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DO THE DEMOGRAPHIC CHARACTERISTICS OF MOBILE PHONE USERS PLAY A ROLE IN USAGE?

Tolga Pusatlı[1]

Mahir Nakip[2]

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ABSTRACT

Gender, age, work, education, history and cyber security knowledge are chosen as the demographic characteristics of the user; these are investigated in the scope of the operating system of the mobile phone and the behavior of the user to keep business data/document on his/her device. A convenience sampling of 153 volunteers has been conducted through a structured survey and Chi-Square tests are performed. Primary findings reveal that storing business data/document behavior shows uniform figures only in terms of the history of the participants. A weaker relationship exists between history and the O/S of the handset participant. Particularly, the cyber security knowledge and the education of the user shows no or insignificant relation to the behavior of keeping business data/documents. The longer the history the participant has with the mobile phone, the more distinguishing his/her behavior in holding business data/document on the handset and selecting handset can be.

Keywords

History
Business data/document
Gender
Age
Work
Education
Cyber security knowledge

CEP TELEFONU KULLANICILARININ DEMOGRAFİK ÖZELLİKLERİNİN CİHAZ KULLANIMINDA ETKİSİ VAR MIDIR?

ÖZ

Bu çalışmada, cep telefonu kullanıcının cinsiyeti, yaşı, işi, eğitimi, siber güvenlik bilgisi ve geçmişi, demografik özellikleri olarak değerlendirilmiştir; bu özellikler, cihazdaki işletim sistemi ve kullanıcının iş verisi ve/veya belgesini cihazda taşıma davranışı kapsamında incelenmiştir. 153 gönüllüden oluşan kolay ulaşılabilir durum örnekleme kümesine, yapısal bir anket uygulanmış ve Ki-Kare testleri yapılmıştır. Birincil bulgular göstermiştir ki telefonda iş verisi/belgesi tutma davranışı, demografik özellikleri açısından sadece kullanıcının cep telefonuyla olan geçmişiyle tekdüze bir görüntü vermektedir. Daha zayıf bir ilişki de kullanıcının cep telefonu geçmişiyle cihazın işletim sistemi arasında çıkmıştır. Kullanıcının siber güvenlik bilgisinin ve eğitiminin, ilginç bir şekilde, cihazda iş verisi/belgesi tutma davranışıyla ilgisi çıkmamıştır. Kullanıcının cep telefonu geçmişinin uzun olması, cihazda iş verisi/belgesi tutma davranışını ve cihaz seçimini daha ayırt edilebilir hale getirmektedir.

Anahtar Kelimeler

Kullanıcı geçmişi
İşyeri verisi/belgesi
Cinsiyet
Yaş
İş
Eğitim
Siber güvenlik bilgisi

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[1] *Doç. Dr.,Çankaya Üniversitesi, pusatli@cankaya.edu.tr*
[2] *Prof. Dr.,Çankaya Üniversitesi, mnakip@cankaya.edu.tr*

1. INTRODUCTION

Mobile phones, mostly smartphones in recent years, are spreading more in the Turkish society today than 15 years ago. With GSM operators offering more coverage and faster Internet connection options, it can be observed these handheld devices are in use not only for communication but also for data/document storage. Here, it is necessary to distinguish between mobile phones and next-generation handsets.

Although the first smartphones, such as the IBM Simon Personal Communicator (BBC, 2014) date back to the mid-1990s, a huge adoption in society can be observed to have occurred between 1999 and the early 2000s when Japanese telecommunication company NTT DOCOMO (NTT-DOCOMO) introduced a mobile Internet service platform in Japan. This innovation opened the path to 3G connection speeds, and hence to an accelerated production of what it is referred as the smartphone today. Since then, the global market has shown its first decline after 18 years, in the last quarter of 2017 (Meulen & McCall, 2018) with 407,845,400 units sold when compared to 432,140,300 units sold in the same quarter of 2016, during which 7% growth was recorded (Goasduff & Forni, 2017). Nevertheless, the decline in the sales can be explained by "not renewing already owned smartphone" action.

The hindrance of WAP has been replaced by fast connections and as a result, handset producers have included wireless devices, browsers for websites and cameras to share multimedia on handsets. These advances seem to have enhanced the sharing of files on the Internet as well as facilitated a natural infiltration of smartphones into workplaces; hence, the security discussions in the cyber world have also spread to smartphones (Allam, Flowerday, & Flowerday, 2014) and (Wang, Wei, & Vangury, 2014).

The main focus in this work is to find potential patterns in two sets of characteristics as visited literature directs: characteristics in smartphone usage, which are operating system of the handset and behavior in keeping business related data or documents on their handsets; and demographic data, which are gender, age, work, history, cyber security knowledge (CSK) and education of the participants.

This research has opted to do convenience sampling as it does not aim to generalize the outcome of the work. Feedback has been collected from 153 smartphone users, participants, to learn about these sets of characteristics. A pollster has spent few

days in public areas to approach potential participants for convenience sampling. 155 participants have agreed to take the survey. The survey papers have not been given to the participants as the pollster read the questions and collected to responses, face-to-face. The survey is anonymously conducted. Of the 155 participants, two of them have been eliminated as they did not answer some of the questions.

With this motivation, the literature on the retention of work related data and documents on smartphones have been collected. There are a number of fragmented works on the demographic characteristics of mobile phone users, especially those relating to the subject of the bring-your-own-device (BYOD), as briefly visited. From that scope, literature is found not fed with works primarily focusing on researching the potential relations among having business data on a handset, gender, age, work sector, education, CSK and history of the participant, to our knowledge.

2. LITERATURE REVIEW AND HYPOTHESES

As the aim is to look for potential relationships among the factors mentions, previously, the following hypotheses have been developed, accordingly:

H1: Keeping business data on the handset is not related to the demographic characteristics of the participants.

H2: Operating system of the handset is not related to the demographic characteristics of the participants.

This work considers gender, age, education, history, work sector and CSK level as the demographic characteristics of the users; hence, all the hypotheses are tested against these characteristics.

Characteristics related to mobile phone usage

In its scope, this study refers to business related data or documents as “business data” for convenience. As the practical usage of mobile phones is increasing, by the time both the employee and employer sides are accepting BYOD at workplaces. Meanwhile, works such as (Allam et al., 2014) and (Wang et al., 2014) underline the security challenges to BYOD in addition to the benefits of BYOD. While the practical usage and security discussions are still ongoing, it is not uncommon to keep business data in mobile phones. In (Mylonas, Kastania, & Gritzalis, 2013), the researchers found that 36% of their interviewees stored business data on their mobile phones. This behavior is

getting adopted; for instance, projects such as (Esser, Muthmann, & Schuster, 2013) where technology to capture business documents on mobile devices are reported to the literature.

O/S is another factor chosen to consider along with the other factors. The O/S factor is a more special case than the other factors because the user has no ability to change it on a smartphone. For instance, an iPhone user cannot install an Android O/S in place of iOS on his handset; likewise, an Android user cannot switch to iOS unless he uses an iPhone handset even though it is not an aim to include handset manufacturers in the scope of this research.

Demographic characteristics

Basically, what this work refers to as "history" is the number of years of experience that a mobile phone user has with smartphones. The diffusion of smartphones in Turkey is clearly seen: the availability of mobile phones is 95.8% in 2022 (Turkish Statistical Institute, 2022). The numbers mentioned so far for the world market and Turkey show an increasing adoption of smartphones, hence and increase in experience in their usage.

Both gender and age are generally considered to be components of demographic attributes. In (Andone et al., 2016), the researchers found that females and younger people use their smartphones more often than males and relatively older people. The primary finding of their work indicates that both gender and age are among the determining factors in the type of phone and application use. Another example of age as a demographic attribute of the participants is given in (Chan, 2018), where the author studies smartphone use in different age groups. Another study (Hong, Trimi, & Kim, 2016) takes senior citizens as a case study wherein the authors have found age to be an active factor in the digital divide.

Additionally, the education levels of the participants have been taken into account as it is considered to be a factor in the literature. For instance, in (Zhang & Ma, 2011), the authors found mobile phone users' reading preferences, i.e. reading publications in a digital form, changing with their levels of education. Statistics on smartphone ownership according to level of education are given at (O'Dea, 2021) for the USA which asserts that from 2011 to 2021, people with a higher education background tended to have smartphones.

Much research has been carried out on cyber security, such as (Renaud & Flowerday, 2017; Strand, 2014; Strawser & Donald J. Joy, 2015); however, not many of studies take user knowledge of cyber security into account. In (Ben-Asher & Gonzalez, 2015), for instance, the authors found that CSK sensitizes users to attacks. While the authors assess the expertise of the participants through several questions on theoretical and practical knowledge, our questionnaire asks the participants to express their CSK (Table 1). Another point with these works is that they are considering cyber security in general, not specifically with regard to smartphone usage. Nevertheless, this work has opted to consider user background in cyber security as a separate factor among the demographic characteristics.

Another point with the related literature is that, to our knowledge, there is little to no considerable work that investigates smartphone user statistics based on participants' workplaces; hence, this work has opted to ask about workplaces – i.e., as to whether they are public, private, or the person is unemployed - to explore potential patterns should they exist.

3. DATA AND ANALYSIS METHOD

Categorical data has been used in this study; for this reason, Chi-Square analysis is necessary in order to understand whether there are correlations between dependent and independent variables.

"...In general the chi-square statistic is used to test the statistical significance of the observed association in a cross-tabulation with two variables. It assists us in determining whether a systematic association exists between the two variables... The test is conducted by computing the cell frequencies that would be expected if no association were present between the variables, given the existing row and column totals..." (Malhotra, 2019)

Contingency coefficient is an important extension of Chi-Square analysis. The contingency coefficient varies between 0 and 1. The 0 value occurs in the case of no association and the maximum value of 1 never occurs. Rather, the maximum value of the contingency coefficient depends on the size of the table, which can be shown according to the number of rows and columns size (Malhotra, 2019). For this reason, it should be used only to compare tables of the same size. That is why tables with 2x2 or 3x3 are

preferred. On the other hand, there is no test which shows the significance of contingency coefficient because the test done already by Chi-Square analysis.

The formula given in (1) is used to calculate contingency coefficient. C is the contingency coefficient, X^2 is Chi-Square and n is number of rows.

$$C = \sqrt{\frac{x^2}{x^2+n}} \qquad (1)$$

In essence, the analysis that best fits the categorical data is Chi-Square, and it is a non-metric analysis. The results are interpreted with the help of the contingency coefficients. Chi-Square analysis can be open to discussion for it requires participants in the data set to be independent; however, one of the powers of this analysis technique is to show the differences between theoretical and observed values with which hypotheses can be tested. In case the results are significant, the contingency coefficient becomes considerable because the degree of relationship between two non-metric variables can be discovered with the contingency coefficient.

Table 1: Survey Questions

Question	Possible Answers
Gender	Male | Female
Age	< 20 | 21-30 | 31-40 | > 40
What is your current employment status?	Public | Private | Student | Housewife | Not working
What is the highest degree or level of school you have completed?	High school or less | Vocational/bachelor | Master's | PhD
How would you define your cyber security knowledge (CSK)?	Professional due to work/Educated | Confident | Not confident
How long have you been using smartphone? (In years)	< 6 | 6-10 | > 10
What operating system does your smartphone use?	Android | iOS | Other or do not know
Do you store business data/document on your smartphone?	Yes | No

The literature visited has led to investigate the relationships among the factors of demographic and mobile phone usage characteristics (Table 1).

Apparently, inquiring about the retention of business related data to the participants who do not work would not be meaningful; hence, this question has been asked as "Would/Did you store business data/document on your smartphone?" If the participant has ever stored anything about the work in his/her handset then the answer

is taken as "Yes". Common examples may include, "Sometimes I take photo of my hard-copy documents, such as reports, and send to my manager via WhatsApp".

The weakness of the test is limited because the participants are not dependent; hence, Chi-Square analyses are performed and the contingency coefficients are calculated; for this, the SPSS software has been employed.

As previously presented, six basic demographic properties of the 153 participants are selected, these being gender, education, age, CSK, public/private work sector and history of usage of the participant. Additionally, two usage characteristics are considered, namely retention of work related data and documents and the operating system of the handset.

4. DESCRIPTIVE FACTS AND RESULTS

The sample population is female dominant with the gender distribution as 41.2% male and 58.8% female. Participants are also young; 22.9% are 20 or younger, 36.6% between 21 and 30, 20.3% in their 30's and 20.3% are 40 years old or older (Table 2).

Table 2: Descriptive Statistics

Gender	Male	53
	Female	90
Age	<20	33
	21-30	56
	31-40	31
	>40	31
Work	Not Working	46
	Public	29
	Private	78
Education	High School or Less	49
	Vocational/Bachelor	64
	Master's	19
	PhD	21
History	<6	73
	6-10	49
	>10	31
CSK	Not Confident	82
	Confident	53
	Professional	18

Of the participants, 70% are working (51% at private and 19% at public) and 30% are not working as they are student, housewife, retired or simply not working.

Chi-Square analyses for the combinations (Table 3) are performed. Note that only business data and history combination yielded significance level less than 0.05. Additionally, relationship between O/S and history is worth to mention.

Table 3: Pearson Chi-Square Significance Levels

	Gender	Age	Work	Education	CSK	History
O/S	0.447	0.403	0.226	0.562	0.490	0.091
Keeping Business Data/Document	0.186	0.400	0.601	0.884	0.988	0.048

Having business data/files on the handset can be regarded as a considerable behavior. Of the participants, 55.6% had such behavior, whereas 44.4% did not. These two ratios are not very distinct from each other; nevertheless, this result should be interpreted in relation to the demographic characteristics. The results gathered from the Chi-Square analysis inform us that this behavior does not show any differences according to gender, age, education, CSK or work sector. On the other hand, history shows association. Hence, it is safe to claim that the retention of data/files on the handset does not show any association with other demographic characteristics of the participants.

The Android and iOS operating systems were adopted by the participants at rates of 60.8% and 35.9%, respectively; the remaining 3.3% is either other O/S or not known. Hypotheses under this topic were assumed as they could be interested by the market researchers. However, Chi-Square analysis results do not support this argument; accordingly, operating systems do not show differences in terms of gender, age, education, CSK or work sector. It can be therefore claimed that the O/S on the handset shows no association with these demographic characteristics of the participants. Meanwhile, history shows an association with the O/S of the handset; although it is 0.091 and not very significant, it is worth to mention.

CSK and education yielded interesting results. While 11.8% of the participants are professional or educated in cyber security, 34.6% feel confident and 53.6% of them classify themselves as “not confident” in cyber security. In the education, 32% of the

participants are high school or secondary school graduates; remaining majority are university graduates with 41.8% vocational or bachelor, 12.4% masters and 13.7% PhD degrees. Interestingly, both CSK and education yielded considerable unrelated results with the keeping business data/document behavior.

Of the participants, 20.3% have been using smartphones for more than 10 years, 32% between 6 and 10 years and 47.7% less than 6 years. This is not surprising as the adoption of smartphones was on the rise, as mentioned in the introduction i.e., a large portion of the adopters has not shown itself yet. There may be considerable findings in marketing before the Chi-Square analysis. For instance, first adopters, the 20.3% of smartphone users, are innovators who are accepted as pioneers in marketing. The 47.7% can be seen as the late majority and laggards and the users in this slice are accepted to be informed often. For this reason, clarifying the relationship between the number of years of usage and retention of work related data/files (Table 4) and O/S of the handset (Table 5) are important and Chi-Square analyses can provide us with remarkable findings.

Table 4: History vs Retention of Business data/document behavior

Keeping Business Data/Document		History (years)			
		<6	6-10	>10	Total
No	Count	40	17	11	68
	% within History	54.8%	34.7%	35.5%	44.4%
	% within Business Data/Doc	58.8%	25%	16.2%	100%
Yes	Count	33	32	20	85
	% within History	45.2%	65.3%	64.5%	55.6%
	% within Business Data/Doc	38.8%	37.6%	23.5%	100%
Total	Count	73	49	31	153
	% within History	100%	100%	100%	100%
	% within Business Data/Doc	47.7%	32%	20.3%	100%

Among the participants, 85 of them keep business data/document in their mobile devices while the rest, 68 of them prefer not to do so. The Chi-Square analysis shows a 0.048 significance level relation between the history and retention of business data/document behavior of the participants (Table 4). The contingency coefficient is 19.5%. This relation degree is just good enough to be interpreted; a meaningful

difference can exist between "how long the participant has a smartphone" and "does the participant keep business related data/document on the handset".

Table 5: History vs Operating System

Operating System (O/S)		History (years)			
		<6	6-10	>10	Total
Android	Count	51	23	19	93
	% within History	69.9%	46.9%	61.3%	60.8%
	% within O/S	54.8%	24.7%	20.4%	100%
iOS	Count	19	25	11	55
	% within History	26%	51%	35.5%	35.9%
	% within O/S	34.5%	45.5%	20%	100%
Other	Count	3	1	1	5
	% within History	4.1%	2%	3.2%	3.3%
	% within O/S	60%	20%	20%	100%
Total	Count	73	49	31	153
	% within History	100%	100%	100%	100%
	% within O/S	47.7%	32%	20.3%	100%

Majority of the participants have mobile devices with Android O/S; this is followed by iOS and only 5 of them have different O/S. The Chi-Square analysis shows a 0.091 significance level relation between the history and the O/S of the handset of the participants (Table 5). The contingency coefficient is 22.3%. This relation degree is not so high however, it is worth to be interpreted; a meaningful difference can probably exist between "how long the participant has a smartphone" and the O/S of the handset. Recall that O/S are meant to be unchangeable in the handsets; hence, an indirect relationship has a potential to exist between the history and the selection of the handset.

5. FINDINGS

History of the participants show significant correlation with the behavior of keeping business data on the smartphone. This may be because the workplaces see BYOD as a factor despite cyber security issues, as stated in (Allam et al., 2014) and (Wang et al., 2014).

No relationship between O/S and the age, gender, education and the CSK factors is found, which is not surprising as O/S is not a choice of the participant once he has selected the handset. This may be explained by the fact that the O/S installed on the

device is not replaceable. However, history shows not so strong but still considerable influence on the selection of the handset. Meanwhile, this finding should not be interpreted for all types of handsets as only smartphones are within the scope of this work. Recalling the literature reviewed (O'Dea, 2021), people with a higher education background tended to have smartphones.

An interesting finding is that the behavior of keeping business data on the smartphone has no correlation with the CSK as well as the education of the participant. The related results show that CSK and the education of the participants have almost no or insignificant influence on this behavior.

6. CONCLUSION AND DISCUSSION

Recall that the aim of this work is not to draw a conclusion for a general case since the sampling method would not represent the whole population. Especially, the effects of the pandemic on the mobile phone users are considerably immature. Meanwhile, significant patterns in the role of demographic properties of the participants in their usage are found. The history of the participants with their mobile phones shows relationship with the retention of business related data/documents on the device and a weaker relationship with the O/S of the handset; it is still too early to infer latter correlation as the handset selection of the participant but this is a promising future study. The marketing of smartphones is as important as production. This research did not only give information about the usage of the system in the smart phones used by the consumers but also revealed the behaviors and attitudes of those who use these systems. Therefore, this finding can guide both smartphone manufacturers and smartphone vendors.

Apparently, the findings emerged from this work have limitations, hence, they provide material for future work avenues. The number of participants in such social research is generally open to discussion as the number may or may not adequately or properly represent the whole population. However, this is not a direct limitation to this work as generalizing the findings is not within the scope. While this limitation should be considered in the conclusion drawn, the number of participants was found sufficient to obtain meaningful differences in the relationships. This is adequate evidence that the survey questions are reliable and can produce meaningful results. Thus, they can be

used in more comprehensive research to survey larger numbers of participants; i.e., these questions can be used in a random sample to project a niche population.

Another limitation can be discussed as the conclusion relies on a single research instrument and just Chi-Square test for analyses. The automatic collection of information from mobile devices can be via a secondary instrument. This would yield less biased answers as human intervention would be eliminated. However, such an application cannot obtain information to answer every survey question as it is still needed to acquire answers to some of the questions from the participants. Additionally, installing such an application to a participant's device would likely make the participant reluctant, thereby making such a secondary research method quite challenging. Nevertheless, with this approach, researcher can collect considerably larger and richer data; hence, can perform further statistical analyses, such as multiple regression to explore cause-and-effect among the factors.

Because of the limitations, it is still too early to claim that behaviors and characteristics become more distinguishing with the history; however, it is promising as it shows more role when compared against age, gender and work of the participants.

Two unexpected findings reveal that both the education and the cyber security knowledge of the participants show insignificant or no influence on keeping business related data and/or document on the handset. This considerable finding will lead us to focus on the education and the experience of the users; hence, we strongly recommend testing the roles of the knowledge given to the user via education and the experience of the user gained through years, in a possible future work.

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