

Self-Powered Sustainable Model of E-Waste Management with CSR Initiative for Manufacturers and Business Consumers for Socio-economic Upliftment in Pune (India)

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Abstract— Organised and Unorganised sectors are rampantly growing with current market dynamics .Green Economy is new dimension opening encouraging focus on sustainable models .With convergence of technology , optimization and effectiveness have become important parameters associated with corporate assets in domains of Infrastructure , Hardware and human resources . Computer manufacturing and consumers s are looking for strategies to offset rising costs and to use technology in ways that reduce their environmental impact.

The article studies the current practices in Pune region of India and suggests innovative solutions that would reduce their operative bills and “green” their practices and gives long term sustainability and socio-economic elevation with Ewaste disposal practices . It also provides insight on opportunities in unorganised sector

I. INTRODUCTION

Green IT is the discipline of using computing resources in ways that help reduce energy and operating costs, enabling sustainable business practices and reduce the environmental impact of IT practices in the larger community. There is inherent essence to create betterment in the socio-economic and biological environment we exist.

The main issues driving Green IT revolution are as follows [1] :

- Rising energy demand with a challenge in supply and increasing utility costs
 - Management of E-waste and disposal (e-waste)
 - Increasing petrol costs, which drive up employee commuting costs leading to retention issues.
 - Increasing real estate costs

- Visa limitations and Rising airline ticket costs and travel complexities
- A stronger regulatory climate at the federal, state and local levels

Electronic industry is the world’s largest and fastest growing manufacturing industry. E-waste is a popular, informal name for electronic products nearing the end of their "useful life." In large IT Organizations the PC’s, Monitors, Keyboard, CPU and laptops are discarded or churned for various reasons. The ' useful life ' of the computer hardware and peripherals are usually dependents on following:

1. The performance of the machine
2. Requirement per special project for higher ended computers and specific model, leading to lay-off of existing hardware .
3. Corporate Policy to discontinue the certain model
4. Malfunction and breakdown of hardware.
5. After completing 3-5 years of workable life.

E-waste is a global concern because of the nature of production and disposal of waste in the world. Although it is difficult to quantify global e-waste amounts, we do know that large amounts are ending up in places where processing occurs at a very rudimentary level. This raises concern about resource efficiency and also the immediate concerns of the dangers to humans and the environment.

Unfortunately, India does not have structured and stringent e-waste disposal mechanism which has led to the mushrooming of unorganised sectors for harvesting the massive e waste being generated in India which has its associated severe health hazards.

Currently the Computer E-Waste coming out of the corporate houses is given to recyclers, dismantlers, scraps dealers or stocked in warehouse for further use of electronic components in the hardware.

The article studies the Green IT awareness with E-waste generation from segments of the Industry small to big organizations, and create a new Business model which would create win-win for the Business, society and the country.



Fig 1 : Ewaste burned in Landfills[3][1]

II. OBJECTIVE OF THE STUDY.

1. Study the current Green IT practices in business houses, manufacturing units and educational institutes in Pune.
2. The Research also covers the current policies and practices for Computer discards in companies in Pune.
3. Convergence of Purpose of Green IT and CSR to create cohesive win-win model
4. The research provides a strong model which creates immense prospects to be adopted by the Government, NGO's, business owners

and consumers which would track the CSR investments and the Ewaste Life Cycle at city, state and national level.

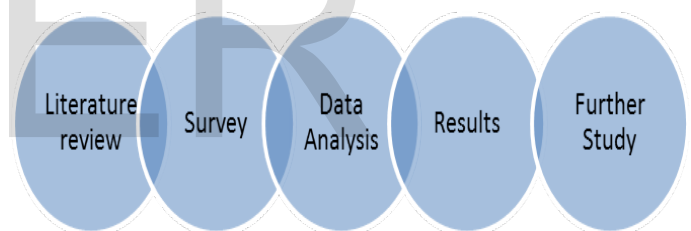
5. The branded PC's are accounted under law via EPR (Extended Producer Responsibility) for E-waste management, however for Assembled PC the regulations have not been distinctly laid out, which leaves gap There is lack of awareness on Ewaste management techniques within the Assembled PC sector. No formal process for disposal.
6. The Research also covers the study on Work hours and environment provided to employees in this sector based on the size of the company.

III. HYPOTHESIS

1. There exists relationship between the size of company and Green IT implementation in enterprise domain in Pune region.
2. Ewaste is scientifically disposed in Pune Region.

IV. METHODOLOGY

The constructive research was carried out which encompassed 5 phases. [Ref IOSR Zeenat Aam, Dr Amol Goje[1]]



Study was performed on 100 companies in Pune Region in Maharashtra, India in interval Mar-2013 to Oct-2014. [3]. The data gathering was done via face to face interview, Questionnaire emailed and Telephonic interview.

V. LIMITATIONS OF THE STUDY

1. Green IT awareness is very limited among business houses, also aspects of Ewaste is treated as a very sensitive issue, which made it difficult for us to acquire detailed information about the ways of e-waste disposal.
2. Questions related to comprehensive details on Green IT practices went unanswered during interviews.

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	48.714a	12	.000
Likelihood Ratio	60.885	12	.000
Linear-by-Linear Association	12.609	1	.000
N of Valid Cases	101		

Symmetric Measures

	Value	Asymp. Std. Error	Approx. T Value	Asymp. Sig. (2-sided)
Nominal by Nominal Phi	.694			
Nominal by Nominal Cramer's V	.401			
Interval by Interval Pearson's R	-.355	.080	-3.779	
Ordinal by Ordinal Spearman Correlation	-.344	.083	-3.650	
N of Valid Cases	101			

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.
- c. Based on normal approximation.
- a. 12 cells (60.0%) have expected count less than 5. The minimum expected count is .95.

Table 1: Chi Square test

3. In most places, permission to take photographs and the entry into the yards was denied.

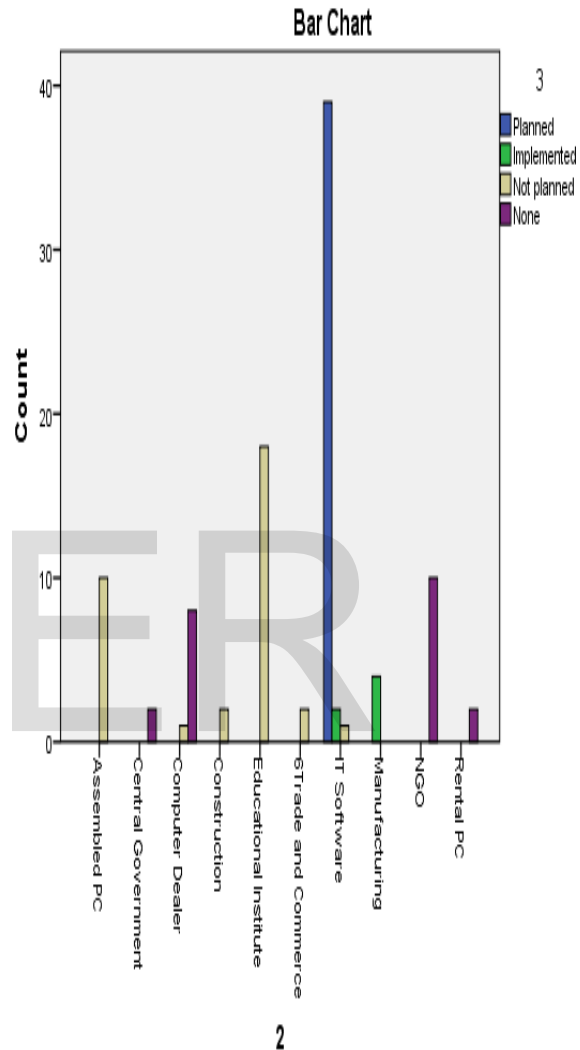
Disclosing the real identity and the real purpose of the study discouraged the subjects to provide information. So we had to devise innovative ways to engage in Conversations in order to obtain information.

VI. HYPOTHESIS TESTING

Hypothesis 1: *There exists relationship between the size of company and Green IT implementation in enterprise*

Survey was carried out in Pune between 29-Jun-2014 to 10-Nov-2014. 101 companies of small -medium and large sizes belonging to domains - IT Software development & services, Financial banks, manufacturing units, Educational institutes, Defense Forces, Assembler PC manufacturers and construction companies were enquired on their Green IT status.

Fig 1 Domains wise distribution and Green IT implementation status.



Chi Square test was applied to test the association and degree of significance between the 2 variables Size of the company and Green IT implemented status

Alpha <0.05 for 95% level of Confidence.

		Disposal					
	Dis ma ntle r	Rec ycle r	NG O	Scrap Deale r	Wareh ouse	Thro wn	
%	28	13	2	33	10	13	Total 100

The P- Value from the test shows 0.000, which shows a strong association between the Size of the company and the Green IT status of Organization.

Cramer's V correlation varies between 0 and 1, value close to 0 means that there is very little association between the variables. A Cramer's V of close to 1 indicates a very strong association. Cramer's V as 0.372 represents moderate relationship between the variables number of employees in the company and the Green IT status. Therefore null Hypothesis is rejected.

Controlling cost is the strongest factor driving Green IT initiatives in world. Under the cost-savings umbrella, four main benefits rise to the top: decreased electricity use, decreased consumables use, decreased future operational expenses or investments and realizing credits or rebates from local utilities and governments. Two additional benefits were also cited as key considerations by many businesses: the ability to better meet customers' demands and increased features and functionality for the business.

2. Hypothesis 2: Ewaste is scientifically disposed in Pune Region.

The survey conducted on 101 organizations across domains from Assembled PC, Central Govt , computer Dealers and Rental PC , Construction companies , Educational Institutes , Trade and Commerce , IT Software and , Manufacturing , NGO and Rental PC .

The respondents were asked on the E-waste techniques they used for disposal. Their statistics gathered shows following percentage.

Table 2 : Percentage Of disposal methods in Pune

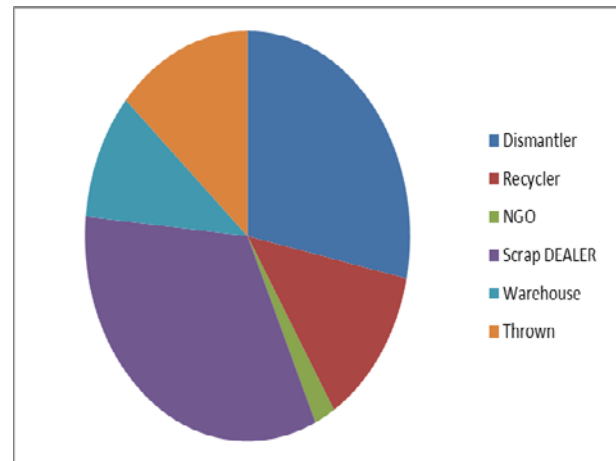


Fig 2: E-waste Disposal Statistics in Pune region

The study shows that 74% of the Ewaste generated from the companies does not pass through the organized -scientific method of disposals . Distribution shows 28% is sold to Dismantler and 33% to scrap dealers who purchase at higher rates as compared to recycler. 13 % of the companies confirmed to dispose to the Recyclers.

Amount donated to schools and NGO's constitute 2%. Rest 13% is non -usable and kept for in-house in warehouse, 10% is discarded and thrown into landfills.

The disposal by throwing away the equipment's are small, and are mainly coming out of unorganized computer manufacturers and NGO's after the second hand HW and components are no more use;

The proportion disposed to Scrap dealers and Dismantler is huge; Dismantlers break down the equipment's and separate the useful and wasteful materials. The useful material like - copper, lead, iron, gold, silver and aluminum is extracted and resold to the raw material vendors. Rest of the residual material like mercury, polyvinyl, carbon etc hazardous material is disposed to landfills. There are 3 Recyclers and 19 Dismantlers registered under MPCB (Maharashtra Pollution Control Board).

Hypothesis 3: The E-waste generated is not tracked and formally disposed by the Assembled PC manufacturers.

E-waste Disposal options and the proportion user by companies based on their size is shared in below table. Most popular options was E-waste created while making computers, is collected over a period of 6 to 8 months in the firm's premises /warehouse. They are sold to scrap dealers or thrown along with the garbage as Solid Waste.

		E-waste		Total	
		Scrap Dealer	Thrown		
Num_emp	<10	Count	6	4	10
		Expected Count	9.1	.9	10.0
	<20	Count	17	0	17
		Expected Count	15.5	1.5	17.0
	<30	Count	14	0	14
		Expected Count	12.7	1.3	14.0
	<40	Count	2	0	2
		Expected Count	1.8	.2	2.0
	<50	Count	1	0	1
		Expected Count	.9	.1	1.0
Total	Count	40	4	44	
	Expected Count	40.0	4.0	44.0	

Table 3: Num_emp * E-waste Crosstabulation

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.960 ^a	4	.005
Likelihood Ratio	13.348	4	.010
Linear-by-Linear Association	7.729	1	.005
N of Valid Cases	44		

a. 7 cells (70.0%) have expected count less than 5. The minimum expected count is .09.

Table 4: Chi-Square Tests

P Value is 0.005, it is less than 0.05, which is 95% confidence level.

		Value	Approx. Sig.
Nominal by Nominal	Phi	.583	.005
	Cramer's V	.583	.005
N of Valid Cases		44	
a. Not assuming the null hypothesis.			
b. Using the asymptotic standard error assuming the null hypothesis.			

Table 5: Cramer's V value

Cramer's V correlation varies between 0 and 1. A Cramer's V of close to 1 indicates a very strong association. The value 0.25 or higher gives very strong relationship between the variable. This validates the hypothesis.

VII. CONCLUSION

1. Green IT is a global initiative for realizing substantial energy savings within the IT sector. Innovative use of IT for the reduction of CO2 emission and creating new business opportunities.

2. The survey demonstrates that 8% of the Companies have Green IT practices implemented, 37% plan to have it implemented in 1 year and 42% of Organizations have not planned for Green practices implementation yet.

India is the world's fourth largest energy consumer. Its energy needs continue to increase, but national energy shortages and an inadequate energy infrastructure could perpetuate national energy poverty.

In India Coal production remains key to energy mix, India is fourth largest consumer of oil and petroleum in the world, India relies on the imports to meet growing demand of gas.

Demand is outpacing supply in meeting the rapidly growing electricity needs of the country. Electricity shortages have resulted in loss of profits for many companies, loss in productivity as plants and businesses have been forced to shut down for a few days a month or slow down manufacturing, and added operational costs as some businesses have been

forced to pay for power back up units. Access to energy is a tremendous problem in India and major inequalities of access plague the subcontinent. [1]. Hence it is extremely important that Energy saving practices are propagated via Education and Government regulations.

3. The 74% of the E-waste produced from the Organization is disposed via unorganized methods comprising Dismantler, scrap dealers, kept in warehouse and thrown; the constituents -ingredients of Ewaste are not scientifically treated which increases risk to the environment, as hazardous materials are exposed to environmental streams. The environmental and health impacts are immense which may be immediate or long term impacting current and future generation. Further details can be read from "Ewaste and Health Hazards" [Ref 2]

VIII.

RECOMMENDATION

A. Uplift Un-Organized Computer Sector

1. Government needs to look into formalizing the Assembled PC Market which constitute 44% of Computer Hardware market share in India and 67 % share in Pune.

There needs to be ROHS quality checks for the Assembled PC to assure the percentage of Hazardous substances are within limits.

2. Currently we do not have measurements on the exports of assembled PC's, Sales of PC's within Indian market and the revenue generated through the informal channel. It leaves critical gap in the GDP and Tax calculation from this sector.

3. India's majority of the population stays in rural areas. Low cost start-ups, huge demand and good earnings give immense motivation to the assemblers to start business from

home. They have good understanding of the local market and are able to reach out to customers conveniently. Low or negligible advertisement and marketing cost. FDI's and big brands usually have high cost of advertisement, also the cost of computers are much higher than what local assembler quotes. From the study 45% Assembling firms in Pune confirmed that during festive season and weekends, they had huge sales when people from rural areas came and took bulk orders for running businesses in small towns and villages.

B. Marriage of Green IT and CSR

New Business model for E-waste management as CSR activity and creating the socio-economic extremely sustainable model.

Companies earning revenue more than 500 crores yearly are supposed to spend 2% revenue in CSR Bill. In India main concerns are Literacy, poverty and energy. The business model addresses all the 3 concerns to great extent. [4][5]

1. Government authorized CSR consultants to authorize and regulate CSR earnings and investments.

2. The Companies taking out Ewaste will be contacting CSR [New job Opportunity] for disposal. They would provide certificates for working non-working HW. The Non-working hardware would be disposed the Government Authorized Recyclers for complete disposal.

The working hardware will be used to setup Public Cloud at district/state level.

The CSR Consultants can engage the Universities and CSR of companies to get technical and financial help to set first time public cloud.

3. Government should facilitate Computer Literacy programs associated with Universities. CSR Consultants to affiliate with

Universities and Governments to launch free education program and create centres for learnings with NGO's for educating people [Men/Women] from 15-40 years.

This will create immense literacy, empowerment and employability for the people living in slums, under privileged, orphans and families below poverty line.

4. The employees from the companies would be interested to share their knowledge in the training centers as part of corporate social Responsibility, which would enhance the personal gratification and engagement.

The model will give benefits at state and national level.

Benefits from the Model:

1. Centralized model for CSR investments to allow visibility and transparency to Government for regulating and directing investments/expenses to needed venues.
2. The model assists in utilizing the discarded HW for betterment of society which otherwise would be restricted in use or put in landfills. In order to extend the life of these assets by an additional two (2) to three (3) years, re-using electronic equipment is nine times greater for the environment than recycling .
3. Immense opportunity for NGO. It provides playground to come with several literacy and employment initiatives to utilize the wealth being made available from CSR funds for collective betterment of society.

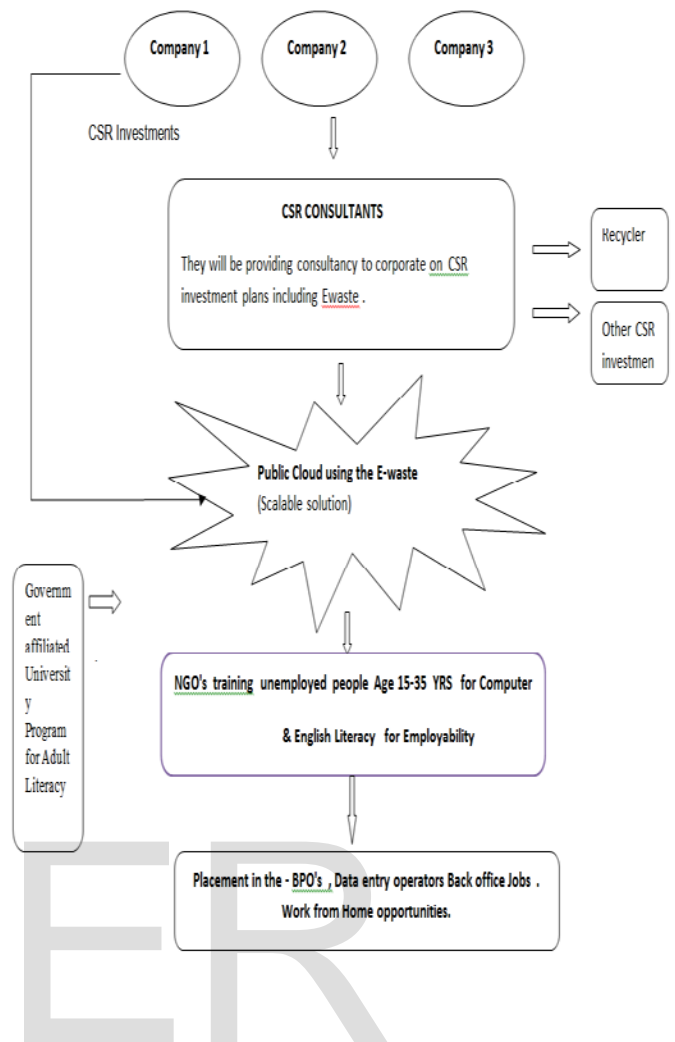


Fig 3: Business Model for Green IT & CSR Tie up

B. Recyclers / NGO's and Electronic Manufacturers can launch the Phones, Ovens, toasters for Food program to mass collect consumer ewaste. The food will be donated to poor people as part of charitable event . The scheme can be launched during festive period of Ramadan, Ganapati, Thanksgiving, Hanukah or Christmas etc. This would help in diverting the disposal to correct channel and enhance CSR branding of the Logo, consequently enhancing brand image of the company.

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