Defects of Smartphones reported by users in social media and questionnaires

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Abstract. The main aim of this article is to identify the most frequent damage of Smartphones and problems reported by users in a questionnaire and on social media. Social media are a relatively new issue; they are used by companies to get information about offered products and advertise them. On the other hand, they are used by users to exchange opinion about products and write recommendations; thus these opinions are studied. At the same time planned obsolescence is applied, which makes shorter the replacement cycle. Some of damage and problems observed by users are the results of planned obsolescence. The obtained data were processed statistically.

1 Introduction

In the United States of America almost three-quarters of internet users use social media [1]. A similar situation is observed in China, which is the largest market considering the number of internet users [2]. Usually social media (SM) are understood as social networking websites. The most important feature of SM is the publication of information available to many internet users. Users publish texts, pictures, sounds and films. Moreover, people build relationships with other people; these relationships depend on activities, areas of interest, backgrounds, accepted convention, country and internet-based applications. There is a diversity of SM web pages and activities. For more information please see [3,4].

Social media provides a large amount of information directly from users, which can be used by companies to: quickly react on opinions, change offered products and increase sales [5-7]. This information is free of charge, but is large and not organised, thus data processing is difficult (large amounts of data). On the other hand, information about defects and problems with products can be quickly spread, which can lead to an image crisis; because information published by Facebook friends is more trustworthy than television advertisements. Thus information about defects of Smartphones published in SM was studied in this article.

On the other hand, planned obsolescence is a policy of designing products with an artificially limited lifetime. This results in increase in sales [8]. The lifetime can be limited for example by, non-replaceable batteries, thin layers of varnish and coatings, brittle screens, brittle or soft materials, operating-system updates, applications running in the background and slowing the processor down [9,10]. New applications drain the phone's battery, take CPU time and thus frozen screens are observed. After two years a Smartphone is no longer functional [11]. These problems should be reported in SM; moreover, a questionnaire survey was conducted. The obtained results are presented below.

2 Investigation of customers' opinions

Questionnaire surveys were conducted in UTP (University of Science and Technology in Bydgoszcz) to obtain information about smartphones. In the UTP studies, 7,700 students,

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220 of them fulfilled the questionnaires, but 212 of the questionnaires were analysed. Questionnaires should be short, whereas questions should be clear, otherwise responders make mistakes. First market shares were studied. The obtained results are presented in Fig. 1, 90% confidence intervals were calculated for the UTP students. Moreover, market shares for fourth quarter of 2017 year are presented [12]. Generally, similar results are obtained, but some trade marks are more popular among young people, which is positive sign for them.

Fig. 1. Market shares reported by companies [12] and estimated for the UTP students.

Next, customer satisfaction with quality of smartphones was studied. Percentages of three groups of customers (satisfied, no-opinion, dissatisfied) were calculated based on independent research and 14,918 opinions published on the internet [13]. Generally, students are more satisfied with smartphones, than internet users (Fig.2). Internet users publish 2.5 times more negative opinions and 8.1 times more neutral opinions; which suggests that problems with products are more powerful motivation to write an opinion than proper functioning. Moreover, satisfaction with batteries was studied. One third of the students are dissatisfied with the quality of batteries; the same problem is reported in one third of internet opinions (Fig. 4); the reasons for this dissatisfaction are presented below. Around 70% of students recharge batteries at least once a day and they are difficult to replace. 69% of batteries are “non-removable”. Moreover, only 4.7% of batteries were replaced. This shows that durability of battery is a key issue and limits the durability of Smartphones. A number of charge cycle is near 600, which gives roughly 600 days (almost two years). Again, 16% of respondents recharge their battery twice a day, 3.7% thrice a day, and 1.4% four times a day. This shows that recharging the battery twice a day is hardly acceptable and leads to a quick end of any battery. This problem can be solved with power bank and installation of an extra large battery (Fig.3). Around 46% of students use power banks, which provide an opportunity to recharge any battery anywhere.

Fig. 2. Percentages of: customers satisfied from Smartphones (a, b), students satisfied from batteries (c), batteries recharged at least one time a day (d), non-removable batteries (e), replaced batteries (f), and students using power bank (g).

Fig. 3. Extra large battery installed in a Smartphone.

Apart from any problems with a battery, a few more defects were reported by users in social media and questionnaire surveys. A total of 289 customer opinions published on internet were analysed (Fig. 4) [13]. Freezing of a Smartphone was reported by 55% of students and 29% internet users. Freezing is a sign of problems with software and hardware. The main reasons can be a slow processor, overheating, applications working in the background, installation of actualisation and many other reasons. A scratched back cover was reported by 48% of students and 11% internet users (Fig. 5cd). The main reason of this problem is application of soft and brittle materials. If the back is painted, which reduces production cost for a variety of offered colours, then varnish is partially removed; which finally is unaesthetic. The solution is an application of a colour polycarbonate and proper surface texture. The screen is a critical part of a Smartphone, thus any defect of this element causes problems (Fig. 5ab). A screen can be scratched if is covered by foil or can be cracked. A cracked screen does not react properly on touch, whereas a scratched screen can reduce video quality. Problems with touch screen were reported by 37% of students and 10% internet users, whereas cracked screens were reported by 23% of students and 8% internet users. More problems are reported in the questionnaires, because they were listed, whereas an internet user can forget about some problems. Nevertheless, the order of problems is the same; week battery, freezing, scratched back cover, not working touch screen and cracked screen.

Fig. 4. Percentages of defects reported in questionnaires and internet opinions [13].

Fig. 5. Scratched screen (a), cracked screen (b), scratched back cover (c), cracked back cover (d).

The described problems can be solved by producers, but they do not ask universities about any solutions [14]. Moreover, reported defects are coupled with planned obsolescence, and are thus accepted by producers. The average age of a Smartphone is 16.6 months which gives a 90% confidence interval in (15.4; 17.8) months. This leads to a conclusion, that the average lifetime is 33.2 months, which gives 90% confidence interval in (30.7; 35.6) months. On the other hand, the average lifetime declared by students is 29.2 months, which gives a 90% confidence interval in (28.0; 30.4) months. This shows good agreement between these two results. Some of the Smartphones are eliminated by screen defects, next by weak battery and finally by the processor slowing down. Only 34% of

students declared that the observed problems are the result of intentional politics. To better illustrate this problem empirical cumulative distribution function is presented (Fig. 6). Very few Smartphones are older than 36 month, which shows that the lifetime is clearly limited. Moreover, Smartphones are removed from the market between the 24th and 36th month of their lives, which is clear from this graph. This issue will be studied in the next article because it is very interesting.

Fig. 6. Empirical cumulative distribution function of age of Smartphones.

3 Conclusions

Defects of Smartphones reported by students and internet users were studied in this article. Internet opinions and surveys provide a similar picture of this issue. Similar hierarchy of problems is observed, but percentages are varied. This is a result of the application of various research methods. Internet opinions provide valid information, which can be used by companies to improve their products, but they apply planned obsolescence. Given internet opinions are various, from upright to unremarkable. The obtained results provide an opportunity to estimate the durability of Smartphones in the range from 30.7 to 35.6 months with a probability of 90%. Which shows that smartphones are carefully designed.

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