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Wi-Fi Adoption and Security in Hong Kong

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Abstract

The benefit of using WiFi for Internet connection is obvious: cost-effective and powerful. WiFi gives us the flexibility and convenience of not being tied to a fixed location. Nowadays, more and more electronic devices and gadgets, such as mobile phones, cameras, gaming devices, TV and entertainment equipment, are WiFi enabled. WiFi also enables your devices to share files instantly. WiFi broadcasting devices, such as Chromecast, give you extra convenience by allowing you to stream video and audio contents from your mobile phone to your TV using WiFi connection. However, this kind of flexibility and convenience comes with a cost. Sharing files, streaming contents or even accessing the Internet via WiFi means signals are being transmitted and they can be captured by anyone with a computer or mobile phone installed with appropriate software. Therefore, it is important to let WiFi users know their security risks and how to minimize them. Educating WiFi users to reduce the WiFi security risk is one of our on-going missions. Basing on empirically collected data, this paper is report of a comprehensive study on the use of WiFi and WiFi networking and the knowledge of WiFi users of the risks and security issues involved in using WiFi in Hong Kong. Findings of the study highlight the WiFi security knowledge gaps of the users in Hong Kong so that stakeholders can take action to improve Internet security by eliminating the security gaps identified.

Keywords: e-Learning WiFi security, internet of everything, Hong Kong, internet access, connectivity

1. Introduction

The popularity and affordability of Wi-Fi-enabled computers and mobile devices have revolutionized the realm of communication. With their application extends well beyond their conventional usability as a communication tool, these devices have become a tool for entertainment, for investment or even an essential learning tool. In recent years, their usability has evolved further to help us organize and manage our personal and professional life in much convenience.

To many people, Wi-Fi accessibility and connectivity are a necessity (Fong and Wong, 2016). Some Internet users even joke that this accessibility and connectivity forms the sixth stage of Maslow's Hierarchy of Needs, sitting right beneath the tier of biological and physiological needs (Rahman, 2015). This means, though in an exaggerated way, that getting online and staying being so are a need more fundamental than our need to survive.

In recent years, Wi-Fi access technology has seen rapid advances. Gigabit wired connection, the standard not long ago, is now being replacing by gigabit Wi-Fi connection using the 802.11ac standard. A Wi-Fi router with a maximum speed of 3.2Gbps, which is common in restaurants and shops for patrons' use, is now a common device for gamers at home (Sheikh et al., 2016). With a speed and stability comparable to that of their wired counterparts, Wi-Fi connection has gained a solid foothold in both commercial and home uses.

However, for this accessibility and convenience to become a way of life, it hinges on the availability of supporting Wi-Fi infrastructure, instant connectivity, a high awareness of information security, and an enhanced ability and interest in learning via this new medium. This report, which is the 5th in a series of research complied by WTIA, investigates Wi-Fi usage, Wi-Fi accessibility, Wi-Fi security and the knowledge of it in Hong Kong. Unlike the previous four reports, this report also examines the respondent perceptions on e-Learning and how Wi-Fi connection facilitates e-Learning for both adults and school children (Lo et al., 2016).

Data collected from the study will help stakeholders to understand more about the user experience, their awareness and perceptions of Wi-Fi service and security in Hong Kong. Through critical data analysis, it is

hoped that the findings of the report will assist both the Government and commercial Wi-Fi network providers to identify gaps in the current service and help shed light on areas of improvement and future directions.

Similar to previous reports, copies of conventional paper-and-pen self-administered questionnaire were used to collect data from a total of 200 respondents. The report is divided into 7 parts: Part 1 is this introduction which sets the scene for and outlines the aims of the study. Part 2 is a descriptive summary of the demographic profiles of the respondents. Part 3 is about Wi-Fi usage in Hong Kong, covering essential details such as the types of Wi-Fi network for Internet access, user profiles of the seven main types of Wi-Fi Internet access, how Wi-Fi network is used by the respondents, the devices used and Wi-Fi tethering. Part 4 details the use of Wi-Fi network for mobile messaging and social networking in Hong Kong, investigating the types of mobile messaging Apps and social networking Apps the respondents are using and the amounts of time they spent on them. Part 5 explores the potential of free Wi-Fi access on e-Learning and investigates the influence of e-Learning on learning interests on adults, secondary school and primary school children, as well as the practical issue of the potential contribution of free Wi-Fi access to this new mode of learning. Part 6 looks into the details of Wi-Fi access, both at home and outside home. It examines the types of Wi-Fi standard the respondents use at home, the Wi-Fi security settings adopted, and the respondent assessment of public Wi-Fi Internet access provided by both private and Government service providers and respondent comments on improving public Wi-Fi services in Hong Kong. Part 7 concludes the report with a discussion of the study results the insights gained. Relevant suggestions on ways to improve the public's awareness of Wi-Fi security, approaches to enhance public Wi-Fi access as well as how to facilitate e-Learning through free Wi-Fi service will also be highlighted.

2. Profiles of Respondents

Among the total of 200 respondents filled out the questionnaire, 1 of them did not answer the question concerning his/her gender. Of the remaining 199 respondents who answered the question, 122 (61.3%) of them are male and 77 (38.7%) are female (Table 1).

Table 1. Gender of Respondents

	Sample		Valid Response	
	No.	%	No.	%
Male	122	61.0	122	61.3
Female	77	38.5	77	38.7
No response	1	0.5		
Base	200	100.0	199	100.0

Table 2 below illustrates the frequency distribution and percentage composition of the age of the respondents. Of the 200 respondents (100%) who answered the question, the majority (40.0%) of them are aged between 26 and 35. Those who are in the 46- to 55-year-old bracket (17.5%) come second, which is followed by those who are in the 36- to 45-year-old bracket (14.5%).

Table 2. Age of Respondents

	Sample		Valid Response	
	No.	%	No.	%
15-18 years old	2	1.0	2	1.0
19-25 years old	27	13.5	27	13.5
26-35 years old	80	40.0	80	40.0
36-45 years old	29	14.5	29	14.5
46-55 years old	35	17.5	35	17.5
56-65 years old	24	12.0	24	12.0
65 years old and above	3	1.5	3	1.5
No response	0	0.0		
Base	200	100.0	200	100.0

As regards their marital status, all respondents answered the question and majority of them are single (67.5% of 135 out of 200) and 65 (32.5%) are married (Table 3).

Table 3. Marital Status of Respondents

	Sample		Valid Response	
	No.	%	No.	%
Single	135	67.5	135	67.5
Married	65	32.5	65	32.5
No response	0	0.0		
Base	200	100.0	200	100.0

All of the respondents answered the question regarding the industry sectors in which they are engaged. Of the

200 respondents, only 28.5% (57 out of 200) of them engage in the IT-related sectors, while the rest (143 out of 200 or 71.5%) engage in sectors unrelated to IT (Table 4).

Table 4. Are you working in the IT related field?

	Sample		Valid Response	
	No.	%	No.	%
Yes	57	28.5	57	28.5
No	143	71.5	143	71.5
No response	0	0.0		
Base	200	100.0	200	100.0

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 (45.0% or 90 out of 200) have a bachelor degree. They are followed by those with an associate degree (28.0% or 56 out of 200) and those with a postgraduate degree (15.0% or 30 out of 200).

Table 5. Education Profile of Respondents

	Sample		Valid Response	
	No.	%	No.	%
Junior Secondary	1	0.5	1	0.5
Senior Secondary	23	11.5	23	11.5
Associate Degree	56	28.0	56	28.0
Bachelor Degree	90	45.0	90	45.0
Postgraduate	30	15.0	30	15.0
Base	200	100.0	200	100.0

A total of 200 respondents answered the question concerning their places of residence. Table 6 below illustrates the frequency distribution and percentage composition of the place of residence profiles of the respondents. The frequency distribution shows that the majority of the respondents live in Kowloon and the New Territories, representing 33.5% (67 out of 200) of the respondents respectively. Those who live on Hong Kong Island (28.5% or 57 out of 200) come third. Only 4.5% (9 out of 200) of the respondents live on outlying islands.

Table 6. Place of Residence Profile of Respondents

	Sample		Valid Response	
	No.	%	No.	%
Hong Kong Island	57	28.5	57	28.5
Kowloon	67	33.5	67	33.5
New Territories	67	33.5	67	33.5
Outlying Islands	9	4.5	9	4.5
Base	200	100.0	200	100.0

Table 7 and Figure 1 below illustrate the frequency distribution and percentage composition of the Wi-Fi experience profile of the respondents. The frequency distribution shows that the majority of the respondents (90.5% or 181 out of 200) have more than 2 years' of experience using Wi-Fi. Comparing with the 81.1% recorded last year, the percentage of respondents with more than 2 years' of experience using Wi-Fi has increased 9.5 percentage points, an indication of the growing popularity of Wi-Fi usage in Hong Kong.

Those with 1-2 years' of experience (4.0% or 8 out of 200) come second. 3.0% (6 out of 200) of the respondents have six months' to one year's of experience using Wi-Fi and 1.5% (3 out of 200) of them have used it for less than six months. Only a small percentage (1.0% or 2 out of 200) of the respondents have never used Wi-Fi before.

Table 7. Experience Profile of Respondents

	This Year (2016)		Last Year (2015)		Differences
	No.	%	No.	%	
Never used it	2	1.0	3	1.5	**-0.5%**
Less than six months	3	1.5	8	4.0	**-2.5%**
Six months to one year	6	3.0	9	4.5	**-1.5%**
One year to two years	8	4.0	18	9.0	**-5.0%**
Longer than two years	181	90.5	163	81.1	**+9.5%**
Base	200	100.0	201	100.0	

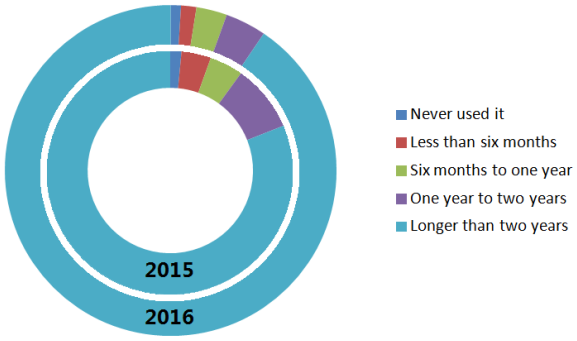

Figure 1. Experience Profile of Respondents

3. Use of Wi-Fi Network in Hong Kong

Table 8 and Figure 2 illustrate the frequency distribution and percentage composition of the amounts of time the respondents spent on accessing the Internet using Wi-Fi. Of the 200 respondents, 1 of them (0.5%) have never used Wi-Fi connection to access the Internet. Compared to the figures last year, 8.5 percentage points more respondents describe themselves as frequent Wi-Fi users (71.0% in 2016 vs. 62.5% in 2015). The percentage of the respondents who describe themselves as occasional user reduce from 27.0% in 2015 to 24.5% in 2016, and those who describe themselves as only using Wi-Fi network unless necessary reduce from 10.5% in 2015 to 4.0% in 2016. The reduction in the number of in light users and the increase in heavy Wi-Fi access users indicate that Wi-Fi has become a daily connection necessity to more and more people.

Table 8. Time Spent on Wi-Fi Connection

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Frequently (e.g. 4 hrs/day)	142	71.0%	62.5%	+8.5%
Occasionally (e.g. < 10 hrs/wk)	49	24.5%	27.0%	-2.5%
Unless necessary	8	4.0%	10.5%	-6.5%
Never used it	1	0.5%	0.0%	+0.5%
Base	200	100.0	100	

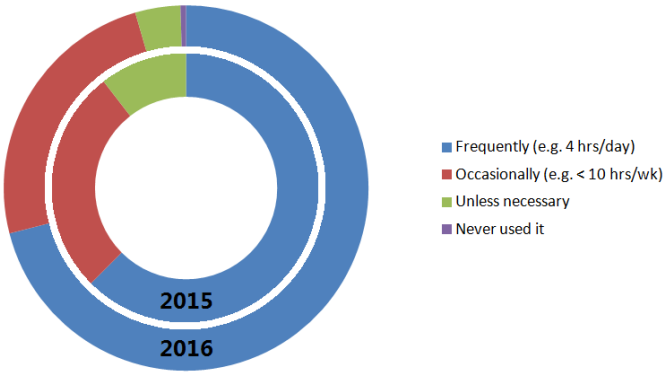

Figure 2. Time Spent on Wi-Fi Connection

3.1 Types of Wi-Fi Network for Internet Access

The types of Wi-Fi network for Internet access are shown in Table 9 and Figure 3. The majority of the respondents (89.5%) use Wi-Fi at home, which is more or less same as the 88.4% reported last year. The number of people who use Wi-Fi in office (67.8%) and on campus (31.7%) increase considerably by 14.8% and 12.0% respectively (the corresponding figures in 2015 were 53.0% and 19.7% respectively). On the contrary, those who use commercial and government free Wi-Fi hotspots drop about 5 percentage points respectively. The percentage of respondents who said they use commercial Wi-Fi hotspots drop from 45.4% of last year to 39.2% this year (a reduction of 5.2 percentage points), and the percentage of respondents who use government free Wi-Fi hotspots reduce from last year's 54.2% to 49.3% this year (reduction of 4.9 percentage points). The percentage of respondents using Wi-Fi in business districts (45.2% of this year vs. 45.5% of last year) and the percentage of respondents using Free Wi-Fi hotspots under the Wi-Fi.HK brand (22.1% of this year vs. 23.2% of last year) remain more or less same as the corresponding figures of the year before.

Table 9. Types of Wi-Fi Network Used for Internet Access

	This Year (2016) No.	This Year (2016) %	Last Year (2015) %	Diff. %
Wi-Fi at Home	178	**89.5**	88.4	**+1.1**
Wi-Fi on Campus	63	**31.7**	19.7	**+12.0**
Wi-Fi in Office	135	**67.8**	53.0	**+14.8**
Wi-Fi in business districts	90	**45.2**	45.5	**-0.3**
Wi-Fi hotspots provided by commercial service providers	78	**39.2**	44.4	**-5.2**
GovWi-Fi public hotspots	98	**49.3**	54.2	**-4.9**
Free Wi-Fi hotspots under the Wi-Fi.HK brand	44	**22.1**	23.2	**-1.1**
Base	199	100.0	100.0	

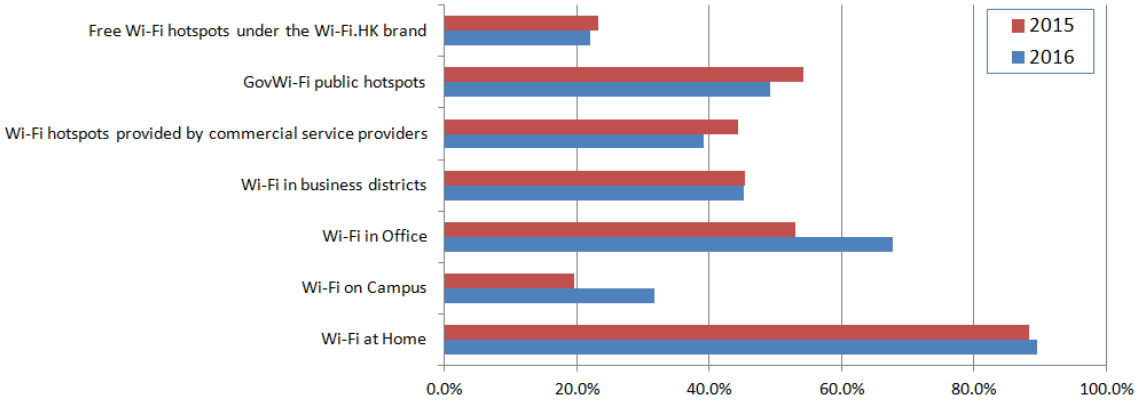

Figure 3. Types of Wi-Fi Network Used for Internet Access

3.2 User Profiles of the Seven Main Types of Wi-Fi Internet Access

3.2.1 Wi-Fi Using Experience Profiles

Table 10 below shows the Wi-Fi using experience profiles of the respondents in terms of the seven main types of Wi-Fi network. It is clear that the more experienced users (those with more than two years of experience of using Wi-Fi) access the Internet using Wi-Fi at home (93.4%), Wi-Fi in office (65.2%), GovWi-Fi (48.6%), and Wi-Fi in business districts (47.0%), while all of the less experienced users (those with less than six months of experience of using Wi-Fi) gain access to the Internet through Wi-Fi hotspots provided by commercial service providers and the GovWi-Fi network.

Table 10. Wi-Fi Using Experience in Terms of Wi-Fi Internet Network

	< 6 months	1/2 to 1 year	1-2 years	> 2 years
Wi-Fi at Home	66.7%	50.0%	25.0%	93.4%
Wi-Fi on Campus	33.3%	16.7%	0.0%	33.2%
Wi-Fi in Office	66.7%	50.0%	12.5%	65.2%
Wi-Fi in business districts	66.7%	16.7%	12.5%	47.0%
Wi-Fi hotspots provided by commercial service providers	100.0%	50.0%	62.5%	36.5%
GovWi-Fi public hotspots	100.0%	66.7%	25.0%	48.6%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	0.0%	16.7%	0.0%	23.2%

3.2.2 Gender Profiles

Table 11. Use of Wi-Fi Network for Internet Access by Gender

	Male	Female
Wi-Fi at Home	90.16%	87.01%
Wi-Fi on Campus	31.15%	32.47%
Wi-Fi in Office	63.93%	59.74%
Wi-Fi in business districts	47.54%	41.56%
Wi-Fi hotspots provided by commercial service providers	38.52%	40.26%
GovWi-Fi public hotspots	51.64%	45.45%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	23.77%	19.48%

Table 11 above shows the gender profiles of the respondents in terms of the seven main types of Wi-Fi network. Both genders show a similar pattern in terms of the types of Wi-Fi network used. The majority of them (90.2% of the males and 87.0% of the females) use Wi-Fi at home. Those who use Wi-Fi in office came second (63.9% of the males and 59.7% of the females). They are followed by those who use GovWi-Fi public hotspots (51.6%

of the males and 45.5% of the females), those who use Wi-Fi in business districts (47.5% of males and 41.6% of females) and those who use Wi-Fi hotspots provided by commercial service providers (38.5% of the males and 40.3% of the females).

3.2.3 Marital Status Profiles

Figure 12 below shows a breakdown of the use of the seven main types of Wi-Fi Internet network by marital status. Although the majority of the respondents, both single and married, use Wi-Fi at home (91.11% of the single and 84.62% of the married) and in office (65.93% of the single and 55.38% of the married), there are more single than married people using Wi-Fi accesses across all the seven main types. About half of the respondents use GovWi-Fi public hotspots (50.37% of the single and 46.15% of the married). More than one-third of the respondents use Wi-Fi in business districts (48.15% of the single and 38.46% of the married) and Wi-Fi hotspots provided by commercial service providers (40.74% of the single and 35.38% of the married). About one-fifth of the respondents use Free Wi-Fi hotspots under the Wi-Fi.HK brand (23.70% of the single and 18.45% of the married). As regards the respondents using Wi-Fi on campus, there are considerable difference between the single (37.78%) and married (18.45%) respondents.

Table 12. Use of Wi-Fi Network for Internet Access by Marital Status

	Single	Married
Wi-Fi at Home	91.11%	84.62%
Wi-Fi on Campus	37.78%	18.46%
Wi-Fi in Office	65.93%	55.38%
Wi-Fi in business districts	48.15%	38.46%
Wi-Fi hotspots provided by commercial service providers	40.74%	35.38%
GovWi-Fi public hotspots	50.37%	46.15%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	23.70%	18.45%

3.2.4 Age Profiles

As there are only 2 respondents in the "15-18 years old" age group and 3 persons in the "over 65 year old" age group, the number is too small for yielding any useful insight hence these two groups are excluded from the analysis.

Table 13 below shows a breakdown of the use of the seven main types of Wi-Fi Internet network by the 5 remaining age groups. Using Wi-Fi at home (with a share ranging from 81.5% to 96.6%), using Wi-Fi in office (with a share ranging from 48.2% to 77.1%) and GovWi-Fi public hotspots (with a share ranging from 46.3% to 57.1%) are the three most used Internet access conduits across all these age groups.

Table 13. Use of Wi-Fi Network for Internet Access by Age

	19-25	26-35	36-45	46-55	56-65
Wi-Fi at Home	81.5%	85.0%	96.6%	94.3%	91.7%
Wi-Fi on Campus	29.6%	26.3%	34.5%	34.3%	45.8%
Wi-Fi in Office	48.2%	61.3%	58.6%	77.1%	66.7%
Wi-Fi in business districts	37.0%	41.3%	41.4%	65.7%	45.8%
Wi-Fi hotspots provided by commercial service providers	40.7%	40.0%	41.4%	42.9%	33.3%
GovWi-Fi public hotspots	51.9%	46.3%	48.3%	57.1%	50.0%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	22.2%	17.5%	17.2%	37.1%	25.0%

3.2.5 Education Profiles

As there is only 1 respondent in the "Junior Secondary" educational level group, the response from this group is too small for yielding any useful insight and hence it is excluded from the analysis.

Table 14 below shows a breakdown of the use of the seven main types of Wi-Fi Internet network by the 4 remaining educational level groups. Using Wi-Fi at home (with a share ranging from 85.6% to 95.7%), using Wi-Fi in office (with a share ranging from 57.8% to 73.9%) and GovWi-Fi public hotspots (with a share ranging from 40.0% to 60.9%) are the three most used Internet access conduits across all these age groups.

It is notable that the respondents with lower education level (Senior Secondary School and Associate Degree) tend to use more free Wi-Fi services. 60.9% of the respondents with senior secondary school education use GovWi-Fi public hotspots, while only 40.0% of the bachelor degree holders use the same; 34.8% of the respondents with senior secondary school education use Free Wi-Fi hotspots under the Wi-Fi.HK brand, while only 16.7% of the bachelor degree holders and postgraduate degree holders use the same. The huge differences in using which conduit of access to the Internet indicates that both GovWi-Fi public hotspots and free Wi-Fi hotspots under the Wi-Fi.HK brand play a helpful role in narrowing the digital gap in Hong Kong.

Table 14. Use of Wi-Fi Network for Internet Access by Educational Level

	Senior Sec.	Asso. Deg.	Bachelor Degree	Postgrad.
Wi-Fi at Home	95.7%	92.9%	85.6%	86.7%
Wi-Fi on Campus	34.8%	35.7%	26.7%	36.7%
Wi-Fi in Office	73.9%	62.5%	57.8%	70.0%
Wi-Fi in business districts	47.8%	46.4%	38.9%	60.0%
Wi-Fi hotspots provided by commercial service providers	52.2%	39.3%	33.3%	46.7%
GovWi-Fi public hotspots	60.9%	57.1%	44.4%	40.0%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	34.8%	28.6%	16.7%	16.7%

3.2.6 Place of Residence Profiles

Table 15 below shows a breakdown of the use of the seven main types of Wi-Fi Internet network by the 4 places of residence groups. Using Wi-Fi at home (with a share ranging from 87.7% to 91.0%), using Wi-Fi in office (with a share ranging from 57.8% to 73.9%) are the most used Internet access conduits across all age groups. However, it is noteworthy that, other than using Wi-Fi at home, respondents living on outlaying islands also use free GovWi-Fi public hotspots for accessing the Internet (44.4%) and only 11.1% of them use Wi-Fi in office. On the other hand, using Wi-Fi in office ranks second as the major Internet access conduit for people living on Hong Kong Island (64.9%), Kowloon (56.7%) and the New Territories (71.6%).

Table 15. Use of Wi-Fi Network for Internet Access by Place of Residence

	HK Island	Kowloon	New Territories	Outlaying Islands
Wi-Fi at Home	87.7%	91.0%	88.1%	88.9%
Wi-Fi on Campus	28.1%	40.3%	28.4%	11.1%
Wi-Fi in Office	64.9%	56.7%	71.6%	22.2%
Wi-Fi in business districts	45.6%	41.8%	50.7%	22.2%
Wi-Fi hotspots provided by commercial service providers	38.6%	38.8%	41.8%	22.2$
GovWi-Fi public hotspots	47.4%	52.2%	47.8%	44.4%
Free Wi-Fi hotspots under the Wi-Fi.HK brand	24.6%	28.4%	16.4%	0.0%

3.3 Use of Wi-Fi Network

Table 16 shows the kinds of device used by the respondents to connect to Wi-Fi network. Amongst the 199 respondents who use Wi-Fi network, the majority of them use smartphones (88.5%) and personal computers (61.5%) to access Wi-Fi. A little over half of them (54.5%) use tablets, such as iPads, to access Wi-Fi. Only very few respondents (2.0%) use PDAs to access Wi-Fi.

Table 16. How do you access Wi-Fi?

	Sample	
	No.	%
Use PC to access Wi-Fi	123	61.5%
Use tablet to access Wi-Fi	109	54.5%
Use smartphone to access Wi-Fi	177	88.5%
Use PDA to access Wi-Fi	4	2.0%
Base	199	

As shown in Table 17, amongst the 199 respondents who use Wi-Fi to access the Internet, only 1.5% of them are not users of smartphones. They, instead, used personal computers, tablets or other portable devices to connect to the Wi-Fi network. For those who use smartphones, the majority of them use Android smartphones (58.8%). However, it is noteworthy that the percentage share in this year has dropped by 16.3 percentage points from the 75.1% recorded in 2015. This share of smartphone users is followed by those who use Apple iPhones(43.2%), which shows an increase of 16.3 percentage points from the 26.9% in 2015. The percentage of the respondents using smartphones other than an Android or iPhone is small (2.5%) and is on the decline (from 5.0% in 2015 to 2.5% in 2016).

Table 17. Are you a Smartphone user?

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
iOS smartphone user	86	43.2%	26.9%	+16.3%
Android phone user	117	58.8%	75.1%	-16.3%
Other smartphone user	5	2.5%	5.0%	-2.5%
Not use smartphone	3	1.5%	1.5%	-
Base	199			

As shown in Table 18 and Figure 4, amongst the 199 respondents who use Wi-Fi to access the Internet, their

Wi-Fi usage pattern shows a slight deviation from that reported last year. In this year (2016), the majority of the 199 respondents use Wi-Fi to obtain information from the Internet (78.4%). They are followed by those who use Wi-Fi to contact friends (70.4%). However, in the survey conducted last year (2015), the main use of Wi-Fi is to contact friends (76.6% in 2015), which is followed by those who use it for obtaining information from the Internet (75.1% in 2015).

Meanwhile, the percentage of respondents who need to use Wi-Fi to conduct activities online (63.3%) and complete their work (55.3%) are both on the rise when compared with the figures reported last year (53.2% and 48.3% respectively). The percentage increases are 10.1 percentage points and 7.00 percentage points respectively.

Table 18. Why do you use Wi-Fi to access the Internet?

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Must use Wi-Fi to complete my work	110	55.3%	48.3%	+7.0%
Must use Wi-Fi to support my learning	63	31.7%	36.3%	-4.6%
Use Wi-Fi to contact friends	140	70.4%	76.6%	-6.2%
Use Wi-Fi to obtain information from the Internet	156	78.4%	75.1%	+3.3%
Use Wi-Fi to conduct activities online	126	63.3%	53.2%	+10.1%
Base	199			

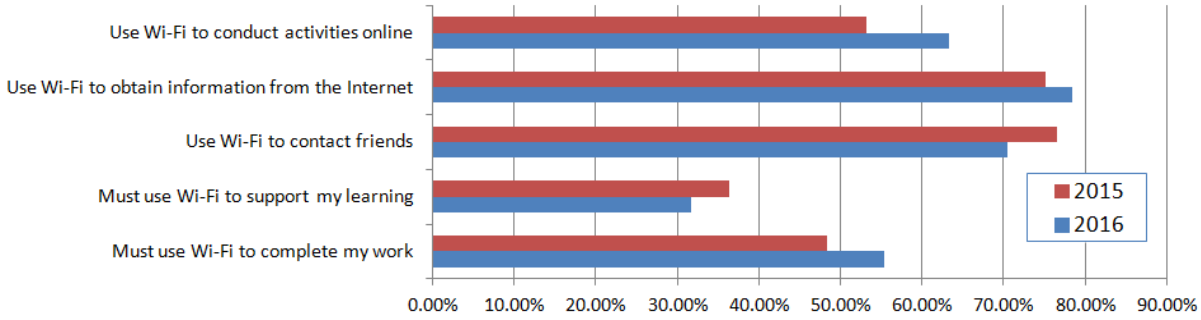

Figure 4. Why do you use Wi-Fi to access the Internet?

Figure 19 below shows a breakdown of the reasons of using Wi-Fi network by gender. Among the 199 Wi-Fi users surveyed, it is revealed that male and female respondents have rather similar Wi-Fi usage patterns. Using Wi-Fi to contact friends, using Wi-Fi to obtain information from the Internet and using Wi-Fi to conduct activities online are the 3 most cited uses of Wi-Fi network in both groups. However, there are minor differences. The use of Wi-Fi to contact friends takes up the biggest share of use among the males (73.6%), while the same use only ranks second (65.5%) among the females. Meanwhile using Wi-Fi to obtain information from the Internet is the most common reason of using Wi-Fi for the female group (76.9%), while the same only ranks second (71.1%) among the males. The male group reports a slightly higher percentage of respondents who claim that they must use Wi-Fi to complete work than the female group (57.0% for the males and 52.6% for the females). Both groups have more or less the same percentage of respondents who claim that they must use Wi-Fi to support their learning (31.4% for the males and 32.1% for the females).

Table 19. Reason of Using of Wi-Fi Network by Gender

	Male (N=121)		Female (N=78)	
	No.	%	No.	%
Must use Wi-Fi to complete my work	69	57.0	41	52.6
Must use Wi-Fi to support my learning	38	31.4	25	32.1
Use Wi-Fi to contact friends	89	73.6	51	65.4
Use Wi-Fi to obtain information from the Internet	86	71.1	60	76.9
Use Wi-Fi to conduct activities online	75	62.0	51	65.4

Table 20 shows the activities conducted by the respondents while using the Wi-Fi network. Social networking (79.4%), checking and answering emails (77.4%), and searching for and downloading information (75.9%) are the 3 most common activities conducted among the 199 respondents. About half of the respondents used Wi-Fi to play on-line games (50.8%), conduct on-line purchasing (50.8%) and download or buy mobile Apps (48.7%). 30.2% of the respondents use Wi-Fi to download/buy ringtones, images, music and only about a quarter of the respondents (25.6%) use Wi-Fi to perform investment activities, e.g., on-line brokerage (30.2%).

Table 20. Activities conducted using the Wi-Fi network

	Sample	
	No.	%
Financial transactions, like transfer payment or credit card payment	91	45.7
Investment, like on-line brokerage	51	25.6
On-line purchasing, e.g. shopping, auction, etc…	101	50.8
Check and answer e-mails	154	77.4
Search and download information	151	75.9
Play on-line games	101	50.8
Download or buying Mobile Apps	97	48.7
Download or buying Ringtones, Images, Music	60	30.2
Social Networking e.g. facebook, WhatApps WeChat	158	79.4
Other activities	2	1.0

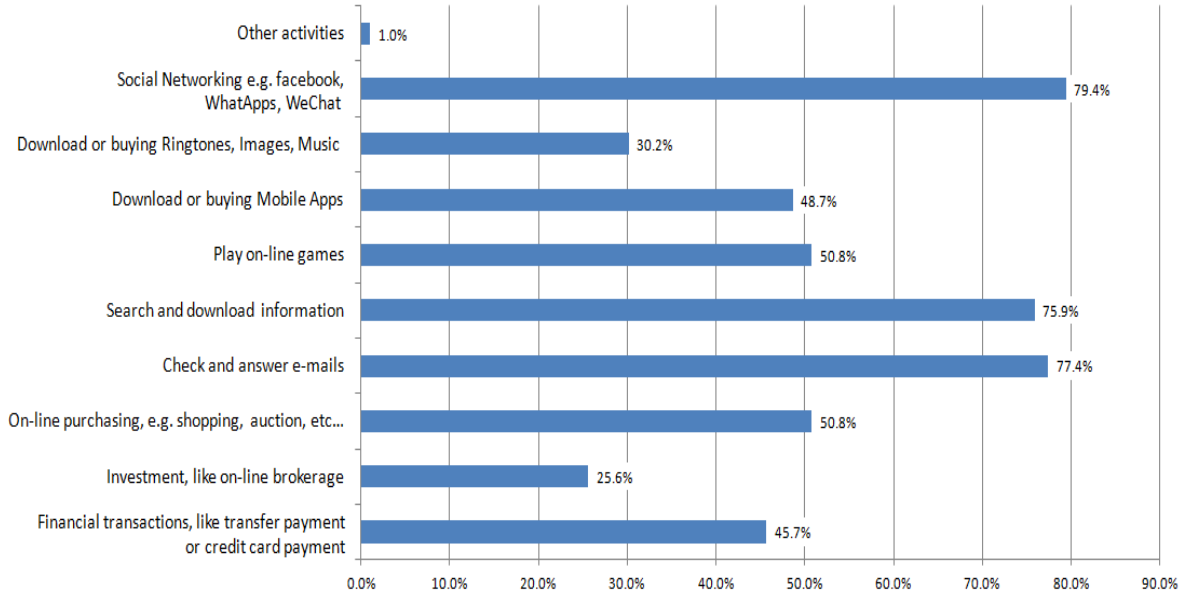

Figure 5. Activities conducted using the Wi-Fi network

4. Using Wi-Fi for Mobile Messaging and Social Networking

4.1 Mobile Messaging

Table 21 below shows the types of mobile messaging Apps used by the respondents and the resulting figures are benchmarked with the percentages reported last year. Similar to last year, only a small percentage of respondents (1.5%) do not use mobile messaging and the percentage has dropped from the 4.0% reported last year to 1.5% this year.

For those 199 Wi-Fi users who used mobile messaging, a large majority of them (95.0%) use WhatsApp, indicating a rising trend. This suggests that WhatsApp is the dominated mobile messaging App in Hong Kong. The second and third most popular Apps are WeChat (40.7%) and LINE (35.7%). The percentage of LINE users increases considerably by 9.3 percentage points, from last year's 26.4% to this year's 35.7%. Meanwhile the percentage of WeChat users reduces slightly by 2.6 percentage points, from last year's 43.3 % to this year's 40.7%. It is also noticeable that more and more Wi-Fi network users are using other mobile messaging Apps, such as Viber. The percentages of people using mobile messaging Apps other than WhatsApp, LINE and WeChat doubles as compared to the year before (increasing from 12.4% in 2015 to 25.1% in 2016).

Table 21. Types of Wi-Fi Mobile Messaging Apps

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Whatsapp	189	95.0	90.5	+4.5
LINE	71	35.7	26.4	+9.3
WeChat	81	40.7	43.3	-2.6
Use other mobile messaging Apps	50	25.1	12.4	+12.7
Not using any mobile message Apps	3	1.5	4.0	-2.5
Base	199			

Table 22 and Figure 6 below show how mobile messaging Apps are used among the 199 Wi-Fi users. It is noticed that the percentages across all mobile messaging Apps used record an increase as compared to the findings last year and the percentages of increases are considerable (ranging from 4.1% to 10.4%) in general except that only a 1.1 percentage points increase is recorded with respect to textual communication. Although the percentage increase is low, similar to last year, textual communication is the most used mobile messaging Apps this year (84.9% in 2016) as well as the year before (83.8% in 2015). Textual plus emoticon is the second most used (78.4 in 2016 and 68.0% in 2015) mobile Apps and the people using this kind of messaging Apps is on the increase (by 10.4 percentage points). Group chat (70.9% in 2016 and 62.4% in 2015) and voice messaging (57.3% in 2016 and 49.2% in 2015) are also important mobile messaging Apps and the percentages of the relevant users are on the rise (by 8.5 and 8.1 percentage points respectively). Although the primary function of mobile phone is voice communication, the percentage of respondents using mobile messaging Apps for voice communication is on the rise, but still remains as the least amongst the various messaging functionalities for two consecutive years (43.2% in 2016 and 39.1% in 2015).

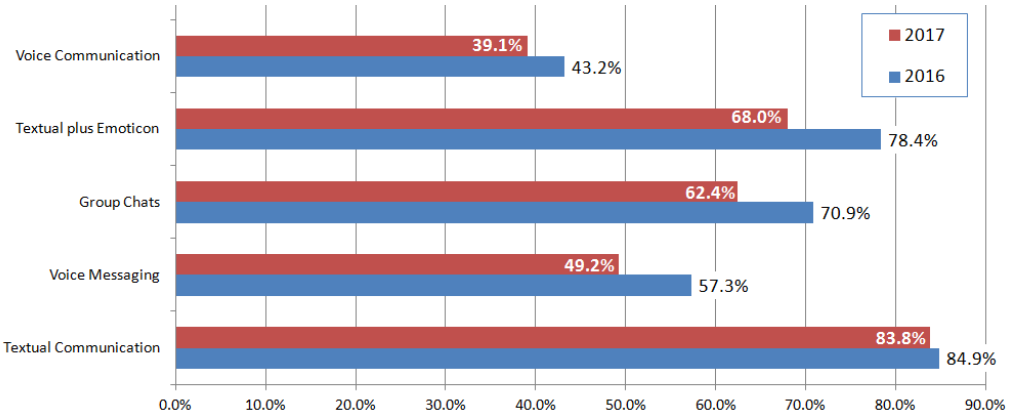

Figure 6. Use of Mobile Messaging Apps Used

Table 22. Use of Mobile Messaging Apps Used

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Textual Communication	169	84.9	83.8	+1.1
Voice Messaging	114	57.3	49.2	+8.1
Group Chats	141	70.9	62.4	+8.5
Textual plus Emoticon	156	78.4	68.0	+10.4
Voice Communication	86	43.2	39.1	+4.1
Base	199			

Table 23 and Figure 7 below show the percentage of online time that the respondents spent on using mobile messaging Apps. After benchmarking the numbers with last year's figures, it is noted that the respondents this year have a rather different profile with regard to the percentage of online time spent on mobile messaging. Last year, we found that the majority (33.0%) of the respondents used 10-25% of their online time for mobile messaging while this year, the majority (34.7%) of the respondents use 26-50% of their online time for mobile messaging.

Those who use less than 10% of their online time for mobile messaging have reduced considerably (by 13.4 percentage points) from 23.5% in 2015 to 10.1% in 2016. On the contrary, those who use more than 75% of their online time for mobile messaging increase considerably (by 5.0 percentage points) from 8.0% in 2015 to 13.0% in 2016 (7.5% of respondents use 76-90% of their online time for mobile messaging and 5.5% of respondents use more than 90% of their online time to do the same). This indicates the growing number of people spending longer and longer time on mobile messaging.

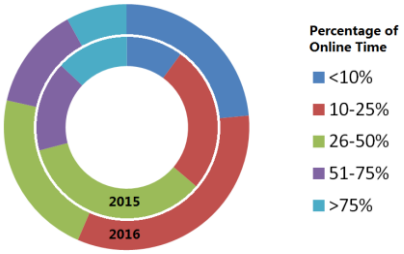

Figure 7. Percentage of Online Time for Mobile Messaging

Table 23. Percentage of Online Time for Mobile Messaging

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
<10%	20	10.1	23.5	-13.4
10-25%	52	26.1	33.0	-6.9
26-50%	69	34.7	22.0	+12.7
51-75%	32	16.1	13.5	+2.6
76-90%	15	7.5	} 8.0	} +5.0
>90%	11	5.5		
Base	199			

4.2 Social Networking

Table 24 shows the types of social networking Apps use by the respondents and the figures are benchmarked with last year's findings. It is noticeable that the percentage of respondents who are not using any social networking Apps has reduced by 2.9 percentage points this year (from 10.4% in 2015 to 7.5% in 2016). Similar to last year, facebook is the most popular social networking Apps and the percentage of respondents using facebook have increased 11.8 percentage points (from 78.1 in 2015 to 89.9% in 2016). Instagram is the second most used social networking Apps among respondents for two consecutive years and the percentage of people using Instagram this year has more than doubled (from 19.9% in 2015 to 46.7% in 2016). Although the user increment is not as high as Instagram, the increase of percentage of LinkedIn users also rise considerably (11.2 percentage points), from 17.4% in 2015 to 28.6% in 2016. In addition, with the growing popularity of social networking Apps, more and more respondents are using other social networking Apps (from 8.5% in 2015 to 13.6% in 2016). Twitter is the only social network Apps that recorded a reduction in percentage of users amongst the respondents (from 13.9% in 2015 to 12.6% in 2016).

Table 24. Types of Social Networking Apps Used

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Twitter user	25	12.6	13.9	-1.3
Facebook user	179	89.9	78.1	11.8
LinkedIn user	57	28.6	17.4	11.2
Instagram user	93	46.7	19.9	26.8
Using other social networking Apps	27	13.6	8.5	5.1
Not using any	15	7.5	10.4	-2.9

Table 25 below shows the percentage of online time the respondents spent on social networking Apps and the numbers are benchmarked with last year's figures. It is noticeable that the respondents this year have a rather different profile with respect to the percentage of online time spent on social networking. Last year, the majority (70.5%) of the respondents used less than 25% of their online time for social networking (35.5% of them used less than 10% and 35.0% of them use 10-25% of their online time), while this year, the majority (61.6%) of the respondents use 10-50% of their online time for social networking (30.8% of them use 10-25% and the same 30.8% of them use 26-50% of their online time).

Table 25. Percentage of Online Time for Social Networking

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
<10%	35	18.9	35.5	-16.6
10-25%	57	30.8	35.0	-4.2
26-50%	57	30.8	17.0	13.8
51-75%	25	13.5	6.5	7
>75%	11	6.0	4.5	1.5
Base	185	100.0		

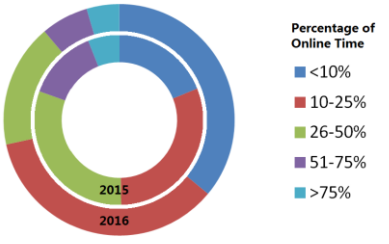

Figure 8. Percentage of Online Time for Social Networking

The number of those who use less than 10% of their online time for social networking have reduced considerably (16.6 percentage points) from 35.5% in 2015 to 18.9% in 2016. On the contrary, those who use more than half of their online time for social networking increase considerably (8.5 percentage points) from 11.0% in 2015 to 19.5% in 2016 (13.5% of respondents use 51-75% of their online time for social networking and 6.0% of respondents use more than 75% of their online time to do the same). This indicates that more and more people are spending longer and longer time on social networking.

5. Internet, Free Wi-Fi and E-Learning

Table 26 shows the attitude toward e-Learning of our respondents. It is found that the majority of respondents (76.9% or 153 out of 200) use e-Learning and the majority of them say that they will encourage people to use e-Learning (86.9% or 173 out of 200).

Table 26. Respondents' Attitude toward e-Learning

	Yes		No	
	No.	%	No.	%
Have you ever used e-learning	153	76.9	47	23.1
Will you encourage people to use e-learning	173	86.9	27	13.1

Table 27 and Figure 9 below show how e-Learning affects learning interest. The majority (74.0%) of the respondents agree that e-Learning can increase his/her learning interest and only a small percentage (6.5%) of the respondents think otherwise.

When being asked whether they believe e-Learning can increase an adult's learning interest in general, the majority (75.0%) of the respondents agree and only a small percentage (4.5%) of them think otherwise. When being asked whether they believe e-Learning can increase secondary school students' learning interest, the majority (78.5%) of the respondents agree but only a small percentage (5.0%) of them do not think so. When being asked whether they believe e-Learning can increase primary school students' learning interest, the majority (80.0%) of the respondents agree and only a small percentage (5.5%) of them disagree.

From the above data, we can conclude that the respondents believe that e-Learning can increase the learning interest of both adults and students. From the small differences observed, our respondents generally believe that e-Learning will benefit younger people (80.0% for primary school student) more than adults (75.0%).

Table 27. e-Learning and Learning Interest

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
e-Learning can increase my learning interest	10.5%	43.5%	20.0%	19.5%	4.5%	2.0%	0.0%
e-Learning can increase adults' learning interest	12.0%	36.0%	27.0%	20.5%	3.0%	0.5%	1.0%
e-Learning can increase secondary school students' learning interest	13.0%	44.0%	21.5%	16.5%	4.0%	1.0%	0.0%
e-Learning can increase primary school students' learning interest	16.0%	44.5%	19.5%	14.5%	4.0%	1.0%	0.5%

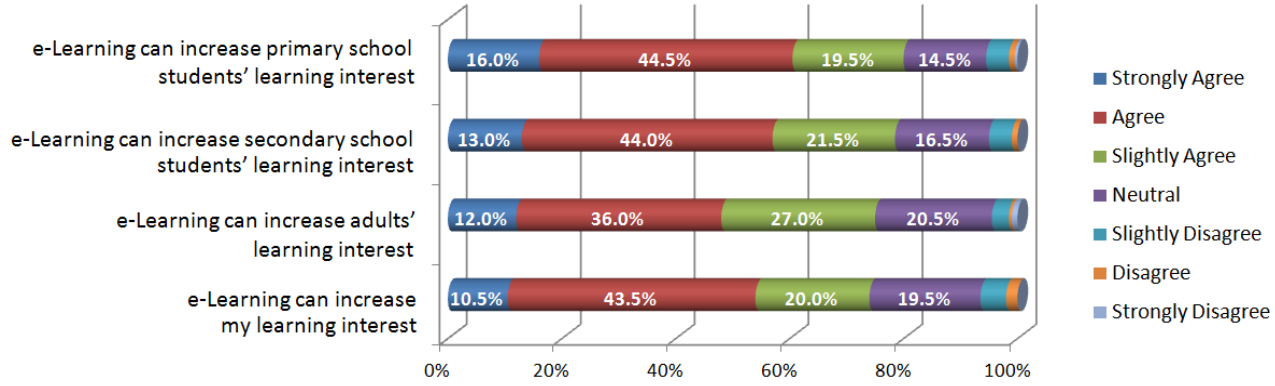

Figure 9. E-Learning and Learning Interest

5.1 E-Learning for Adults

Table 28 below shows how e-Learning helps adults improve their learning interests. The majority (69.0%) of the respondents believe that e-Learning enhances interest in learning and only a small percentage (7.0%) of them think otherwise. A large majority (92.0%) of the respondents believe that e-Learning makes their information

collection easier and, among them, 36.0% strongly agree. Only a small percentage (2.0%) of the respondents disagree. A large majority (87.5%) of the respondents believe that e-Learning broaden their horizons and, among them, 29.0% strongly agree. Only a small percentage (1.5%) of the respondents do not believe so. The majority (82.5%) of the respondents believe that e-Learning facilitates communication with their fellow students and only a small percentage (4.0%) of them think otherwise. The majority (81.0%) of the respondents believe that e-Learning facilitates communication with their tutors and only a small percentage (5.5%) of them do not think so. The majority (81.0%) of the respondents believe that e-Learning enhances an adult's self-learning ability but a small percentage (4.0%) of them think otherwise.

Table 28. e-Learning for Adults

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
Enhance interest in learning (n=200)	9.0%	38.0%	22.0%	24.0%	4.0%	2.0%	1.0%
Make information collection easier (n=200)	36.0%	46.5%	9.5%	6.0%	2.0%	0.0%	0.0%
Broadened horizons (n=200)	29.0%	41.0%	17.5%	11.0%	1.0%	0.5%	0.0%
Facilitate communication with fellow students (n=200)	16.0%	45.0%	21.5%	13.5%	3.0%	1.0%	0.0%
Facilitate communication with tutors (n=200)	13.0%	43.5%	24.5%	13.5%	3.5%	1.0%	1.0%
Enhance self-learning ability (n=200)	16.5%	43.0%	21.5%	15.0%	3.5%	0.5%	0.0%

5.2 E-Learning for Secondary School Students

Table 29 below shows how e-Learning helps secondary school students improve their learning interests. The majority (81.8%) of the respondents believe that e-Learning enhances secondary school students' interest in learning but only a small percentage (3.5%) of them do not think so. A large majority (90.9%) of the respondents believe that e-Learning makes secondary school students' information collection easier and, among them, 31.0% strongly agree. Only a small percentage (2.0%) of the respondents do not believe e-Learning helps them in this way. The majority (77.7%) of the respondents believe that e-Learning broaden a secondary school student's horizons and, among them, 23.4% strongly believe so. Only a small percentage (4.0%) of the respondents disagree. The majority (81.3%) of the respondents believe that e-Learning facilitates secondary school students' communication with their fellow students and only a small percentage (6.6%) of them think otherwise. The majority (77.7%) of the respondents believe that e-Learning facilitates secondary school students' communication with their tutors and only a small percentage (8.6%) of them disagree. The majority (80.2%) of the respondents believe that e-Learning enhances secondary school students' self-learning ability but a small percentage (5.5%) of them disagree.

Table 29. e-Learning for Secondary School Students

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
Enhance interest in learning (n=197)	11.2%	46.7%	23.9%	14.7%	3.0%	0.5%	0.0%
Make information collection easier (n=197)	31.0%	47.7%	12.2%	7.1%	1.5%	0.5%	0.0%
Broadened horizons	23.4%	46.7%	16.2%	9.6%	3.0%	0.5%	0.5%
Facilitate communication with fellow students (n=197)	19.3%	43.7%	18.3%	12.2%	4.1%	2.0%	0.5%
Facilitate communication with tutors (n=197)	14.2%	40.1%	23.4%	13.7%	5.6%	2.0%	1.0%
Enhance self-learning ability (n=197)	14.2%	45.2%	20.8%	14.2%	3.0%	1.5%	1.0%

5.3 E-Learning for Primary School Students

Table 30 below shows how e-Learning helps primary school students improve their learning interests. The majority (81.8%) of the respondents believe that e-Learning enhances a primary school student's interest in learning but a small percentage (6.0%) of them disagree. The majority (81.2%) of them believe that e-Learning makes primary school students' information collection easier but a small percentage (6.6%) of them disagree. The majority (83.7%) of the respondents believe that e-Learning broaden primary school students' horizons, those who disagree constitute only a small percentage of 5.0%. The majority (73.1%) of the respondents believe that e-Learning facilitates primary school students' communication with their fellow students but a small percentage (11.7%) of them disagree. The majority (70.4%) of the respondents believe that e-Learning facilitates primary school students' communication with their tutors but a small percentage (11.7%) of them do not think so. The majority (75.7%) of the respondents believe that e-Learning enhances primary school students' self-learning ability but a small percentage (9.1%) of them disagree.

Although the respondents generally believe that e-Learning can benefit primary school students, when the data is benchmarked with those for secondary school students and adults, it is obvious that the respondents believe that the benefits will be greater to secondary school students and adults than to primary school students.

Table 30. E-Learning for Primary School Students

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
Enhance interest in learning (n=197)	17.8%	45.2%	18.8%	12.2%	2.0%	3.0%	1.0%
Make information collection easier (n=196)	17.9%	39.3%	24.0%	12.2%	4.6%	1.0%	1.0%
Broadened horizons	19.4%	42.9%	21.4%	11.2%	2.0%	2.0%	1.0%
Facilitate communication with fellow students (n=196)	12.8%	37.8%	22.5%	15.3%	7.1%	3.1%	1.5%
Facilitate communication with tutors (n=196)	12.2%	34.2%	24.0%	17.9%	6.6%	3.1%	2.0%
Enhance self-learning ability (n=196)	13.2%	39.1%	23.4%	15.2%	4.6%	3.0%	1.5%

5.4 Free Wi-Fi and e-Learning

Table 31 and Figure 10 below summarize the perceptions of the respondents on whether Free Wi-Fi can help people learn online or not. Respondents in general have a very positive view on the contribution of Free Wi-Fi on e-Learning. The majority (82.0%) of the respondents believe that Free Wi-Fi helps them learn online and only a small percentage (6.5%) of them disagree. The majority (82.9%) of the respondents believe that Free Wi-Fi helps students learn online and only a small percentage (6.0%) of them disagree. The majority (81.5%) of the respondents believe that Free Wi-Fi helps their fellow citizens learn online but only a small percentage (6.0%) of them disagree.

Table 31. Free Wi-Fi and e-Learning

	Strongly Agree	Agree	Slightly Agree	Neutral	Slightly Disagree	Disagree	Strongly Disagree
Free Wi-Fi help me to learn online (n=200)	21.5%	34.5%	26.0%	11.5%	1.5%	3.5%	1.5%
Free Wi-Fi can help student to learn online (n=199)	25.1%	34.2%	23.6%	11.1%	2.5%	2.0%	1.5%
Free Wi-Fi can help our fellow citizen to learn online	22.0%	37.5%	22.0%	12.5%	2.5%	2.5%	1.0%

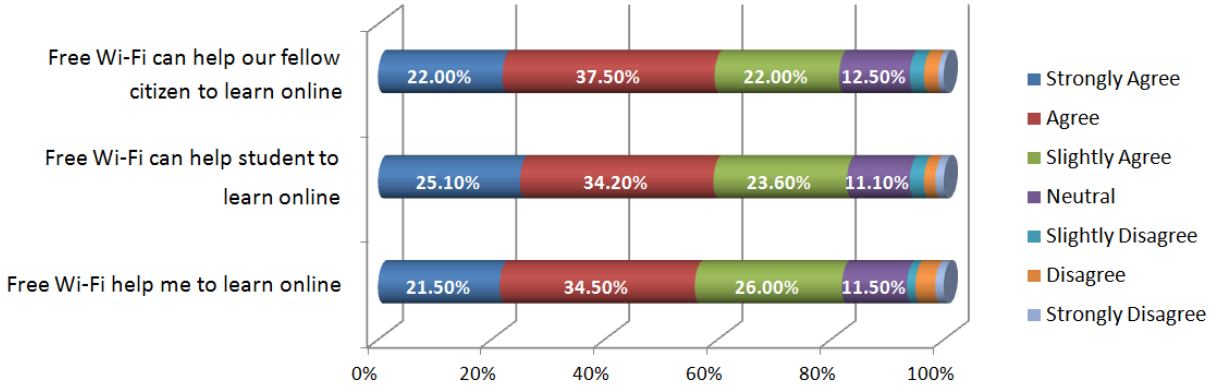

Figure 10. Free Wi-Fi and e-Learning

When being asked whether they are worried that their personal information could be leaked while using e-Learning platforms, 188 out of the 200 respondents answered this question. Amongst the 188 respondents, the majority of them (77.13% of 145 out of 188) express concerns over the possible leakage of personal information due to access to e-Learning platforms.

6. Wi-Fi Access

6.1 Wi-Fi Tethering

Last year, we observed that 2.0% of the respondents didn't know what is tethering and didn't know that they could use their smartphones as Wi-Fi hotspots to share Wi-Fi signal. As shown in table 32, this year, among the 199 people responded to our survey, all of them know what is tethering.

Similar to last year, when being asked whether they have ever shared their smartphones as a Wi-Fi Hotspot, i.e.,

Wi-Fi tethering, the majority (66.8%) of the respondents answer in the affirmative but 33.2% of the respondents answer in the negative. However, that percentage of respondents who claimed they have shared their smartphones as a Wi-Fi hotspot increase considerably by 13.8 percentage points to 66.8% from last year's figure of 53.0%.

Table 32. Have you ever shared your Smartphone as a Wi-Fi Hotspot?

	This Year (2016)		Comparison	
	No.	%	Last Year (%)	% Changes
Yes	133	66.8	53.0	+13.8
No	66	33.2	45.0	-11.8
Don't Know	0	0.0	2.0%	
Base	199	100		

6.2 Wi-Fi at Home

Table 33 below shows the types of Wi-Fi standard the respondents use at home and the data are benchmarked with the 2015 findings. It shows that the majority (51.0%) of the home Wi-Fi users do not know what kinds of Wi-Fi standard they are using. The number is 8.4 percentage points higher than the 42.6% reported last year. One of the reasons may be there are many different Wi-Fi standards and less experienced users might get confused. For those who know the standards they are using, most of them (20.9%) use 802.11n. Those who use 802.11ac (15.3%), which is the most marketed standard for new routers selling in Hong Kong, rank second. The shares of home Wi-Fi users who use older standards, i.e., 802.11a standard, 802.11b standard and 802.11g, are 6.1%, 8.2% and 14.3% respectively. All of them show a decrease when compared with the figures last year.

Table 33. Wi-Fi Standards Used by Home Wi-Fi Users

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
802.11b	16	8.2	12.9	-4.7
802.11a	12	6.1	6.9	-0.8
802.11g	28	14.3	18.3	-4.0
802.11n	41	20.9	29.2	-8.3
802.11ac	30	15.3	14.4	+0.9
Other	2	1.0	1.5	-0.5
Don't know	100	51.0	42.6	+8.4
Base	196			

Table 34 below shows the types of Wi-Fi encryptions use by the respondents at home and the data are benchmarked with the 2015 findings. A total of 188 respondents answered the questions and 42.0% of them do not know what kinds of Wi-Fi security they were using. The number is slightly higher than 33.2% reported last year. For those who know what kinds of Wi-Fi security they are using, 4.8% (9 out of 188) of them do not use any Wi-Fi encryptions on their home Wi-Fi networks, which is a slight improvement (1.1 percentage points) compared to the 5.9% last year. For those home Wi-Fi users who use Wi-Fi security, the majority of them (33.5%) use "WPA/WPA2 using AES". They are followed by those who use "WPA/WPA2 using TKIP" (15.4%). Only 4.8% (2015 was 7.4%) of the home Wi-Fi users use WEP (Wired Equivalent Privacy).

Table 34. Wi-Fi Encryptions Used by Home Wi-Fi Users

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
No Encryption	9	4.8	5.9	-1.1
WEP	14	7.4	7.4	0
WPA/WPA2 using TKIP	29	15.4	18.8	-3.4
WPA/WPA2 using AES	63	33.5	38.6	-5.1
Don't know	79	42.0	33.2	+8.8
Base	188			

Table 35 shows that the types of Wi-Fi authentication protocol the respondents use at home and the data are subsequently benchmarked with the 2015 findings. It shows that a total of 39.3% of the Wi-Fi users have no idea of the kinds of authentication protocols they are using at home. The number is 16.5 percentage points higher than the 22.8% of the respondents who said so last year.

Table 35. Wi-Fi Authentication Protocols Used by Home Wi-Fi Users

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Open	10	5.1	4.5	+0.6
Shared	3	1.5	3.0	-1.5
WPA-Personal	41	20.9	22.3	-1.4
WPA-Enterprise	4	2.0	6.4	-4.4
WPA2-Personal	68	34.7	42.1	-7.4
WPA2-Enterprise	6	3.1	5.0	-1.9
Don't know	77	39.3	22.8	+16.5
Base	196			

For those who know the kinds of Wi-Fi authentication protocol they are using, the majority (34.7%) of them use WPA2-Personal (aka WPA-PSK or Pre-Shared Key mode). They are followed by those who are using WPA-Personal (20.9%). Only a small percentage of the respondents use WPA-Enterprise (3.1%) or WPA2-Enterprise (2.0%) at home.

6.3 Public Wi-Fi Access

Table 36 below shows the respondents' comments and suggestions on the public Wi-Fi hotspots provided by commercial service providers and the data are benchmarked with those reported in 2015. Same as last year, unstable service quality (67.3% in 2016 and 62.9% in 2015), inadequate Wi-Fi access points (61.7% in 2016 and 60.9% in 2015) and inadequate bandwidth (43.9% in 2016 and 46.5% in 2015) are the top 3 comments given by the respondents. They are followed by inadequate transparency in service pricing (32.7%) and high service charges (25.0%).

Table 36. Respondent Comments/Suggestions on Commercial Wi-Fi Services

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Cost or service charge too high	49	25.0	27.7	-2.7
Inadequate transparency in service pricing and service charge	64	32.7	29.7	+3.0
Unstable service quality	132	67.3	62.9	+4.4
Inadequate bandwidth	86	43.9	46.5	-2.6
Inadequate Wi-Fi access points	121	61.7	60.9	+0.8
Other reason	10	5.1	8.9	-3.8
Base	196			

Table 37 below shows the respondents' comments and suggestions on the public Wi-Fi hotspots provided by the HKSAR Government known as GovWi-Fi, and the data were benchmarked with those reported in 2015. Same as last year, inadequate Wi-Fi access points (72.4% in 2016 and 75.7% in 2015), unstable service quality (61.2% in 2016 and 58.4% in 2015) and inadequate bandwidth (45.9% in 2016 and 52.5% in 2015) are the top three comments given by the respondents. They are followed by inadequate contents or services (25.0%).

Table 37. Respondent Comments/Suggestions on GovWi-Fi

	This Year (2016)		Comparison	
	No.	%	2015 (%)	% change
Inadequate Wi-Fi access points	142	72.4	75.7	-3.3
Inadequate bandwidth	90	45.9	52.5	-6.6
Unstable service quality	120	61.2	58.4	+2.8
Inadequate contents or services	49	25.0	23.3	+1.7
Other reason	12	6.1	5.4	+0.7

As shown in Table 38 below, a total of 195 respondents gave suggestions on where to install more Wi-Fi hotspots and their suggestions are shown in Table 37 below. The majority of the respondents suggest installing more Wi-Fi hotspots at MTR (66.2%), promenades (52.8), in shopping malls and at public transport interchanges (51.8%). They are followed by installing at bus stations (47.2%), public transport (45.6), park (45.1%), restaurants (40.5%) and public housing estates (37.5%).

Table 38. Suggestion on places to install more Wi-Fi hotspots

	Response	
	No.	%
Public housing estates	73	37.5
MTR	129	66.2
Wet market	46	23.6
Bus stations	92	47.2
Public transport	89	45.6
Coffee shop	58	29.7
Hotel	58	29.7
Park	88	45.1
Promenade	103	52.8
Shopping malls	100	51.3
Restaurants	79	40.5
Public Transport Interchange	101	51.8
Other	5	2.6

7. Discussion

The advent of "Internet of things" (IoT) has changed how people interact with other people as well as devices, animals and objects around them (Wortmann & Flüchter, 2015). IoT is not only a buzzword, but also a major focus of research and business on a global scale. To connect us with the "things" or “everything” around us, Wi-Fi is the most obvious conduit. Since the beginning of the Wi-Fi age, this technology has not only changed how people interact but completely transformed our way of life. It makes doing business, managing our daily routines and personal lives easier, more mobile and can be conducted at a lower costs both in terms of time and money. With Wi-Fi and the myriad of supporting devices and applications, business, work and personal affairs can be conducted from anywhere, anytime. Wi-Fi keeps people in sync with what is going on both within and outside their social circle and has become an integral part of our daily lives.

Setting out to examine the use of Wi-Fi in Hong Kong, the knowledge and knowledge gap in Wi-Fi security, the status of Wi-Fi connectivity Hong Kong and the possibility of Wi-Fi as a facilitator of e-Learning, this report seeks to empirically assessment the user perceptions on Wi-Fi usage with a view of providing evidence-based suggestions to both commercial and government stakeholders in Hong Kong (HKSAR Government, 2015).

7.1 Wi-Fi Usage

It is revealed that the majority of the respondents use Wi-Fi network (99.5%) both in-home (89.5%) and in office (67.8%). Close to half (49.3%) of the respondents use free GovWi-Fi public hotspots to connect the Internet.

It is observed that, comparing with the year before, the respondents this year spend more time on Wi-Fi to access the Internet in general. The majority of the respondents (71.0%) consider themselves as frequent users of Wi-Fi, representing an increase of 8.5 percentage points over the figure of last year. Meanwhile, only 4.5% of the respondents said they seldom use or have never used Wi-Fi, accounting for about a half of those who said so (10.5%) in the 2015 study.

It is also revealed that 100.0% of the new Wi-Fi users, i.e., those who reported that they have used Wi-Fi for less than 6 months, start their Wi-Fi usage experience with free public Wi-Fi provided by the government and Wi-Fi hotspots provided by commercial service providers. Moreover, for the users with a half to one year Wi-Fi usage experience, 66.67% of them use GovWi-Fi public hotspots and half of them (50%) use Wi-Fi hotspots provided by commercial service providers. These findings highlight the importance of public Wi-Fi, especially those provided for free, to first time users to get started with the experience of staying connected while on the move.

Our study reveals that people with a lower level of education tend to use more free GovWi-Fi public hotspots. This finding highlights the importance of free Wi-Fi in narrowing down the digital gap. Contrary to previous two studies, this study shows that aside from education level and Wi-Fi usage experience, other factors, such as gender, marital status and age differences do not have an obvious effect on the respondents’ pattern of Wi-Fi network usage.

The majority of the respondents use smartphones (88.5%), PC (61.5%) and tablets (54.5%) for Wi-Fi connection. For those who use smartphones for Wi-Fi connection, the majority of them use Android phones (58.8%), while the number of Apple i-phone users have also increased, i.e., by 16.3 percentage points to 43.2% over that of last year. The majority of the respondents use their Wi-Fi enabled devices to obtain information from the Internet (78.4%), to conduct activities online (63.3%) and to complete their work (55.3%), all these three types of use of Wi-Fi indicate a notable increase ((ranging from 3.3 to 10.1 percentage points increase) than those reported last year. Again, contrary to the findings in the previous two studies, gender difference does not have a substantial

effect on reasons underlying the use of Wi-Fi connection. The most performed activities online via Wi-Fi connection are social networking (79.4%), checking and answering emails (77.4%) and searching for and downloading information (75.9%).

7.2 Use of Wi-Fi for Mobile Messaging and Social Networking

The study shows that mobile messaging and social networking have become an integral part of people's lives and more and more people are conducting messaging and networking activities through Wi-Fi. It is observed that WhatsApp, WeChat and LINE are the 3 most used mobile messaging Apps used and nearly all of our respondents (95.0%) are users of WhatsApp. Mobile messaging Apps are used by the respondents for a wide variety of purposes, in particular, for textual communication (84.9%), textual plus emoticon communication (78.4%), group chats (70.9%) and voice messaging (57.3%). All these usages have reported a considerable increase (ranging from 1.1 to 10.4 percentage points) comparing with the figures last year. Correspondingly, the amounts of time that the respondents spent on mobile messaging has also increased, 29.1% of the respondents spent more than half of their online time on mobile messaging, which is 7.6 percentage points more than the 21.5% reported last year.

The use of social networking Apps reveals a pattern similar to that of mobile messaging Apps. It is observed that facebook and Instagram are the two most used social networking Apps amongst our respondents. Nearly all (89.9%) of our respondents use facebook. Only 7.5% of our respondents claimed that they are not using any social networking Apps. The share of this particular group of non-users drop 2.9 percentage points comparing with the rate last year. The amounts of time spent on social networking also hike this year, with 19.5% of the respondents claimed that they spend more than half of their online time on social networking, an 8.5 percentage points increase over the 11.0% reported last year.

7.3 Wi-Fi and Security Measures

With the proliferation of mobile devices and widespread adoption of cloud storage, Wi-Fi tethering has now become increasingly popular in Hong Kong. The study shows that Wi-Fi tethering increases steadily from 50.0% reported 3 year ago, 53.0% last year to 66.8% this year. This finding indicates that Hong Kong people are embracing Wi-Fi tethering, a technology which enables them to use low cost Wi-Fi-only tablets to connect to the Internet while on the go.

Nowadays smartphones are serving as a common Wi-Fi "hotspot" which allows users to share and gain access to Internet connection by a simply click of a button. However, this type of convenience also comes with a potential security risk to the people who share and use the Wi-Fi connection (Khoula et al., 2016). Therefore, Wi-Fi users have to be reminded not to use unknown Wi-Fi connections as there is a potential danger of giving access to hackers to obtain important personal information including emails or passwords which could therefore give culprits access to bank details or any other data that you share or transmit. Greater efforts must be made to educate users about the potential risks of Wi-Fi tethering and what are the proper security measures to be adopted to ensure safe Wi-Fi tethering functionality.

Other than Wi-Fi tethering, home Wi-Fi routers may pose an even higher security risk because home Wi-Fi routers are always on. This gives hackers much more time to hack into the Wi-Fi connection if they want to do so. It is surprised to note that the majority (51.0%) of the respondents have no idea of what kinds of Wi-Fi standard they are using at home. This finding shows that there is a big room for improvement in respect of promoting Wi-Fi security to the general public. Both the government and commercial service providers must take the lead to promote Wi-Fi security both in-home and in public venues and areas. Although the study shows that the percentage of people using older Wi-Fi standard keeps dropping, it is noteworthy that 8.2% and 6.1% of the respondents are still using 802.11a and 802.11b respectively. One of the explanations could be that they find changing their Wi-Fi routers difficult and hence are reluctant to do so.

When being asked what kind of Wi-Fi encryptions they are using at home, it is found that 42.0% of the respondents cannot answer and 4.8% of them say they do not have any encryption in their home Wi-Fi network. When being asked what kind of Wi-Fi authentication protocols they are using at home, 39.3% of the respondents cannot answer and 60.7% of the respondents say they are using WPA/WPA2 based authentication protocols.

7.4 Wi-Fi Accessibility

Similar to the last 3 reports, inadequate Wi-Fi access points, inadequate bandwidth and unstable service quality continue to top the list of problems that frustrate Wi-Fi users in Hong Kong. These problems are found in both public Wi-Fi access services run by commercial service providers and those provided by the HKSAR Government. However, unlike the last 3 reports, the study this year found that complaints on inadequate

bandwidth have considerably reduced (6.6 percentage points for GovWi-Fi and 2.6 percentage points for commercial Wi-Fi service). Meanwhile complaints on inadequate GovWi-Fi access points have also reduced considerably by 3.3 percentage points. This finding indicates that public Wi-Fi services in Hong Kong are improving, in particular the GovWi-Fi service. This may be due to the continuous investment on Wi-Fi access points by the HKSAR government in recent years. However, complaints on unstable service quality on free GovWi-Fi service and commercial Wi-Fi service increase slightly by 2.8 and 4.4 percentage points respectively. That means both the HKSAR government and the commercial sector need to further improve the quality of free Wi-Fi connection service in Hong Kong.

When being asked the possible places to install more Wi-Fi hotspots, respondents point to MTR (66.2%), promenade (52.8%), public transport interchange (51.8), shopping malls (51.3%), bus stations (47.2%), other public transport (45.6%) and parks (45.1%) as the most preferred locations. This finding is particularly meaningful to the service providers when looking for places to expand their present Wi-Fi coverage.

7.5 Free Wi-Fi and E-Learning

Learning is the acquisition of new knowledge and information, it can take place in the traditional pen and paper form, or using mobile devices to search for information or communicate with or consult others for advice or input. E-Learning is a growing trend in today's educational system and many people, including adults and school children are using computers or mobile devices to consult their teachers or fellow classmates, to discuss group projects, to search for information or to broaden their knowledge by watching a Youtube channel.

The study shows that our respondents are generally having a very positive attitude toward e-Learning. The majority of them say they have experience of using e-Learning and they will encourage other people to do so (86.9%). The majority (82.0%) of them believe that free Wi-Fi helped them learn online. They perceive that by giving adults, students and their fellow citizens free Wi-Fi can help them to learn online more effectively. They generally believed that e-Learning can increase people's learning interest, make information collection easier, broaden a person's horizon, facilitate communication with fellow students and tutors and enhance self-learning ability.

From the finding, it is believed that both government and commercial sector should provide more e-Learning platforms, encourage people to produce more learning material, and more importantly, to provide free, or low-cost Wi-Fi connection for people to access those learning materials.

Our world is getting more and more globalized despite occasional setbacks due to geopolitical issues. In the globalized world of today, the competitiveness of a place hinges very much on the citizens' ability and imitativeness to acquire new knowledge and advanced skills. E-learning is the obvious platform for people to learn more and become more informed and skilled in order to compete in the global market. Hong Kong, as a city without natural resources, needs to encourage and facilitate its citizens to learn either through the traditional education system and/or on their own through the new medium of e-Learning. And most importantly, Hong Kong, as one of the most modern and most knowledge-intensive cities in China, must leverage on its advantages of Wi-Fi coverage, free flow of information and global Internet connectivity to create an environment where people and businesses are more competitive, more prosperous and more ready to reap the benefits of their hard work.

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