

Surveying users' practices regarding mobile phones' security features

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Abstract: Despite the fact that mobile phone's security measures have been increased during the last years, users don't take the necessary measures to avoid a possible unauthorized access and/or sensitive data retrieval from their mobile phone. In order to investigate this issue, in this paper, we present the results of a survey conducted in the University of Ioannina, Greece according to which 282 participants were asked about quite many key factors concerning their mobile phone security. The results are very interesting and can be considered as a potential guide by various mobile operators for their future technological investments and their customer's briefing about mobile's phone security.

Keywords: questionnaire survey, security issues, mobile usage, content preference

1. Introduction

Mobile phones play vital roles in human societies and particularly, in developed and developing countries. The last few years mobile phones surpassed their role of a simple communication medium and became a valuable business (mobile applications) and entertainment tool (mobile games, m-commerce). This is a result of mobile phones' rapid technological evolution. This evolution however allowed mobile phone users to store sensitive information in their phones (e.g. private life photos shot by phone's internal camera or credit card numbers and PINs) which must also be protected from unauthorized third party access. So apart from the traditional security measures such as the PIN usage and the voice encryption, users have to take extra security measures and to follow new best practices. This paper aims to survey the user's knowledge and behavior regarding this issue.

2 Related Work

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 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 282 respondents participating in this 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

Our survey was divided in two parts. In the first part we asked the participants some generic question related with their gender, age and field of studies. In the second we asked more specific questions related with their practices regarding mobile phone's security issues.

3.2.1 Generic Queries

3.2.1.1 Gender, Age and Studies Profile

The participants were asked about their gender, age and field of studies. 57% of the participants where males and 43% where females. Most of the respondents were aged between 18-23 (88%) and they were studying Applied Sciences (51%) while a smaller percentage of the participants studied in an other scientific area (33% Theoretical and 16% Technological).

3.2.2 Specific Queries

3.2.2.1 General Characteristics

In the following two questions we asked some questions regarding the amount of money they are spending for their mobile phone. These questions regarding the connection type (post paid, pre paid) and the amount of money they spend per month for their mobile phone. The results differ from males to females and to the following two figures we see some interesting results.

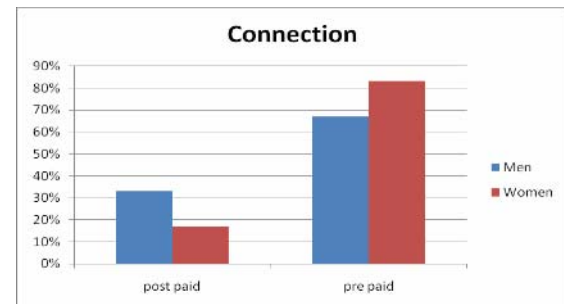


Figure 1: Connection type by gender.

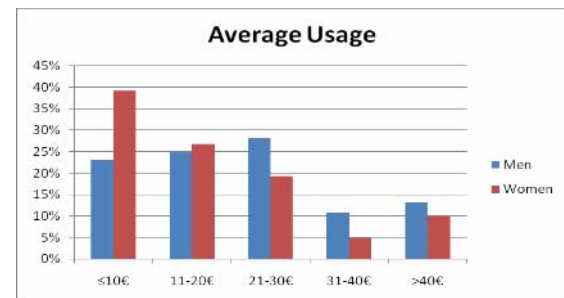


Figure 2: Average Usage by gender.

We see that women prefer prepaid connections than men while in phone usage we see that women spend significantly less than men.

As we see in figure 3 over 40% of the participants prefer Sony-Ericsson phones. Of course the brand itself is not enough to categorize attack vectors and practices, since there is also the feature of the specific operational system running on each phone. It gives however guidance that if a security awareness campaign would focus on that brand it would immediately affect almost half of the users.

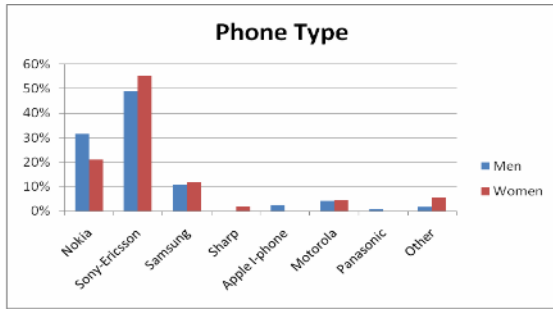


Figure 3: Phone Type by gender.

3.2.2.2 Security Related Questions

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

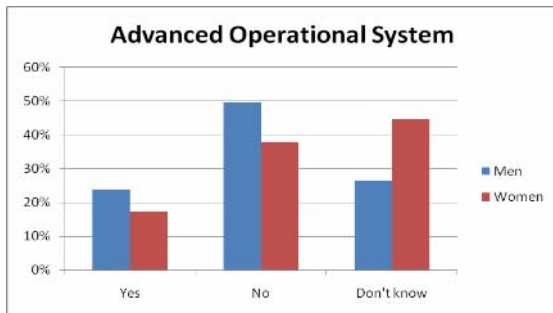


Figure 4: Advanced Operational system by gender

In figure 4 we see that a significant percentage of the participants doesn't know about the capabilities of his phone's operational system. This ignorance renders users more vulnerable to hacker attacks with the use of exploits. We must note here the fact that women seem to be significantly less aware of this technical feature, leaving them more vulnerable to attacks.

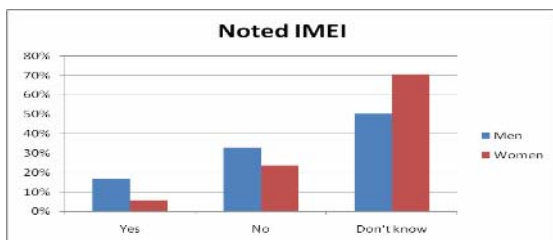


Figure 5: IMEI knowledge by gender

Similarly in the next figure only a very small percentage of the participants (17% men and 6% women) knows his/her phone's IMEI and has noted it somewhere. The 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.

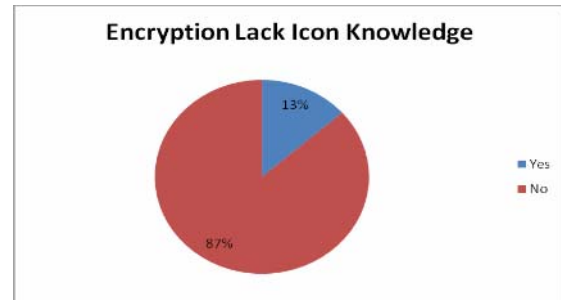


Figure 6: Encryption Icon knowledge

An expected fact can be seen in figure 6. A very large percentage of the participants (87%) doesn't know the existence of the icon that informs the user that his/her phone encryption has been disabled. Ignorance of this security icon leaves users vulnerable to man in the middle attacks. The most interesting finding is the following however: Out of the remaining 13% that stated that has knowledge of this icon's existence, the vast majority failed to correctly answer as to what kind of an icon their own mobile phone presents in such a case (every brand of mobile phone presents a different security icon- question 10). We must also note that there was almost no difference between the responses of male and female participants.

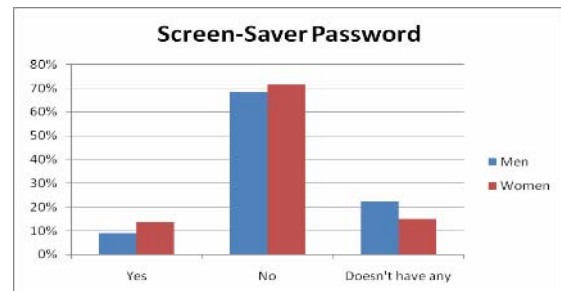


Figure 7: Screen-Saver Password by gender

In figure 7 we see that only a small percentage of both genders uses screen-saver password. Those that don't use screen-saver password have their data vulnerable to 3rd party people that might use they phone without their knowledge.

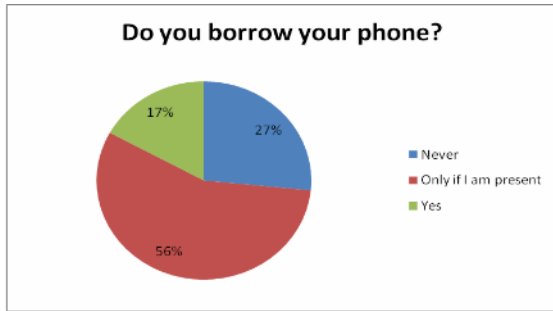


Figure 8: Phone borrowing

The same way a significant percentage of the participants borrows his/her phone (figure 8). 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.

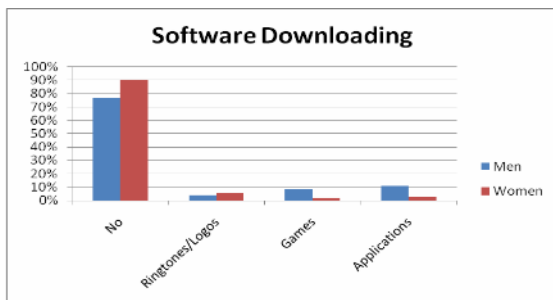


Figure 9: Software Downloading by gender

Following, a very large percentage of the participants doesn't download any software at all. This means that they 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].

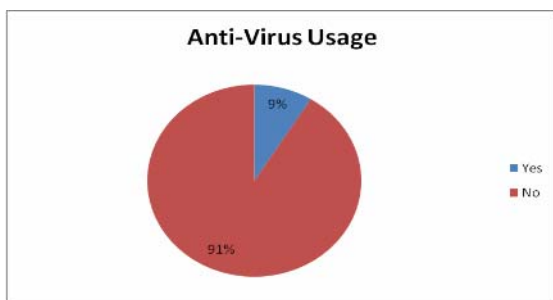


Figure 10: Anti-Virus Usage

A very high percentage (over 90% as seen in figure 10) didn't use Anti-virus programs in their phone.

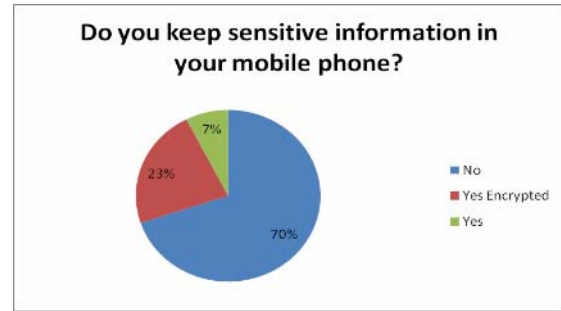


Figure 11: Sensitive informations kept in phone by gender

In figure 11 we see that the participants keep sensitive information into their mobile phone that need to be protected. The percentage of the participants that keep sensitive information into their mobile phone is high probably because our sample is more specific (university students) and not general population.

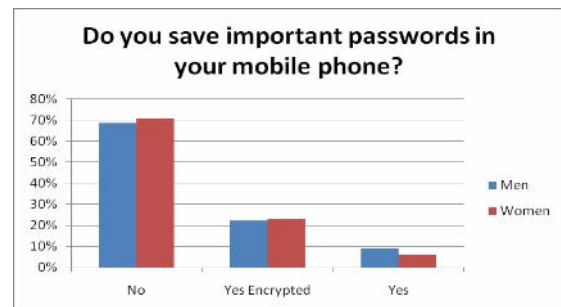


Figure 12: Important passwords kept in phone by gender

Probably this finding stems from the fact that the participants were students.

Contrary in figure 12 the participants are very careful with the use of important passwords in their phone. Quite contrary to most of the findings of this survey. Less than 10% of users save such data without any kind of "encryption"

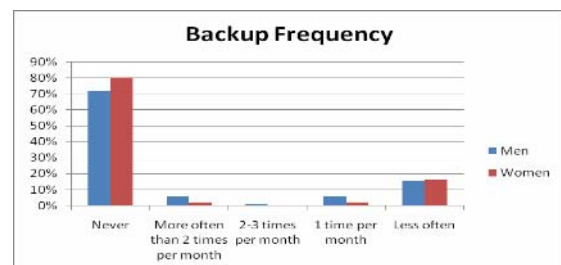


Figure 13: Backup Frequency by gender

Finally in figure 13 a very large percentage of the participants of both genders never makes a backup of his/her phone's data. This is very

disappointing and shows a lack of security culture and precaution.

4 Conclusions

Our research has shown some challenging findings. While most of the people care about security issues [19] they don't know some vital security information about their phone. Also a very high percentage (almost 90%) of both genders didn't know the phone's indication when someone has remotely disabled their phone's encryption. Most of them don't take backups at all while at the same time would borrow their phone to somebody else. Men seem to be more informed about their phone operational system and the IMEI code presence than women.

These findings conclude to the fact that phone manufacturers and providers must make a campaign to inform their customers and raise awareness about the security measures they must take to ensure the confidentiality, privacy and availability of their data and communications.

References

- [1] Androulidakis N., Androulidakis I. MBusiness: The base for creating competitive advantage. The case of Vodafone-Panafon, *Wseas Transactions on Information Science and Applications*, Issue 5, Vol 1, 1309-1313, 2004
- [2] Androulidakis, N. and Androulidakis, I. Perspectives of Mobile Advertising in Greek Market, *2005 International Conference on Mobile Business (ICBM 2005)*, 2005
- [3] Dillman, D. A. Mail and Internet Surveys: The Tailored Design Method, John Wiley & Sons, 2nd edition, November 1999
- [4] International Telecommunication Union, Worldwide mobile cellular subscribers to reach 4 billion mark late 2008, Press Release, Geneva, 25 September 2008
- [5] Krenik, W., Wireless User Perspectives in the United States, *Wireless Personal Communications* [Online], vol. 22, issue, 2, pp.153-160, 2002
- [6] Ling R. We release them little by little: Maturation and gender identity as seen in the use of mobile telephony, *Personal and Ubiquitous Computing*, vol. 5, pp. 123-136, 2001
- [7] NTT DoCoMo. Current Trends in Mobile Phone Usage Among Adolescents, DoCoMo Report No. 10, March 2001
- [8] NTT DoCoMo. Mobile Phones Increasingly Popular Among the Elderly, DoCoMo Report No. 11, May 2001
- [9] NTT DoCoMo. The Use of Cellphones/ PHS-phones in Everyday Urban Life: A survey of 1,000 People, DoCoMo Report No. 9, November 2000
- [10] Pfleeger, S. L. and Kitchenham, B. A. Principles of Survey Research Part 1: Turning Lemons into Lemonade *ACM SIGSOFT Software Engineering Notes*, vol. 26 (6), November 2001
- [11] Rahman, M. & Imai, H., Security in Wireless Communication, *Wireless Personal Communications* [Online], vol. 22, issue, 2, pp.218-228, 2002
- [12] Vrechopoulos, A.P.; Constantiou, I.D. and Sideris, I. Strategic Marketing Planning for Mobile Commerce Diffusion and Consumer Adoption, in *Proceedings of M-Business 2002*, July 8-9, 2002
- [13] Androulidakis I., Androulidakis N. On a versatile and costless OMR system *Wseas Transactions on Computers* Issue 2, Vol 4, 160-165 (2005)
- [14] I. Androulidakis, "Security Issues in Cell Phones", article-interview into *Magazine "Defence and Diplomacy"*, Issue 187, pp 100-102, November 2006
- [15] I. Androulidakis, "This is how hackers hack into our cell phones", article-interview into *Sunday Newspaper "To proto thema"*, Issue 90, pp 40-41, November 12, 2006
- [16] I. Androulidakis, C. Basios, N. Androulidakis, Survey Findings towards Mobile Services Usage and M-Commerce Adoption, *Proceedings of 18th European Regional ITS Conference, International Telecommunications Society*, pp: CD-ROM, September 2007
- [17] I. Androulidakis, C. Basios, N. Androulidakis, Surveying Users' Opinions and Trends towards Mobile Payment Issues, *Frontiers in Artificial Intelligence and Applications - Volume 169*, pp. 9-19, 2008 (Techniques and Applications for Mobile Commerce - Proceedings of TAMoCo 2008)
- [18] I. Androulidakis, V. Christou, A. Karametis, C. Papanikolaou, Modern Telephony Threats & Countermeasures, *New Aspects of Communications, Proceedings of 12th WSEAS International Conference on*

COMMUNICATIONS, 2008, pp 106-109, July 2008

[19] I. Androulidakis, D. Papapetros, Survey Findings towards Awareness of Mobile Phones' Security Issues, *Recent Advances in Data Networks, Communications, Computers, Proceedings of 7th WSEAS International Conference on Data Networks, Communications, Computers (DNCOCO '08)*, pp 130-135, Nov. 2008

[20] I. Androulidakis, Intercepting mobile phones and short messages, *Computers and*

simulation in modern science, Selected papers from WSEAS conferences, Vol II, 2008, pp 320-321, Dec. 2008

[21] I. Androulidakis, On the Importance of Securing Telephony Systems, *WSEAS TRANSACTIONS ON COMMUNICATIONS*, Issue 1, Volume 8, pp 102-111, Jan. 2009

[22] I. Androulidakis, Intercepting Mobile Phones, Article in «IT security professional» magazine, Issue 8, pp. 42-28, Jan-Feb 2009

APPENDIX

The questionnaire used for our survey was 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)
- 3) In which science area do you study? (A Theoretical, B Applied Sciences, C Technological)
- 4) Your mobile phone is with post-paid (A) or with pre-paid card (B)?
- 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 Panasonic, H Other)
- 7) Your mobile phone has an advanced operational system (eg Symbian OS, Windows Mobile)? (A yes, B no, C I do not know)
- 8) Do you have recorded somewhere your mobile phone's IMEI? (A Yes, B No, C I do not know what it is)
- 9) Do you know the icon's existence in your mobile telephone which informs you for the encryption's deactivation? (A Yes, B No)
- 10) If yes which one from the following icons declares the lack of encryption in your mobile phone? (A Stars and exclamation mark, B Open lock, C Exclamation mark and triangle, D I don't know)
- 11) Do you have PIN activated? (A Yes, B No)
- 12) Do you use password in your mobile phone's Screen-Saver? (A Yes, B No, C Doesn't have)
- 13) Do you borrow your mobile phone? (A Never, B Only for a while and if I am present, C Yes)
- 14) Do you "download" software in your mobile phone? (A No, B Ringtones/Logos, C Games, D Applications)
- 15) Do you use Antivirus software in your mobile phone? (A Yes, B No)
- 16) 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)
- 17) 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 One time per month, D Less often)
- 18) Do you keep sensitive personal data into your mobile phone (photo's/video/Sound recordings)? (A Yes, B No)