

Young People and Smart Phones: An Empirical Study on Information Security

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Abstract

This paper reports on a study of mobile phone usage by young people in the UK tertiary education sector. Responses from 397 respondents were analysed to explore the attitudes of young people towards data security issues for mobile devices. Results from the comparative analysis found that there were significant differences in data security risk concerns across ethnic groups. Those who reported extrovert personalities tend to take more risk in data security issues. In addition, young people who were 'technology savvy' were less likely to expose themselves to risk to data security issues through the use of free wifi and access of installed applications. The research reported here is part of a wider study looking at the overall communications and mobile phone usage of young people and taken as a whole, the paper contributes to this increasingly important area of Information Technology.

This paper reports on a research study that examined young peoples' adoption of mobile technology, particularly smart phones (those with internet access), to support their communication needs. The research focuses on the use of mobile technology in the everyday lives of young people studying at Universities in the United Kingdom. While the research had a range of research questions reflecting the broadness of the original brief, this paper reports on the following:

To determine linkages between mobile communications, risk-taking and at-risk behavior among young people.

In this paper, risk-taking is broadly interpreted as risk taking concerned with information security. For the purposes of this paper we define information (and data) security as: "The safeguarding of an individual's data from unauthorised access or modification to ensure its availability, confidentiality and integrity" (<http://ishandbook.bsewall.com/risk/Methodology/IS.html>). We deliberately narrow this definition of risk to focus on information security. The wider use of risk referred to range of risk taking behavior such as the sending of offensive texts, driving whilst texting which are not relevant to this paper. Thus the paper will present findings on the attitudes of young people towards issues of information security related to their communications based activities on mobile devices.

Research reporting on mobile phone usage amongst young people is now widely available. There have been studies conducted in Australia exploring models of technology adoption [3], East Asia [4] and the USA for example [5]. The latter is an example that specifically explored issues around data / information security.

Research that explores behaviour of young people in their use of mobile technology continues to increase in importance. Thus this study contributes current data on the use of the mobile phones in the context of Internet related activity and presents findings that note significant differences towards information security between different demographic groups. These distinctions have potential marketing, technical and policy implications to those involved in

1. Introduction

In the last decade, there has been a rise in mobile phone ownership in the United Kingdom, particularly among young people. In the year 2000, it was found that 17% primary school children and 58% of secondary school children have their own mobile phones (Office of National Statistics, 2002). More recently the OFCOM Communications Market Report for 2012 reported 66% of those aged 16-24 possessed a smart phone. The same group also reported that they are most likely to choose the mobile phone as the medium they would miss most (40%).

The value of mobile phones can partly be explained by how mobile phone based communication has become embedded in youth culture bringing out new spaces for social interaction among young people [1, 2]. Accompanying these changes, mobile phones have also begun the process of modifying behaviour towards risk taking, and in particular the risks associated with a possible lack of understanding towards data security implications associated with mobile phones.

the eco-systems around mobile technology.

The remainder of the paper is organised as follows. Section 2 briefly reviews previous work that has explored how young people utilise mobile technology. In particular, the issue of data or information security is considered within the context of established theoretical models such as the Technology Acceptance Model [6] [7]. Section 3 develops the research methods utilised to explore the question above. Section 4 presents both our descriptive statistics and an analysis using correlations for understanding the relationship of young people, their behaviours and awareness towards data security. The paper is concluded with final remarks.

2. Related Work

The young people surveyed in this research represent the so-called 'digital natives' [8], that generation of young people born after 1980 and possessing sophisticated knowledge of information technology having grown up surrounded by electronic gadgets and the Internet. Importantly, despite the wide availability of a preponderance of electronic devices, the smart mobile phone providing access to a range of services (voice, text, email, social networks, rich media) and ubiquity of network connectivity means that it has become the device of choice for young people [5].

The wider literature into the relationship between technology and society has consistently highlighted the rapid embedding of mobile phones communication into youth cultures and its effects on altering the social and geographical aspects of their everyday life. Specifically, mobile phone communications have opened up new spaces for social interaction among the youth: talk to friends, arrange to meet and for parents and young people to stay in touch [1, 2]. The availability of mobile communications has also expanded young people's private spheres and, allowed them to have more control over their own communication channels and geographies [9] [10, 11]. Thus, this type of communication has created a 'private setting' for young people and serve as means for integration in their peer group.

Mobile phones, due to their physical characteristics, are more vulnerable to threats of accidental loss or theft. And while the device itself may represent the target, the increasing use of the phone for a range of activities leading to increasing amounts of personal information stored in the phone suggests that data/information security will become

increasingly important. In 2005, a study of 297 mobile phone users [12] found that a third did not use PIN technology, however 83% were willing to accept some form of biometric authentication. PIN based security was again the subject of further study by Kurkovsky and Syta and reported similar results [5]. However as our results will show, in 2013 young peoples' awareness to the importance of PINs has increased.

The phenomena of social network sites (SNS) dominated the year of 2007 [13] and show no signs of losing impetus as SNSs have moved to mobile devices. Their relationship to data security in general is significant as a typical Facebook user profile frequently includes large amounts of personal and sensitive personal data as defined by the European Data Protection Directive (DPD). When this is coupled with the inherent vulnerability of mobile phones the security of personal and sensitive data and associated risk is further exacerbated.

The rate at which advances in mobile technology are being made requires that a young person's willingness in risking an adoption of new technology may depend upon their disposition to engaging with innovation and their general technology savviness.

Although psychological and personality metrics exist for measurement of domain-specific individual innovativeness in the adoption of IT in general such as that by Agarwal [14], as our research was broader than the topic addressed in this paper, we utilised the widely deployed personality Eysenck scale as a potential predictor for risk taking activities in relation to information security [15].

Previous research suggests that personality of an individual will predict types of mobile phone use (see [16]). For example, extraversion is associated with traits such as assertiveness, activity-oriented, excitement-seeking and positive emotions [17]. Thus, personality of individuals should also predict the types of interactions and activities in which people are prepared to engage using mobile phone technology. Also, problematic mobile phone users or addictive users are more likely to be extraverted [16]. As extroverts are more likely to take risks, they have a higher likelihood to engage in risk-taking behaviour that could compromise the security of data stored on a mobile device or expose sensitive data/information to misuses. While psychological theory, in particular personality traits, can explain patterns of and behavior in mobile phone use [18], there is comparatively little information available on the relationship between personality traits and perception of data security/information privacy among mobile phone users. Therefore, the present study makes an important contribution in addressing the

psychological predispositions that might underpin mobile phone use.

Huang et al [19] reported on a study to investigate people's perception of information security with the aim to unveil the factors that influence peoples' perception of different threats to information security. Given that perception is a critical cognitive function by which individuals assess external input in order to generate a behavioural response, the work by Huang et al is significant. Following a survey of 602 respondents and an exploratory factor analysis, a six-factor structure characterising people's perception of different threats to information security was developed. This model contains factors of knowledge (K), impact (I), severity (S), controllability (C), awareness (A) and possibility (P). The study did not however, consider people-related features such as cultural style, personality and risk sensitivity. For young people and mobile phones such omissions may be of relevance.

While research on mobile phone security exists (see [20] and [21]) it has not explored the experiences of young people in depth and in particular the questions of security and how digital natives differ has not been addressed. Some studies have compared perceptions and the use of mobile phone across cultures, age groups and gender. For example, Campbell [22] (2007) in his survey of 231 students from diverse cultural groups (i.e. US, Hawaii, Japan, Taiwan and Sweden) found that various types of cultural characteristics among these students are associated with the mobile communication practices and perception towards mobile technology, ranging from psychological or relational tendencies to socio-economic and political conditions. Younger/adolescent users perceived mobile phone technology as a tool for expressive purposes or fashion statement [23] [24]; while older/adult users associate it with instrumental purposes and safety/security [25]. For gender comparison, males emphasised the technical functions of mobile phones, while females appreciate social and physical appearance aspects, such as casing, design and ring tone [9].

Recent research work suggest that although technology is embedded in young people's lives, their use and degree of fluency in technology are not uniform, particularly in aspects above and beyond computer games and emails that require a deeper understanding of the technology and its possible impacts [26]. Kennedy and colleagues' (2007) survey on young people usage of Web 2.0 tools revealed that only a relatively small proportion of students are capable of utilising the newer technologies such as

blogs, wikis and social bookmarking which enable students to collaborate and to produce and publish material online [27]. Others indicated that college students have very basic technological skills and do not recognise the enhanced functionality of the applications they own and use [28]. This lack of knowledge on information technology may have pertinent implications on young people's attitudes towards vulnerability of mobile phone data security.

The most widely used methods of authentication on mobile phones are PINs and passwords. While, study on IT professionals provides evidence on the relationship between general awareness or concern of data security and security measures/actions that individuals take to protect their mobile phones and sensitive data stored on them (see [29]), other studies on young people indicate that many mobile users are either unaware or do not use the security features available on their mobile phones (i.e. did not use any PIN or password security) [5] [12]. Kurkosky and Syta (2010) have argued that the lack of knowledge is not the reason why young people choose to leave their mobile device unprotected. They asserted that majority of the young people in their survey are aware of phone-level (80%) and SIM-level PINs (67%) but less than a third use PINs to lock phones and Sim cards.

Mobile phones/devices have a particular set of risks and vulnerabilities associated with them, especially risk factors related to youth populations. The mainstream media has highlighted the concern about young people being targeted by bullies and pedophiles through mobile phones and other media technologies [30] [31]. For example, Valentine and Holloway who explored young people's use of cyberspace noted parental concerns about young people's vulnerability, and their high level of technological competence, which exposed them to pornography and pedophiles while using the internet [32].

To understand perceptions of young people towards issues of data security on their mobile phones, theoretical models from IS/IT research literature were also contemplated. Key theories such as the Technology Acceptance Model (TAM) [6] and The Diffusion of Innovation Theory [33] were considered but discounted as they did not appear to satisfactorily address the perceived dichotomy between convenience and security (that is, the likelihood that users behave less securely in the presence of free services). Issues of rapid development and diffusion of smart-phones and mobile technologies in general also prevents adoption of these theoretical models.

In the context of this paper, the existing literature presents limited evidence on correlational factors leading to awareness of data security amongst this target group 18-25 year old young people especially since the large-scale adoption of smart phones. Thus the primary contribution of this paper is to present findings on factors that influence behaviour that has impact on information security for users of mobile smart phones and how such factors are correlated. This study hypothesized the following: (a) Young people's perception of risks of data security would be associated to their socio-demographic characteristics; (b) Young people's personality would be significantly related to their perception on mobile phone security; (c) Young people IT/information literacy and data privacy/security measures would be associated to their perception on mobile phone data security. The findings have potential for policy and design implications for mobile phone manufacturers.

3. Research Method

This research was conducted at four tertiary (higher education) institutions in the UK with the population from which the sample was obtained studying a range of courses such as computer science, sociology, psychology, criminology and business studies at both undergraduate and postgraduate levels.

An on-line approach to survey design was chosen because of the clear advantages offered: storage of data, flexibility and accuracy; targeting different segments and the lower cost.

Students were recruited through university courses, primarily through a web link sent via email. The survey was a standardised instrument and developed to elicit demographic details from the young people (i.e. personal, social and family background characteristics). Participation was strictly voluntary. Other standardised instruments and open-ended questions were used to gather information on the usage and experience of mobile technology as well as the role of mobile communication in the wider social world of young people. In addition to the survey, focus group discussions with 40 students were also held during the piloting of the on-line questionnaire and at the end of the survey. Data were collected over a period of November 2012 through to end of January 2013.

The lead institution obtained ethics approval and the questionnaire design was subject to validation and pilot testing to ensure readability, consistency and error correction. The focus groups served as important consultations to cross check with the

student views and experiences that were captured by our research instruments. The focus groups also provided additional qualitative data on mobile phone usage.

While the survey addressed a range of areas, those related to the research question under evaluation in this paper included:

1. Information Literacy
2. Data Security
3. Experience towards Mobile Phone Usage
4. Communication & Personality
5. Demographic Details.

As noted in the introduction earlier, this paper reports on the linkages between mobile phone usage and risk-taking behavior. In this paper, risk taking is broadly conceptualised as risks associated with concern and management of data/information security. Drilling down, for this exploration of attitudes towards data security, the following survey-derived items were determined to be potential factors that may influence young people towards data security issues on mobile phones (see Table 5). The factors are discussed in section 4. Note that each predictor variable group reported a minimum of 0.71 on the Cronbach Reliability Scale.

The wider scope of the research was exploratory in nature. The five areas listed above were deemed as predictors of perceptions towards (information security) risk taking behaviour. It would be of value to replicate this study in other country contexts. Sample questions are shown in Table 7 and the full research instrument is available from the authors.

4. Results and analysis

This section presents the results and analysis focusing on the exploration of attitudes and practices of young adults towards data security on mobile phones. We first introduce descriptive statistics that outline the demographic data. The descriptive analysis section explores responses to key questions related to the factors influencing information security. This is followed by relevant correlation analysis performed on the data.

At the end of the survey, base line data included: 397 respondents who started the survey with 291 respondents completing all questions. The socio-demographic profile of young people and family is presented in Table 1. The sample was 47.4% (n=137) male and 52.6% (n=152) female; and average age is 23 years old (SD=6.15) with the majority (89.3%, n=258) between 16 to 30 years old during the time of the study. In terms of age for first mobile phone, the average age is 15 years old (SD=5.94). A majority

(72.6%, n=226) of the respondents reported that they first had a mobile phone at age 15 or below.

Table 1 Descriptive Data

Variable	N	Mean or %
Male	137	47.4
Female	152	52.6
Age (years)	289	23.12
White British	74	25.8
White Other	63	22.0
Mixed	22	7.7
Black/ African/ Caribbean/ Black British	41	14.3
Asian/ Asian British	78	27.2
Home/EU Student	219	75.8
Overseas Student	70	24.2
Living away from family home	170	58.9
Living at home with family	119	41.2

The current sample comprised young people from different ethnic backgrounds. Almost half (47.8%, n=137) of the youth were White with 25.8% (n=74) White British and 22% (n=63) other White ethnic background, while the rest were of black and minority ethnic background (52.2%, n=150). This includes those of Black British/African/Caribbean (14.3%, n=41), Asian/British Asian (27.2%, n=78) mixed-parentage (7.7%, n=22) and other ethnic groups such as Arabs (2.3%, n=9). The ethnic categories used in this research are based on the widely used categories in the UK census (<http://www.ons.gov.uk/ons/guide-method/census/2011/uk-census/index.html>). The majority (75.8%, n=219) of young people were Home/EU students while the rest were overseas students (24.2%, n=70).

There were almost similar numbers of students living away from family home (58.8%, n=170) and those living at home with family during the time of the study (41.2%, n=119). Table 1 provides some of the relevant overview descriptive statistics from the sample.

Mobile phones present inherent security risks concerning issues of data and privacy. Some of the background to the nature of associated risks has already been noted in section 2 earlier. Further descriptive statistics explored the general concerns of young people towards aspects of data security. Here we report on the responses to questions by our respondents that provide some insight into how issues of data and privacy security are of concern to our demographic. Table 2 shows that almost half of our sample were concerned about the security of data

stored in their mobile phone. Moreover, From the table, it is clear that young people recognise that there are risks associated with securing data on mobile phones with almost 50% reporting some concern about infiltration by viruses or worms; and a similar proportion expressing concern about wireless attacks using Bluetooth or wifi connection.

At odds with this are the relatively small numbers who are concerned about the risks of using free wifi in public spaces (only 33%).

Table 3 and 4 also illustrate young people's perceptions on privacy and security measures in relations to mobile phone technology. Items on password security measures were derived from Kurkovsky and Syta [5] to examine mobile phone data security and privacy measures among young people. Our data show that half of our sample report that they do not allow applications to access their contacts; whilst two-fifths do not allow applications to access any information. Only 1 in 10 regularly allow apps access to information and their contacts. The 'sometimes' response suggests that young people are rather discerning in which applications they allow to access their personal information and contacts (See Table 3). This finding is consistent with a recent PEW report [34].

The majority of the young people had indicated that their mobile-phone (71.7%, n=230) and sim-card (39.8%, n=127) are password protected while almost 75% of the young people rarely/never change their password on their mobile phone (See Table 4). About one third (30.7%, n=98) tend to change their password as a security measure on a regular basis (frequently or occasionally).

Slightly more than half of the young people (53.8%, n=172) reported that no other people are aware of their password; while the rest indicated one (22.5%, n=72), two to three (16.6%, n=53) and four or more (7.2%, n=23) people are aware of their mobile phone password.

4.1 Descriptive Analysis

Table 5 shows the descriptive statistics of the measures for personality, IT/information literacy, data security and risk taking behaviour. The Eysenck Personality Questionnaire (Extraversion vs Introversion) [15] was used in the present study. This 12-item measure assesses a young person's personality on an extraversion/introversion continuum (i.e. outgoing, talkative, high on positive affect (feeling good), and in need of external stimulation). Higher scores on the Personality Questionnaire reflect greater tendency towards extraversion personality. Based on the group median,

more than half (60.3%, n=179) of the young people reported low levels of extraversion personality. while the remaining 40% (n=118) tend to have high tendency of extraversion personality.

Table 2 Concern about data security

	Security of data	Risk of using free wifi	A virus of Worm attack	A wireless attach (Bluetooth or wifi)
Absolutely unconcerned/ Somewhat concerned	80 (24.5%)	114 (35.5%)	106 (32.2%)	103 (32.2%)
Neutral	85 (26.5%)	100 (30.3%)	63 (19.7%)	62 (19.4%)
Somewhat concerned/ Absolutely concerned	156 (48.6%)	107 (33.3%)	150 (47.1%)	155 (48.4%)
Total	321 (100%)	321 (100%)	319 (100%)	320 (100%)

In relation to IT literacy, information related to overall information literacy, self-assessed technology savviness and online activities were collected (see Table 5). A 5-point Likert scale was developed to measure the frequency of mobile usage on various life aspects related to the youths: advanced communication, entertainment, blogging, information searching and other online activities ([35, 36]). Three items were used to measure the knowledge and literacy of information technology among youth in relations to online journal or blogging, online sharing or use material online for own artistic creation. Higher composite score reflect higher level of IT/information literacy. Based on the group median, result showed that there were slightly more (56%, n=188) young people who have a low level of information literacy than those with a high level (44%, n=148). Majority of the young people perceived themselves to have a high level of technology savviness. Almost two thirds of our sample (61.4%, n=197) rated their technical skills and general technology savviness as at least intermediate or advanced with 35.5% advanced/intermediate level and 25.9% advanced level. A quarter of the sample (25.8%, n=99) rate themselves at intermediate level and only a minority (7.8%, n=25) perceived low or intermediate/low level of technology savviness. More young people reported 'rarely' (19.2%, n=65) or 'never' (37.9%, n=128) engaging in online shopping compared to those who did engage in such activity (42.9%, n=145). It should be noted that there were almost a quarter (23.1%, n=78) who do online shopping using their mobile phone on a 'frequently' or 'all the time' basis. Similarly, there is a high percentage of young people

(44.7%, n=141) who use free wifi in public areas on a regular basis (i.e. frequently or all the time) compared to those who rarely or never (27%, n=85).

Table 3 Application access on mobile phone

	Yes	Some-times	No	Total
Allow applications to access info	38 (11.9%)	157 (49.1%)	125 (39.1%)	320 (100%)
Allow applications to access contacts	39 (12.4%)	114 (36.2%)	162 (51.4%)	305 (100%)

Table 4 Privacy and security measures on mobile phone

Password Security Measures	N	%
Mobile password protected (n=321)	230	71.7
Sim-card password protected (n=319)	127	39.8
Set password yourself (n=308)	229	74.7
How often do you change your password? (n=319)		
Once after purchase	16	5.0
Frequently	31	9.7
Occasionally	67	21

4.2. Correlation Analysis

The following section presents inferential statistics, that include comparative and correlational analyses to further explore and examine the distribution and relationship between the main variables in the study.

We now present the results and analysis focusing on the exploration of attitudes of young people towards data security on mobile phones.

Here we were particularly interested in investigating how the perceived risks of data security, security measures and frequency of online activities are related to ethnicity, gender and student status (Table 6). Both Analysis of Variance (ANOVA) (more than 2 groups) and Independent Sample t-test (2 groups) were used to examine the group differences across ethnic groups, gender and student status. Result from comparative analyses indicated that there were significant differences in the perception on mobile phone data security among young people across ethnic background and student status. It was found that young people of Non-White ethnic background tend to have higher awareness of

mobile phone data security than those of White ethnic background ($t=-3.38$, $p<.001$). Specifically, post-hoc analysis showed that young people of Black and Asian ethnic background reported greater awareness of mobile phone data security than young people of White ethnic background ($F=5.06$, $p<.001$). Similarly, overseas students also demonstrated higher level of awareness towards mobile phone data security compared to Home/EU students ($t=4.10$, $p<.001$).

In terms of gender differences, young men were found to be more likely to allow applications to access their personal information and contact details on phone and do online shopping than young women. However, it should be noted that these differences were only marginally significant, $p<.10$.

Table 8 presents results of the correlational analysis between socio-demographic characteristics with youth perception on mobile phone data security, personality, IT/Information literacy and online activities. Person Product Moment Correlation was used to determine the magnitude and direction of the relationship between these variables. It was found that older students reported significantly greater awareness of security threats on mobile phone than younger students ($r=.19$, $p<.001$). Young people of White ethnicity background ($r=-.20$, $p<.0001$) and those who are Home/EU students ($r=.24$, $p<.0001$) tended to report lower level of concern on the vulnerability of mobile phone security. Results in Table 8 also showed that not only White ($r=.13$, $p<.05$) and Home/EU students ($r=-.12$, $p<.05$) were more likely to report a more extroversion personality, they were also less information/IT literate (Ethnicity: $r=-.21$, $p<.0001$; Student status: $r=.22$, $p<.0001$). Surprisingly, females tend to score higher in extroversion personality as compared to males in the present study ($r=-.17$, $p<.001$).

Table 9 presents the result of the correlations between perception on mobile phone data security, personality, IT literacy and online activities among young people. It was found that young people who are more concerned about the threats on their mobile phone security were more literate in information technology ($r=.15$, $p<.001$), less likely to allow applications to access their personal details ($r=-.14$, $p<.05$) and more regular in using password security measures on mobile phones ($r=.14$, $p<.05$). Besides, young people who have higher awareness towards mobile phone security threats are also less likely to have an extrovert personality ($r=-.12$, $p<.0001$).

In addition, young people who are more extroverted not only experienced higher tendency to use free wifi in public area ($r=.17$, $p<.001$) but also allow applications to access personal information

($r=.12$, $p<.05$). Young people with extroverted personality were also more IT literate ($r=.14$, $p<.05$) and regularly use password as security measures on mobile phone ($r=.12$, $p<.05$). Those who are more IT literate tend to be more likely to use their mobile phone for activities such as online shopping ($r=.34$, $p<.0001$), free wifi in public areas ($r=.14$, $p<.05$) and allow applications to access to information in their mobile phones ($r=.17$, $p<.001$).

5. Conclusion

For young adults, the importance of mobile phones as the device of choice coupled with continuous network connectivity raises key issues of risk-taking behaviours. The attitudes of young people towards data/information security are particularly important. Further, the gamut of communications styles and the range of activities that can be performed on a phone increases considerable risk arising from data security and privacy concerns. Our research with students from four UK universities has shown factors related to IT literacy, data security measures and online/application activities are correlated with different demographic groups. Of note, are the comparative analyses that indicate significant differences on the risks associated with data security with respect to ethnic groups, gender and student status (Overseas versus Home/EU). The level of IT literacy also determined the extent to which apps are allowed to access data from the phone or the extent to which the use of free public wifi is adopted. Another key finding of this study is that young people's personality is also significantly related to their use of mobile phone technology and perceptions of data security.

We acknowledge limitations of the findings reported here. Specifically, we accept that the young people participating in this project are from the tertiary education sector and hence generalisations to the wider younger population should be treated with caution. Further, sensitive data such as financial personal data and how young people handle it on mobile phones needs further research.

Given the move towards mobile devices, research that explores behaviour of young people in their use of mobile technology continues to increase in importance. Thus, this study contributes current findings on the use of smart phones in the context of internet related activity and presents findings that note significant differences towards information security between different demographic groups. These distinctions have potential marketing, technical

and policy implications to those involved in the eco-systems around mobile technology.

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Table 5 Factors influencing data/information security

Variable	n (%)	Mean (SD)	Median	Min	Max
Personality (Extraversion) (n=297)		7.89 (3.22)	9.00	0	12
Low	179 (60.3)				
High	118 (39.7)				
Information & IT literacy measures					
Information Literacy (n=336)		6.55 (3.11)	6.00	3	15
Low	188 (56.0)				
High	148 (44.0)				
Self-assessed 'Tech Savviness' (n=336)		3.77 (0.97)	4.00	1	5
Low	7 (2.2)				
Intermediate/Low	18 (5.6)				
Intermediate	99 (25.8)				
Advanced/Intermediate	114 (35.5)				
Advanced	83 (25.9)				
Frequency of Online Shopping (n=336)		2.35 (1.33)	2.00	1	5
Never	128 (37.9)				
Rarely	65 (19.2)				
Occasionally	67 (19.8)				
Frequently	52 (15.4)				
All the time	26 (7.7)				
Free wifi use at public places (n=336)		3.24 (1.26)	3.00	1	5
Never	38 (12.1)				
Rarely	47 (14.9)				
Occasionally	89 (23.2)				
Frequently	81 (25.7)				
All the time	60 (19.0)				
Data security and Privacy					
Perception of data security (n=311)		39.47 (8.05)	40.00	16	55
Low	166 (53.4)				
High	145 (46.6)				
Password security (n=306)		2.20 (1.34)	2.00	0	4
Low	159 (52.0)				
High	147 (48.0)				
Application Accessibility (n=315)		3.35 (1.20)	3.00	2	6
Low	170 (54.0)				
High	145 (46.0)				

Table 6 Description of Data Security Measures across Ethnicity, Gender and Student Status

		Perception on Mobile Phone Data Security		Password security measures		Applications Accessibility		Frequency of Online Shopping		Usage of free wifi at public places	
		N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Ethnicity											
White (WB)	British	72	36.44 (6.95)	74	3.34 (1.41)	71	2.18 (1.41)	74	2.45 (1.37)	71	3.25 (1.23)
Other (OW)	White	63	39.52 (7.93)	62	3.27 (1.16)	62	2.16 (1.46)	63	2.17 (1.31)	63	3.21 (1.22)
Black (B)		40	42.00 (7.71)	39	3.15 (0.99)	36	1.67 (1.39)	40	2.63 (1.39)	41	2.97 (1.42)
Asian/Asian		75	40.97 (7.83)	76	3.35 (1.01)	75	2.34 (1.19)	77	2.30 (1.31)	76	3.30 (1.29)
British (AB)											
Mixed (M)		20	41.85 (9.24)	21	3.67 (1.32)	21	2.57 (1.33)	21	2.24 (1.14)	21	3.71 (0.90)
Others (O)		9	39.88 (9.86)	9	3.00 (1.12)	9	2.13 (1.25)	9	2.67 (1.22)	9	3.67 (1.11)
<i>F-value#</i>			5.06**		<i>n.s.</i>		2.14+		<i>n.s.</i>		<i>n.s.</i>
			<i>WB < B, AC,</i>								
White		129	38.16 (7.54)	12	2.17 (1.44)	130	3.31 (1.32)	13	2.33 (1.24)	12	3.24 (1.44)
				8				1		8	
Non-White		135	41.42 (8.14)	13	2.14 (1.31)	136	3.31 (1.08)	13	2.41 (1.30)	13	2.14 (1.31)
				2				8		2	
<i>t-value</i>			-3.38***		<i>n.s.</i>		<i>n.s.</i>		<i>n.s.</i>		<i>n.s.</i>
Gender											
Male		134	39.67 (7.95)	13	2.14 (1.38)	134	3.46 (1.22)	13	2.51 (1.26)	13	3.33 (1.21)
				0				7		6	
Female		151	39.50 (8.18)	14	2.24 (1.35)	149	3.21 (1.15)	14	2.23 (1.39)	14	3.18 (1.30)
				4				9		7	
<i>t-value</i>			<i>n.s.</i>		<i>n.s.</i>		1.81+		1.85+		<i>n.s.</i>
Student status											
Overseas		67	43.01 (7.39)	67	2.06 (1.39)	68	3.47 (1.18)	70	2.39 (1.25)	69	3.34 (1.34)
Home/EU		213	38.51 (7.97)	20	2.23 (1.35)	215	3.28 (1.19)	21	2.36 (1.35)	21	3.21 (1.23)
				7				6		4	
<i>t-value</i>			4.10***		<i>n.s.</i>		<i>n.s.</i>		<i>n.s.</i>		<i>n.s.</i>

Note. + $p < .10$ * $p < .05$. ** $p < .01$. *** $p < .001$ # Mixed and Other ethnic groups were excluded for ANOVA due to small sample size.

Table 7 Sample questions

Sample Questions
Information & IT literacy measures:
a) Do you use FREE WIFI in public places? (Yes, No)
b) How do you rate your technical skills and general 'tech' savviness? (Advanced, Intermediate, Low)
Password security and data privacy:
a) Is your mobile phone password protected? (Yes, No)
b) Is your simcard password protected? (Yes, No)
c) How often do you change your password? (once after purchase, frequently, occasionally, rarely, never)
d) Do you allow application to access your contact? (Yes, Sometimes, No)
e) Do you allow applications to access your personal information? (Yes, Sometimes, No)
Perception of data security:
a) In general, to what degree are you concerned about the risk of using any FREE WIFI in public places?
b) To what degree are you concerned about the security of data in your mobile phone being compromised by A virus or worm somehow getting into your mobile phone?
The full research instrument is available from the authors (b.barn@mdx.ac.uk)

Table 8 Correlational Analysis of Socio-demographic Characteristics with youth perception on mobile phone data security, Personality IT Literacy and Online Activities

Socio-Demographic Characteristics	r-value						
	Perception on Mobile Phone Data Security	Extraversion Personality	Frequency of Online Shopping	Usage of free wifi at public places	Information Literacy	Applications Accessibility	Password security measures
1. Age (years)	.19***	-.11+	.03	-.03	-.20	-.10	-.08
2. Gender (1=Male,0=Female)	.01	-.17**	.11+	.06	.08	.11+	-.04
3. Ethnicity (1=White,0=Non White)	-.20***	.13*	-.03	-.02	-.21***	.00	.01
4. Overseas students (1=Yes,0=No)	.24***	-.12*	.01	.04	.22***	.07	-.05
5. Intact family (1=Yes,0=No)	.07	-.01	-.03	.03	.08	-.03	-.01
6. Living away from Home (1,0)	-.01	.06	-.06	-.04	.00	.06	-.10+
7. Father Education level	.00	.12+	-.13*	-.12+	.05	.16*	-.01
8. Mother Education level	-.10	.07	-.08	.03	.03	.08	.04

Note. + $p < .10$ * $p < .05$. ** $p < .01$. *** $p < .001$

Table 9 Correlational Analysis of youth perception on mobile phone data security, Personality, IT Literacy and Online Activities

Variables	r-value						
	Perception on Mobile Phone Data Security	Extraversion Personality	Frequency of Online Shopping	Usage of free wifi at public places	Information Literacy	Applications Accessibility	Password security measures
1. Perception on Mobile Phone Data Security	-						
2. Extraversion Personality	-.12*	-					
3. Frequency of Online Shopping	.07	.00	-				
4. Usage of free wifi at public places	-.07	.17**	-.11+	-			
5. Information Literacy	.15**	.14*	.34***	.14*	-		
6. Applications Accessibility	-.14*	.12*	.05	.01	.17**	-	
7. Password security measures	.14*	.12*	.10+	.06	.13*	.02	-

Note. + $p < .10$ * $p < .05$. ** $p < .01$. *** $p < .001$