Article **Journal-Labor and Demographic economic**
December 2019 Vol.3 No.5 23-30

Technology scrap material´s extended life cycle applied to learning environments

Extensión de vida de materiales tecnológicos con calidad, aplicada en ambientes de aprendizaje

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Received August 15, 2019; Accepted December 22, 2019

Abstract

Planned obsolescence was created in the need to maintain growing economy by increasing sales of high volume items with short life cycle, so as to have balance within the enterprises. Although in the beginning this was beneficial, it brought other consequences such as ecological imbalance, due to the wild consumption of nonrenewable energy and the scrap excess that last thousands of years to break down. Today the development of technology is so fast that items such as cellphones, computers, TVs, etc. that have limited life cycle and get promptly obsolete, and then they become waste. This leads in pollution and environment damage. It is better to recycle all this materials and to have a different mindset in the university community in order to reduce the environment damage, better life quality and a sense of social responsibility. The proposal to develop sustainability standards is an approachable solution to create products to be consumed and that at the same time can be recyclable and easily transformed. It is possible to teach to the new generations the need to extend the life cycle of the products and / or to recycle materials from those obsolete technology items. This qualitative research found that since 2012, the planned obsolescence topic has been taught in the Formación Sociocultural I subject, in the Information Technology (IT) area at the Universidad Tecnológica de Puebla. Students were asked to develop from technology products scrap three types of items: ornaments, products of daily use, and finally learning supplies. It was found that the learning supplies were a very good option because those could be used by several students for many more years, which is the main objective of recycling.Therefore this qualitative research proposes to reuse scrap technology material products, to make learning supplies and then give social benefits and at the same time to reduce pollution.

Learning Environments, Technology Obsolescence, Social Responsibility

Resumen

La obsolescencia programada surgió de la necesidad de mantener una economía creciente gracias a la venta y consumo de objetos de duración corta para conservar el equilibrio dentro de las empresas; aunque en principio parecía beneficioso, trajo otro tipo de consecuencias como el desequilibrio ecológico, debido al desenfreno en el consumo de energías no renovables y el exceso de desperdicios que tardan miles de años en descomponerse. Hoy en día con los avances acelerados en la tecnología, se tienen productos como celulares, computadoras, televisores, entre otros., que tienen una duración limitada, pasado el tiempo la tecnología se vuelve obsoleta y muchos de esos productos van a la basura, ocasionando un deterioro al medio ambiente; para lo cual se deben buscar soluciones como la reutilización de estos componentes y generar un cambio de consciencia en la comunidad universitaria mediante acciones que permitan disminuir el deterioro ambiental, fomentar el sentido de responsabilidad social y con ello mejorar la calidad de vida. El desarrollo sustentable es una propuesta de solución viable al buscar generar productos para una sociedad de consumo, pero que al mismo tiempo se reutilicen o transformen fácilmente; es posible crear consciencia en las nuevas generaciones sobre la necesidad de extender la vida de los productos y/o desarrollar materiales que cumplan con los requerimientos de calidad para ser utilizados nuevamente. En la Universidad Tecnológica de Puebla, dentro de la división de Tecnologías de la Información, desde el 2012 se ha visto la temática sobre obsolescencia programada en la materia de Formación Sociocultural I, existe una evolución al inicio desarrollando objetos de ornato, después productos de uso cotidiano hasta llegar a la realización de materiales con beneficio social. La presente investigación es de tipo cualitativo descriptiva, plantea la propuesta de extensión de vida de los productos informáticos de calidad para la creación de ambientes de aprendizaje.

Ambientes de Aprendizaje, Obsolescencia Tecnológica, Responsabilidad Social, Calidad

Citation: LIZARDI-ROJO, Verónica, DE SAMPEDRO-POBLANO, Héctor, BOLAÑOS-ORTEGA, Rosalba and ROLDÁN-OROPEZA, Norma Angélica. Technology scrap material´s extended life cycle applied to learning environments. RINOE Journal-Labor and Demographic economic. 2019. 3-5: 23-30.

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Introduction

With the Industrial Revolution (1760-1840) the first ways to integrate science into production and make it more productive emerge. That is why it was sought to increase efficiency within the factories and that the workers obtained greater profit in turn to meet the consumer's demand, keeping them dissatisfied with their product and making it quickly obsolete. (Ramírez, 2012)

The planned obsolescence of the products was developed for the first time between 1920 and 1930, it is a production policy that consists in designing the product in a way that meets its determined useful life and then becomes obsolete, useless or broken. This time is arbitrarily arranged by its manufacturer who at least has an oligopoly of the product in question. Programmed obsolescence positively stimulates demand by encouraging consumers to buy new products in an accelerated manner; although there is a risk of an adverse reaction by consumers causing them to change to the competition, basing their choice on the durability and quality of the product. Therefore, companies must weigh whether using cheaper technological components satisfies or not the projection of useful life for their products, this is part of a discipline known as "value engineering". (Ramírez, 2012)

The first world association called Phoebus emerged in 1924 in Geneva; This grouped the main manufacturers of electric light bulbs: Philips, Osram and General Electric, its mission was to keep a common patent registry and set global standards that all companies would contemplate. During the economic crisis of 1932 London, he proposed making obsolescence planned in all consumer items mandatory refers to the creation of a state agency dedicated to the confiscation of the items even if they still work against the will of the consumer, this idea under the argument of the reduction of unemployment. (Vega, 2012).

At the same time Batista says that the cost of impoverishment of merchandise quality has been quickly adopted with the intention of achieving greater profit, and has been imposed as a measure of the useful life of an item, adding that obsolescence can be felt by the consumer as a problem or a guarantee of quality (Batista de Andrade, 2007).

Batista takes up Vance Packard's proposal by stating that he was one of the first to criticize said consumption system, made an analysis of obsolescence by subdividing it into at least two types:

- Functional obsolescence: that produced by some physical reason outside the consumer in which the object is no longer able to fulfill its function. For example, the implementation of thermal fuses that will break after an amount of stress, chips whose function is to count the times the product has been used and block it; the use of inferior quality materials; lack of spare parts; repair cost higher than the product in question.

- Psychological obsolescence: in which the manufacturer tries to deplete or make the object obsolete in the consumer's mind even if it has not culminated its useful life.

In that sense, the useful life of technological equipment is shortened by the accelerated increase in the supply of new devices, and is related to Moore's Law - issued in 1965, it owes its name to Gordon Moore (co-founder of Intel), he considers that the density of transistors on a chip doubles every 18 months - although it has lost its original effect with technological evolution. Then, it can be noted that true life is not always considered, because the so-called artificial obsolescence leads to consider an obsolete device even without it. Such obsolescence is also related to the guarantees for the equipment, as it is easier and cheaper to ensure that a device will work perfectly for a short period, even if its operation is possible for a longer time. (González, 2009)

The growing technological development, with its high offer of devices and services, together with the programmed obsolescence tactic, results in a high volume of technological garbage that sometimes does not have adequate treatment, and carries a serious ecological risk. If the programming of the products did not expire, there would be objects such as cars, cell phones, ovens, refrigerators that would last longer; but due to the end of life of the product cycle, they have to be discarded when any breakdown arises or they simply stop serving; Then comes the questioning: what about all that technology that stops working after a while? Where do all those electronic devices whose useful life is previously programmed go?

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It can be said that in most cases they go to waste and generate pollution and problems to the environment, so where is the issue of corporate social responsibility, and also why not mention that society contributes greatly to this problem As Ramírez (Ramírez, 2012) says, "... at the beginning of the 20th century with the Industrial Revolution and Mass Production, the mentality responsible for manufacturers and producers towards the environment was non-existent" ... also states that "... the deposition Electronic waste in landfills is highly harmful to health because electronic components contain many heavy metals, for example, Lead, Mercury, Gold, Silver, Arsenic, Bromine, Beryllium, Aluminum, Chrome among others "(p.15). Ideally, find a balance between what is consumed and discarded in order to improve the quality of life of both this generation and future generations. If you have a balance with the environment you are talking about sustainable development, on the other hand if the economy is also in equilibrium with the environment then it is a viable development; Hence the idea is to look for sustainability, both in what is consumed and discarded.

In 1987, the World Commission on Environment and Development, also known as the Brundtland Commission created by the United Nations Organization (UN) and led by the Swedish Gro Harlem Brundtland, used for the first time the concept called Sustained Development describing it as: a process of change whereby the exploitation of resources, the direction of investments, the orientation of technological progress and the modification of institutions become in line with present needs as well as future ones (UN, 1987) p. 24)

All this means that the development of the human being must be done in a manner compatible with the ecological processes that support the functioning of the biosphere. In other words, a sustainable product "is one that can meet the needs and aspirations of the present, without compromising the ability of future generations to meet their own needs and aspirations." (UN ,, 1987) p. 59) In this regard, the UN (UN, 1987) argues that a development process can be described as sustainable when it takes into account three fundamental aspects of human well-being: economic profitability, ecological integrity and social justice.

On the other hand, recycling technologies, for example, have increased the availability of certain resources, particularly metals, and decreased the time it takes for them to become available again after they have been originally used. This saves the need to extract, transport, benefit and refine the minerals required for the metal to be available first; It is also necessary to consider questions of fundamental ethics about the sustainability of a global structure when there are high degrees of international inequality. The interest in biodiversity, in its broadest sense, encompasses not only threatened flora and fauna, but also the survival of human communities. It is important to remember that a fundamental objective of social sustainability is equity, this implies the solution of poverty, the equitable distribution of the benefits of development, and the realization of dignity conditions for human life; Unfortunately, there are many vested interests that prevent it, from those of large companies to the same production schemes that characterize the world economy..

Methodology

In the words of Omar Antonio Vega "In response to technological obsolescence, some protocols and initiatives have appeared to take advantage of those wastes, through recycling and reuse. It is common, especially in the so-called info-poor countries, that many digital inclusion projects are carried out with second-hand, donated and repowered equipment." (Vega, 2012) p.2.

Derived from the above, the objective of this research is that the students of the Technological University of Puebla design and develop didactic material with obsolete resources of technological equipment such as computers, cell phones, televisions; that are useful, that comply with standards of safety, quality, social responsibility, sustainability, that guarantee the satisfaction and expectations of final customers. In order to solve the problem of planned obsolescence, during 2012 it is proposed that the students of the first four-month period of the Information and Communication Technologies division recycle computer products generating new life to the materials; This resulted in mainly ornate products such as Christmas trees, births, lamps and photo frames among others.

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The project was assigned in the subject of Sociocultural Training I because that is when students see the topic called “Sustainable Development”.

Figure 1 Design of decorative products

This activity continued to be presented in the following generations, but it was discovered that once the subject was approved, some of these products ended up in the trash contradicting the hypothesis of the extension of life of the materials. That is why by 2015 it is proposed that the theme focus more on the issue of double use of objects, that is, products of daily use. The students began to generate bags, earrings, backpacks, pet houses, etc. which solved the aspect of finding objects in university dumps.

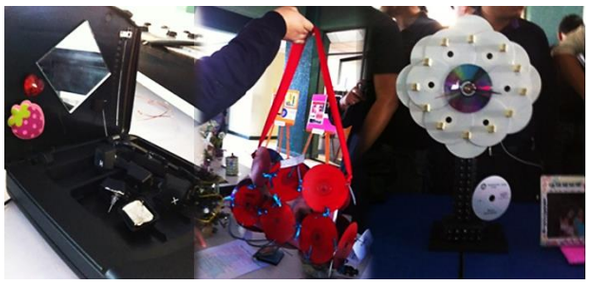

Figure 2 Life extension of computer materials

Subsequently, the question that arises is: how to use everything is technological garbage and generate social awareness in the new generations? How can education generate learning environments that help students to generate social awareness and care for the environment? Is it possible to generate quality teaching materials with technological waste that help the development of social sectors with low economic resources ?

Some experts such as Perkins and Biggs argue that learning is understood as: ensuring that the learner understands, not only that he knows a knowledge, but that he thinks from what he knows and acts flexibly in conditions different from the context where it originated. (Perkins, 1999-2003) For his part, Cesar Coll, C. (2008) mentions that "knowledge has become the most valuable commodity of all, and education and training on the roads to produce and acquire it." (Coll, 2008) Thanks to the incorporation of multimedia and internet technologies, knowledge has been allowed not only to be acquired in educational institutions but also to be mobilized by eliminating spatial and temporal barriers, making it possible in virtually any scenario (school, home, workplace, leisure spaces, etc.). This is how more people can access new resources and educational possibilities, so that learning is no longer seen solely as an instrument for the promotion of people's development, socialization and culture, but also becomes a fundamental engine of social and economic development.

Learning environments are perceived as the great set of factors involved in the process of acquiring knowledge, as Daniel Raichvarg states: “The environment derives from the interaction of man with the natural environment that surrounds him. It is an active conception that involves the human being and therefore the pedagogical actions in which those who learn are able to reflect on their own action and those of others, in relation to the environment” (Duarte D., 2003) This forces teachers to promote the environment that allows cognitive, social and emotional development that permeate in the application of knowledge in everyday life, taking into account: space, light, sound, images, distribution of places, empathy and interaction between the group and the group, educational content, recreational dynamics, communication and information management; the proper integration of all these elements make up the learning environment. It is not even necessary that those involved are in the same physical space because, thanks to technology, there are tools that generate these environments and both parties, teachers and students should have the same degree of importance in the interaction.

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The process of designing a didactic material requires good planning and a procedure. From this perspective, a decision-making process, taking as a reference the characteristics of the population to which it is intended, the context where it will be used, objectives, resources that are available, the learning contents that are intended to be developed as well as the supports that different resources or symbolic systems can offer to present and structure the information.

For the creation of didactic materials and learning environments generated with recycled products, the model of Didactic Materials Design proposed by Roldán N. (2010) is taken as a basis, which has already been used to model other materials such as the Didactic Package of Programming Logic (Roldan N. Lizardi V., 2008 (Roldan & Lizardi, 2017)), Propedical Study Technical Courses (Lizardi V, Roldán N, Bolaños R, 2016), material that is still in force and is a reference in the Division of Information and Communication Technologies of the Technological University of Puebla. By using this model, students not only leave the contribution of the recycling project but also add teaching materials that can be used at various educational levels in support of society.

It is worth mentioning that the design of these learning materials must also comply with certain standards or quality standards that allow trust in end users to be generated, in aspects such as safety, environmental protection, responsibility, ethics; This undoubtedly causes the growth of awareness about quality and social responsibility.

The development of these prototypes must also serve to improve learning environments, in order to understand more what environmental education refers to, six conceptions about it must be identified, according to Lucié Sauvé (1994, pp. 21-28) and then retakes Jackeline Duarte Duarte:

1. The environment as a problem, for the student to identify environmental problems, once they gain knowledge of research, evaluation and action of environmental issues.

2. The environment as a resource to manage, refers to being a resource the environment is depleted and degraded, so you must learn to manage it.

3. The environment as nature, should develop a high sensitivity towards nature and create awareness that we are part of it.

4. The environment as a biosphere, this implies the understanding of the different interrelated systems: physical, biological, economic, political.

5. The environment as a way of life, each of the spaces of man: school, family, work, leisure; To develop a feeling of belonging.

6. The community environment refers to a shared, supportive way of life. (Duarte, 2003)

Results

In an effort to raise social awareness and permeate in society, by 2018 this new approach is given to the project by asking students to generate support materials for learning environments, giving rise to teaching materials and others related to an educational institution. This gave double use to computer objects in addition to generating a benefit to society, coupled with this, students learned to create teaching products and gave them security to know that their products would support other generations.

Figure 3 Development of teaching materials and learning environments using technological waste components

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By 2019, the subject of Sociocultural Training I will have a more personal approach, that is, the adaptation of the individual to a globalized environment and they will only be asked for a life portfolio. On the other hand, for the subject of Sociocultural Training IV, its main objective is the generation of prototypes, which is why the recycling project is intended to be moved to this level; It is worth mentioning that in the thematic content of this subject students are more like creativity, innovation, idea generation, proof of concept and incubation. It is possible that with these topics, a better understanding on the part of the student is achieved for the improvement of their creativity and the approach so that they can provide quality learning materials to society, that help the environment, achieve a social responsibility and work ethic. Another advantage is that, by doing so in the fourth semester, students already have more competencies in the field of networks, electronics, programming, digital design and even the English language so it is feasible that in this semester they develop larger projects Difficulty level than those newly admitted to the race. At this stage, it is considered that in order to develop good quality teaching material that meets the standards of use, duration, aesthetics and price, the student must also follow a process for its elaboration; That is why, according to the ISO 9001: 2015 Standard, Quality Management System, which "promotes the adoption of a process-based approach, by developing, implementing and improving the effectiveness of a management system quality, to increase customer satisfaction ", indicates that certain requirements must be met, for this in section 1.3 called Process Based Approach, consider the following aspects:

1. Understanding and consistency in meeting the requirements.

2. The consideration of processes in terms of added value.

3. The achievement of effective process performance.

4. The continuous improvement of processes based on the evaluation of data and information. (ENLACE S.C., 2019)

This standard proposes the following schematic representation considered for any process showing the interaction of its elements.

Monitoring and measurement control points are specific to each process and may vary depending on the related risks.

Figure 4 Schematic representation of the elements of a process / ISO 9001: 2015 Standard, Quality Management System

If this technique is followed, it is possible to implement and maintain a design and development process that is adequate to ensure the subsequent production of materials, that is what the norm tells us about organizations. In the case of this study, students can resume the process that would be useful as a guide for the design and development of their products. For the planning of your design, you must follow a series of aspects that the standard mentions and that it is important to consider:

1. The nature, duration and complexity of the design and development activities.

2. The required process stages, including revisions of the applicable design and development.

3. The required verification and validation activities of the design and development.

4. The responsibilities and authorities involved in the design and development process.

5. The needs of internal and external resources for the design and development of products and services.

6. The need to control the interfaces between the people involved in the design and development process.

7. The need for the active participation of the members and the teacher in the design and development process.

8. The level of control of the design and development process expected by the teacher.

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9. Documented information necessary to demonstrate that the design requirements have been met. (ENLACE S.C., 2019)

In a second stage, students should consider that the development of their project includes:

1. Functional and performance requirements.

2. Information from similar previous design and development activities.

3. The potential consequences of failure due to the nature of the products.

4. Entries must be suitable for design and development purposes, be complete and unambiguous.

5. This entire process must be preserved and documented.

Finally, the standard tells us that customers' perceptions of the degree to which their needs and expectations are met must be monitored. The academy must determine the methods to obtain, monitor and review this information, which will determine whether the projects fulfilled the function of life extension as well as the impact on learning environments. Customer perception may include surveys, congratulations, meetings and interviews to get your feedback on the products delivered.

If you want to develop quality products, quality standards must be applicable to all types of organizations. Its objective is to increase the organization's awareness of its tasks and its commitment to meet the needs and expectations of users and their stakeholders.

At the Technological University of Puebla, the importance of having educational materials that allow the knowledge, skills and experiences that have and that can be shaped through educational materials to be used as support in training processes and autonomous learning has been raised. If students extend the life of computer products by developing educational materials, they would achieve a double function, the generation of products and awareness of the impact on society.

The proposal is that through the students of the technological universities they generate educational materials, for institutions where we detect greater lack of these educational resources; measure these contributions to know what the opinions are and the impact regarding the training and learning of the knowledge for which they were elaborated. On the other hand, the technique to be used is structured observation, it facilitates observing phenomena systematically and using techniques, processes and development models that allow measuring and organizing information (processes, rubrics, checklists or evidence portfolio).

References

Batista de Andrade, V. (2007). *Estética da Mercadoria e Obsolescência: umestudo da induçãoao consumo no capitalismo atual.* Araraquara, Brasil: Universidade Estadual Paulista (Dissertação de MestradoemSociologia).

Coll, C. (2008). Aprender y enseñar con las TIC: expectativas, realidad y potencialidades. *Boletín de la Institución Libre de Enseñanza,* 17-40.

Duarte D., J. (2003). AMBIENTES DE APRENDIZAJE: UNA APROXIMACION CONCEPTUAL. *Estudios Pedagógicos [en linea].*, (29), 97-113. Recuperado el 10 de 09 de 2019, de http://www.redalyc.org/articulo.oa?id=17351413000

Duarte, J. (2003). AMBIENTES DE APRENDIZAJE UNA APROXIMACIÓN CONCEPTUAL. *Revista Iberoamericana de Educación*(ISSN: 1681-5653), 2. Recuperado el 10 de 09 de 2019, de https://rieoei.org/historico/deloslectores/524Duarte.PDF

ENLACE S.C. (2019). *enlacewtc.com*. (T. W. México, Editor) Recuperado el 10 de 09 de 2019, de http://enlacewtc.com/index.php/material-de-apoyo/norma-iso-9001-2015

González, G. j. (30 de junio de 2009). *¿Cuándo comprar? Los tiempos de obsolescencia en electrónica e informática*. Recuperado el 1 de agosto de 2019, de http://www.terra.es/tecnologia/articulo/html/tec21333.htm

ISSN-On line: 2524-2067

ONU,. (1987). *DESARROLLO Y COOPERACION ECONOMICA INTERNACIONA: MEDIO AMBIENTE.* ONU, Naciones Unidas. Oslo: Comisión Brundlandt. Obtenido de http://www.ecominga.uqam.ca/PDF/BIBLIOGRAPHIE/GUIDE_LECTURE_1/CMMAD-Informe-Comision-Brundtland-sobre-Medio-Ambiente-Desarrollo.pdf

Perkins, D. S. (1999-2003). *La enseñanza para la Comprensión Vinculación entre la investigación y la práctica.* Argentina: Paidós Buenos Aires.

Ramírez, P. D. (24 de 09 de 2012). Obsolescencia Tecnológica Programada. 2Un artículo que no se desgasta es una tragedia para los negocios". 20. Recuperado el 28 de 08 de 2019, de https://studylib.es/doc/6759683/obsolescencia-tecnológica-programada

Roldan, N., & Lizardi, V. (2017). *Materiales didácticos.* Puebla: Universidad Tecnologica de Puebla.

Vega, O. A. (21 de Enero-Junio de 2012). Efectos colaterales de la obsolescencia tecnológica. *Redalyc*, 9. Recuperado el 1 de abril de 2019, de Facultad de Ingeniería [en linea]: www.redalyc.org/articulo.oa?id=413940771005 > ISSN 0121-1129.

ISSN-On line: 2524-2067