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PLANNED OBSOLESCENCE – ROADWAY TO INCREASING E-WASTE IN INDIAN GOVERNMENT SECTOR

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Abstract - **Today, there is a pressing need for the Indian electronics industry to persistently track and unravel the complexities of the global supply chain, which is now being reshaped by a gamut of environmental compliance norms that have come into force. Without an actionable 'India Strategy' relying on a set of appropriately benchmarked environment management policies and implementation programmes, the competitiveness and growth of the electronics and information technology (IT) industry are bound to be hamstrung. It is, therefore, absolutely essential for companies to develop robust practices to avoid high non-compliance costs. Action in the global market place for cleaner technology processes and recycling programmes has already gathered significant momentum.**

This thesis makes an attempt to re-discover the path of planned obsolescence resulting in the generation of e-waste in the Indian Government sector and the proposed actions towards control of growth of e-waste.

Key Words : **E-Waste (Electronic Waste), BER (Beyond Economical Repairs), MSW (Municipal Solid Waste), DGS&D RC (Director General of Supply and Disposal Rate Contract, WEEE (Waste Electrical and Electronic Equipment), End Of Life, Survey.**

I. INTRODUCTION

Recent statistics indicate that the total annual global volume of WEEE – also referred to as e-waste – is soon expected to reach 40 million metric tons (UNU, 2007). In parallel, there is a dropping lifespan of electronic and electrical products, high consumerism of these products, low recycling rates and illegal transboundary movement from developed to developing countries (Puckett et al., 2002; Brigden et al., 2005; Deutsche Umwelthilfe, 2007; Cobbing, 2008). The number of electronic devices used per capita at the global scale will continue to increase, while their size will further decrease and microprocessors will invade more and more everyday objects (Hilty et al., 2004; Hilty, 2005, 2008). All these facts have triggered the disposal of electronic goods in a planned obsolescence manner and an increasing scientific and political interest for how to safely dispose off and recycle WEEE and solutions have been proposed from the perspective of new industrial product designs, manufacturing and recycling philosophies (e.g. the extended producer responsibility, EPR and various other green procurement policies).

The automotive industry took a lot of rack in the 1970s for a perceived practice called planned obsolescence. Detractors of the industry claimed that automakers intentionally designed and built models that would rust or suffer critical mechanical breakdowns after five or six years, thus ensuring another sale within a few years.

Perhaps only a conspiracy theorist would accuse software makers of borrowing this tactic from Detroit, but certainly the constant upgrades of computer programs have helped bolster the revenue of software companies. And to their credit or discredit, depending on one's point of view--they sped up the obsolescence cycle by introducing upgrades every two or three years. In many cases, upgraded hardware with additional memory was required along with the software upgrade. For computer equipments, the first part of the pattern is largely in place. Markets have mushroomed for re-usable equipment, chips, power units and some other components. Unfortunately, much of what remains has traditionally been sent to the landfill. Several considerations may be bringing about a change in what happens to computer equipment when it reaches the end of its useful life. Environmentalists are concerned about the disposal of computers in landfills. Similarly, troubling questions concerning environmentally safe and sound practices overseas have been raised about the once lucrative export market [1].

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II. E-WASTE DEFINITION AND ITS GENERATION BY THE INDIAN GOVERNMENT SECTOR

Ours is a country which invests very little in primary education and very little in primary health care. Majority of people of our motherland are not even aware of the harm that e-waste can cause to us and many taking advantage of lax laws in our country and government regulations make an easy buck out of it.

The term e-waste comprises of obsolete computers, mobile phones and such other electronics that have reached their EOL and are of no material value to the original/end user. The end users thus discard these as scrap and these thus find their way as part of MSW stream or in the attics at homes or workplaces due to the sentimental value attached with these electronics. It is to be borne in mind that about 8-9 % of MSW in our country comprises of e-waste and this figure is constantly growing. We all are so pervasive and dependent upon electronics that it has become the status symbol when we own electronic devices that have the latest features. The rapid technology change, low initial cost, high obsolescence rate have resulted in a fast growing problem of discard of electronics around the globe. Presently India generates about 3,50,000 Tons of e-waste annually which is the figure that is available from the records that are documented. Also, it is anticipated that about 5 lakhs tons (plus) of e-waste enters our country through the informal means under the guise of charity/donations etc. The starting point for generation of e-waste in the Indian Government sector is the Government rules themselves. Presently, India has no strict/stringent and tough rule/law regarding transportation, disposal and transboundary movement of e-waste, and in the bargain many people have taken advantage of the same. The same is supported by the golden triangle of e-waste hierarchy in Indian Government context which is depicted at Figure 'A'. The same is evident form the fact upon tracking the life cycle of e-waste from cradle to grave. This thesis for the sake of understanding has considered the life cycle of PC as is envisaged below at a Government organization right from the time of its birth (inception into service) to its EOL [2] :

(a) Central procurement of the PC by the stores/warehousing department.

(b) Upon living its life until 05 years, the same is 'surveyed' and book keeping of the same is done by 'writing it' off the Government ledger. By this is meant that the PC is first declared BER by a group of 03 personnel, its HDD crushed using crude and rudimentary methods and the same disposed off as part of MSW.

(c) E-Auction of this electronic waste is carried out to the registered vendors registered with the Government and the stock disposed off to the highest bidder. Extensive survey at the Government offices at the southern states of India by the author reveal that these scrap are sold at a price of Rs 80-100/Kg for CPUs, Rs 250 for monitors etc. However, the smaller devices such as keyboard, mouse, printers are taken for free. The highest bidder either resells it to a metal extractor or sentences the same by recovering the valuable/rare metals and disposing off the rest as part of MSW.

When any EOL PC is either a historical or an orphan waste, the same is stored in attics and never disposed off as then the disposal of the same becomes a nightmare to the Government department as no record of the source of procurement or any other such records exists with the owner.

All the above thus results in the generation of e-waste and thus the same has thus resulted in the massive amount of e-waste generated by the Government sector. Estimation of the correct figure of e-waste generated in Government sector by the author has proved futile in view of the fear of disclosure by the government offices.

III. THE ILL SIDE OF PLANNED OBSOLESCENCE - WEEE RECYCLING

The discard of electronics in the Government sector follows a planned route wherein after the entry of electronics into its service life, it lives a useful pre-defined life and at its EOL it is sentenced by the user department / organisation. With such planned obsolescence come a huge stockpile of e-waste and the emissions from the recycling of this poses to be a great challenge for mankind. WEEE recycling in developing countries is a daisy chain of processes which are carried out in the informal economy. Such informal economies can constitute a considerable amount of the gross national product (GNP) of developing or transitional countries (Schneider and Enste, 2003). The activities of WEEE recycling in the informal sector are carried out by a range of legal, unregistered and publicly accepted businesses who give little concern to illegal and clandestinely executed processes which have consequences of great concern to the environment and human health.

The businesses collect, sort and manually separate electrical and electronic equipment. The processes involve applying crude methods to segregate substances or material of interest from their original location within the electrical/electronic equipments. The same is supported by the figure depicting the stages of value of EEE which is shown at Figure 'B'. Numerous studies have described various WEEE recycling techniques. These techniques include open burning printed circuit boards (CBs) and cables (Steiner, 2004; Brigden et al., 2005;Gullett et al., 2007;Wong et al., 2007c), burning of CBs for component separation or for solder recovery (Brigden et al., 2005; Wong et al., 2007c), toner sweeping, plastic chipping and melting, burning wires to recover copper, heating and acid leaching of CBs (Hicks et al., 2005; Leung et al., 2006), gold recovery from CBs with cyanide salt leaching or nitric acid and mercury amalgamation (Keller, 2006; Torre et al., 2006; Rochat et al., 2007), and manual dismantling of cathode ray tubes and open burning of plastics (Puckett et al., 2005; Jain and Sareen, 2006). The three main groups of substances released during recycling can be identified as thus: (i) original substances, which are constituents of electrical and electronic equipment; (ii) auxiliary substances, used in recycling techniques; and (iii) by-products, formed by the transformation of primary constituents. These substances can be found within the following type of emissions or outputs:

(a) Leachates from dumping activities.
(b) Particulate matter (coarse and fine particles) from dismantling activities.
(c) Fly and bottom ashes from burning activities.
(d) Fumes from mercury amalgamate "cooking", desoldering, and other burning activities.
(e) Wastewater from dismantling and shredding facilities.
(f) Effluents from cyanide leaching, other leaching activities or mercury amalgamation.

Dumped materials containing heavy metals and brominated and chlorinated flame retardants can affect soils. The mobility of these substances towards other environmental compartments depends on diverse environmental parameters such as pH, organic matter content, temperature, adsorption–desorption processes, complexation, uptake by biota, degradation processes, and the intrinsic chemical characteristics of the substance (Sauvé et al., 2000;Georgopoulos et al., 2001; Hu, 2002; Gouin and Harner, 2003; Qin et al., 2004). Ionic and occasionally, methylated heavy metals, are particularly mobile and bioavailable (Dopp et al., 2004; Hirner, 2006). Lower brominated congeners of flame retardants such as PBDEs are also particularly mobile while higher brominated congeners tend to bond to particles and exhibit lipophilic properties (Gouin and Harner, 2003). Heavy metals not recovered during WEEE treatment and residual auxiliary substances like mercury and cyanide can leach through the soil after disposal of effluents and form inorganic and organic complexes within soils. These effluents can also enter water bodies and the subsequent fate of original and auxiliary substances will depend on the processes described above as well as scavenging processes (between aqueous phase and sediments) and volatilization [Figure 'A' and 'B'].

Dismantling activities also release dust particles loaded with heavy metals and flame retardants into the atmosphere. These particles either re-deposit (wet or dry deposition) near the emission source or can be transported over long distances depending on their size. In addition, dust directly incorporated in wastewater can enter the soil or water systems and together with compounds found in wet and dry depositions, can leach into groundwater or react with the biota. The environmental fate of particles, ashes and fumes containing heavy metals and PBDEs released by burning activities is similar to that of the emissions released by dismantling activities. However, the thermal or inadequate metallurgical treatment of WEEE can lead to the formation of extremely hazardous byproducts such as polyhalogenated dioxins and furans. They are among the most hazardous anthropogenic pollutants (Allsopp et al., 2001; Tohka and Lehto, 2005) and one of their most important formation pathways is the burning of plastic products containing flame retardants and PVC (USEPA, 1997). As copper (Cu) is a catalyst for dioxin formation, Cu electrical wiring coated with chlorine containing PVC plastic contributes to the formation of dioxins (Kobylecki et al., 2001; Gullett et al., 1992). Chlorinated and brominated dioxins and furans (PCDD/Fs and PBDD/Fs), and mixed halogenated compounds like the polybrominated– chlorinated dibenzo-p-dioxins (PBCDDs) and polybrominated–chlorinated dibenzofurans (PBCDFs) can be formed during WEEE burning (Söderström, 2003). Once emitted into the atmosphere, dioxins and furans are dispersed into the environment, and because of their semi-volatile and hydrophobic properties, they tend to accumulate in organic rich media (Adriaens et al., 1995; Smith and Jones, 2000). Higher brominated or chlorinated congeners degrade more slowly and tend to partition more into lipids (Webster and Mackay, 2007). They often deposit near the sources of emission while the lower halogenated compounds are typically transported over longer distances. In the atmosphere, dioxin and furans are subject to photodegradation and hydroxylation (Watterson, 1999).

IV. CONSUMER USAGE PROFILE IN GOVERNMENT SERVICE

Advent of new companies, constant change in the price structure, and leap in manufacturing capacity, affect the profitability & margins of the companies drastically. Manufacturers have got to shed focus on distinction of the products not only in terms of packaging but also considering look & technology. This can stand the veritable & genuine products out from the generic & shoddy products. Easy access to internet information and presence of extensive array of choices have made the consumers smarter, they want to own a quality product at low rate, leading to the fierce competition. The same has thus led to various Government offices purchasing electronics of the desired configuration at the lowest rate offered by the manufacturer which is in cognizance with the Government purchase policy. Also an all-out effort is made in the direction of providing electronics with the best and latest configuration to all in the Government service.

In making product retirement decisions in the Indian Government scenario, consumers consider many issues, including convenience and product functionality [3,4]. As such, there is a high variability in the timing of end-of-life decisions, which influences the age distribution and the quality of returned products [3,4]. Since product age and quality directly influence value of a product on the resale market [5,6,7], they are included in the model. Data were collected about the retirement ages of the IT products in various Indian Governmental offices [3,4] across the country. Age distributions were shown to be best characterized using the gamma distribution whose shape and scale parameters can be altered to reflect differences in collection stream characteristics. The gamma distribution herein can be best described to be of the form :

$f(x,k,\Theta) = x^{k-1} e^{-x/\Theta} / \Gamma(k)$
Θ^{k} for $x > 0$; $k, \Theta > 0$

Here x = random variable (here, age), k = shape parameter, and θ = scale parameter. Age distributions of retirement that occurs after a product's first service life were used to characterize end of lease retirements [3,8]. The means of the distributions were shifted older to represent asset recovery returns. Retirements that occur after a product's second service life were used to characterize municipal pick-up retirements [9]. The means of the distributions were shifted slightly younger to represent retail take-back returns. On a relative scale, the distributional means (in years of age) of the aforementioned collection modes can be represented as:

μEnd-of-Lease < μAsset Recovery < μRetail Take-back < μMunicipal Pick-up.

No quantitative data exist on the relationship between continued functionality of a product and its age, but industry experts anecdotally correlate the two. Thus, it was assumed that in the case of Indian Government service that functionality drops linearly with age. For example, the probability that a one-year-old product is still functional is assumed to be 0.90; for a five-year-old product it is 0.45.

V. HOW TO DEAL WITH PLANNED OBSOLECENSE IN INDIAN GOVERNMENT SECTOR

It's really hard to buy a safe, durable and easy to dispose and more so all coupled with this, an electronic loaded with the latest features because they just don't exist. But the good side of this is that many computer and electronic companies are slowly moving in a better direction. So far, the efforts have focused more on reducing toxic chemicals in their products than making them longer lasting, but it's a start. Post extensive field work, the author has chalked down a few of the methods to deal with planned obsolescence in the Indian Government sector :

(a) Don't replace electronic gadgets unless you really need to. A big percentage of the PC's and other electronic gadget that we toss out in the Government service are still working — so resist replacement and instead opt for reuse [10].

(b) Resist the urge to upgrade unless your current device really won't work anymore. And, we as sons of this motherland can help the country in setup of self-propelled groups such as the *Electronics Take Back Coalition* to help pressure companies to make their products safe and long lasting. And finally, when you do toss out an electronic, be sure to give it to a Government authorized e-waste recycler so you know it won't end up poisoning someone else.

(c) In view of all electronic products purchased by the Government falling under the purview of DGS&D RC, the firms/manufacturers/OEM listed under DGS&D RC need to be pressurized to follow the EPR by way of firms/ manufacturers taking back their electronic products at their EOL. This will ensure that the e-waste generated by the Government sector is contained and effective steps can be taken by the Government towards disposal of the same.

(d) Resort to the purchase of green electronics which will ensure that there is no environment degradation.

(e) Ensure that there is no preset lifespan for electronics before they are sentenced to EOL.

VI. THE ROAD WAY AHEAD

From available data, it can be seen that the Indian Government sector alongwith the private and public sector industries generate about 70 % of e-waste in this country. Since these three being the major players in the generation of e-waste in our country, the control of generation of e-waste by these three major players can ensure that the e-waste generated is regulated.

The various approaches suggested by the author towards control of e-waste but not limited to, include:

(a) Include all the producers of electronics which include the following, as part of a road team of e-waste players by the creation of a Free society on Reduction of E-wastE (FREE) so as to curb/control the growth of e-waste. This society needs to include the following players so as to achieve a zero e-waste society :

- (i) Consumers
- (ii) Traders, brokers, retailers, logistics and treatment
- (iii) Companies, re-use centres and recyclers
- (iv) Compliance schemes
- (v) National and sub-national authorities
- (vi) Municipalities
- (vii) NGOs

Set a mission for the FREE society which should include:

- (i) Sharing of experiences and lessons learnt of management of e-waste.
- (ii) Develop newer and newer e-waste management tools.
- (iii) Set ambitious standards.
- (iv) Work in close liaison with the GoI (MoEF) towards achievement of zero e-waste society.
- (v) Set a label of excellence i.e set high standards and work towards achievement of the same.
- (vi) Aim for the WEEE standards to be amalgamated with the ISO 14001 standards.

(b) In view of majority of our products/services being internet enabled and since the common man in India wants himself to be associated with the IT age and considers it as the need of the hour, we need to also consider the management of e-waste in an internet enabled manner. All electronic products need to be tagged with RFID (Radio Frequency Identification Device) code so that they are easily tracked from cradle to grave and the same will thus ensure that they are sentenced in an ESM at their EOL. The same can be thus propelled by the set up of i-WEEE groups at all levels right from the rag picker to the Government through the generators of e-waste.

(c) The Government needs to pitch in and bear 50 per cent of Capex for e-waste recycling facilities on public private partnership (PPP) mode. Although, the same has taken shape by the MoEF with support from Industry which needs to take a practical and pragmatic approach for effective implementation of the upcoming e-waste policy, the same needs to be taken seriously with the Government in cracking down heavily on the informal e-waste players [11].

VII. CONCLUSIONS

India with the second largest country in the world being in terms of population and with the generation of e-waste surmounting to unimaginable standards and with tons and tons of e-waste pouring in every other day into our country, the need of the hour is to tackle it in a tough, firm and diligent manner.

Although there are reports that indicate that the winners at the 2010 Vancouver Winter Olympics would be adorning medals that contain gold, silver and copper recovered from e-waste [12]. We also need to infer from this and take advantage of the presence of rare and valuable metals in e-waste and draw out lessons accordingly. The Cabinet Committee on Economic Affairs (GoI) has although cleared Rs.3.5 billion project to clean up hazardous waste/municipal solid waste dump sites in Andhra Pradesh and West Bengal on pilot basis, much more needs to be done so as to tackle the growing menace of e-waste [13].

At the grass root level although various steps are being taken by the Indian Government, the Indian Government also needs to pitch in by reducing the generation of e-waste. A first step which the author feels that can be taken is by reducing the principle of planned obsolescence and in using electronics beyond their pre defined life by following the 3R principle of reduce, reuse and recycle/repair of electronics till they cease to function, which could be first implemented in the Government services.

The author will thus sum it up be appealing to all that "Arise, Awake and Stop Not Till The Goal is Reached" in curbing the growth of e-waste and sentencing them in an ESM [14].

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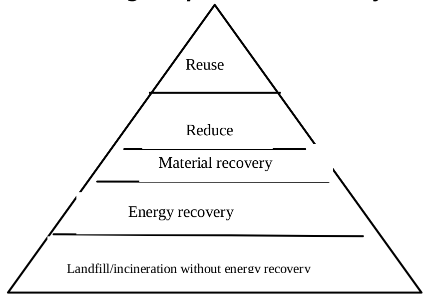
[14] Source : Author

Figure 'A'

The Golden Triangle Of Waste Hierarchy In Indian



Context

The Waste Hierarchy

Figure 'B'

Stages Of Value Of EEE