

The Environmental Consequences in a Process of Planned Obsolescence of Mobile Phones

Sardo, Bianca Christine¹, Marques, Moacir², Vieira, Thais Cristine³

¹(Production Engineering, University do Vale do Itajaí, Brazil)

²(Production Engineering, University do Vale do Itajaí, Brazil)

³(Production Engineering, University do Vale do Itajaí, Brazil)

Corresponding Author: Sardo, Bianca Christine

ABSTRACT : *The waste coming from the cell phone becomes a problem in the allocation of these around the world, since the electrical and electronic equipment symbolize one of the fastest growing industrial markets today. Renew the product portfolio has just no longer a differentiator and becomes critical to a company remain competitive in the market. Knowing this, the mobile phone companies, take advantage of the opportunities to develop new handsets with software and increasingly technological design and modern, influencing consumer's desire to acquire new technologies and open the obsolete. In this sense, the article aims to analyze what the environmental consequences concerning the planned obsolescence of mobile handsets. For this, in addition to deepening theoretical, field research was carried out in the form of a questionnaire applied to consumers in General, participants responded that expect product characteristics, preferences, etc. Through the analysis it was possible to show that the vast majority of consumers return their appliances each year 1, this being the time the consumption and only 1% of consumers admit to discard the old appliance in proper place, therefore, becomes a worrying factor for sustainable development.*

KEYWORDS -Obsolescence; Environmental impact; Cell.

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I. INTRODUCTION

The mobile technology market is quite warm. Mobile phones and the internet present a significant difference compared to years ago. Has seen constant innovations, such as the creation of tablets, smartphones and other similar; and even the evolution of these. The competition between the manufacturers and the renovation of technologies, reducing older appliances was a facilitator for the consumer access.

Second Ragazzi and Andrade (2016, p. 2):

"With the arrival of smartphones to the market, the possibility of replacement of mobile phones, which was once encouraged by technological innovations in each new version of physical devices (new camera, more memory, Bluetooth or wifii, for example), had you get a strengthening of their manufacturers to ensure your quick replacement. The solution to this new stage of the mobile phone manufacturers are in constant update of the operating system used in these smartphones, ensuring the effectiveness of what is called "planned obsolescence".

With the accelerated demand in the industry of mobile phones to meet the consumer, enhanced with the proposal of product analysis that is proposing, study and analyze the product development Process (PDP) becomes essential. For Rozenfeld et al. (2006, p. 3):

" The PDP is the set of activities whereby if you are looking for, from the needs of the market and of the possibilities and technological constraints, and considering the competitive strategies and company product, get project specifications of a product and of your production process to manufacture is able to produce it and follow the product after launch to perform any necessary changes to this specification, planning the discontinuation of the product on the market and incorporate, in the development process, lessons learned throughout the product life cycle ".

According to the abovementioned text, the planned obsolescence induces consumers to buy substitutes within smaller and with a frequency greater than naturally would consume. The firmament of obsolescence is related to the pleasure of the people to have something that is new on the market, based on the idea that everything that is old has no value and no status vis-à-vis the company. The withdrawal of the cell phones of circulation, environmental requirements are taken into consideration, which may involve the reuse of parts, disassembly or complete disposal.

So, with the evolution of technology, cell phones are becoming more enhanced features in the operating system or in news in manufacturing, factors that leave consumers vulnerable to the rapid exchange of equipment.

A large part of the population exchanges the equipment without first taking them to a service, that is, buy a new handset and the 'old' is donated, stored or discarded. According to a survey by the IDEC (Brazilian Institute of consumer Defense) (2013, p. 5), "mobile phones or smartphones are present in 93% of Brazilian homes and are also the equipment's that are less time with your users, on average, about of 2 and a half years. "

In view of the strong competition in the market of technologies, manufacturing and the service performed by the companies, are adopted as a great advantage to gain even more users. The ideal time and the actual duration tends to be greater among users who exchange their devices with operating problems, than among users who swap to upgrade the equipment.

According to news website Uol (2016), Efe, the analysis of the consulting firm IDC, Francisco Jerônimo, States that "the innovation of the manufacturers is not as strong as in the past, it's not enough to convince users to change their phone so often ". The handset market is a very competitive environment, so companies suffer from constant changes to meet the market and its consumers.

According to news website Uol (2017), "the iPhone 6s was the best-selling smartphone in the world last year, according to the IHS consultancy firm Market, totaled 60 million units marketed device for 2016". In the image below, published by IHS Market, Apple released the 2nd with the iPhone 7 (about 50 million), 3 with the iPhone 7 Plus (25 million) and 4th place with iPhone 6s Plus (25 million), as shown in Fig1.

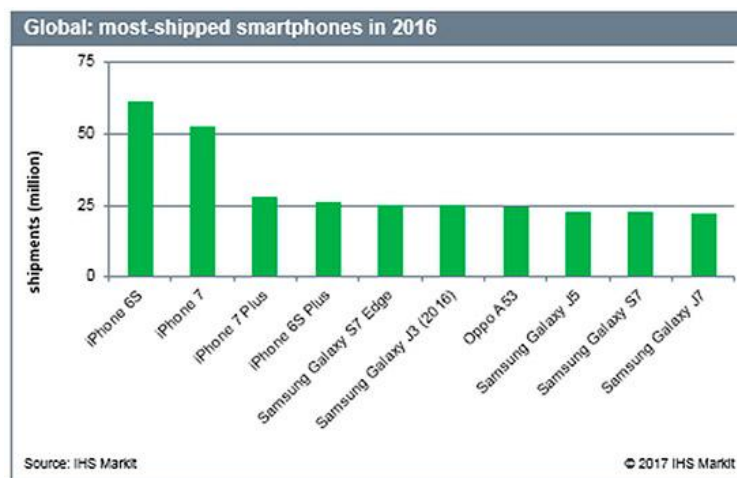


Figure 1-Cellphones bestsellers in the world in 2016.

Source: UOL Website (2017)

Through the data collected, we sought to understand the interaction between consumers and the new mobile phones. In other words, the study aims to analyze the central consumer vulnerability in relation to Smartphones and the planned obsolescence, as well as understand this technology and what the paths used by their manufacturers, knowing that the number of users is becoming increasingly significant.

II. PLANNED OBSOLESCENCE

Mészáros (1989, p. 88) says that "we live in a disposable society that relies on decreasing usage of the goods and services produced.

Following the same line of reasoning, the strategy of planned obsolescence for Wada (2011, p. 38), "aims to reduce the life-cycle of products, or even the creation of relatively short cycles, aiming for quick movement of the market for feed the economy and consumer wishes. "

Thus, the electronic market, according to Leonard (2010, p. 161 apud Wada, 2011, p. 39), "has four basic conditions to be the target of planned obsolescence, being they: the cost of repair, replacement parts, new components and incompatibility the promotion of the exchange of the old with the new. In addition to the

battery change, there are other factors which lead to the disposal of smartphones in General: low product quality, operating system upgrade not picking up more the old model, complexity in your auto repair and cost, distance between supplier and consumers, low price of new products, search for modern equipment.

III. PLANNED OBSOLESCENCE IN CELL PHONES

The electronics market, according to Leonard (2010, p. 161 apud Wada, 2011, p. 39), "has four basic conditions to be the target of planned obsolescence, being they: the cost of repair, replacement parts, the incompatibility of new components and the promotion of return of the old with the new. "

According to news published on the Site Uol (2013), the Apple company is accused by the Brazilian Institute of politics and law of computing (IBDI), to carry out planned obsolescence on iPad 4, which was released in a period of less than one year from your last posting. If you lose the case, the company may have to reimburse consumers who purchased the iPad 3.

In addition to the battery change, there are other factors which lead to the disposal of smartphones in General: low product quality, operating system upgrade not picking up more the old model, complexity in your repair and high cost, distance between supplier and consumer, low price of new products, search for modern equipment.

The obsolescence program in the industry of mobile handsets, according to author above, "is one of the pillars for the capital turned into this trade. While cell phones also symbolize a social status, in which owners of newer models demonstrate have a higher purchasing power, the design of new appliances will continue happening and planned obsolescence used as a pillar of production ". CHERNEV (2013, p. 14).

IV. ENVIRONMENTAL CONSEQUENCES

Increasingly the waste becomes a challenge for the public managers worldwide, since the electrical and electronic equipment (EEE) symbolize one of the fastest growing industrial markets today. There is a significant increase in waste generation of such equipment. For Mansur (1993, p. 13) "garbage is basically any solid residue from human activity."

The significant increase in the generation of solid waste from electronic equipment is related to rapid obsolescence applied in mobile phones. According to data of the site G1 (2015), "the Brazil drops a year 1.2 million tons of junk mail, in addition, according to the World Bank, the volume of it increases three times faster than common garbage."

In Brazil the law No. 12,305, August 2 2010 , The establishment of the Brazilian solid waste Policy, which establishes the shared responsibility for the lifecycle of products: individual assignments and chained set of manufacturers, importers, distributors and marketers of consumers and holders of public services of urban cleaning and solid waste management, to minimize the volume of solid waste and waste generated, as well as to reduce the impacts to human health and environmental quality (BRAZIL, 2010).

V. E-WASTE

Junk mail, or e-waste, can be defined as "is a conglomeration of electronic devices that are no longer useful, for being defective or obsolete" (UDESC, 2013). Cell phones have more than 40 chemical elements, the damage to the environment and human health are numerous.

In the junk e-mail, specifically on cell phones are found elements such as lead, arsenic and beryllium, which can damage the nervous system, blood, skin diseases, lung cancer (MOREIRA, 2007). With that, the way that cell phones are discarded, become a problem: technological, environmental and social. Oliveira and Slavers (2010, p. 6) points out that "the environmental concern regarding the inadequate provision e-waste occurs due to the release of toxic substances that can cause serious impacts on nature."

Constantly, the electronics were evolved and improved. By providing some comfort to humans, and the increasingly rapid releases, brought the obsolescence for various products. At this juncture, tons of electronic devices called for technological waste are disposed of continuously, causing major environmental impacts (PRUX, 2009).

VI. ENVIRONMENTAL IMPACTS OF MOBILE PHONES

"The environmental impact generated from the sales of the product have long been neglected, being difficult to control and administration, because after a transfer of possession to the final consumer product liability marketed becomes diffused "(VBGVUES, 2007, p. 25). "The problem of the WEEE (waste electrical and electronic equipment) is still far from a simple solution, mainly due to the complexity with which are designed" (CHERNEV, 2013, p. 13).

According to Wheat , Antunes and Balter (2013, p. 5-6), "there are many problems caused by some components used in the production of mobile, both to human health with regard to the environment, which were raised from your life cycle assessment, which are: circuits Electronics: metals such as gold and Palladium, used

in this step are rare. The extraction of the same is pollutant and little productive, because to produce one ton of gold, are generated at least 10000 tons of CO₂, carbon dioxide, which contributes to phenomena such as global warming, "heat islands" and heat exchange. Battery: in the process of making this part, are used, among others, nickel and cobalt. They are obtained by mining, essentially highly impactful. Housing: polymers such as PVC and polycarbonate, are derived from oil, which is a non-renewable source. In addition, aluminum production requires a huge expenditure of energy and water. LCD screen: Indium is a rare mineral in pure form (usually is obtained in the extraction of other minerals) and so, besides the impact of mining, there is still a great expenditure of energy in electrolysis to separate the ore. Keyboard: the touch screen was a good technological advancement for the environment because it dispenses with the use of silicone and plastic, which are materials more difficult to reuse or recycle the glass. Other mobiles without this technology have the keyboard of the same material as the car case. "

One of the major concerns of the companies and the Government, is the destination of the electronic equipment's, accessories and components. The information below highlight this reality:

- a) According to the website of the United Nations in Brazil (2015), "predicts that the world will have in the year 2017, 50 million tons of electronic garbage";
- b) According to the United Nations Website in Brazil (2013), "of the 7 billion inhabitants of the world, 6 bi have cell phones, but bi do not have 2.5 bathrooms";
- c) "The medals of the Olympic Games of Tokyo 2020 will be made from the recycling of precious metals found in junk mail from Japan" (UN BR, 2016);
- d) "If the global population in fact reach 9.6 billion in 2050, it will take almost three planets Earth to provide the natural resources needed to maintain the current lifestyle of humanity" (UN BR, 2016);
- e) "The Brazilian cellular Exchange, every 1 year and 1 month on average", according to Exam Magazine (2015).

VII. VULNERABILITY OF CONSUMERS IN THE INDUSTRY OF MOBILE PHONES

Second Ragazzi (2010, p. 151), "the principle of consumer vulnerability is the great foundation of the system, because its rules were built for the purpose of harmonizing the consumer relations between suppliers and consumers."

A second vulnerability should be thinking of Nunes (2012, p. 675), "this weakness, that fragility, is real, concrete, and stems from two aspects: one technical and the other economic measures".

"The consumer is the consumer's own vulnerability to consumer relations, underprivileged part, or weaker, ends up having to undergo the conditions that are imposed by the providers, the strongest" (Borges, 2010, p. 58).

VIII. MATERIALS AND METHODS

The methodology of this work, went through a literature review and a structuring of components of this research in accordance with the listing of key concepts associated with the vulnerability of the consumer in the industry of mobile handsets, planned obsolescence, product development process and environmental impacts.

This study was quantitative and qualitative in nature with exploratory and descriptive objective, given the possible deficiency of studies that address the situation of vulnerability of consumers of mobile technology, specifically iPhones, and the disruption of these process.

According to George (2003), "exploratory research may be characterized by develop and clarify ideas making them clearer their data provided support to deepen the theme and for being named" basic research ". Descriptive research already to Gil (2000), "the description of the characteristics of a given population is goal of this research. Features the use of questionnaires or observation in order to achieve the results. "

Finally, the process of discontinuation of the product in a specific cell phone brand (iPhone) and the impact of your consumer's underscoring the vulnerability of the user. Still, even if you work with a mobile device specific model, this study can cover all other brands because it is a standard case of discontinuity and obsolescence that occurred.

IX. APPLICATION OF RESEARCH

The site Survio sent to search for 3000 people and the remainder was for reach in social networks of academic and friends. Ideal for sample was receiving 357 responses, according to the calculation of sampling, however, were collected and all replies 606 was used for field research had a great result.

606 people participated in the research of the day 01 to 31 March 2017, being male and 268 females 338 (1 graph of percentage below) and the same aged 14 and 67 years old, with an average age of 25 years. In addition to the questionnaire conducted with consumers over the internet has set some criteria for application: people who own cell phones and age greater than 13 years.

Graph 1 presents the percentage of age of each consumer.

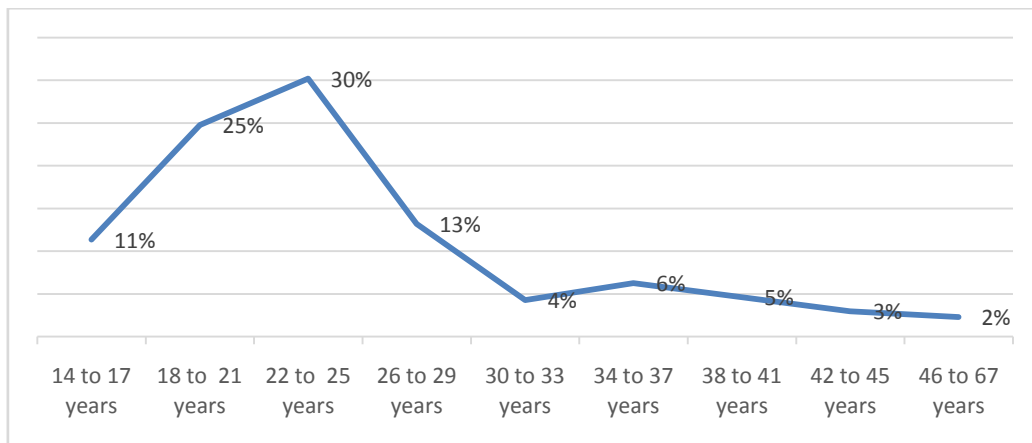


Chart 1-percentage of Age of the questionnaire

The first question asks what brand of equipment that each has, for personal or family use. We placed 4 brands of cell phones and other option containing other brands. Below is the question and the answers to the first question, presented in graphical formatting.

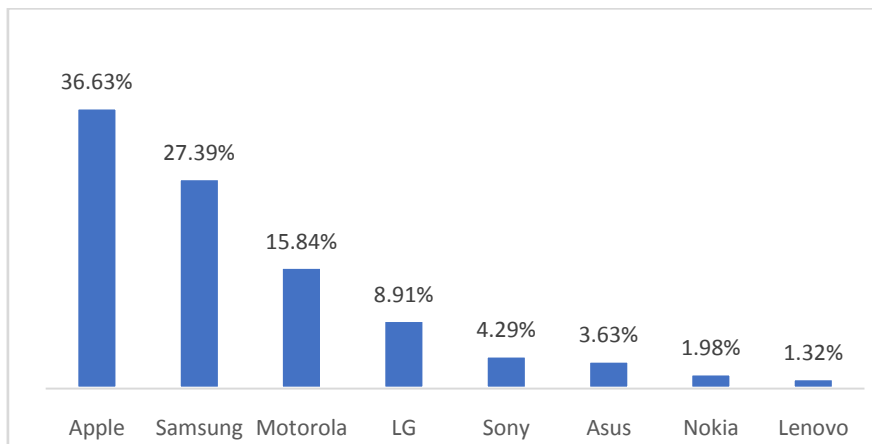


Chart 2 – equipment Brand used by users

The next question is pertinent at the time of use of the current mobile device and it can range from 1 month of use until 3 years or more, and the answers provided by the chart 3.

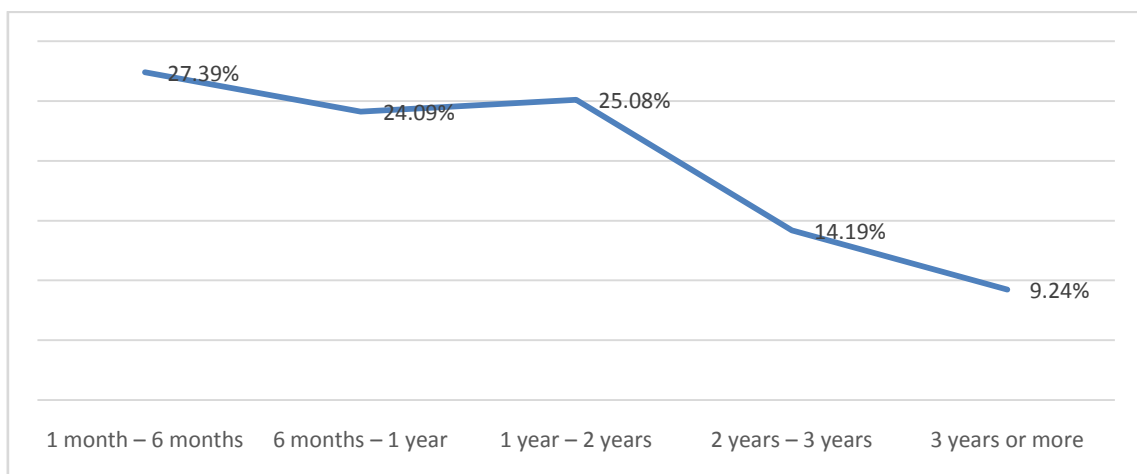


Chart 3 – Time of use of the mobile device

And as the above chart shows a considerable short period between user and device, the next question held assists and the firmament to the limited life cycle of mobile device.

According to the responses obtained in question number 3 the majority of the population had more than 5 cell phones during life and other 15% responded that they already had 4 devices throughout your life, as the graph 4 below.

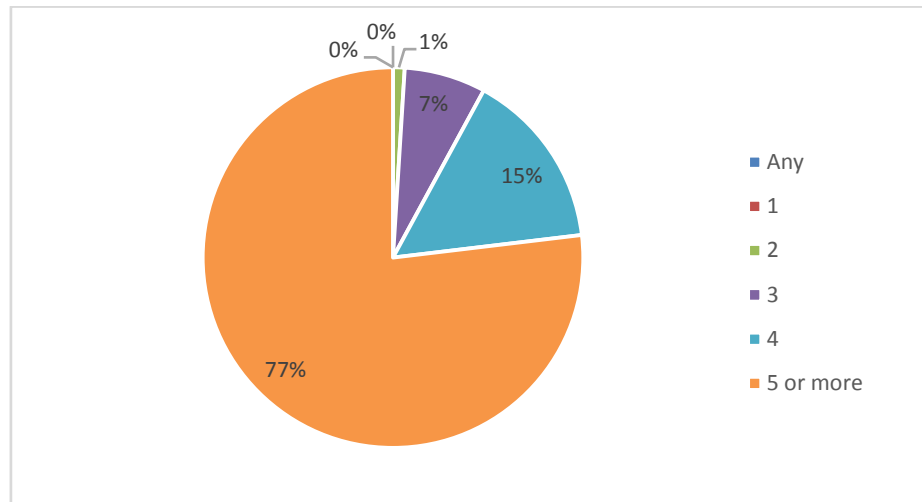


Chart 4 – number of devices obtained by users

The next question (number 5) is pertinent to the customer satisfaction with the performance of the mobile device. The fully satisfied has 54.5% of the survey responses. Already 33.3% of respondents reported being satisfied in parts and 3.3% reported to be totally dissatisfied.

The question number 6 and the chart below refer to the performance of the mobile device, as your durability and lifetime. 34.7% of respondents reported being fully satisfied with the durability of the appliance and 16.8% reported being dissatisfied in part and 1% completely dissatisfied.

Already the number 7 graph, shown below, assessing what interferes with the purchase of a mobile device, and the speed of the system was the issue that most stood out in front of users. 42.4% reported buying the unit according to the speed of your system, 20.4% reported being the main battery durability and 12.2% buy as the brand.

The next question (number 8) is related to consumer trade reasons. Then follows representative chart of responses, and the new functions become the essential reason for return. 27.1% reported buying new appliance for the amount of functions. 22.8% reported that the reason for purchase is the previous operation of the device and not 19.5% reported purchasing the new handset due to your modernity.

Thinking about what consumers did with the old cell was prepared to question number 9, presented by chart. The donation of the old appliance is the answer more presented answers, however, only 1% of users drop in the correct locations, alarming information for sustainability. 40.6% of respondents reported giving to others the old appliance; 33.3% reported that they keep the appliance at home and 1.3% reported playing in the trash.

The next graph is being presented on the issue 10 of the questionnaire applied to consumers and presents how likely the replacement of the current mobile device. 30.69% reported that it is very likely the switch of the appliance, 31.02% reported to be unlikely and 19.14% reported not an unlikely.

And finally, the last issue, number 11, cell Exchange reasons. 46.5% for the slowness of the system. 36% and 9.6% features for personal status.

X. RESULTS

There are several discontinuities related consequences of cell phones in both the consumer and environmental impacts, the product has several factors that compromise human life. The use of mobile devices has increased greatly in recent years and there is an environmental concern in relation to discard inadequate due to release of toxic substances, because they carry more than 40 chemical elements.

The environmental impacts generated for the device have been neglected for years, making it difficult to control at the present time, because after the purchase by the final consumer to the correct destination ends up being disseminated by the user and manufacturer. "Induced obsolescence in society, everything ends up in garbage. The faster passing and for the life of the products, the greater the drop. Advertising is the engine that makes all this dynamic work "(P, 2013).

Thus, the consequences of environmental impacts are huge as seen on theoretical foundation. Is the duty of every human being to give a correct destination for the appliance and duty of manufacturers give the full support and teach ways to occur in the best possible way? According to Morais et al (2008, p. 4), "what to do with the scrap is a complicated process, because you can reuse in product levels, parts and components, and there is still the possibility of the second-hand market or the use of parts or parts for maintenance. Anyways always be · When the device reaches the end of your life, and it is at this time that the need for a proper logistics to drive your destination, avoiding contamination of the environment.

XI. CONCLUSION

There are several discontinuities related consequences of cell phones in both the consumer and environmental impacts, the product has several factors that compromise human life. The use of mobile devices has increased greatly in recent years and there is an environmental concern in relation to inadequate disposal due to the release of toxic substances because they carry more than 40 chemical elements. The environmental impacts generated for the device have been neglected for years, making it difficult to control at the present time, because after the purchase by the final consumer to the correct destination ends up being disseminated by the user and manufacturer.

Awareness of the problem of e-waste is important for the entire world population and all manufacturers of technology, especially the focus of this study, must carefully seek sustainable solutions for the process of development of these devices becomes a future disorder, the possibility of reusing parts and components by preventing contamination of the environment and the faster is the cell lifecycle, the greater the drop.

Therefore, the product development process with planned obsolescence is complex, it is not possible to exhaust the subject and opens doors for other studies, signaling to new paths. Anyway, it is essential to the study of equipment which are directly linked to the daily life of human beings.

REFERENCES

- [1]. RAGAZZI, João Luiz; ANDRADE, Paulo Henrique Loyola Vianna. The Retirement of the iPhone 4: an analysis of the evolution of planned obsolescence in violation of fundamental rights. *Anima: electronic journal of law school faculties OPET*. Curitiba PR- Brazil. Year VIII, n° 14, jan/jun 2016. Available at: <http://www.anima-opet.com.br/pdf/anima14/artigo-13.-a-aposentadoria-do-iphone-4-uma-analise-da-evolucao-da-obsolencia-programada-na-violacao-dos-direitos-fundamentais-do-consumidor.pdf>. Access in: 19 August 2016.
- [2]. ROZENFELD, Henry; FORCELLINI, Fernando Antonio; AMARAL, Capaldo Daniel; TOLEDO, José Carlos; SILVA, Sergio Luis; ALLIPRANDINI, Dario Henry; SCALICE, RégisKpvacs. *Product development management: a reference for improving the process*. São Paulo: Saraiva, 2006.
- [3]. UOL WEB SITE. "Biggest challenge" for Apple are increasingly renewal cycles long. *EFE in Madrid*, 16 Sept. 2016. Available at: <http://tecnologia.uol.com.br/noticias/efe/2016/09/16/maior-desafio-para-a-apple-sao-os-ciclos-de-renovacao-cada-vez-mais-longos.htm>. Access in: 05 set. 2016.
- [4]. UOL WEB SITE. iPhone was the best-selling smartphone 6s of 2016, says consulting. São Paulo: Adrenaline, 27 mar. 2017. Available at: <http://adrenaline.uol.com.br/2017/03/27/48949/iphone-6s-foi-o-smartphone-mais-vendido-de-2016-afirma-consultoria/> accessed: 27 Apr 2017.
- [5]. MÉSZÁROS, István. *Destructive production and the capitalist state*. São Paulo: essay, 1989
- [6]. WADA, Warren Sonoda. *Perceptive obsolescence in the context of Contemporary Consumption: The Apple brand on sale of iPhones*. Undergraduate conclusion work. Escola Superior de Propaganda e Marketing, São Paulo, SP, Brazil, 2011.
- [7]. LEONARD, F.S. & SASSER, W. E., "The tilt of quality". *Harvard Business Review*, 60 (5): 163-171.2010 (p. 164).
- [8]. UOL WEB SITE. Apple is expected to Respond in court By planned obsolescence of the iPad. São Paulo: writing Digital Look, 21 Feb. 2013. Available at: <http://olhardigital.uol.com.br/noticia/apple-devera-responder-na-justica-por-obsolenciaprogramada-do-ipad/32762>. Access in: 05 set. 2016.
- [9]. CHERNEV, Lucas Matveichuk. *Habits Of consumption and disposal of cell phones in navsari*. 2013. 48 f. TCC (graduation)- Environmental Engineering, *Federal Technological University of Paraná, Londrina, 2013*. Available at: http://repositorio.roca.utfpr.edu.br/jspui/bitstream/1/2388/1/LD_COEAM_2013_2_17.pdf. Access in: 05 Oct. 2016.
- [10]. MANSUR, Gilson; MONTEIRO José Henrique R. Penido. You need to know about urban cleaning. Rio de Janeiro. IBAMA/CPU, 1993. Available at: <http://www.resol.com.br/cartilha/rs.php>. Access in: 05 Oct. 2016.
- [11]. WEBSITE G1. Brazil drops year 1.2 million tons of electronics waste. Sao Paulo, nov 09. 2015. Available at: <http://g1.globo.com/jornal-nacional/noticia/2015/11/brasil-descarta-por-ano-12-milhao-de-toneladas-de-lixo-eletronico.html>. Access in: 05 set. 2016.
- [12]. Brazil. Law No. 12,305, August 02 2010. The establishment of the Brazilian solid waste Policy; amends Law n° 9,605, of 12 February 1998; and other matters. *DiárioOficial da União, Brasília, DF, 02 Aug. 2010*. Available at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/112305.htm. Access in: 27 Sep. 2016.
- [13]. Brazil. Law No. 12,305, August 02 2010. The establishment of the Brazilian solid waste Policy; amends Law n° 9,605, of 12 February 1998; and other matters. *DiárioOficial da União, Brasília, DF, 02 Aug. 2010*. Available at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/112305.htm. Access in: 27 Sep. 2016.
- [14]. Brazil. Law No. 12,305, August 02 2010. The establishment of the Brazilian solid waste Policy; amends Law n° 9,605, of 12 February 1998; and other matters. *DiárioOficial da União, Brasília, DF, 02 Aug. 2010*. Available at: http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/112305.htm. Access in: 27 Sep. 2016.
- [15]. OLIVEIRA, Simone, SLAVERS, Janari. of the. *Junk: a study of environmental liability in the context ofEducation Science and Technology Institute of Amazonas-Manaus Center Campus IFAM*. In: Brazilian Congress of environmental management, 1, 2010,

- Bauru. Anais ... IBEAS, 2010. Available in: <
http://www.senepf.cefetmg.br/galerias/Anais_2010/Poster/GT06/LIXO_ELETRONICO.pdf>. Access in: 12 jan. 2017.
- [16]. PRUX, Oscar Ivan. Responsibility for the reuse, recycling or disposal of electronic waste. 2009. Available at: <
<http://www.tribunapr.com.br/blogs/direito-consumidor/a-responsabilidade-pelo-reaproveitamento-reciclagem-ou-descarte-do-lixo-eletronico/>>. Access in: 27 SEP 2016.
- [17]. WHEAT, Aline Guimarães Monteiro; AGARWAL, Hemant Rao; BALTER, Rodrigo S.n. A Sustainable Vision Of Waste Electronics From Cellular Devices. IV Brazilian Congress of environmental management, Salvador, v. 1, n. 1, p. 1-1, 25 nov. 2013. Available at: <
<http://www.ibeas.org.br/congresso/Trabalhos2013/VII-032.pdf>>. Access in: 05 Oct. 2016.
- [18]. UNITED NATIONS IN BRAZIL (ONUBR). UN predicts that the world will have 50 million tons of trash in 2017. São Paulo, 13 mai. 2015. Available at: <
<https://nacoesunidas.org/onu-preve-que-mundo-tera-50-milhoes-de-toneladas-de-lixo-eletronico-em-2017/>>. Access in: 06 Oct. 2016.
- [19]. UNITED NATIONS IN BRAZIL (ONUBR). Of the 7 billion inhabitants of the world, 6 Bi have cell phones, But Bi don't have Bathrooms 2.5. São Paulo, 22 mar. 2013. Available at: <
<https://nacoesunidas.org/onu-dos-7-bilhoes-de-habitantes-do-mundo-6-bi-tem-celulares-mas-25-bi-nao-tem-banheiros/>>. Access in: 06 Oct. 2016.
- [20]. UNITED NATIONS IN BRAZIL (ONUBR). Tokyo 2020 medals will be made with gold and silver from junk e-mail. 05 set in São Paulo, Brazil. 2016. Available at: <
<https://nacoesunidas.org/medalhas-da-toquio-2020-serao-feitas-com-ouro-e-prata-de-lixo-eletronico/>>. Access in: 06 Oct. 2016.
- [21]. Nunes, Luis Antonio Ram. Course of consumer law. 7. ed. view and current. São Paulo: Saraiva, 2012.
- [22]. GIL, Antonio Carlos. How to develop research projects. 4 ed. São Paulo: Atlas .2000.
- [23]. MORAIS, Jorge Fernandes; SILVA, Wainer da Silveira; R, Patricia Fraga R. *Environmental Impacts from The New Telecommunications Technologies*. XII national meeting of technologies of the built environment: Generating Value in the built environment: innovation and sustainability, Fortaleza, v. 1, n. 1, p. 1-1 7, Oct. 2008. Available at: <
<http://www.infohab.org.br/entac2014/2008/artigos/A1758.pdf>>. Access in: 05 Oct. 2016.

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