Hong Kong Wi-Fi Adoption and Security Survey 2014

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Abstract

WiFi connectivity is a necessity as most of the mobile devices nowadays are coming with built-in WiFi adaptors. WiFi enables your electronic gadgets to 'talk' to other gadgets and to control and being controlled by other gadgets via Internet without complicated cabling systems. You can use your mobile phone to talk, to download, to control your TV, home security camera or even to open the door for you. WiFi connectivity makes life easier and more convenient. But in that convenience lies vulnerability if the WiFi network is not properly secured. A secured WiFi network is an important way of protecting your data, personal information or other tangible or intangible things in life. Building on the quantitative data collected from the 207 respondents in 2014 and comparing the findings with the data collected in the previous year, this paper investigates WiFi usage and WiFi security in Hong Kong. This study has two objectives: to identify any knowledge gap exists in using and setting up WiFi system; and to use the findings to help policy makers, WiFi security advisory bodies and service providers devise appropriate WiFi security measures and education programmes.

Keywords: WiFi, Hong Kong, internet access, internet security, WiFi security, WiFi encryptions, WiFi tethering

1. 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 (HKSAR Government Digital 21 Strategy, 2014). According to Greg So, the Secretary for Commerce and Economic Development, the Digital 21 Strategy is the blueprint for ICT development in Hong Kong. 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. 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.

This report, which is WTIA's 3rd report in a series, examines WiFi usage, WiFi accessibility, WiFi security and WiFi knowledge in the specific setting of Hong Kong. Findings of the research will help policy makers and industry players understand more about the user experience, awareness and perceptions of WiFi service and security in Hong Kong. By means of critical analysis, it is hoped that the research will assist policy makers and industry players to identify gaps in service provision and help shed light on areas of improvement and the way forward.

Data collection was conducted by inviting participants to fill out a paper-based questionnaire. A total of 207 respondents participated and completed the survey voluntarily.

This paper has three objectives. First, it explores the WiFi usage pattern of WiFi users in Hong Kong. Second, it identifies the WiFi security knowledge gaps of WiFi users and provides suggestions to policy makers and industry players so that appropriate user education can be provided to increase the overall safety of WiFi services in Hong Kong. Finally, it aims at understanding the problems that WiFi users are facing in using government and

commercial WiFi access services. The findings can help the HKSAR Government and the commercial WiFi access service providers to improve the quality of WiFi access services in Hong Kong.

2. Profiles of Respondents

A total of 207 respondents completed and handed in the questionnaire. Among them, 8 of them did not indicate their gender. As shown in Table 1, of the remaining 199 valid responses, the majority (156 respondents or 78.4%) were male and 43 (21.6%) were female.

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 respondents (3.9%) did not indicate their marital status. As shown in Table 2, of the remaining 199 valid responses, the majority (114 respondents or 55.1%) were married and 85 (41.1%) were single.

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

As for the sectors in which the respondents were working at, 7 (3.4%) of them did not answer. As shown in Table 3, 76 (38.0%) of the remaining 200 respondents said they worked in the IT-related sectors, while the rest (124 out of 200 or 62.0%) worked in sectors unrelated to IT.

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

Table 4 shows both the frequency distribution of the age of the respondents and their percentage composition. A total of 7 respondents (3.4%) did not indicate their age. Among the 200 respondents (96.6%) responded, 68 (34.0%) were aged between 46 and 55. The second largest group (43 respondents or 21.5%) was those who aged between 36 and 45. Only 19 respondents (9.5%) were "25 years old and below". The distribution of the age of the valid respondents is shown in Figure 1.

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
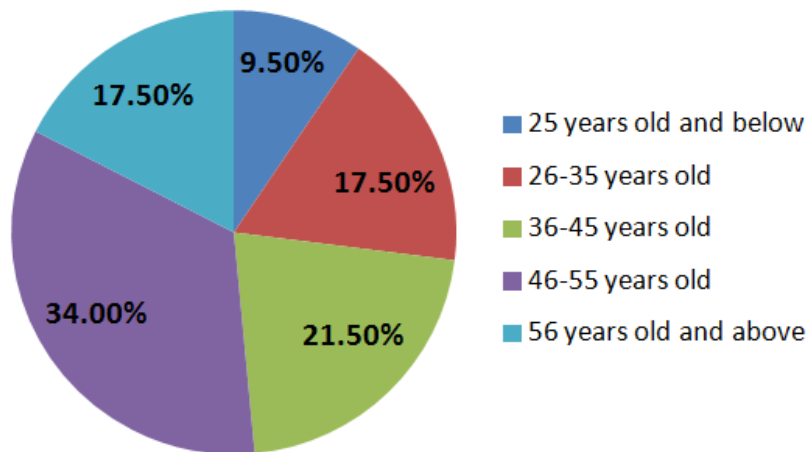
Figure 1. Age of respondents

Table 5 shows both the frequency distribution of the education profile of the respondents and their percentage composition. 7 respondents (3.4%) did not reveal their level of education. Among the 200 respondents (96.6%), 62 of them (31.0%) had a bachelor degree. 46 r(23.0%) had an associate degree. Only 13 (6.5%) said they were in the "Junior Secondary" education category. The distribution of education profile of the valid respondents is shown in Figure 2.

Table 5. Education profile of respondents

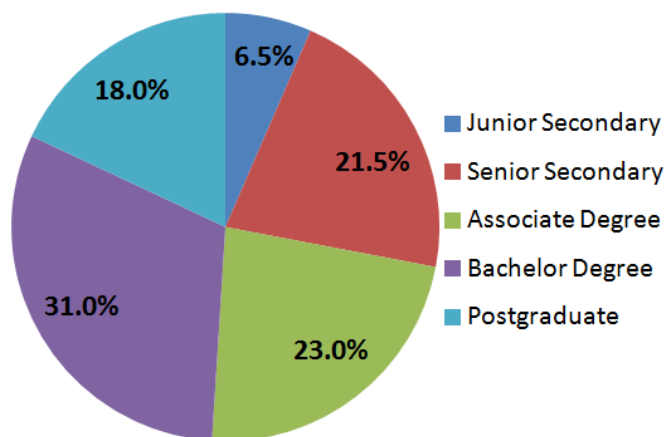|	Sample		Valid Response	
	No.	%	No.	%
Junior Secondary	13	6.3	13	6.5
Senior Secondary	43	20.8	43	21.5
Associate Degree	46	22.2	46	23.0
Bachelor Degree	62	30.0	62	31.0
Postgraduate	36	17.4	36	18.0
No response	7	3.4		
Base	208	100.0	200	100.0

Figure 2. Education profile of respondents

Table 6 shows both the frequency distribution of the place of residence of the respondents and their percentage composition. A total of 7 respondents (3.4%) did not indicate their place of residence. Among the 200 respondents who responded to the question, the majority (85 respondents or 41.4%) said that they lived in the New Territories. 65 (32.5%) said that they lived in Kowloon. 44 (22.0%) said they lived on Hong Kong Island. Only 6 respondents (3%) said that they lived in the outlying islands. The distribution of place of residence of the valid respondents is shown in 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
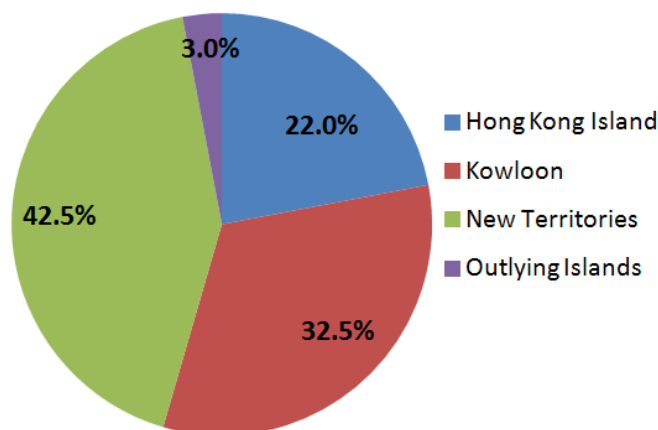
Figure 3. Place of residence profile of respondents

Table 7 shows both the frequency distribution of the WiFi experience profile of the respondents and their percentage composition. 8 respondents (3.9%) did not respond to the question. Of the 199 respondents who did, the majority (142 respondents or 71.4%) said that they had used WiFi for more than 2 years. 27 respondents (13.6%) said that they had used WiFi for 1 to 2 years. Only 8 (3.9%) said that they had no experience in using

WiFi. The distribution of the experience in using WiFi of the valid respondents is shown in Figure 4.

Table 7. Experience profile of respondents

	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
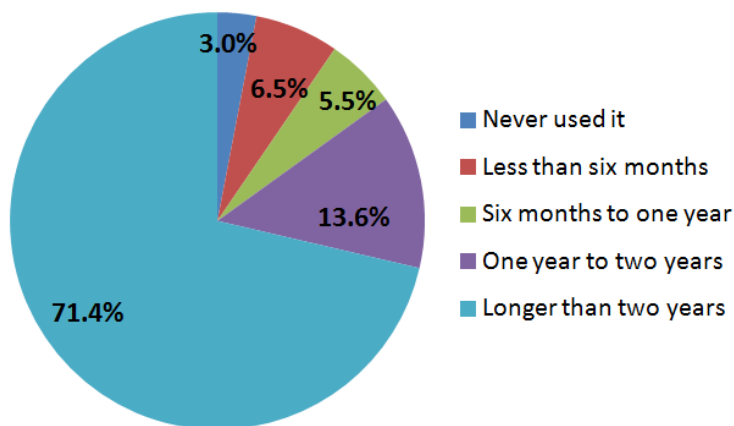
Figure 4. Experience in Using WiFi

3. WiFi Using in Hong Kong

3.1 Types of WiFi Network Being Used for Internet Access

The types of WiFi network being used by our respondents for accessing the Internet are illustrated in Figure 5. As shown in Figure 5, the majority of the WiFi users (79.7% or 165 out of 207) used home WiFi network, 53.1% (110 out of 207) of them used WiFi in their office, 48.8% (101 out of 207) of the WiFi users had experience in using GovWiFi, 47.3% (98 out of 207) had used WiFi in business districts and 22.7% (47 out of 207) had used WiFi in their schools.
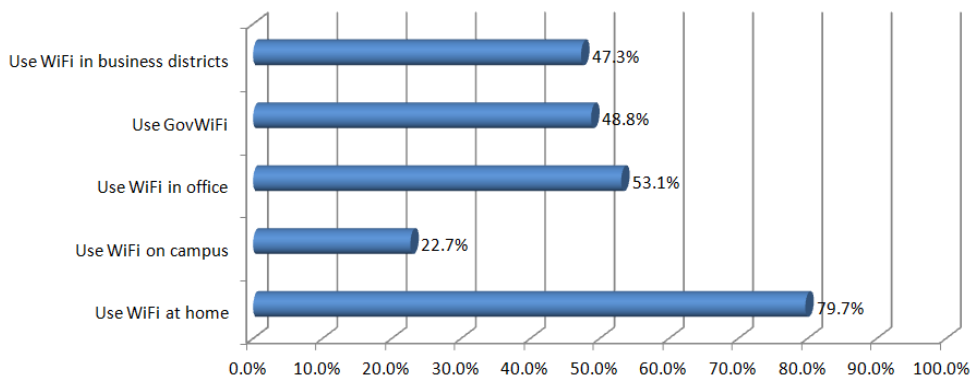

Figure 5. Types of WiFi network used for internet access

3.2 User Profiles of Main Types of WiFi Network Used for Internet Access

WiFi Experience Profile

Table 8 summarizes the WiFi experience profiles of the respondents by the types of WiFi connection used to access the Internet. Figure 6 shows the bar chart for the same information. Our study finds that experienced users (those who had more than 2 years of WiFi experience) used WiFi at home (64.25%) and in office (45.41%). They also use GovWiFi (37.68%), free government WiFi and paid WiFi service in business districts (36.23%). As for the less experienced users (those who had less than six months of WiFi experience) mainly accessed the Internet using government's free WiFi service (3.38%).

Table 8. WiFi Experience by Types of WiFi Internet Network

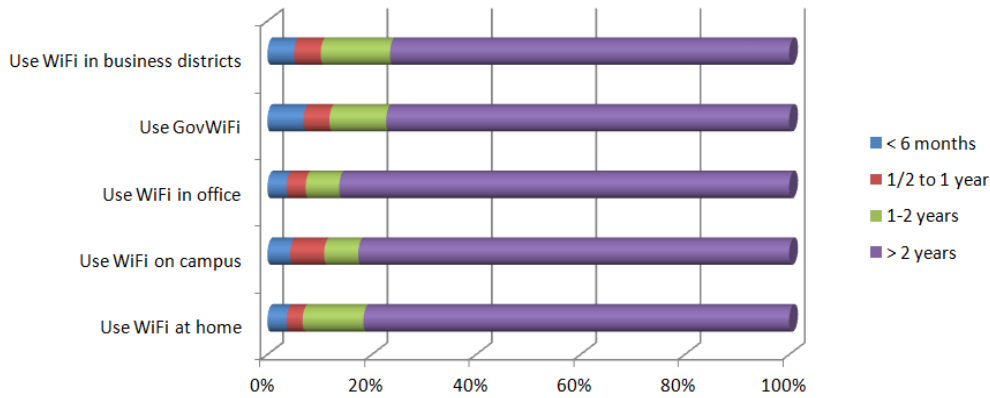|	< 6 months	1/2 to 1 year	1-2 years	> 2 years
Use WiFi at home	2.90%	2.42%	9.18%	64.25%
Use WiFi on campus	0.97%	1.45%	1.45%	18.36%
Use WiFi in office	1.93%	1.93%	3.38%	45.41%
Use GovWiFi	3.38%	2.42%	5.31%	37.68%
Use WiFi in business districts	2.42%	2.42%	6.28%	36.23%

Figure 6. WiFi Using Experience in Terms of WiFi Internet Network

Gender Profile

The bar chart in Figure 7 below illustrates the use of different types of WiFi connection by gender. As shown in Figure 7, across all five types of WiFi connections, about 80% of the WiFi users were male and only about 20% were females.
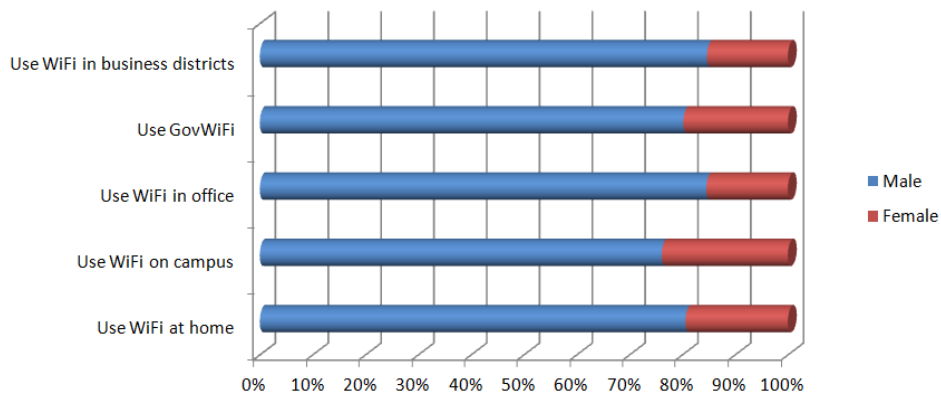

Figure 7. Gender Profile of Users of WiFi Connection

Marital Status Profile

The bar chart in Figure 8 below illustrates the use of different types of WiFi connection by marital status. The chart indicates that married users predominant over single users in all types of WiFi connections being studied.
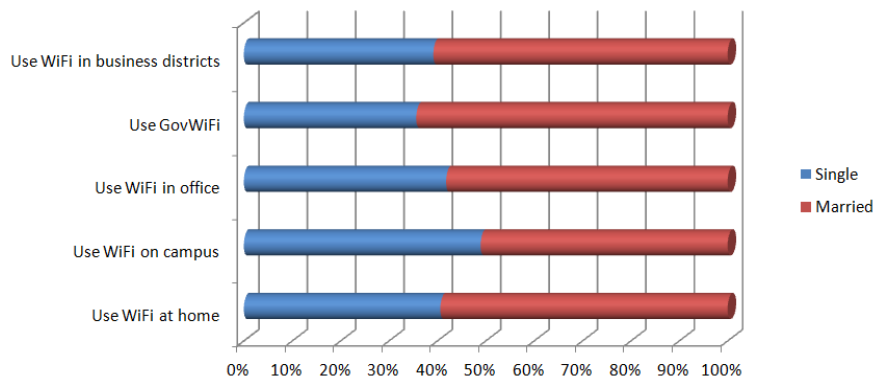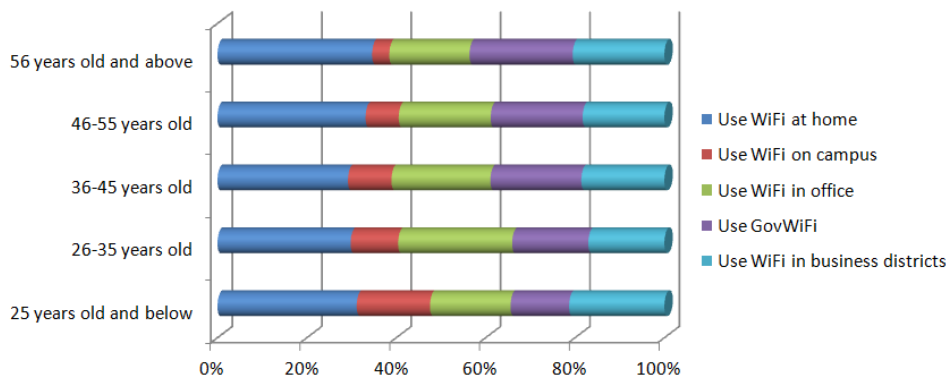

Figure 8. Marital Status Profile of Users of WiFi Connection

Age Profile

The bar chart in 9 below illustrates the use of different types of WiFi connection by age. It is found that the majority of the respondents use home WiFi to access the Internet. Comparing to other age groups, respondents in the "25 and below" group used more WiFi in schools and used less free Wifi provided by government.

Figure 9. Age Profile of Users of WiFi Connection

Education Profile

The bar chart in 10 below illustrates the use of different types of WiFi connection by education level. The chart indicates 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.
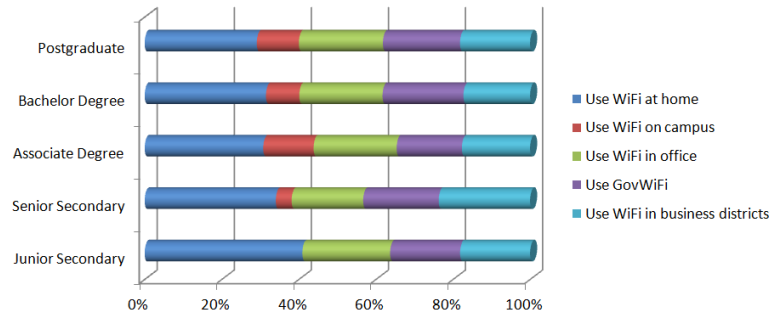
Figure 10. Educational Level Profile of Users of WiFi Connection

Place of Residence Profile

The bar chart in 11 below illustrates the use of different types of WiFi connection by place of residence. The chart indicates that the percentage composition of place of residence of our respondents is similar across the five main types of WiFi connections being studied.
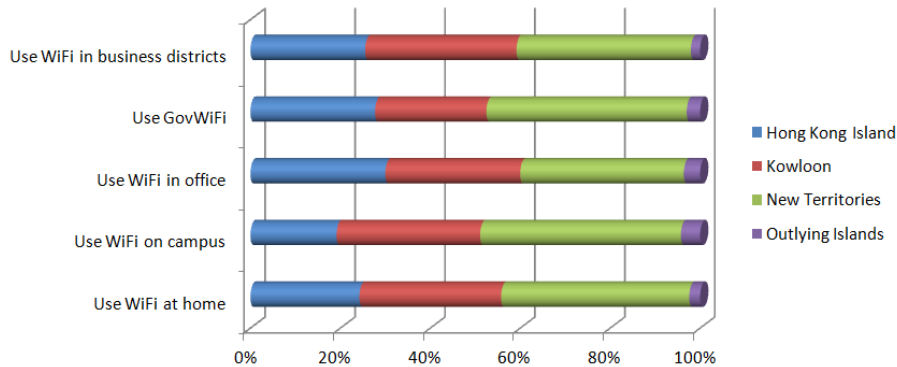

Figure 11. Place of Residence Profile of Users of WiFi Connection

3.3 Use of WiFi Network

The amounts of time spent on WiFi connection and the corresponding percentage are shown in Table 6.

Among the 207 respondents, 3.9% (8 respondents) did not respond to the question and 1.9% (4 respondents) said that they had never used WiFi connections. These respondents were excluded from further analysis.

Of the remaining 195 valid responses, the majority (54.77%) of them were frequent users who spent around four hours each day on WiFi connection. Nearly one-third (31.66%) of them are occasional users who spent less than 10 hours a week on WiFi connection. 11.56% of them used WiFi connection only when necessary.

Table 9. Time Spend on WiFi Connection

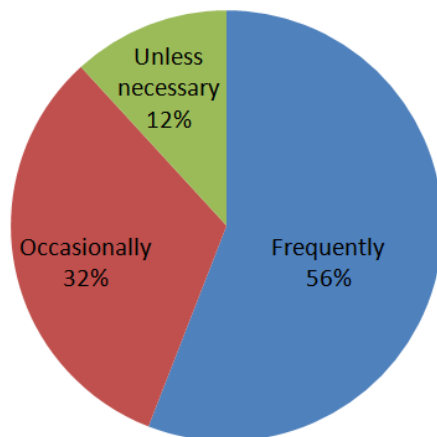|	Sample		Valid Response	
	No.	%	No.	%
Frequently (e.g. 4 hrs/day)	109	52.7%	109	54.77%
Occasionally (e.g. < 10 hrs/wk)	63	30.4%	63	31.66%
Unless necessary	23	11.1%	23	11.56%
Never used it	4	1.9%		
No response	8	3.9%		
Base	207	100.0	195	100.0

Figure 12. Time Spend on WiFi Connection

Figure 13 shows the type of WiFi enabled devices that the respondents used to gain access to the Internet. It is found that the majority of them used WiFi-enabled Smartphones (75.8%) and personal computers (56.0%) to connect to the Internet. Slightly more than half (51.2%) of the them used WiFi-enabled tablets to connect to the Internet.
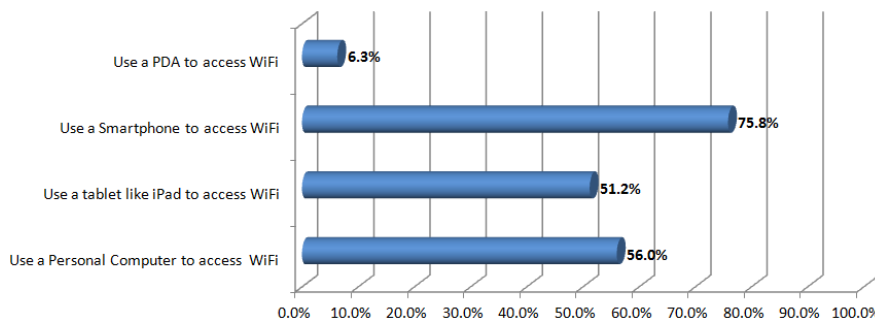

Figure 13. Devices Used to Access WiFi

Figure 14 shows the type of Smartphones used by the respondents. It is found that only small percentage (5.3%) of them were not using Smartphones. As for the Smartphone users, more than two-thirds (67.1%) of them used Smartphones running on Android. Close to one-fourth (24.2%) of them used iPhones running on iOS. Only a small percentage (4.8%) of them used Smartphones running on other operating systems (neither Android nor iOS).
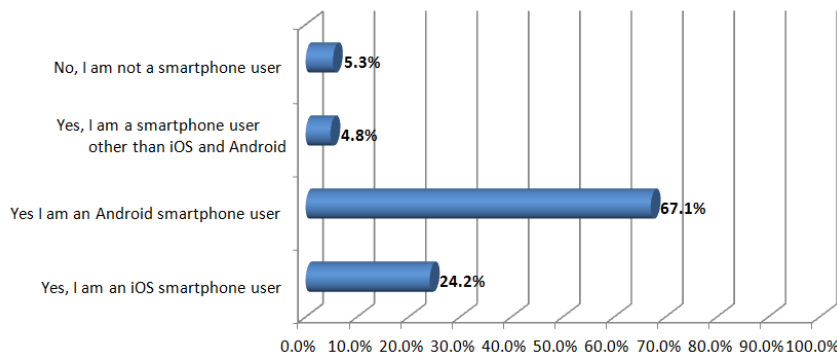

Figure 14. Types of smartphone used by respondents

Figure 15 shows the reasons of why respondents use WiFi network for gaining access to the Internet. It is found that more than two-thirds of the respondents (68.6%) used WiFi to access the Internet in order to obtain information. More than half (58.9% and 55.6% respectively) of them used it to contact friends and conduct online activities. Nearly half (47.3%) of them used it to complete their work. Slightly more than one-third (36.2%) of them used it to support learning.
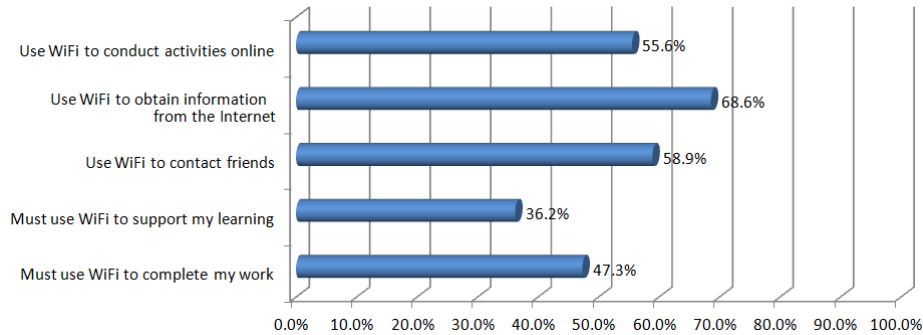

Figure 15. Purpose of using WiFi for the Internet Connection

Figure 16 below shows the purposes of using WiFi connection by gender. It is found that the gender difference is small on using WiFi to obtain information (69.0% for males and 64.8% for females) or to conduct online activities (56.1% for males and 51.4% for females). However, gender difference is quite considerable on using WiFi to contact friends (62.9% for males vs. 44.7% for females) or to complete work (50.5% for males vs. 33.6% for females).
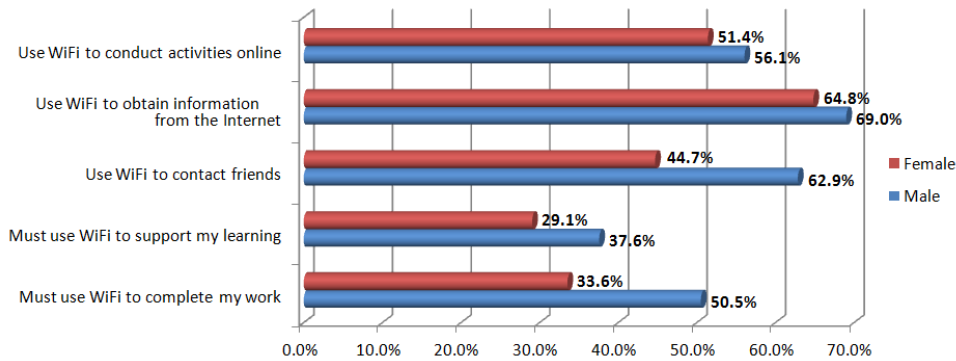

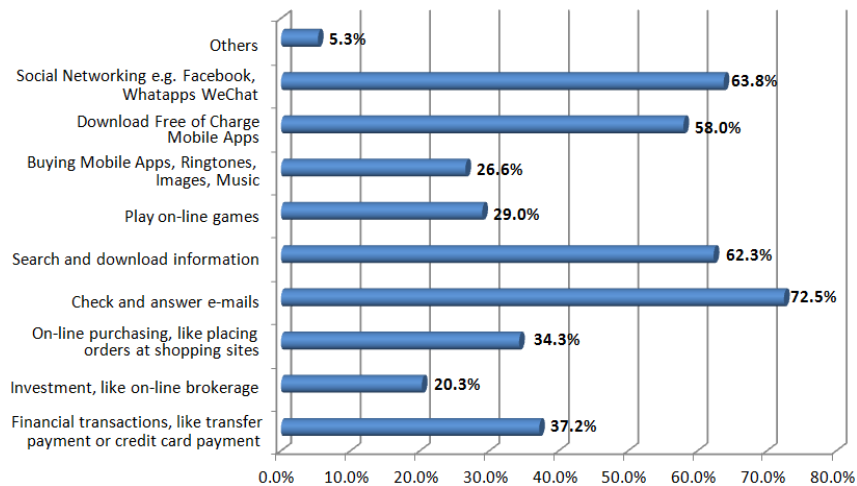Figure 16. Gender Differences on Use of WiFi Network

Figure 17. Activities Conducted by using WiFi Connection

Figure 17 summaries the respondents' answers to the question about what kind of activities they conducted with WiFi connection. It is found that the majority of them used WiFi to gain access to the Internet so that they can check email (72.5%). More than half of the respondents used it to access social networks, such as Facebook and WhatsApp (63.8%), to search and download information (62.3%) or to download mobile apps (58.0%). Slightly more than one-third of them used it to conduct on-line financial transactions (37.2%), to buy things on-line (34.3%) or to play Internet games (29.0%). Slightly less than a quarter of them used it to purchase ringtones, music, mobile apps and images (24.5%) and slightly more than one-fifth of them used it to conduct investment activities, for example, on-line stock buy and sell (20.3%).

3.4 WiFi Tethering

WiFi tethering is the use of Smartphone to share WiFi connection to other electronic devices (Fong and Wong, 2013). Figure 18 shows the respondents' answers to the question about whether they have experiences on using WiFi tethering. It is found that 7.25% of them did not know what is WiFi tethering. The majority of them (53.14%) had experiences in WiFi tethering while 39.61% of them had never used WiFi tethering.
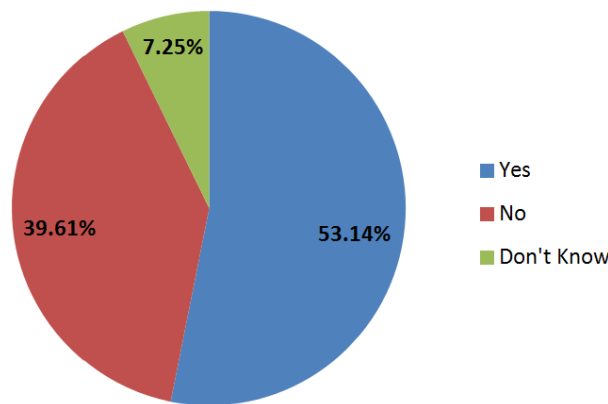

Figure 18. WiFi tethering

4. Using WiFi for Mobile Messaging and Social Networking

4.1 Mobile Messaging

Figure 19 below shows the types of mobile messaging apps used by the respondents. It shows that only a small percentage of respondents (8.3%) did not use mobile messaging. For those who did, a large majority of them (88.1%) used WhatsApp, 45.2%used WeChat and 36.2% used LINE.
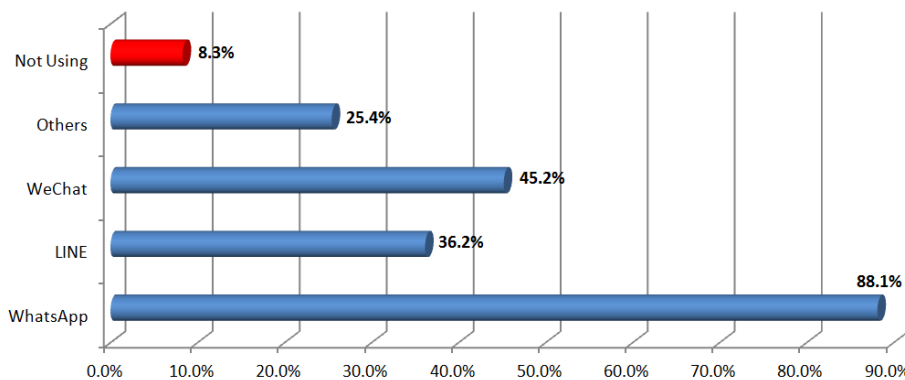

Figure 19. Types of WiFi mobile messaging Apps

Figure 20 below shows how the respondents used mobile messaging apps. It 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%).
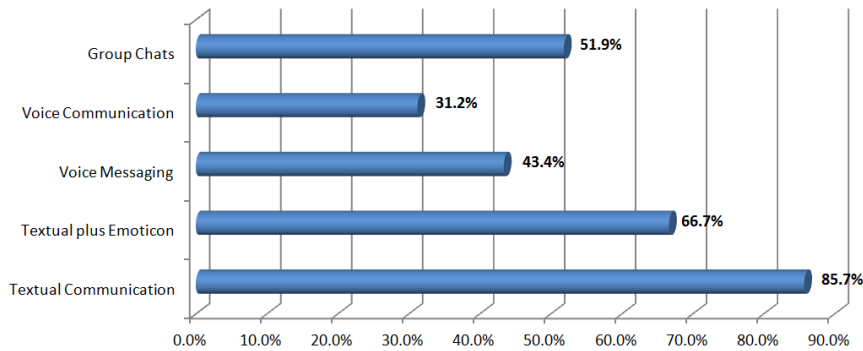

Figure 20. Use of mobile messaging Apps used

Figure 21 below shows the percentage of online time the respondents spent on using mobile messaging apps. It is found 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.
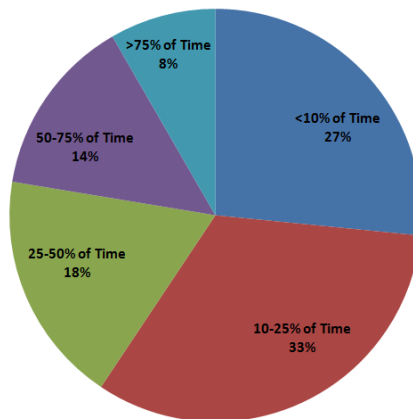

Figure 21. Percentage of online time for mobile messaging

4.2 Social Networking

Figure 22 shows the type of social networking apps used by the respondents. It is found that only a small percentage of respondents (8.8%) did not use social networking apps. For those who did, 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.
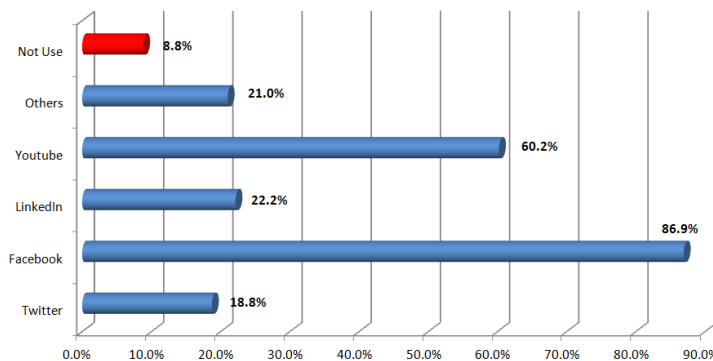
Figure 22. Types of social networking Apps used

Figure 23 indicates the percentage of online time our respondents spent on social networking. It is found 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.
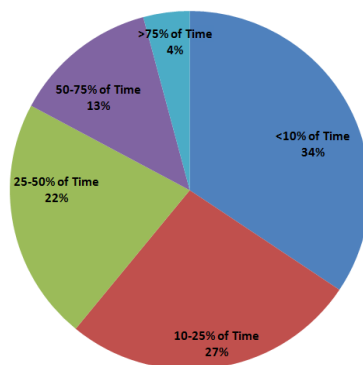

Figure 23. Percentage of online time for social networking

5. WiFi Security

WiFi security is important in protecting personal data on mobile devices safe (Sobh, 2013; Grobauer, Walloschek and Stocker, 2011; Shang, Lui, Xu, 2011). Table 10 and Figure 24 below show the respondents' perception on WiFi security. It is found that 47.2% of them expressed concern over the issue of personal privacy and the possible disclosure of personal information by intruders when using WiFi. Though a slightly more than half (53.8%) of them thought that using WiFi was safe, less than one-fifth (18.1%) of them thought otherwise. Moreover, about half (48.5%) of the respondents thought that the WiFi connection have sufficient security measures to protect their personal data and less than one-fourth (23.5%) of them thought otherwise.

Table 10. Perceptions on 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%
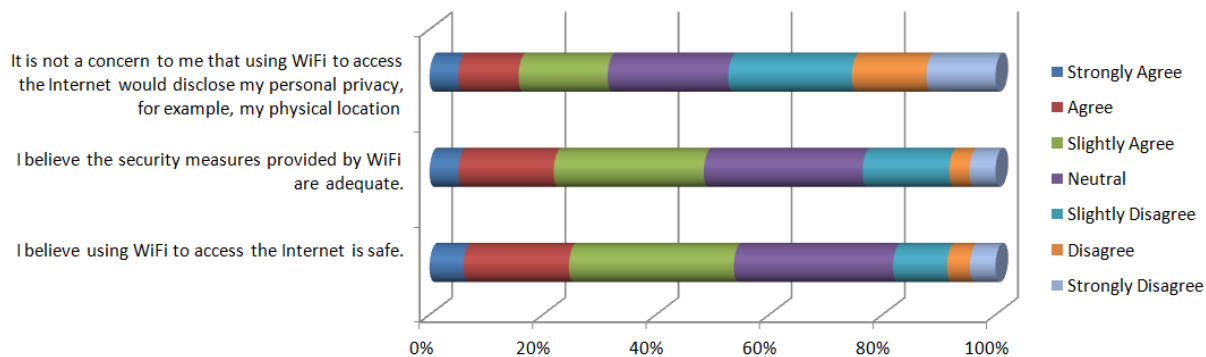
Figure 24. Perceptions on WiFi security

Gender differences on perceptions of WiFi security are shown in Table 11 and Figure 25 below. It is found that there is no major gender difference across all questions about respondent perceptions on WiFi security.

Table 11. Gender differences on perceptions of 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%
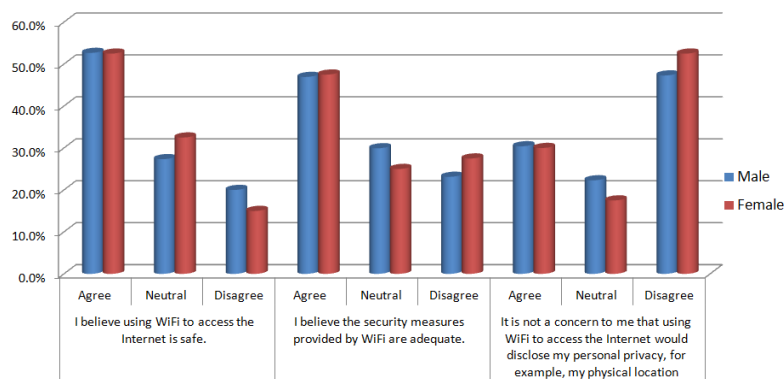
Figure 25. Gender differences on perceptions of WiFi security

Figure 26 below illustrates the type of WiFi standards used in home WiFi network by respondents. It is found that 25.6% of the respondents did not know the type of WiFi standards used in their home WiFi network. For the 74.4% of respondents who said they know the type of WiFi standards used in their home WiFi network, nearly half (44.8%) of them used the 802.11n WiFi standard. 30.5% of them said that they were using the 802.11g WiFi standard. It is found that there are still considerable shares of WiFi users using older standards (15.6% for 802.11a and 28.6% for 802.11b). It is also found that 17.5% of WiFi users are using the latest standard, i.e. 802.11ac.
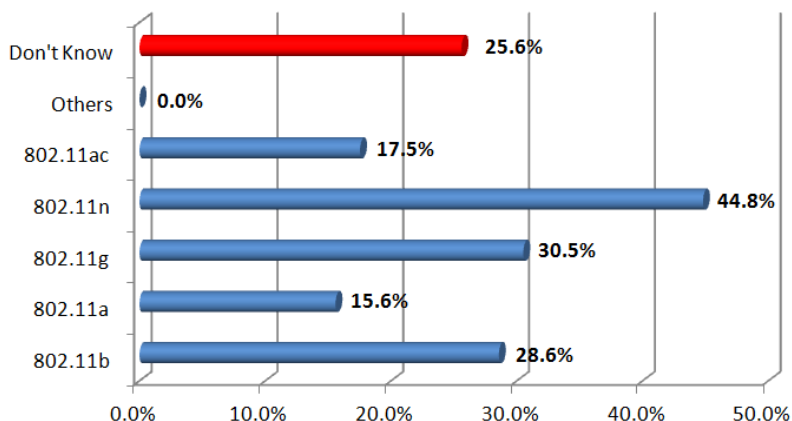

Figure 26. WiFi standards being used in home WiFi network

Figure 27 below illustrates the type of WiFi encryption technologies adopted in the respondents' home networks. It is found that most of the home WiFi network users used secured WiFi encryption technology: those who were using "WPA/WPA2 using AES" accounts for 46.7% of the total; those who were using "WPA/WPA2 using TKIP" accounts for 25.5% of the total. However, it is also found that 17.1% of the respondents were not sure about the type of WiFi encryption technologies adopted by their home WiFi networks. Among those who said they know what they were using, nearly one-tenth (9.1%) of them did not encrypt their home WiFi networks. For those who said they did encrypt their WiFi network, 12.1% of them used the less secured WEP (Wired Equivalent Privacy) encryption technology. The lack of knowledge of the type of encryption technology used, the decision not to use any encryption technology or the used of less secured encryption technology all highlight the need that more public education is needed on WiFi security.
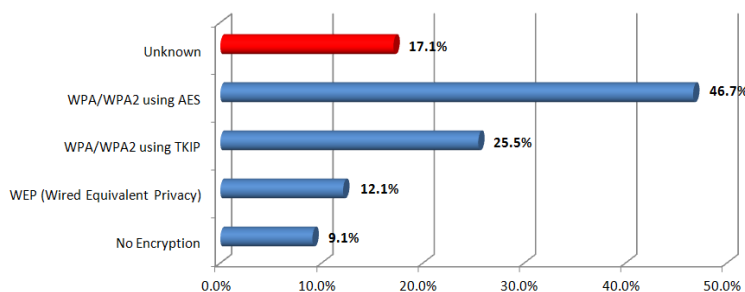

Figure 27. WiFi encryptions being used in home WiFi network

Figure 28 shows that there are considerable gender differences on user knowledge with respect to the type of WiFi encryption technologies adopted in home WiFi networks. 14.1% of the male respondents and 27.9% of the female respondents said that they had no idea of the type of WiFi encryption technologies adopted in their home networks. Among the respondents who said they knew what they were using, 7.5% of the male respondents and 16.1% of the female respondents said that they did not use any encryption at all. As for the use of the latest encryption technology, i.e. "WPA/WPA2 with AES", 49.3% of the male respondents said they used it, but only about one-third (35.5%) of the females said so. A similar pattern is found in the use of "WPA/WPA2 using TKIP", the male and female share in the use of the technology was 26.9% and 19.4% respectively.
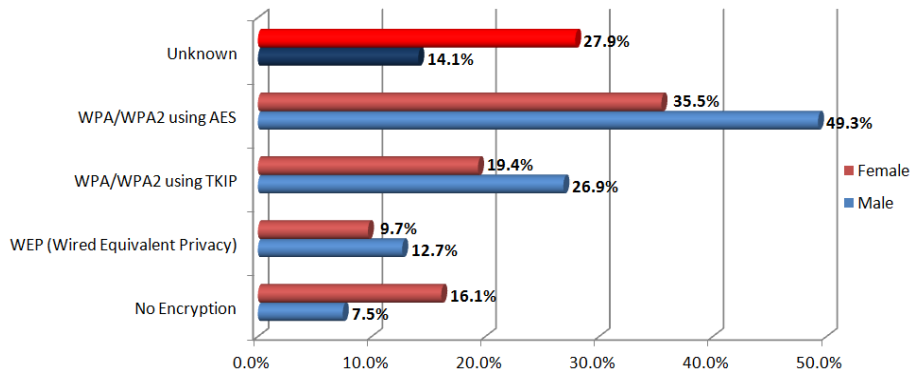
Figure 28. Gender differences on encryptions used in home WiFi network

In responding to a follow-up question on the user knowledge on WEP encryption, among the 12.7% of male WiFi users and 9.7% of female WiFi users who said they were using WEP in their home networks, 42.1% of them said that they knew WEP was unsafe. While of those who knew that the WEP technologies were unsafe, 56.4% said they were not using it (Figure 29).
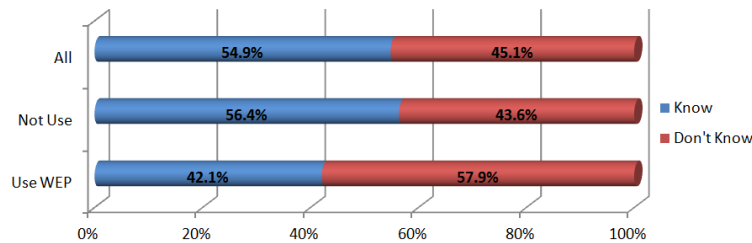
Figure 29. Use of WEP vs Knowledge on WEP

Of the respondents who were aware that WEP encryption was not safe, 35.3% of them said they went on using it because they did not know how to change the setting (Figure 30). About one-fifth (20.3%) of them said they went on using it because the devices they were using did not support safer alternatives. Other reasons for the continued use of WEP included routers could not support safer alternatives (15.0%), router settings were done by service providers and they could not change it (12.0%) and having no time to make the change (8.3%).

Figure 30. Reasons of continue to use WEP encryption

6. WiFi Security Knowledge

Table 12 and Figure 31 below show WiFi security knowledge of WiFi users in Hong Kong. In responding to the question of "I have good knowledge on WiFi security", the share of male and female respondents who were af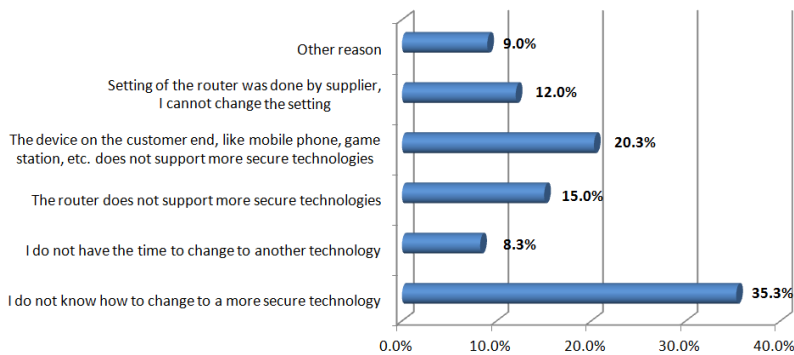firmative to the question was 63.5% and 37.2% respectively. For the question of "I can explain WiFi security to others", majority of male respondents (60.3%) were affirmative while only about one-third (37.2%) of the female respondents believed the same. For the question of "I know how to use the security setting in WiFi", majority of the male respondents (64.7%) believed that they were capable of doing it while only a little over one-third (39.5%) of the female respondents thought so. For the question of "I know how to teach others to use the security setting in WiFi", the majority of male respondents (58.3%) believed so while only one-third (34.9%) of the female respondents believed they were capable of doing that.

Table 12. Security knowledge of WiFi users in Hong Kong

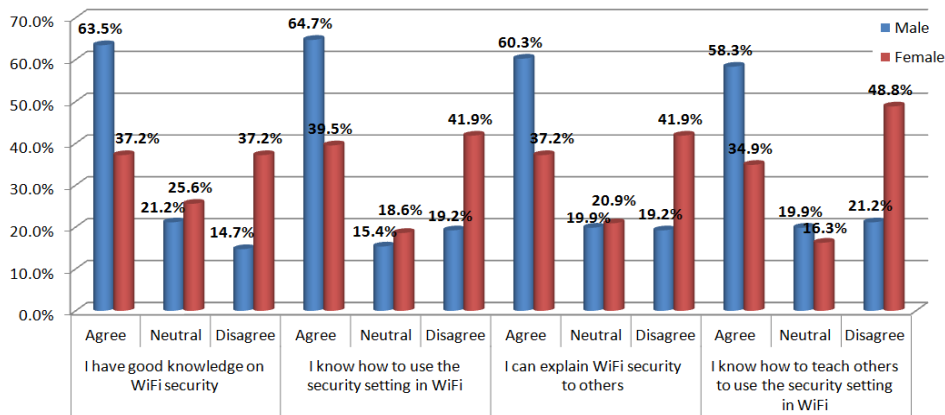|	Male			Female		
	Agree	Neutral	Disagree	Agree	Neutral	Disagree
I have good knowledge on WiFi security	63.5%	21.2%	14.7%	37.2%	25.6%	37.2%
I know how to use the security setting in WiFi	64.7%	15.4%	19.2%	39.5%	18.6%	41.9%
I can explain WiFi security to others	60.3%	19.9%	19.2%	37.2%	20.9%	41.9%
I know 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. Security knowledge of WiFi users in Hong Kong

7. Commercial and Government WiFi Access

In general, Hong Kong WiFi users found both the commercial and government WiFi services unsatisfactory.
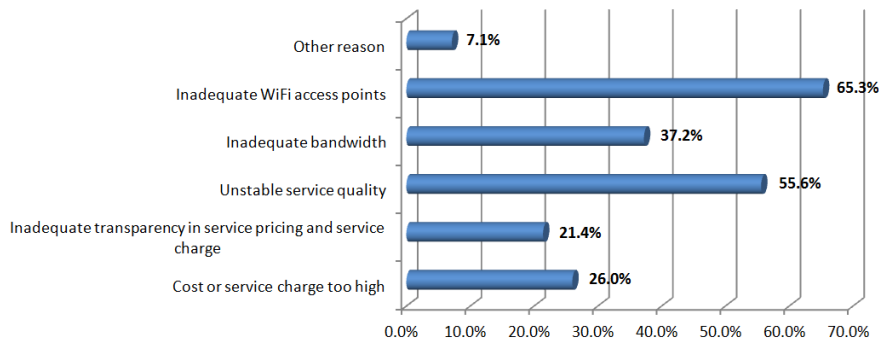

Figure 32. Respondent comments on commercial WiFi services

For the commercial WiFi services, as illustrated in Figure 32, the two main drawbacks were inadequate WiFi access points (65.3%) and unstable service quality (55.6%). Inadequate bandwidth (37.2%), high service charge (26.0%) and lack of transparency in service pricing (21.4%) are also factors which adversely affect WiFi users' perception on commercial WiFi services.

As for the government WiFi services, Figure 33 shows that the three main drawbacks are inadequate WiFi access points (70.4%), inadequate bandwidth (51.6%), and unstable service quality (51.6%).
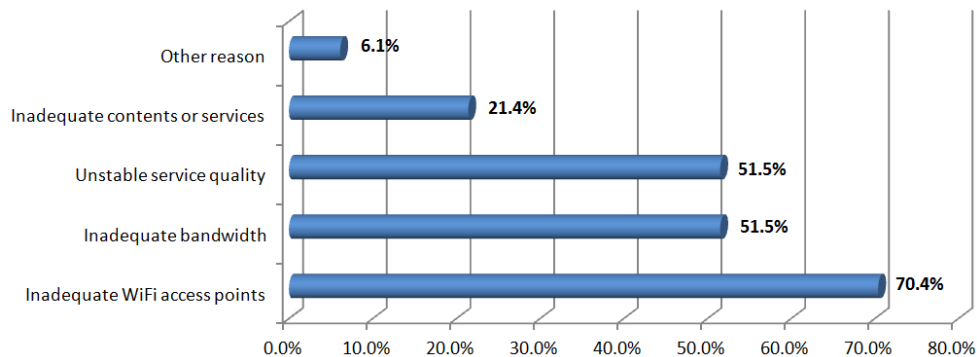

Figure 33. Respondent comments on GovWiFi

8. Discussion

In today's Hong Kong, the need to stay seamlessly connected to the Internet, to access information on-line and to share experiences instantly and electronically has become more important than ever before (Lo, 2012). The WiFi network allows us to watch YouTube and streaming releases 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. In the following the findings on usage, accessibility and user knowledge of WiFi in Hong Kong in 2014 are examined and contrasted with the findings in 2014 so that insights can be gained to help policy makers, WiFi2security advisory bodies and service providers devise appropriate WiFi security measures and education programmes.

8.1 WiFi Usage

Our 2013 Report reveals that the majority of our respondents used WiFi to obtain information from the Internet, contact friends and conduct online activities (Wong and Fong, 2013). The findings of 2014 reveal a similar pattern of usage. However, a further examination of the research findings shows there is a reversal of gender difference on the purpose of getting WiFi connection. Our 2013 Report notes that female respondents tended to use WiFi connection for social networking 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%).

It is also noted that a growing number of male respondents were conducting activities online and obtaining information from the Internet using WiFi in 2014. In 2013, the gender difference in these two areas of WiFi usage was about 8%, but in 2014, the difference has narrowed down to less than 5%.

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 and more interested in using their mobile devices to express their feelings, share their experiences, 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 connect to 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.

8.2 Use of WiFi for Mobile Messaging and Social Networking

With the growing popularity of the use 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. Our research in 2014 shows that most of the respondents used Android Smartphones (67.1%) to text (over 80%) and over 90% of the respondents used social networking apps. 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 (Eldaw, Zeki & Senan, 2013).

8.3 Knowledge about WiFI Security 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 connect to the Internet. Having said that, 47.2% of the respondents expressed concern about their personal privacy might be disclosed 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% 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%, 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 WiFi provided adequate security measures to safeguard their Internet connection, 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%, 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 (Lee, Lee, Yi, Rhee & Chong, 2013).

The 2013 Report highlighted the big "gender difference in the respondent perception of WiFi security in Hong Kong" (Wong and Tong, 2013). 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 signal to be used by other mobile devices using WiFi tethering. Our research shows that 53.14% of the respondents indicated that they used WiFi tethering to share WiFi connection, up 3.14% 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 (Corradi, Fanelli, Foschini & Cinque, 2013).

8.4 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. 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.

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% from last year's 37.5%.

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 educate the users and tell them what are the differences among different encryption technologies. Among various encryption technologies, two of them, namely TKIP (Temporal Key Integrity Protocol) and AES (Advanced Encryption Standard) are commonly used in WPA and WPA2. AES needs CPU with higher computational power than TKIP, but is better and faster. 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 (Lo, 2012; Suomalainen, J., Hyttinen, P. & Tarvainen, 2010).

8.5 WiFi Accessibility

Insufficient number of WiFi access points, not enough bandwidth and unstable service continue to be the top three problems that upset Hong Kong WiFi users. These three problems were not only found in free public WiFi services provided by the HKSAR Government, but also on paid services provided by commercial WiFi access service providers.

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 accessibility of GovWiFi, were consistent with the finding of the March 2013 issue of the Director of Audit's report on GovWiFi service. 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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