Trends in users' security perceptions regarding mobile phone usage

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Abstract: Following a similar survey about users' security perceptions regarding mobile phone usage that took place in 2009 [23] we repeated the process in an extended pool of respondents at the same place (University of Ioannina, Greece) reaching 780 answers. Results show that users still don't take the necessary measures to avoid a possible unauthorized access and/or sensitive data retrieval from their mobile phone. It is unquestionable that since users fail to secure their mobile phones, industry and academia should proceed to educating them and designing better user interfaces in order to mitigate the dangers.

Keywords: mobile phone security, security perceptions, user interface security, questionnaire survey, mobile phone usage

1. Introduction

Mobile phone usage nowadays has by far surpassed computer usage and mobile phones are part of our everyday life. Their enhanced capabilities allow them to be almost as versatile as a computer becoming a valuable business (mobile applications) and entertainment tool (mobile games, m-commerce). At the same time users store more and process more and more data including sensitive information in their phones (e.g. private life photos shot by phone's internal camera or credit card numbers and PINs). A few years ago the only concern of a mobile phone user would be his communication privacy. This is not the case anymore. Users have to be protected from unauthorized third party access to their data. It is logical that apart from the traditional security measures such as PIN usage and voice encryption, users have to take extra security measures and to follow new best practices. Unfortunately they still fail to do so as the results of this paper clearly show.

2 Related Work

This paper, examines the changes in users' security perceptions regarding mobile phones during the last year where a similar survey took place [23].

In any case, the security of mobile phones is proven not to be adequate in many research papers [11][18][20][22]. There also exist several survey studies in this direction. Some of these surveys studies focus on mobile phone's security issues [19] while others on mobile phone services, touching also security issues [1][2][12][16][17].

A recent survey [19] published in November 2008 focused on mobile phones security issues and in which degree these issues concern the users. The conclusion was that a major part of the participants are extremely concerned about security and don't want any of their private data to be available to 3rd party unauthorized users.

According to other surveys [16][17] a major part of the participants is interested in mobile services adoption only if the prices are low and the security framework tight enough. This is why in the present paper we try to address users' security awareness and practices.

3 Research Analysis and Results

3.1 Methodology

A very useful evaluation method for surveying user's practices is the use of multiple-choice questionnaires (i.e. in person delivery or e-mail questionnaires) [3][13]. Our survey was conducted using in-person delivery technique, with a total of 780 respondents participating in this survey (3 times broader sample than the previous survey). This method was selected from other alternatives because is more accurate and has a bigger degree of participation from the respondents (e-mail questionnaires usually treated as spam mail from the respondents or they might misunderstand some questions).

The target group of the survey is university students from ages mostly 18-24 because these ages are more receptive to new technologies. They also understand better the technological evolution than older people who use mobile phones mostly for phone calls.

For the statistical analysis, we selected 'gender' to be our main variable, because we wanted to evaluate the significance degree regarding mobile phone's security features between the two genders.

3.2 Survey Results

The questionnaire was divided in two parts. In the first part we asked the participants some demographic data including gender, age and field of studies. In the second part we proceeded to the specific questions related with their practices and security perceptions regarding mobile phones' security issues.

3.2.1 Generic Queries

3.2.1.1 Demographic questions

The participants were asked about their gender, age and field of studies. The sample was very similar to the sample that participated in last year's survey. 56% of the participants where males and 44% where females while most of the respondents were aged 18-23 (80%). The main body of respondents was studying theoretical or applied sciences in equal parts of 40%. Technological sciences and other fields

participated less due to the lack of many such departments in the University.

Regarding mobile phone usage, almost 60% of them are using daily a single mobile phone, while 34% are actually using two phones regularly. Their favourite brand seems to be Sony Ericsson (46%) followed by Nokia (26%) and Samsung (9,5%). Apple's iPhone seems to be scarce among students (1.5%). Focusing on Sony-Ericsson phones a security awareness campaign would immediately target almost half of the users.
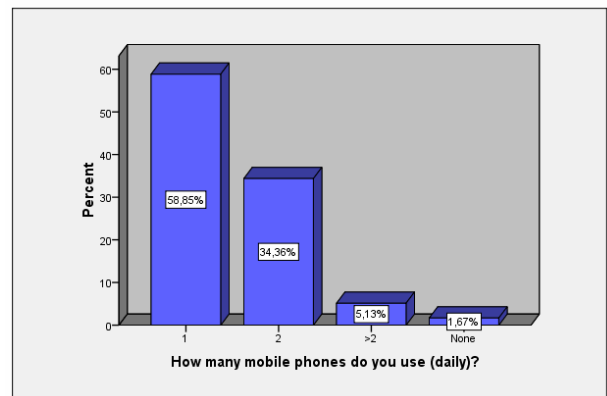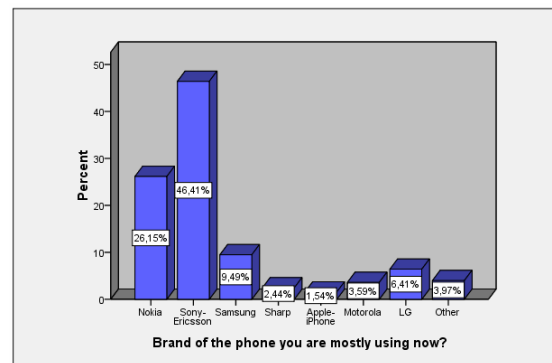

Figure 1. Mobile phone usage

Figure 2. Favourite brands

3.2.2 Specific Queries

3.2.2.1 General Characteristics

Mobile phone usage type and amount of money spent on average show some interesting results differencing among men and women. Pre-paid (card) is still prevalent in both genes. Men however use Post-paid (Contract)

surpassing by 15% women in the same category. Men keep spending more money, in the range of bills that surpass 21 Euros, while the bulk of users is still in the region of less than 20 Euros (Figure 4).
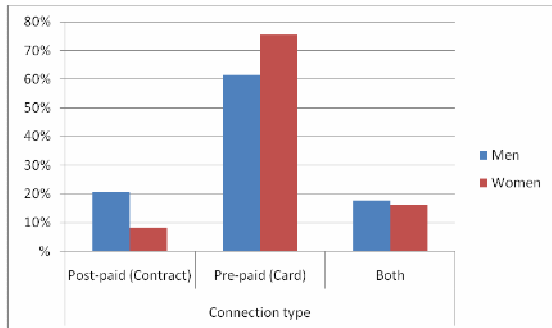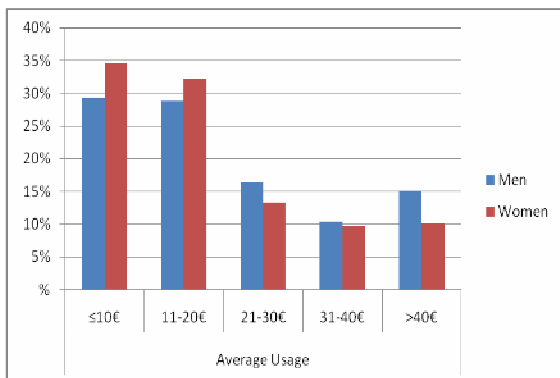

Figure 3. Connection type.

Figure 4. Average usage.

As we can see in Figures 2 and 5 over 46% of the participants prefer a Sony-Ericsson phone (which is even bigger than previous year's 40%). Of course the brand itself is not enough to categorize attack vectors and practices, since there is also the feature of the specific operating system running on each phone. The finding however provides clear guidance that if a security awareness campaign would focus on that brand it would immediately affect almost half of the users in the target group, proving very cost effective.
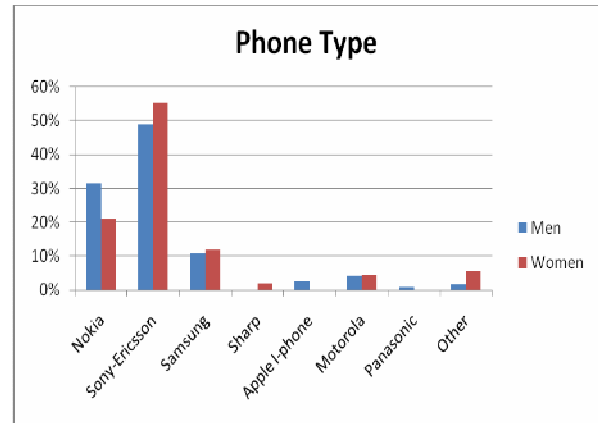

Figure 5: Phone type.

3.2.2.2 Security Related Questions

The objective of this particular subsection of our research was to determine whether our participants acknowledge some security related features of their phone. The results are analyzed in the following paragraphs.

In Figure 6 we see that a significant percentage of the participants doesn't know about the capabilities of his phone's operational system, a result that practicaly didn't change at all since last year. This ignorance renders users more vulnerable to hacker attacks with the use of exploits.
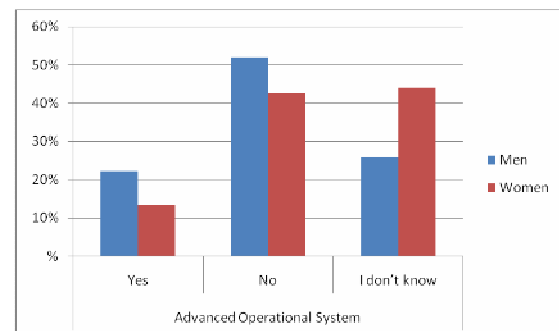

Figure 6: Operating system.

We must note here the fact that women seem to be significaly less aware of this technical feature, a finding that complies with other surveys too.

Similarly, in the next figure only a very small percentage of the participants 18,5% men and 8% women) knows his/her phone's IMEI and has noted it somewhere. There was a slight increase (+1,5% for men and +2% for women) yet still a lot has to be done. IMEI is very significant because if the phone is stolen using this code the provider can block access of the

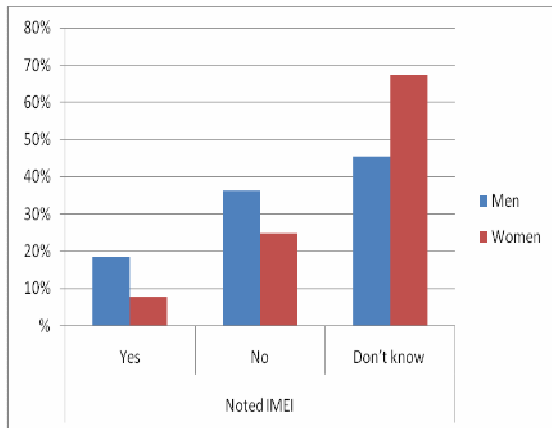stolen phone effectively mitigating the stealing risks.

Figure 7. IMEI knowledge

At the same time, just 2% more users since the previous survey (15% compared to 13%) are aware of the existance of the icon that informs the user that his/her phone encryption has been disabled [20]. Ignorance of this security icon leaves users vulnerable to man in the middle attacks.
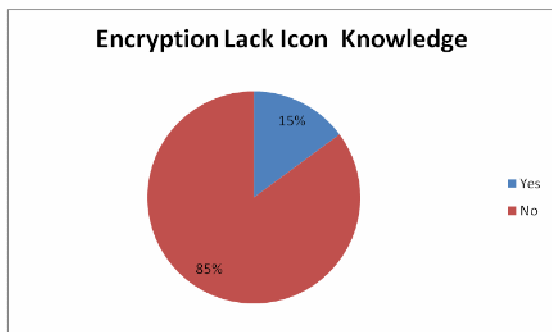

Figure 8. Encryption icon knowledge

We must also note that there was some 10% difference among the responses of male and female participants (males are aware of it in a percentage of 20% while females in a percentage of 11%).
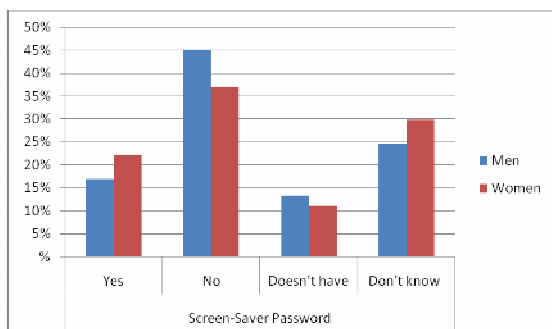

Figure 9. Screen-saver password.

In Figure 9, the trend shows that only a small percentage of both genders uses screen-saver password. The positive finding is that there was a grow of almost 10% in the users that do use screen saver. At the same time, it is dissappointing that 30% of female users and 25% of male users do not know whether there exsits such a feature in their phone. Combined with a PIN code, a simple screen saver password could provide a simple and effective means of security.
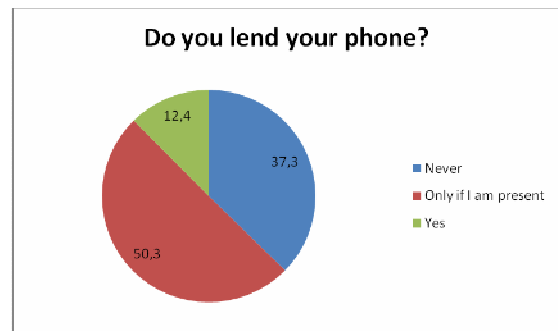

Figure 10. Phone lending

There was a positive finding in the next question. Users that do not lend their phone to anybody grew to 37% compared to 27% last year. A significant percentage however still lends his/her phone (Figure 10). This is a major factor that compromises the phone's security even if the participant is present, because only a minute is needed for someone to install malicious software in the phone.

Following, a very large percentage of the participants doesn't dowload any software at all. There was a slight inrease in percentage of users that actively download software but still the usage is limited.
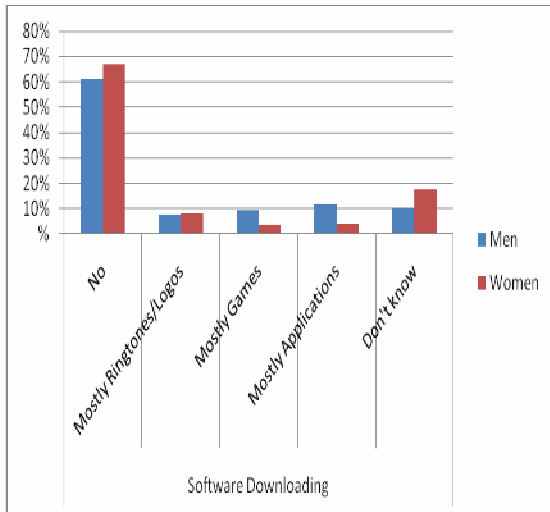
Figure 11. Software downloading

This means that users are protected from exploits possibly downloaded to the phone by using unauthorised software. It is also a sign that data services have not yet penetrated the mobile phone market [1][2][7].
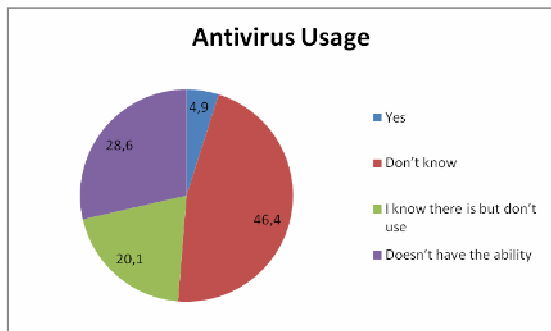

Figure 12. Anti-virus usage

In order to elaborate on mobile phone antivirus software usage, we added more options in the question regarding its usage (Figure 11). 20% of users acknowledge it exists such a product but don't use it, while half of them do not know whether such a product exists. That leaves just a fraction of 5% using it, which compared with PC users shows a clear lack of security education.

58% of university students keep sensitive information into their mobile phones (Figure 13). Such kind of information should be protected. There was a decrease of 6%, a positive sign but still a lot is left to be desired.
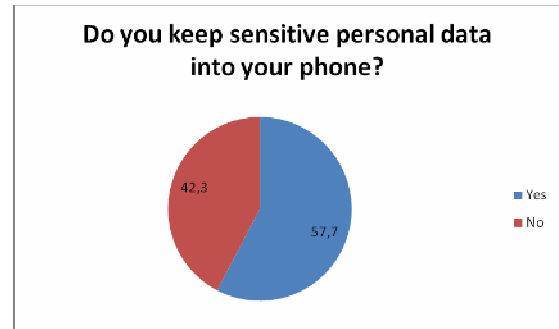

Figure 13. Sensitive information kept in phone

Participants were very careful in regards to saving important passwords in their phone (Figure 14). Quite contrary to most of the findings of this survey, less than 15% of users save such data without any kind of "encryption"

Figure 14. Important passwords kept in phone
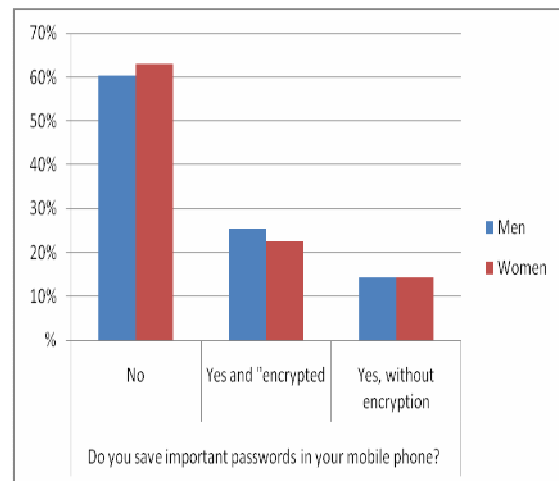
Closing our survey, we examined the issue of backup. As it can be seen in Figure 15 a very large percentage of the participants of both genders, surpassing 65% never performs a backup of his/her phone's data. Once can argue that this was one of the most expected findings since even PC users don't actively back their data up.
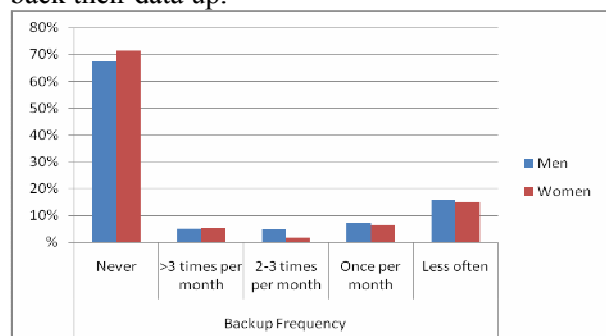

Figure 15. Backup frequency

4 Conclusions and future work

Repeating the survey in a broader sample proved that the challenging findings of last year's survey were true. While most of people care about security issues [19] they still don't know some vital security information about their phone. A very high percentage of both genders didn't know there is an icon that informs them about the phone encryption status. Most of them don't take backups at all while at the same time would lend their phone to somebody else. In addition, men seem to be more informed about their phone operating system and the IMEI code presence than women. In order to have comparative results, we have conducted a similar survey in more than 10 European countries and the results will soon be published. The preliminary findings however, show that users have the same behavior everywhere

Since users do not actively follow most of security best practices, phone manufacturers and providers must team up informing their customers, raising awareness level and building more secure systems and user interfaces.

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APPENDIX

Part of the questions used for our survey were the following

1) Gender: Male (A) or Female (B)?
2) Age? (A < 18 years, B 18-20 years, C 21-23 years, D 24-26 years, E 27 and above)
4) Post-paid (contract) user (A), pre-paid user (card) (B), or both (C)
5) Which amount of money do you spend monthly in your mobile phone? (A up to 10 Euros, B 11-20 Euros, C 21-30 Euros, D 31-40 Euros, E over 40 Euros)
6) What mobile phone brand do you have? (A Nokia, B Sony-Ericsson, C Samsung, D Sharp, E Apple I-phone, F Motorola, G LG, H Other)
7) Does your mobile phone have an advanced operating system (eg Symbian OS, Windows Mobile)? (A yes, B no, C I do not know)
8) Have you noted somewhere your mobile phone's IMEI? (A Yes, B No, C I do not know what it is)
9) Do you know there is an icon in your mobile telephone that informs you when encryption is deactivated? (A Yes, B No)
10) Do you use password in your mobile phone's Screen-Saver? (A Yes, B No, C Doesn't have, D don't know if it has)
11) Do you lend your mobile phone to others? (A Never, B Only for a while and if I am present, C Yes)
12) Do you "download" software in your mobile phone? (A No, B Ringtones/Logos, C Games, D Applications, E don't know if my phone supports it)
13) Do you use Antivirus software in your mobile phone? (A Yes, B Don't know if it supports it, C I know there is but I don't use it, D It doesn't have the ability)
14) Do you store important passwords in your mobile phone (eg Credit cards passwords, Cash retrieval passwords)? (A No, B Yes and "encrypted", C yes, without encryption)
15) How often do you create backup copies of your mobile phone's data? (A Never, B More often than two times per month, B 2-3 times per month, C Once per month, D Less often)
16) Do you keep sensitive personal data into your mobile phone (photo's/video/Sound recordings)? (A Yes, B No)