	199	100.0

Table 3: Are you working in the IT related field?				
	Sample		**Valid Response**	
	No.	**%**	**No.**	**%**
Yes	76	36.7	76	38.0
No	124	59.9	124	62.0
No response	7	3.4		
Base	207	100.0	200	100.0

As regards the industry sectors in which the respondents were engaged, 7 (3.4%) of them did not respond to the question. Of the remaining 200 respondents who answered the question, only 76 (38.0%) of them engaged in the IT-related sectors, while the rest (124 out of 200 or 62.0%) engaged in sectors not related to IT (Table 3).

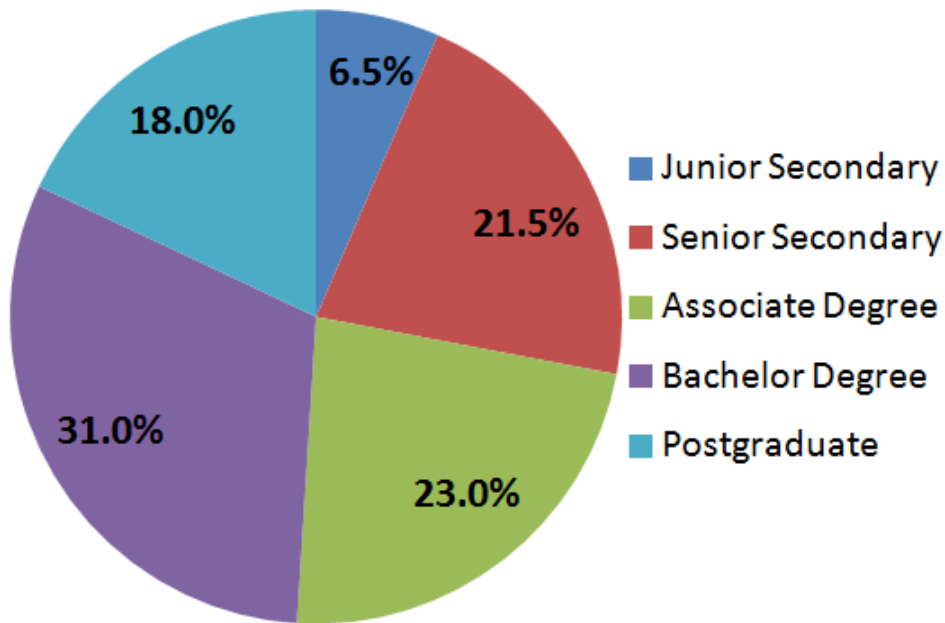| Table 4: Age of Respondents				
	Sample		**Valid Response**	
	No.	**%**	**No.**	**%**
25 years old and below	19	9.2	19	9.5
26-35 years old	35	16.9	35	17.5
36-45 years old	43	20.8	43	21.5
46-55 years old	68	32.9	68	34.0
56 years old and above	35	16.9	35	17.5
No response	7	3.4		
Base	207	100.0	200	100.0

Table 4 illustrates the frequency distribution and percentage composition of the age of the respondents. Of the 200 respondents (96.6%) who answered the question, the majority (34.0%) of them were aged between 46 to 55. Those who were in the 36- to 45-year-old bracket (21.5%) came second. Figure 1 illustrates the distribution of age among the respondents who answered the question on age.
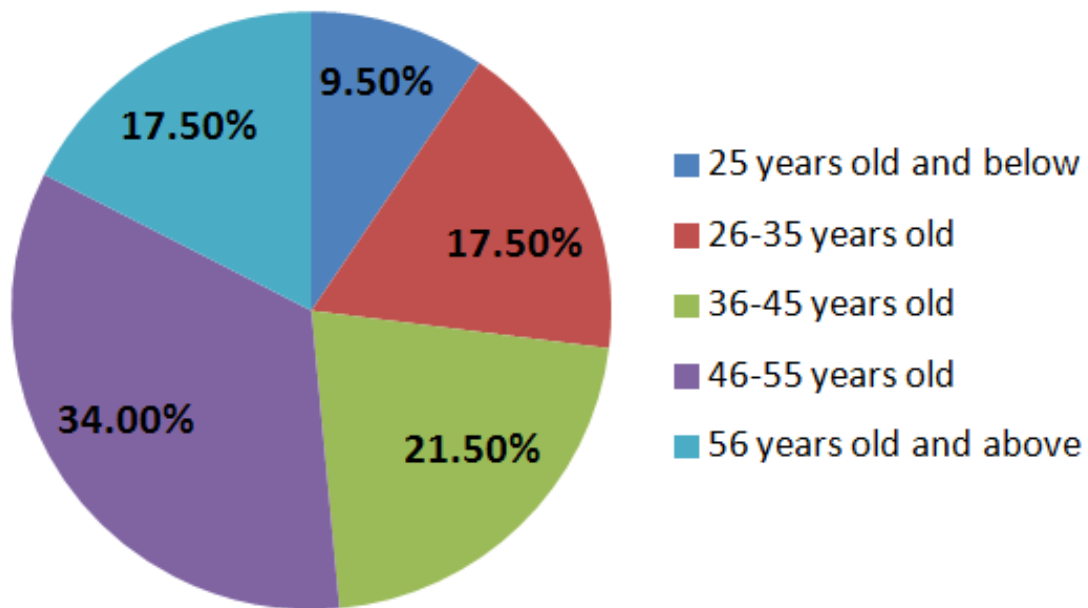
Figure 1: Age of Respondents

Table 5 below illustrates the frequency distribution and percentage composition of the education profile of the respondents. The frequency distribution shows that the majority of the respondents (31.0% or 62 out of 200) had a bachelor degree. They were followed by those with an associate degree (23.0% or 46 out of 200) and those who had completed senior secondary education (21.5% or 43 out of 200).
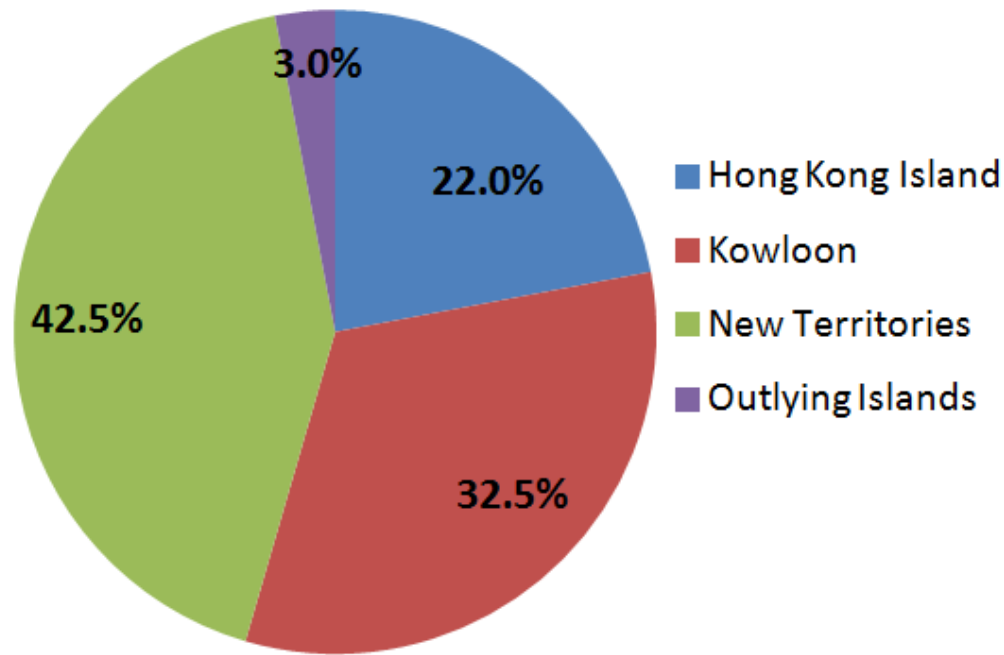
Table 5: Education Profile of Respondents				
	Sample		**Valid Response**	
	No.	**%**	**No.**	**%**
Junior Secondary	13	6.3	13	6.5
Senior Secondary	43	20.8	43	21.5
Associate Degree	46	22.2	46	23.0
Bachelor Degree	62	30.0	62	31.0
Postgraduate	36	17.4	36	18.0
No response	7	3.4		
Base	208	100.0	200	100.0

Figure 2: Education Profile of Respondents

Table 6 below illustrates the frequency distribution and percentage composition of the place of residence profile of the respondents. The frequency distribution shows that the majority of the respondents (41.1% or 85 out of 200) lived in the New Territories. Those who lived in Kowloon (32.5% or 65 out of 200) came second and those who lived on Hong Kong Island (22.0% or 44 out of 200) came third. Only 3% (6 out of 200) of the respondents lived on outlying islands (Figure 3).

| Table 6: Place of Residence Profile of Respondents				
	Sample		**Valid Response**	
	No.	**%**	**No.**	**%**
Hong Kong Island	44	21.3	44	22.0
Kowloon	65	31.4	65	32.5
New Territories	85	41.1	85	42.5
Outlying Islands	6	2.9	6	3.0
No response	7	3.4		
Base	208	100.0	200	100.0

Figure 3: Place of Residence Profile of Respondents

Table 7 below illustrates the frequency distribution and percentage composition of the WiFi experience profile of the respondents. The frequency distribution shows that the majority of the respondents (71.4% or 142 out of 200) had more than 2 years of experience using WiFi. Those with 1-2 years of experience (13.6% or 27 out of 200) came second. 5.5% (11 out of 200) of the respondents had six months to one year of experience using WiFi and 6.5% (13 out of 200) of them had used it for less than six months. Only a small percentage (3.9% or 8 out of 204) of the respondents had never used WiFi before (Figure 4).

|	Sample		Valid Response	
	No.	**%**	**No.**	**%**
Never used it	6	2.9	6	3.0
Less than six months	13	6.3	13	6.5
Six months to one year	11	5.3	11	5.5
One year to two years	27	13.0	27	13.6
Longer than two years	142	68.6	142	71.4
No response	8	3.9		
Base	207	100.0	204	100.0

Table 7: Experience Profile of Respondents
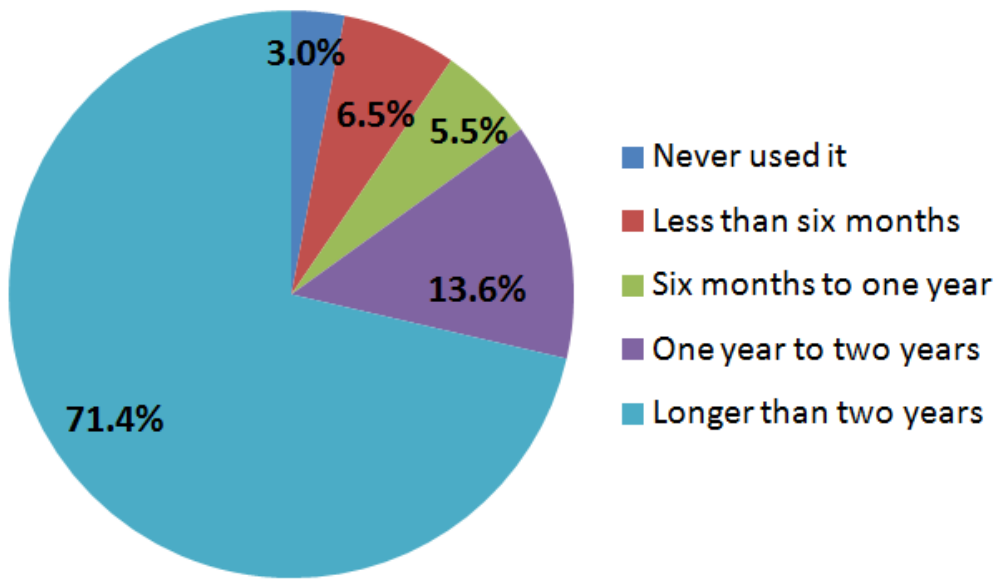
Figure 4: Experience Profile of Respondents

WiFi in Hong Kong

Types of WiFi Network for Internet Access

Figure 5 below shows the types of WiFi network used by the respondents for Internet access. The Bar Chart shows that the majority of the respondents (79.7% or 165 out of 207) used WiFi at home, 53.1% (110 out of 207) of them used WiFi in office, 48.8% (101 out of 207) of them used GovWiFi, 47.3% (98 out of 207) of them used WiFi in business districts and 22.7% (47 out of 207) of them used WiFi on campus.
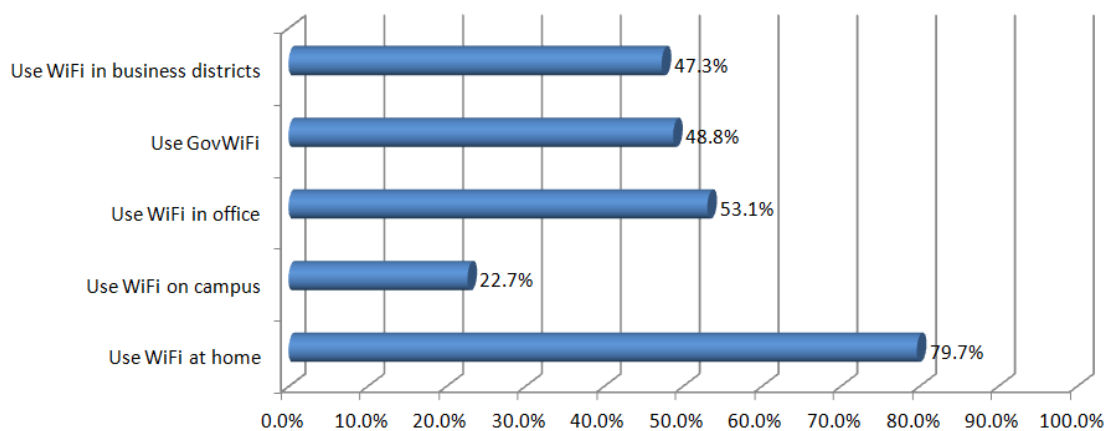
Figure 5: Types of WiFi Network Used for Internet Access

User Profiles of the Five Main Types of WiFi Internet Access

WiFi Using Experience Profiles

Table 8 and Figure 6 below show the WiFi using experience profiles of the respondents' in terms of the five main types of WiFi network. It is clear from the Table and the Bar Chart that the more experienced users (those with more than 2 years of experience of using WiFi) accessed the Internet using WiFi at home (64.25%), WiFi in office (45.41%), GovWiFi (37.68%), and WiFi in business districts (36.23%), while the majority of the less experienced users (those with less than six months of experience of using WiFi) accessed the Internet using the GovWiFi network (3.38%).

**Table 8: WiFi Using Experience in Terms of WiFi Internet Network**

	< 6 months	1/2 to 1 year	1-2 years	> 2 years
Use WiFi at home	2.90%	2.42%	9.18%	64.25%
Use WiFi on campus	0.97%	1.45%	1.45%	18.36%
Use WiFi in office	1.93%	1.93%	3.38%	45.41%
Use GovWiFi	3.38%	2.42%	5.31%	37.68%
Use WiFi in business districts	2.42%	2.42%	6.28%	36.23%
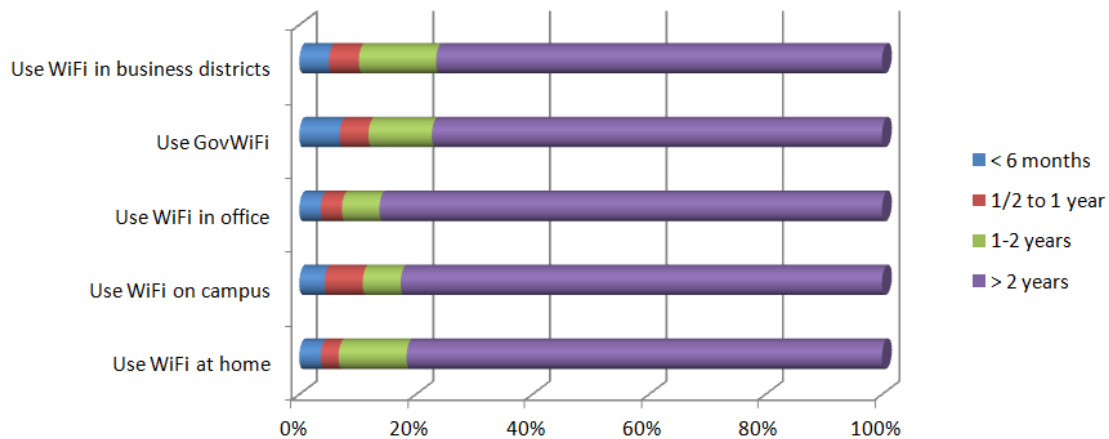
Figure 6: WiFi Using Experience in Terms of WiFi Internet Network
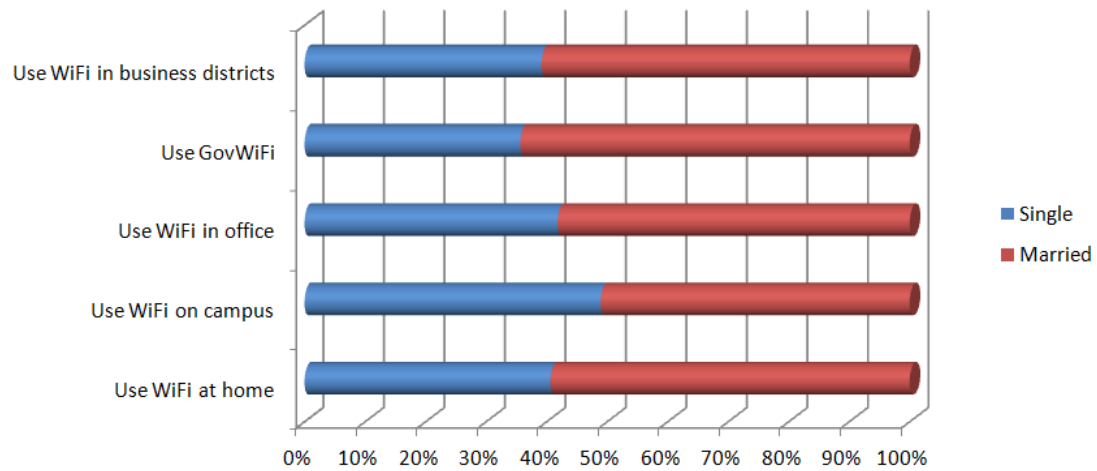
Gender Profiles

Figure 7 below shows the breakdown of the use of the five main types of WiFi Internet network by gender. The Bar Chart shows that the gender profiles of the respondents across all five types of WiFi Internet network are similar.
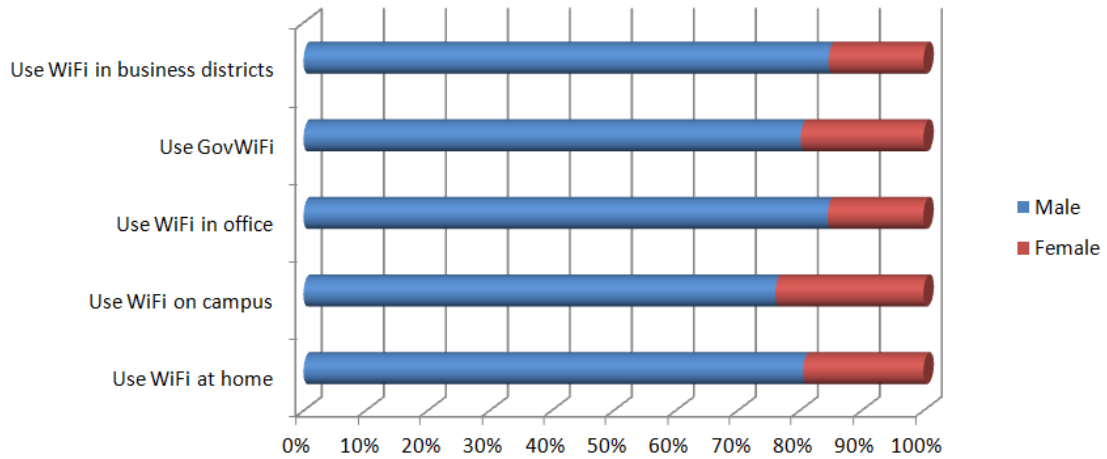
Figure 7: Use of WiFi Network for Internet Access by Gender

Marital Status Profiles

Figure 8 below shows the breakdown of the use of the five main types of WiFi Internet network by marital status. The Bar Chart demonstrates the predominance of married users over single users in all five categories of WiFi Internet access.

Figure 8: Use of WiFi Network for Internet Access by Marital Status
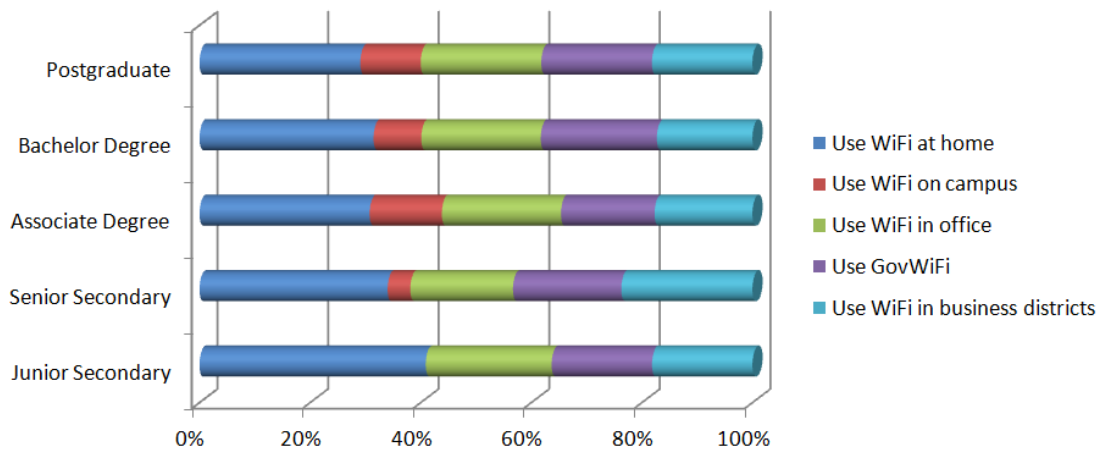
Age Profiles

Figure 9 below shows the breakdown of the use of the five main types of WiFi Internet network by age. The Bar Chart demonstrates that the majority of the users across all five age groups used WiFi at home. Comparatively, those aged 25 and below used less GovWiFi than other age groups.
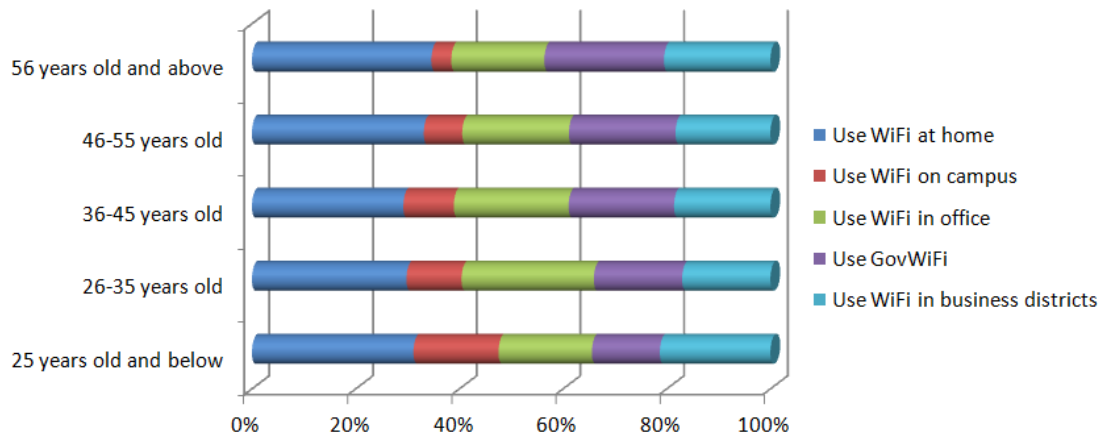
Figure 9: Use of WiFi Network for Internet Access by Age

Education Profiles

Figure 10 below shows the breakdown of the use of the five main types of WiFi Internet network by education level. The Bar Chart shows that the percentage shares of those using WiFi at home, WiFi on campus, WiFi in office, GovWiFi and WiFi in business districts across all educational level groups are similar. However, it is noteworthy that the percentage of those using WiFi on campus varies from 0% for those who completed junior Secondary to 8.21% for those with an Associate Degree.
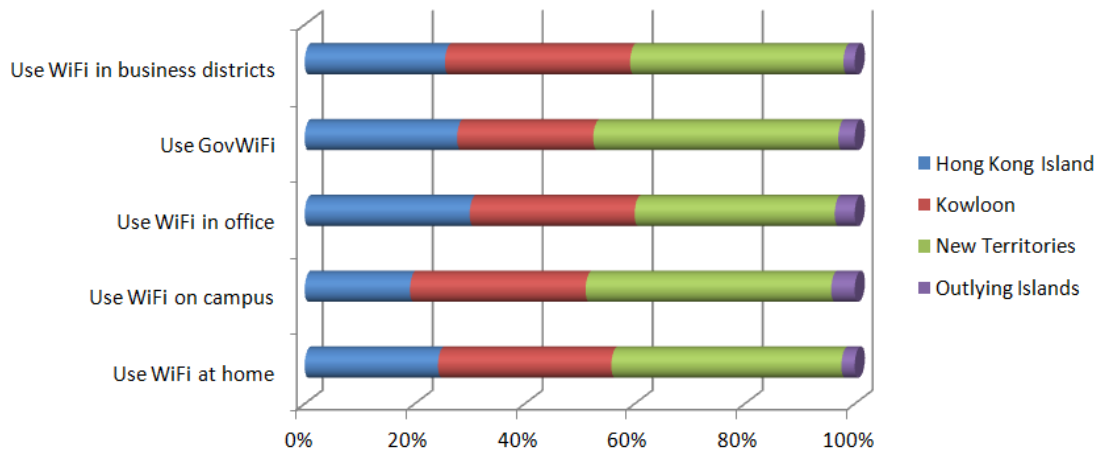

Figure 10: Use of WiFi Network for Internet Access by Educational Level

Place of Residence Profiles

Figure 11 below shows the breakdown of the use of the five main types of WiFi Internet network by place of residence. The Bar Chart shows that the percentage

composition of place of residence of the respondents is similar across all five types of WiFi Internet network.

Figure 11: Use of WiFi Network for Internet Access by Place of Residence

Use of WiFi Network

Table 9 illustrates the frequency distribution and percentage composition of the amounts of time the respondents spent on WiFi connection. Of the 207 respondents who completed the questionnaire, 8 (3.9%) did not answer the question on the amounts of time they spent on WiFi connection and 4 of them (1.9%) indicated that they had never used WiFi connection. Of the 195 respondents (94.2%) who stated that they used WiFi connection (see Figure 12), the majority (54.77%) of them used WiFi frequently (about 4 hours per day). They were followed by the occasional users (31.66%) who spent less than 10 hours on WiFi connection per week. Those who used WiFi connection when necessary accounted for 11.56% of the total.

| Table 9: Time Spend on WiFi Connection				
	Sample		Valid Response	
	No.	%	No.	%
Frequently (e.g. 4 hrs/day)	109	52.7%	109	54.77%
Occasionally (e.g. < 10 hrs/wk)	63	30.4%	63	31.66%
Unless necessary	23	11.1%	23	11.56%
Never used it	4	1.9%		
No response	8	3.9%		
Base	207	100.0	195	100.0
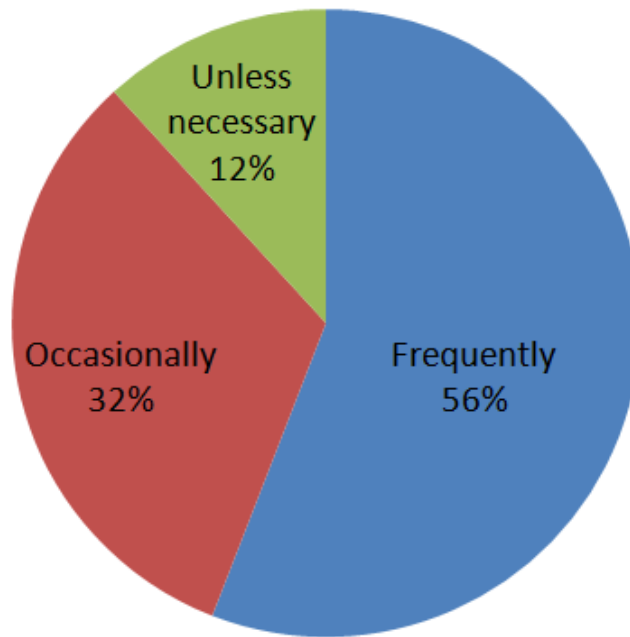
Figure 12: Time Spend on WiFi Connection

Figure 13 shows the kinds of device used by the respondents to connect to WiFi network. It is revealed that the majority of WiFi users used Smartphones (75.8%) and personal computers (56.0%) to access WiFi. About half (51.2%) of the respondents used tablets, such as iPads, to access WiFi. Very few (6.3%) respondents used PDAs to access WiFi.
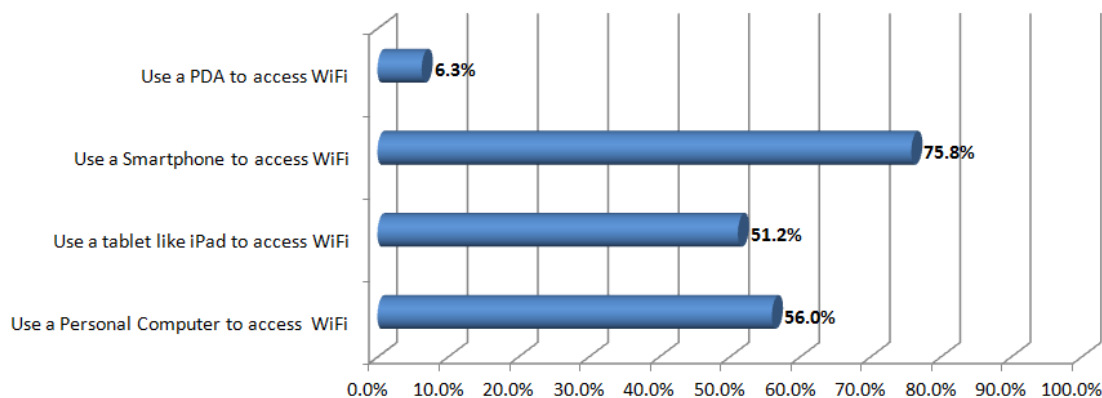

Figure 13: How do you access WiFi?

As shown in Figure 14, only 5.3% of the respondents were not users of Smartphones and notably, for those who used Smartphones, the majority of them used Android Smartphones (67.1%). They were followed by those who used iOS (Apple iPhone) (24.2%). Only 4.8% of the respondents used Smartphones other than an Android or an iPhone.
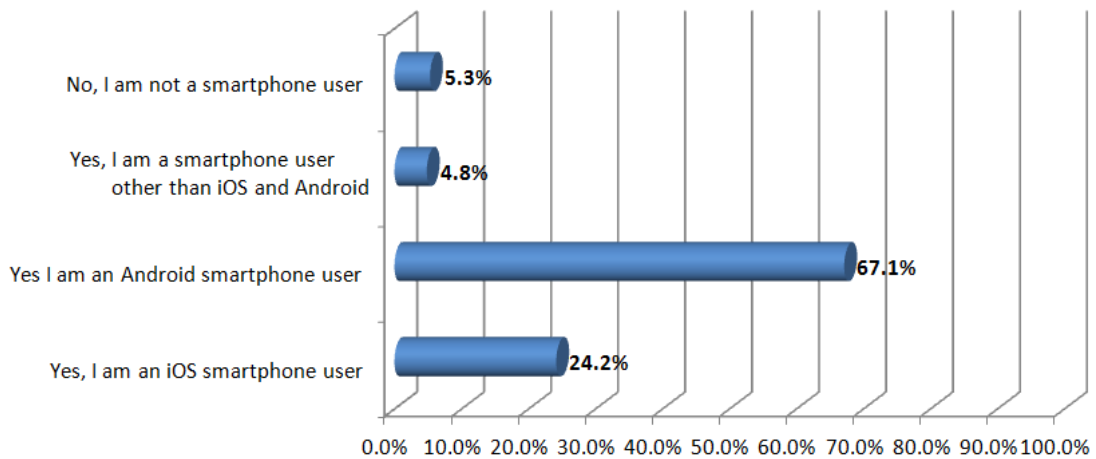
Figure 14: Are you a Smartphone user?

Figure 15 shows the purposes of the respondents in seeking access to WiFi networks. The majority of the respondents used WiFi to obtain information from the Internet (68.6%). They were followed by those who used WiFi to contact friends (58.9%) and to conduct online activities (55.6%). About half (47.3%) of the respondents used WiFi to complete their work. Only about one-third (36.2%) of the respondents used WiFi to support their learning.
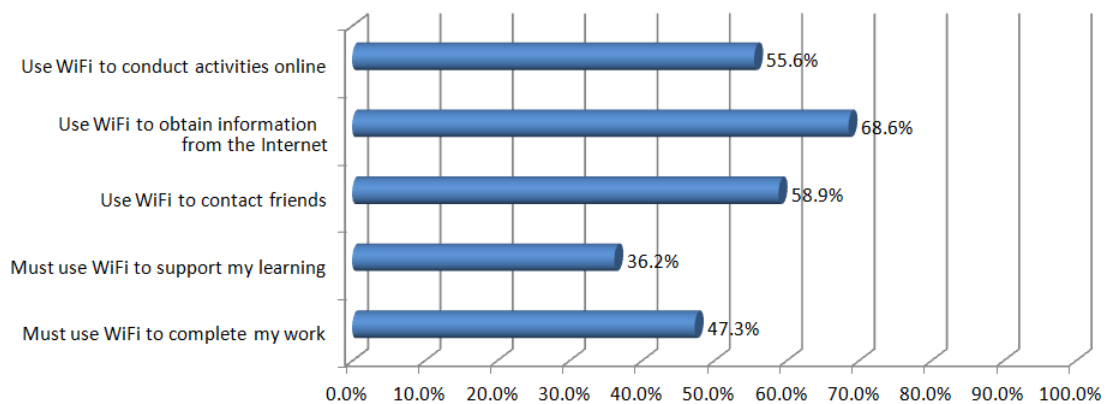

Figure 15: Why do you use WiFi to access the Internet?

Figure 16 below shows the breakdown of the reasons of using WiFi network by gender. It reveals that roughly the same number of male and female users used WiFi network to obtain information from the Internet (69.0% and 64.8% respectively) or to conduct activities online (56.1% and 51.4% respectively). Male users were more likely to use WiFi network to contact friends (62.9% vs. 44.7%) and complete their work (50.5% vs. 33.6%) than female users .
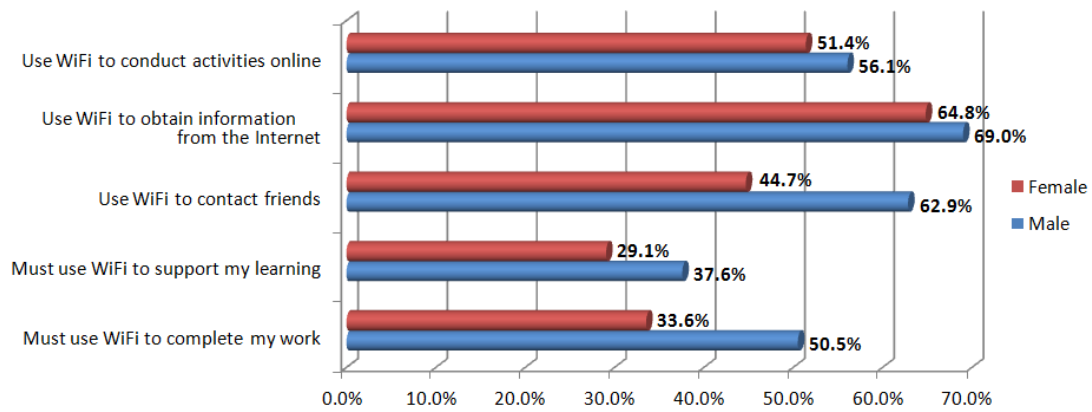
Figure 16: Reason of Use of WiFi Network by Gender
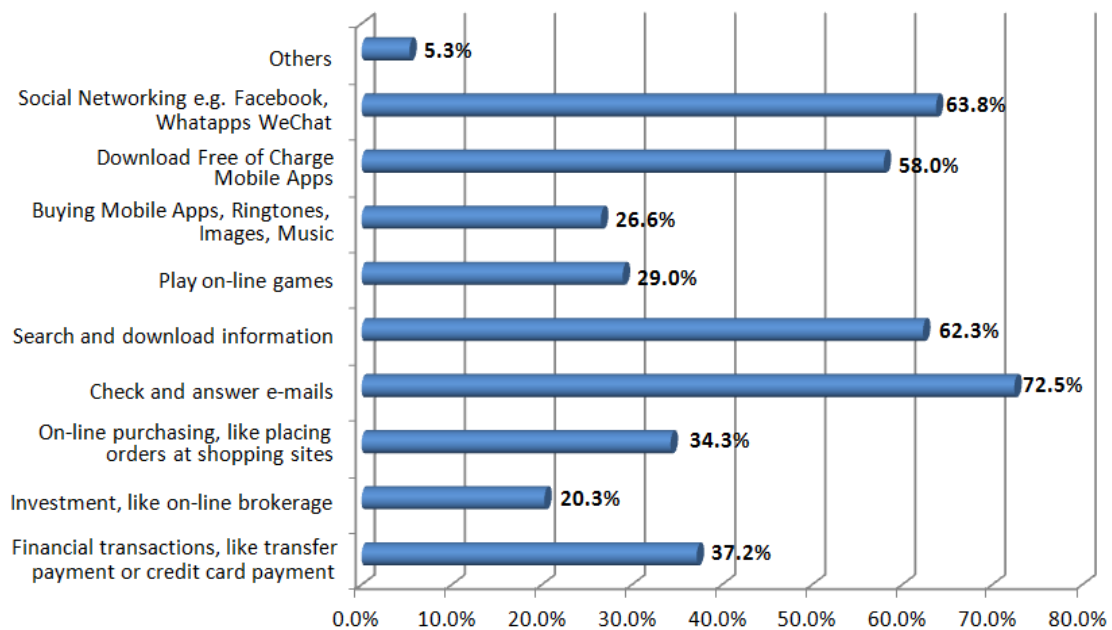
**Figure 17: What activities have you conducted using the WiFi network?**

Figure 17 shows the activities conducted by the respondents using WiFi network. The majority of the respondents used WiFi to check and answer emails (72.5%). They were followed by those who used WiFi to access social networks, such as Facebook, WhatsApp and WeChat (63.8%), to search and download information (62.3%) or to download free-of-charge mobile apps (58.0%). About one-third of the respondents used WiFi to perform financial transactions (37.2%), to make on-line purchases (34.3%) or to play on-line games (29.0%). About a quarter of the respondents used WiFi network to buy mobile apps, ringtones, images and music (24.5%) and about one-fifth of the respondents used WiFi network to perform investment activities, for

example, on-line brokerage (20.3%). Only a small percentage of respondents (5.3%) used WiFi to perform other activities.

WiFi tethering

When being asked whether they had ever shared their Smartphones as a WiFi Hotspot, i.e. WiFi tethering, the majority (53.14%) of the respondents answered in the affirmative but 39.61% of the respondents answered in the negative. A small percentage (7.25%) of respondents were not sure whether they had ever shared their Smartphones as WiFi hotspots (Figure 18).
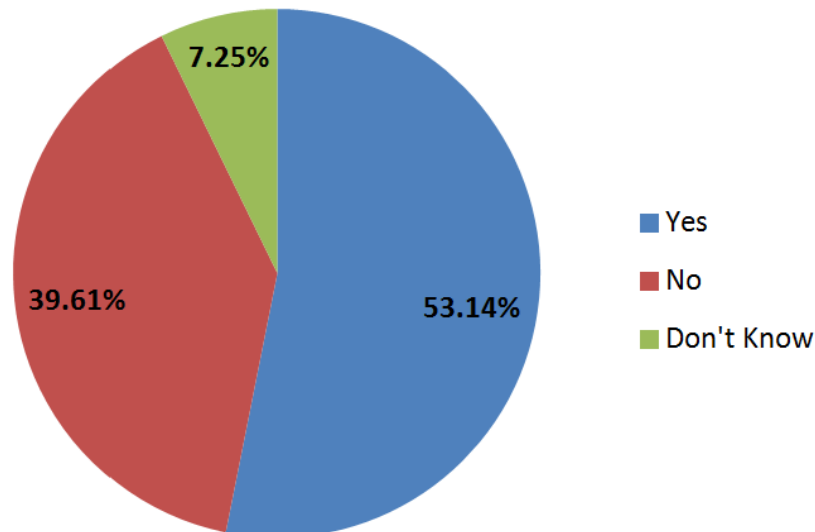
Figure 18: Have you ever shared your Smartphone as a WiFi Hotspot?

Using WiFi for Mobile Messaging and Social Networking

Mobile Messaging

Figure 19 below shows the types of mobile messaging apps used by the respondents. The Bar Chart shows that only a small percentage of respondents (8.3%) did not use mobile messaging. For those who used mobile messaging, a large majority of them (88.1%) used WhatsApp. They were followed by those who used WeChat (45.2%) and LINE (36.2%).
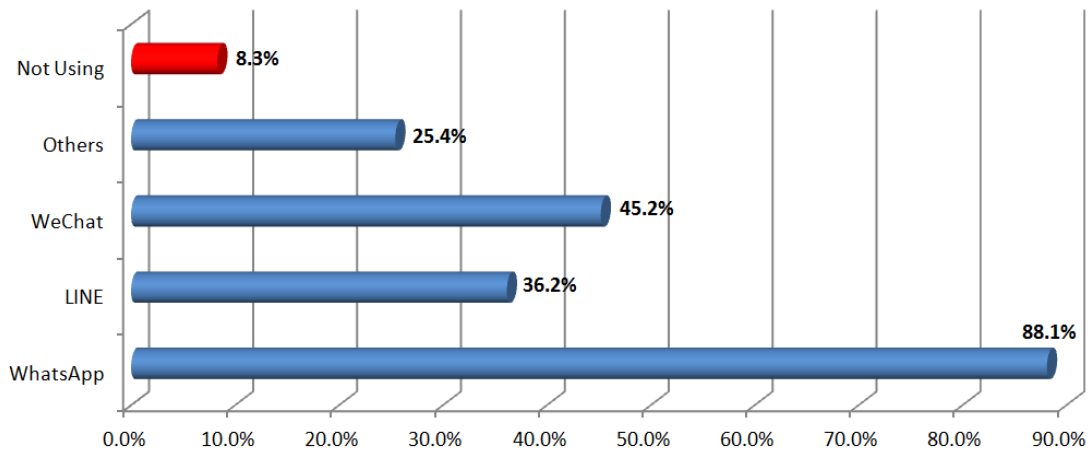
Figure 19: Types of WiFi Mobile Messaging Apps
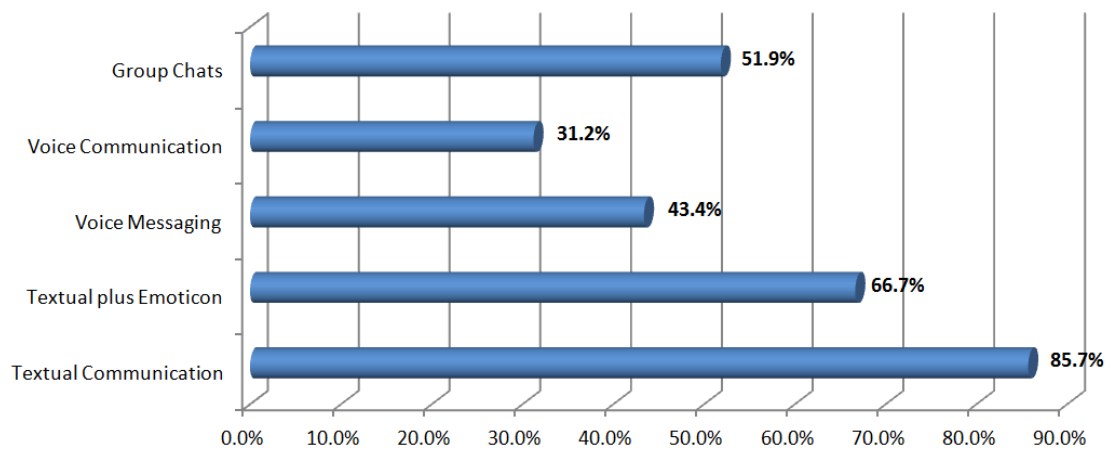
Figure 20 below shows how the respondents used mobile messaging apps. The Bar Chart shows that a large majority of them (85.7%) used mobile messaging apps for textual communication. They were followed by those who used them for textual plus emoticon (66.7%). About half of the respondents used mobile messaging apps for group chats (51.0%). Other uses of mobile messaging apps included voice messaging (43.4%) and voice communication (31.2%).

Figure 20: Use of Mobile Messaging Apps Used

Figure 21 below shows the percentage of online time the respondents spent on using mobile messaging apps. The pie chart shows that the majority of them (33%) spent 10-25% of their online time on using mobile messaging apps. They were followed by those who spent less than 10% of their online time (27%) and those who spent 25-50% of their online time (18%) on such apps. Only 8% of the respondents spent more than 75% of their online time on mobile messaging.
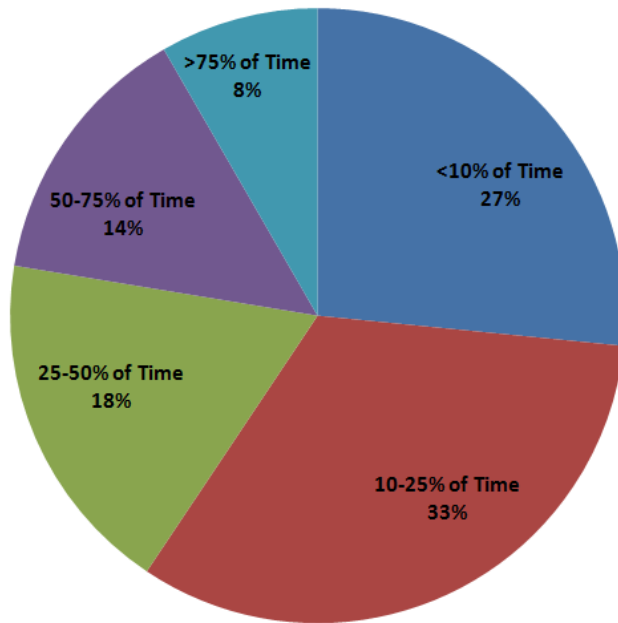
Figure 21: Percentage of Online Time for Mobile Messaging

Social Networking

Figure 22 shows the types of social networking apps used by the respondents. The Bar Chart shows that only a small percentage of respondents (8.8%) did not use social networking apps. For those who used such apps, a large majority of them (86.9%) used Facebook. They were followed by those who used YouTube (60.2%). About one-fifth of them used LinkedIn (22.2%) and Twitter (18.8%). A slightly more than one-fifth (21.0%) of them used other social networking apps.
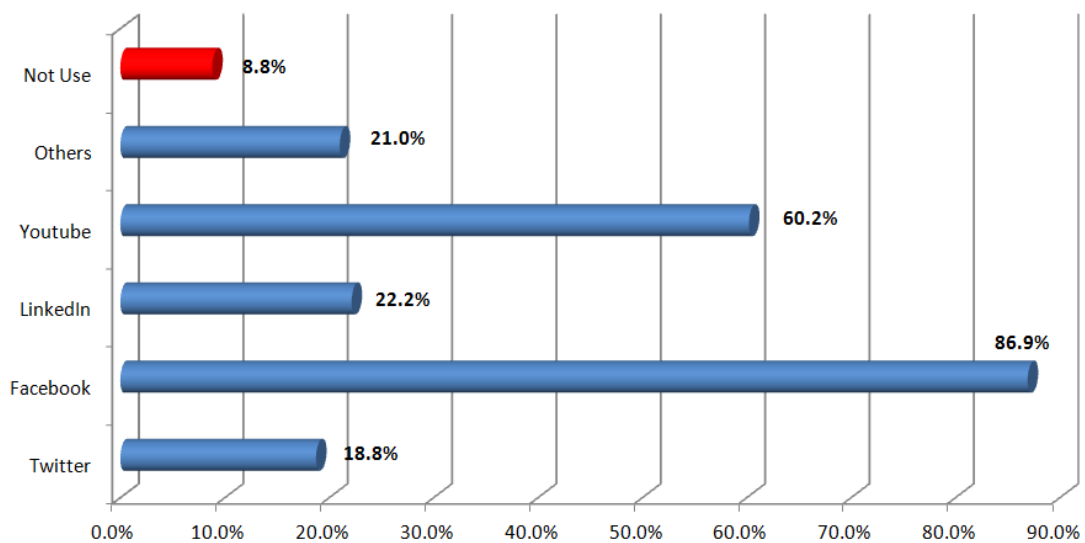

Figure 22: Types of Social Networking Apps Used

Figure 23 below shows the percentage of online time the respondents spent on social networking. The Pie Chart shows that the majority of them (34%) spent less than 10% of their online time on using social networking apps. They were followed by those who spent 10-25% of their online time (27%) and those who spent 25-50% of their online time (22%) on such apps. Only 4% of the respondents spent more than 75% of their online time on using social networking apps.
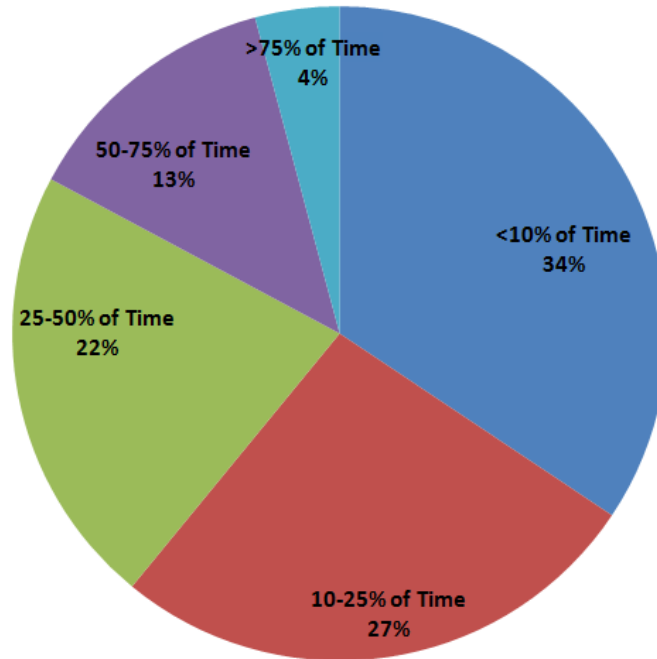
Figure 23: Percentage of Online Time for Social Networking

WiFi Security

Table 10 and Figure 24 below show that about half (47.2%) of the respondents expressed concerns over the use of WiFi to access the Internet as they were worried that their personal privacy might be disclosed as a result. Though a slightly more than half (53.8%) of the respondents believed that using WiFi to access the Internet was safe, less than one-fifth (18.1%) of them thought otherwise. Moreover, about half (48.5%) of the respondents believed that security measures provided by WiFi were adequate and less than one-fourth (23.5%) of them thought otherwise.

Table 10: WiFi Security

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
I believe using WiFi to access the Internet is safe.	6.0%	18.6%	29.1%	28.1%	9.5%	4.0%	4.5%
I believe the security measures provided by WiFi are adequate.	5.1%	16.8%	26.5%	28.1%	15.3%	3.6%	4.6%
It is not a concern to me that using WiFi to access the Internet would disclose my personal privacy, for example, my physical location	5.1%	10.7%	15.7%	21.3%	21.8%	13.2%	12.2%
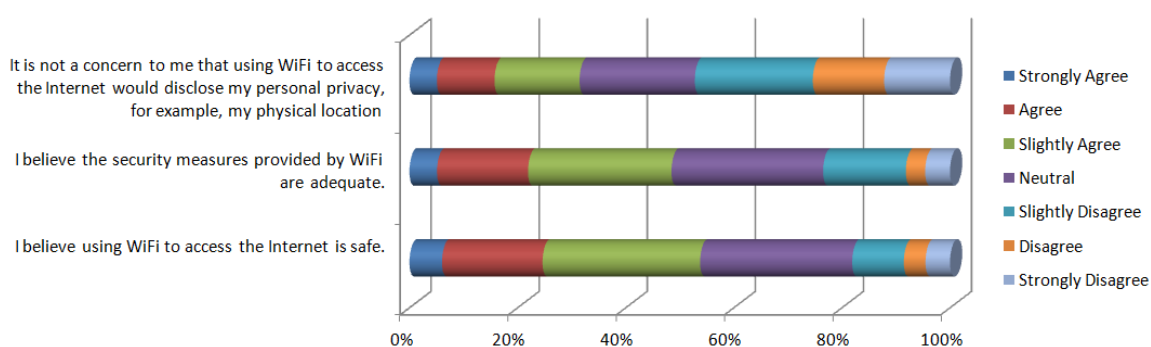
Figure 24: WiFi Security

Table 11 and Figure 25 below are a breakdown of the respondents' perceptions of WiFi security by gender. It reveals that, there was not much difference in perception between males and females in responding to the three questions on WiFi security.

Table 11: WiFi Security

|	Male			Female		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
I believe using WiFi to access the Internet is safe.	52.7%	27.3%	20.0%	52.5%	32.5%	15.0%
I believe the security measures provided by WiFi are adequate.	46.9%	29.9%	23.1%	47.5%	25.0%	27.5%
It is not a concern to me that using WiFi to access the Internet would disclose my personal privacy, for example, my physical location	30.4%	22.3%	47.3%	30.0%	17.5%	52.5%
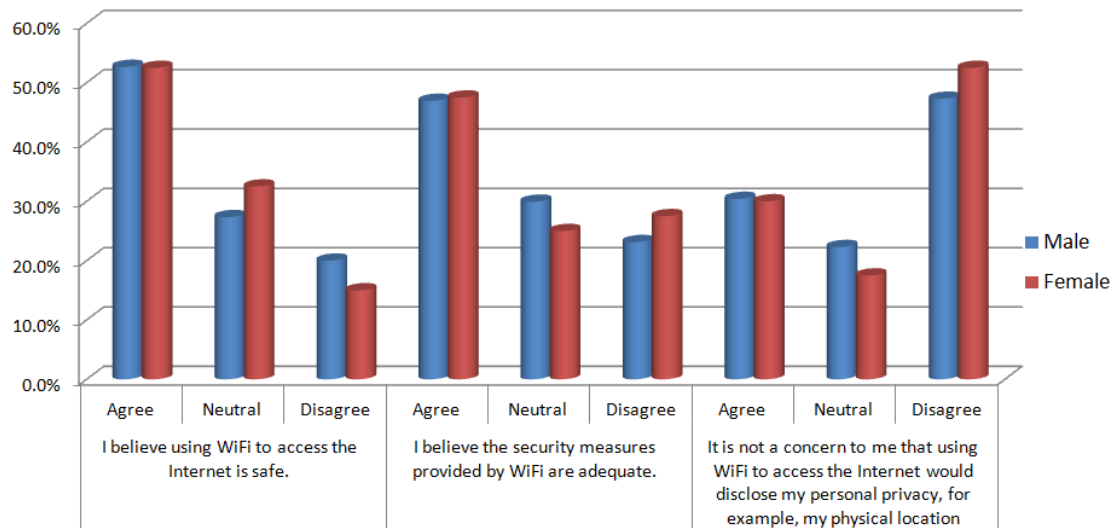
Figure 25: Respondent Perceptions of WiFi Security by Gender

Figure 26 below shows the types of WiFi standard that the respondents used at home. It shows that more than one-fourth (25.6%) of the home WiFi users did not know what kinds of WiFi standard they were using. For those who knew what standards they were using, nearly half (44.8%) of them used 802.11n. They were followed by those who used 802.11g (30.5%). The shares of home WiFi users who used older standards, i.e., 802.11a standard and 802.11b standard, were 15.6% and 28.6% respectively, while the share of home WiFi users who used the latest standard, i.e. 802.11ac, was 17.5%.
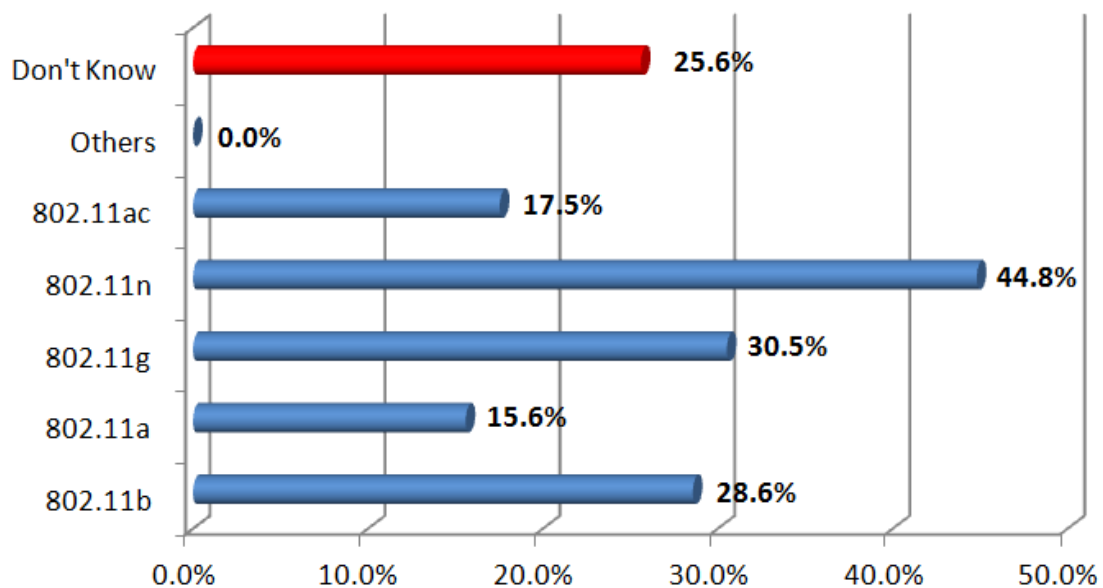
Figure 26: WiFi Standards Used by Home WiFi Users

Figure 27 below shows the types of WiFi encryptions used by the respondents at home. It shows that 17.1% of the home WiFi users did not know what kinds of WiFi security they were using. For those who knew what kinds of WiFi security they were using, 9.1% of them did not use any WiFi encryptions on their home WiFi networks. For those home WiFi users who used WiFi security, the majority of them (46.7%) used "WPA/WPA2 using AES". They were followed by those who used "WPA/WPA2 using AES" (25.5%). 12.1% of the home WiFi users used WEP (Wired Equivalent Privacy).
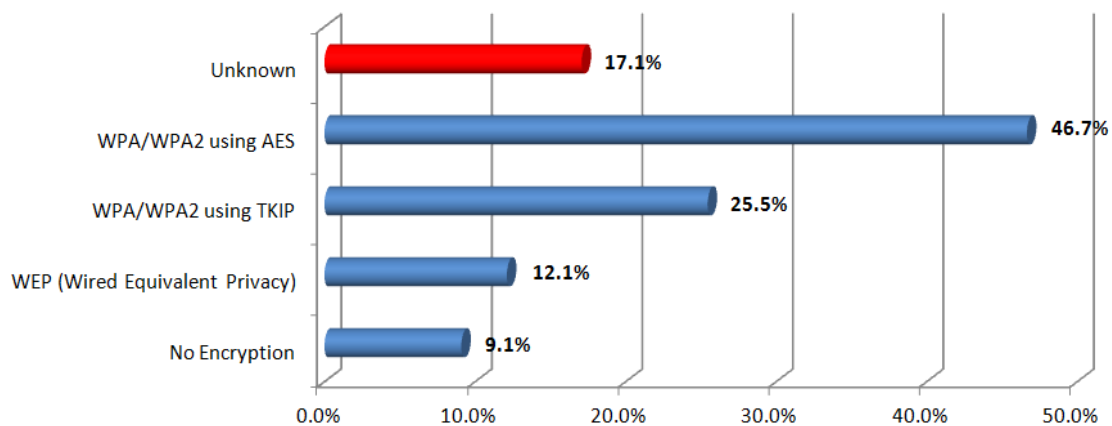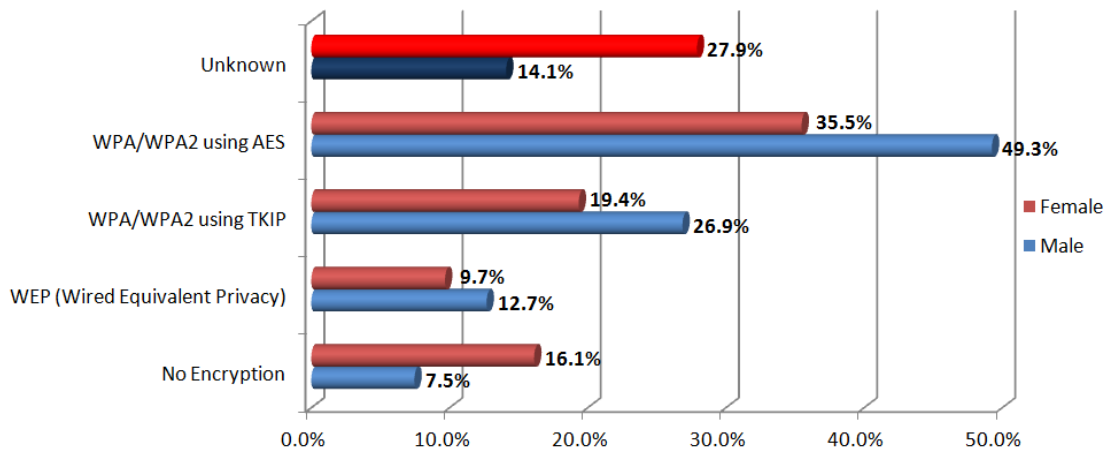

Figure 27: WiFi Encryptions Used by Home WiFi Users

Figure 28 shows that 27.9% of the female WiFi users did not know what kinds of encryption method they were using at home, which is much higher than the 14.1% share of male home WiFi users. Moreover, for those who knew what kinds of WiFi encryption they were using, 16.1% of the female WiFi users did not use any encryption on their home WiFi network, which is considerably higher than the 7.5% share of male home WiFi users.

It also shows that 49.3% of the male WiFi users used the most advanced WPA/WPA2 with AES encryption technology at home, but only 35.5% of the female WiFi home users used the technology. The percentage of male home WiFi users who used WPA/WPA2 using TKIP encryption technology is also higher than that of the female users (26.9% vs. 19.4%).

Figure 28: WiFi Encryptions Used by Home WiFi Users by Gender

In responding to a follow-up question on the safety of WEP encryption technologies, among the 12.7% of male WiFi users and 9.7% of female WiFi users who were using WEP at home, 42.1% of them indicated that they were aware of the fact that the WEP technology they were using was unsafe. On the other hand, 56.4% of those who knew that the WEP technologies were unsafe stated that they were not using it (Figure 29).
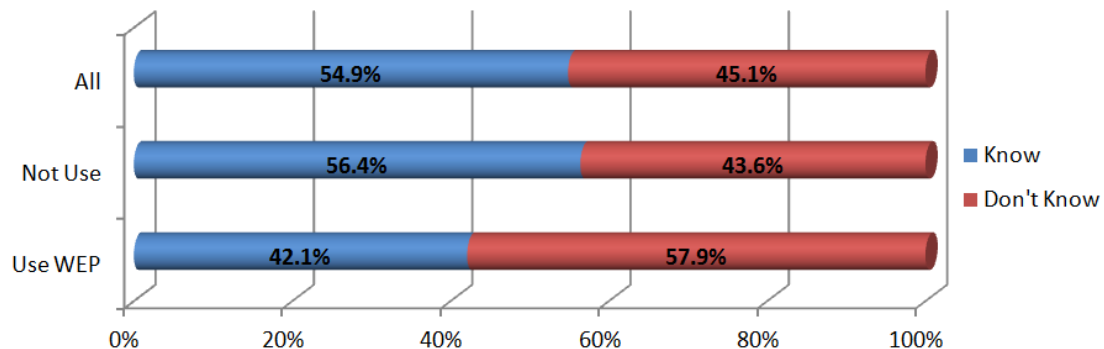
Figure 29: Use of WEP vs Knowledge on WEP

Of the respondents who said that they were aware of the fact that WEP technologies were not safe, 35.3% of them said that they still used WEP WiFi encryption technologies because they didn't know how to change to a more secure technology (Figure 30). They were followed by those who said that they were still using WEP because the devices on the customer end did not support more secure technologies (20.3%). Other reasons for not changing to safer alternatives include the routers did not support more secure technologies (15.0%), they could not change the setting because the router settings were done by suppliers (12.0%) and their lack of time to change to another technology (8.3%).
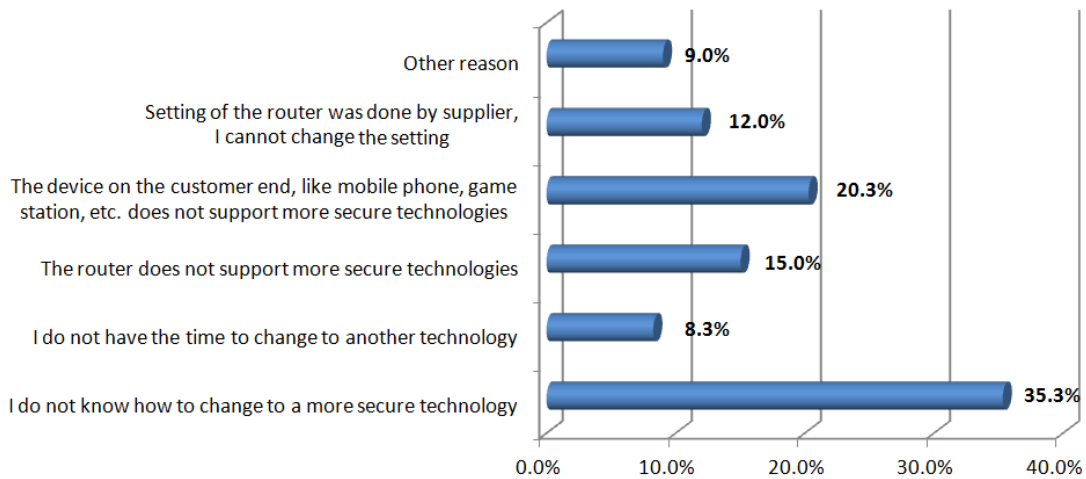
Figure 30: Reasons of still using WEP Encryption technologies

WiFi Security Knowledge

Table 12 and Figure 31 below show a breakdown of respondents regarding to questions on knowledge of WiFi security. In responding to the question of whether they had good knowledge on WiFi security, 63.5% of the male respondents believed they had while only 37.2% of the female respondents believed so. In responding to the question of whether they could explain WiFi security to others, 60.3% of the male respondents believed they could while only 37.2% of the female respondents believed so. In responding to the question of whether they knew how to use the security setting in WiFi, 64.7% of the male respondents believed they knew while only 39.5% of the female respondents believed so. In responding to the question of whether they knew how to teach others to use the security setting in WiFi, 58.3% of the male respondents believed they knew it while only 34.9% of the female respondents believed so.

Table 12: WiFi Security Knowledge

	Male			Female		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
I have good knowledge on WiFi security	63.5%	21.2%	14.7%	37.2%	25.6%	37.2%
I know how to use the security setting in WiFi	64.7%	15.4%	19.2%	39.5%	18.6%	41.9%
I can explain WiFi security to others	60.3%	19.9%	19.2%	37.2%	20.9%	41.9%
I know how to teach others to use the security setting in WiFi	58.3%	19.9%	21.2%	34.9%	16.3%	48.8%
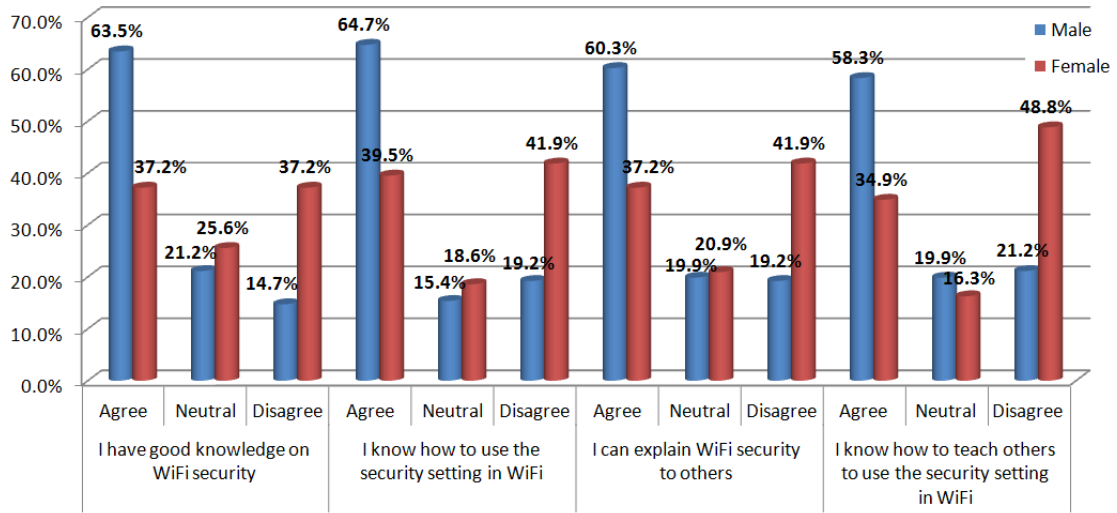
Figure 31: WiFi Security Knowledge

Public WiFi Access

Figure 32 below shows the respondents' comments and suggestions on the public WiFi hotspots provided by commercial service providers. Inadequate WiFi access points (65.3%), unstable service quality (55.6%) and inadequate bandwidth (37.2%) were the top three comments given by the respondents. These were followed by service charge (26.0%) and inadequate transparency in service pricing (21.4%).
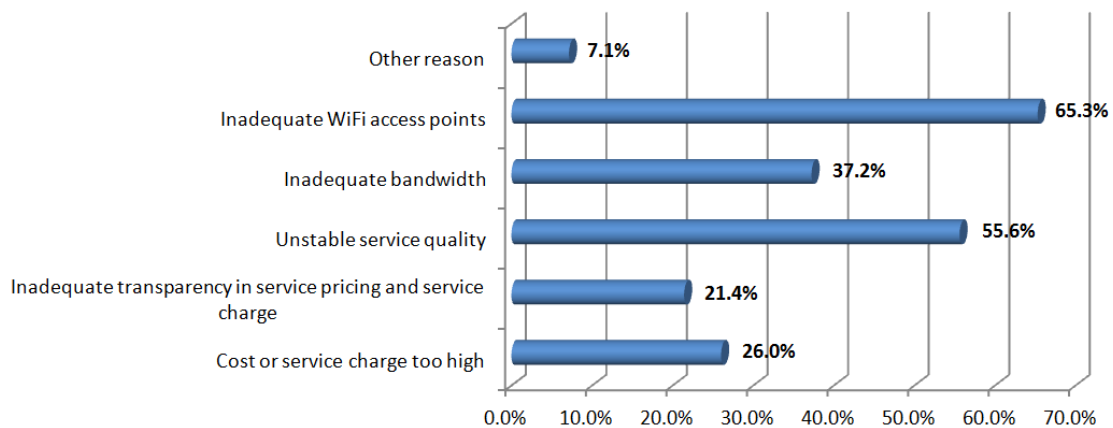
Figure 32: Respondent Comments/Suggestions on Commercial WiFi Services

Figure 33 below shows the respondents' comments and suggestions on the public WiFi hotspots provided by the HKSAR government known as GovWiFi. Inadequate

WiFi access points (70.4%), inadequate bandwidth (51.5%) and unstable service quality (51.5%) were the top three comments given by the respondents. These were followed by inadequate contents or services (21.4%).
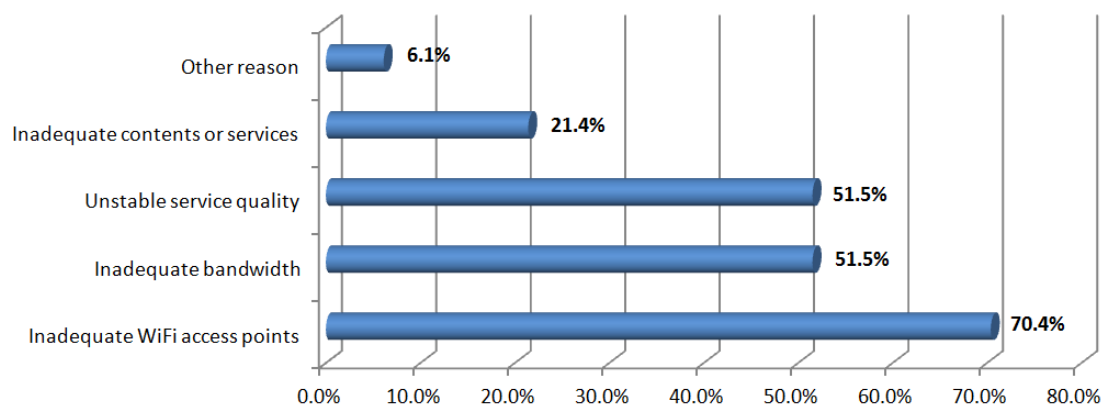
Figure 33: Respondent Comments/Suggestions on GovWiFi

Discussion

In today's Hong Kong , the need to get seamlessly access live feeds of information and to share experiences via social media and engage with the rest of the world through a WiFi enabled device – be it a notebook computer, a smart phone, a tablet, a media player, game console or even a TV – has become more important than ever before. The WiFi network allows us to watch YouTube and streaming release of TV programs, to play interactive online games, to maintain constant contact with business partners, customers, families and friends whenever and wherever needed or wanted. Setting out to examine WiFi usage, accessibility, user knowledge and security in Hong Kong, this report seeks to provide an evidence-based and empirical assessment of user perceptions on the above fundamental issues of WiFi usage, technology, security and future development in Hong Kong.

WiFi usage

Our 2013 Report reveals that the majority of respondents used WiFi to obtain information from the Internet, contact friends and conduct online activities. The findings of 2014 reveals a similar pattern of usage (A comparison of WiFi usage is tabulated in Table 13 below). However, a further examination of the research

findings shows there is a reversal of gender difference on the purpose of obtaining WiFi connectivity. Our 2013 Report notes that female respondents shows a greater tendency to use WiFi for social networking purposes than male respondents (69.8% vs. 55.4%), while in our findings this year, more males than females indicated that they used the WiFi for social networking purposes (62.9% vs. 44.7%).

Table 13: WiFi usage 2014 vs 2013

	2013			2014		
	Overall	Female	Males	Overall	Female	Males
Use WiFi to conduct activities online	62.0%	55.8%	63.7%	55.6%	51.4%	56.1%
Use WiFi to obtain information	74.5%	69.8%	76.4%	68.6%	64.8%	69.0%
Use WiFi to contact friends	58.7%	69.8%	55.4%	58.9%	44.7%	62.9%
Must use WiFi to support learning	44.2%	37.2%	45.9%	36.2%	29.1%	37.6%
Must use WiFi to complete work	49.0%	34.9%	53.5%	47.3%	33.6%	50.5%

It is also noted that less people were conducting activities online and obtaining information from the Internet using WiFi in 2014. The reduction is more significant for male respondents and this, in turn, has narrowed down the gender difference with respect to the said Internet uses via WiFi.

One reason for the growing similarity between male and female respondents with respect to WiFi usage may be attributed to our newfound freedom to text friends, upload photos and tweet real-time updates due to the increasing availability of mobile devices and improved accessibility. Rather than obtaining information, males are now getting more interested in using their devices to share their experiences, express their feelings and keep in touch with their social circle just like their female counterparts. Females, as our findings this year reveal, are expanding their online interests to information gathering and transactional activities such as online shopping.

Many people believe that we are now at the threshold of the Post-PC era that will witness the decline of traditional computers and the rise of WiFi-enabled mobile devices. Our research seems to confirm this belief as both the 2013 and 2014 findings show that the majority of people in Hong Kong use Smartphones to access the Internet via WiFi (75.8% in 2014 and 76.9% in 2013). Of the 4 main types of access devices (PDA, tablets, Smartphones and PCs), the percentage of people using a tablet

to access the Internet via WiFi has increased 4.1%, from 47.1% of 2013 to 51.2% of 2014, while the percentage of people using a PC to access the Internet via WiFi has dropped 10.8%, from 66.8% of 2013 to 56.0% of this year. The reasons for the shift from PCs to mobile devices for WiFi connectivity maybe twofold: the increasing number of WiFi routers installed at home to avoid the use of expensive mobile data plan; and the availability of low-cost WiFi only tablets on the market.

Use of WiFi for Mobile Messaging and Social Networking

With the growing popularity of mobile messaging and social networking, we tasked ourselves to take a closer look of these two aspects in this year's research. Our findings show that people not using mobile messaging services at all accounted for only a small percentage of the respondents (8.3%). For those who used the services, the majority of them (88.1%) used WhatsApp, signifying the dominance of WhatsApp in the mobile messaging market of Hong Kong. On the other hand, 45.2% of the respondents used WeChat, which is the most popular mobile messaging apps on Mainland China. The popularity of WeChat in Hong Kong (though not as popular as WhatsApp) underlines the close communications ties between Hong Kong and the Mainland of China.

Like mobile messaging, only a small percentage of respondents (8.8%) did not use social networking services in 2014. For those who used social networking services, the majority of them (86.9%) used Facebook, showing the dominance of Facebook in the territory's social networking services arena. It is also found that 60.2% of the respondents used YouTube in 2014. This may reflect an increasing trend of uploading and downloading videos among Hong Kong people.

Instant messaging and social networking facilitated by apps has strengthened the position of Smartphones as key communicators in our daily lives. They are with us all the time and help us stay connected. The intimacy and immediacy of these apps offer users a lot of freedom, but it is important to remind the users to frequently update their software to have the latest security fixes and to download apps from reputable vendors to minimize security breach or attack of a malware or malicious apps.

WiFi Security – Knowledge and WiFi Tethering

The respondents are in general satisfied with the level of WiFi security they enjoy in Hong Kong. Only 18% of respondents in 2014 thought that it was not safe using WiFi to access the Internet. Having said that, 47.2% of the respondents expressed concern over the possible disclosure of personal privacy due to accessing the Internet via WiFi. Those who said they had no such concern accounted for 21.5% of the respondents. Compared with 2013, the number of people who were concerned about possible disclosure has slightly dropped by 2.8 percentage point from 50% of the respondents in 2013 to 47.2% in 2014, and the number of people who expressed no concern has increased slightly by 1.1 percentage point, from 30.4% of the respondents in 2013 to 31.5% in 2014. While less respondents expressing concern over possible privacy disclosure via WiFi may suggest that more people feel safer in using WiFi than last year, the decrease in percentage share may also suggest that people are more aware of WiFi safety and are more ready to take precautionary measures against possible breaches.

Moreover, 48.4% of our respondents believed that the security measures provided by WiFi were adequate, similar to the 49.8% share reported last year. However, the percentage of respondents who believed WiFi security measures were inadequate has increased 3.5 percentage point, from 20.0% of the respondents in 2013 to 23.5% reported this year. This may suggest that user expectations for WiFi security have evolved in line with increasing online connectivity. It is important that service providers will continue to upgrade their service and the relevant infrastructure along with evolving user expectations.

The 2013 Report highlighted the big gender difference in the respondent perception of WiFi security in Hong Kong. Last year, 47.1% of the male and 60.5% of the female respondents expressed concern over the possible disclosure of personal privacy due to accessing the Internet via WiFi. The findings of this year reveals, however, that the difference persists but is getting less (47.3% for male respondents and 52.5% for female respondents). One possible explanation for the narrowing gender difference may be attributed to the efforts of the industry, in particular the Hong Kong WTIA, in promoting WiFi security through seminars and a variety of educational programmes that sought to include all sectors of the community.

In Hong Kong, it is quite common for people to have more than one mobile device, and it is also quite common for users of Smartphones to share WiFi connection with other mobile devices by means of WiFi tethering. Our research shows that 53.14% of the respondents indicated that they used WiFi tethering to share WiFi connection, up 3.14 percentage point from the 50.0% share reported last year. One possible reason for the growth may be attributed to tethering and the popularity of low-cost Wi-Fi only tablets. Using a Smartphone as a hotspot, one can easily get an Internet connection for his/her tablet without the need to waste money on additional data plans.

Encryption and Extra Security Measures

On the question of WiFi encryption, this year 17.1% of the respondents indicated they did not know what kind of WiFi encryptions technology they were using, showing a slight improvement over the 17.8% reported last year (A comparison of Types of Encryption Used is tabulated in Table 14 below). Moreover, of those who knew what kind of encryption they were using, 9.1% of them admitted that they had not use any encryption to protect their WiFi network. It is also surprising to find that 12.1% of the respondents were still using the relatively unsafe WEP encryption technologies.

Table 14: Types of Encryption Used 2014 vs 2013

	2013			2014		
	Overall	Male	Females	Overall	Male	Females
Don't know	17.8%	13.4%	34.9%	17.1%	14.1%	27.9%
WPA/WPA2 using AES	37.5%	42.7%	20.9%	46.7%	49.3%	35.5%
WPA/WPA2 using TKIP	27.9%	29.9%	23.3%	25.5%	26.9%	19.4%
WEP	8.7%	8.7%	9.3%	12.1%	12.7%	9.7%
No Encryption	5.8%	4.5%	7.0%	9.1%	7.5%	16.1%

A further examination of the research findings shows there is a significant gender difference with respect to the types of encryption used. Both 2013 and 2014 studies found that more female than male respondents said that they had no idea of what types of encryption they were using. More female WiFi users were found not using any encryption or were using a relative unsafe one. However, we do see a slight increase in the percentage share of women who were using more secure encryption methods to protect their data and privacy. Our finding this year reveals that 35.5%

the female respondents used the most advanced "WPA/WPA2 using AES" encryption, representing a 14.4 percentage point improvement over the 20.9% reported last year.

While 25.5% of the respondents said that they were using "WPA/WPA2 using TKIP" encryption technology, which is a slight dip from last year's 27.9%, 46.7% of the respondents said they were users of the most advanced "WPA/WPA2 using AES" encryption technology, up about 9 percentage point from last year's 37.5%. While majority of the respondents used some sort of encryption to protect their home network, 17.1% of them had no idea of what kinds of WiFi security they were using. This suggests not only a deficiency of knowledge, but a potential safety hazard as it reflects home users' reluctance or simply inability to discern the pros or cons of different encryption technologies or to choose the encryption technology that fit their needs. Our finding also reveals that 35.3% of the respondents who were using WEP knew the technologies were not safe. With the growing sophistication of encryption technology, one may naturally conclude that users who are confused, frustrated and discouraged in using encryption now might one day give up the attempt to catch up with the technology if they feel they are being left behind too much. Therefore, it is important for stakeholders, both government and non-government, to enhance efforts to reach out to ordinary users, especially those with no or little computer knowledge.

The findings highlight the need to step up WiFi security education in Hong Kong by both industry players and the Government. Meanwhile, it is all the more important to teach users of the differences between encryption technologies. There are two encryption technologies in use in WPA and WPA2, namely Temporal Key Integrity Protocol (TKIP) and Advanced Encryption Standard (AES). AES encryption is faster and better than TKIP encryption, but requires more computing power. As the CPUs used in WiFi routers and WiFi hotspots are getting more and more powerful, AES has become a standard encryption technology available in the majority of high-end and middle-range WiFi routers and WiFi hotspots. Education on WiFi should hit home the message that WiFi security can be easily achieved by enabling this encryption feature on the WiFi router and the WiFi hotspot.

WiFi Accessibility

Inadequate WiFi access points, inadequate bandwidth and unstable service quality continue to top the list of problems that frustrate WiFi users in Hong Kong. These problems are found in both public WiFi access services run by commercial service providers and the HKSAR Government.

Thanks to the effort of the HKSAR Government in providing more GovWiFi hotspots (HKSAR Government, 2014), the "inadequate access points" problem of GovWiFi service has shown a slight improvement by 1.3%, from 72.1% in 2013 to 70.4% this year. Meanwhile the "inadequate access points" problem of commercial WiFi services deteriorated slightly by 0.4%, from 64.9% in 2013 to 65.3% in 2014. As both government and commercial WiFi access providers pledged to increase investment in hotspot infrastructure, the mixed respondent perception on the adequacy of access points may reflect the fact that respondent expectation on public WiFi access services has yet to be fully met.

The findings of both 2013 and 2014 reports, in particular of those on respondent perceptions of GovWiFi accessibility, echo the findings of the Director of Audit's report on GovWiFi service published in March 2013. The report highlights the inadequacy of GovWiFi coverage, bandwidth and service quality and recommends that measures be taken "to enhance the connection to the GovWiFi service, the accessibility to the Internet websites and the connection speed, where appropriate" (HKSAR Audit Commission, 2013, p.ix). Dissatisfaction with GovWiFi persists in spite of significant efforts made by the Government to tackle the coverage hurdles. Maybe it is the time for the Government to conduct a thorough study of WiFi connectivity of places where Internet service is "reasonably expected" (HKSAR Audit Commission, 2013), and take concrete measures to meet user expectations and then address the perhaps more subjective "perception" problem.

To turn Hong Kong into a truly digital city requires the joint efforts of both Government and the private economy. The aim of providing public WiFi is to make Internet access easier so that information can be made available in a rapid and simple way to every device user. It is important for both government and commercial WiFi access providers to join hands in providing more as well as safer and more reliable WiFi hotspots across the territory

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