AN EMPRICAL STUDY ON IMPACT OF E-WASTE MANAGEMENT

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***Abstract:* Over the past two decades, the global market of Electrical and Electronic Equipment (EEE) continues to grow exponentially, while the life span of those products becomes shorter and shorter. Due to Rapid economic growth, urbanization and industrialization, demand for consumer goods, has been increased for both the consumption and the production of EEE. Any improperly disposed electronics can be classified as E-waste. While the Government and the industry are unanimous on the view that E-waste needs to be efficiently managed from a social and environmental standpoint, there still is a need for them to mutually arrive at a consensus by understanding the practical and cultural realities on ground.**

***Keywords :*E-waste, Social Implications, E-waste management**

INTRODUCTION

In the 21st Century, the information and communication revolution has brought remarkable changes in the way we organize our lives. The development in communication and technology in India has a great impact on our economy, industries and life style of people. Initially, we dealt with record players, radios, VCRs and black-and-white televisions; followed by CD and DVD. Air conditioners, air coolers, cellular phones, refrigerators, computers, laptops, power bank and many other gadgets arrived in the Indian market and in the hands of common man. Electronic gadgets are meant to make our lives comfortable, happier and simpler, but they contain poisonous toxic substances, their disposal and recycling becomes a health nightmare. These have led to various problems including the problem of huge amount of hazardous waste and other wastes generated from electric products. Over the past two decades, the global market of Electrical and Electronic Equipment (EEE) continues to grow exponentially, while the life span of those products becomes shorter and shorter. Due to Rapid economic growth, urbanization and industrialization, demand for consumer goods, has been increased for both the consumption and the production of EEE. Any improperly disposed electronics can be classified as E-waste. E-waste basically comprises electronic goods that are not fit for their original use.

OBJECTIVES OF THE STUDY

1. To reveal the demographic profile of the General Public and E-Waste Management Companies.
2. To identify the reasons for increasing the E-Waste and its efficient and effective disposal methods.

3. To study the differences between demographic profile of the General Public with respect to social implications of E-Waste management.
4. To examine the various ways to solve E-Waste problems.
5. To assess the impact of E-Waste management to the local communities.

Research Design

Research design is the conceptual structure within which the research is conducted. It is a blue print for the collection, management and analysis of the data. The research design in the present study is descriptive in nature since it describes the phenomena of socio economic implications of E-Waste Management. Apart from this, the present study has its own objectives and pre-determined methodology. It is purely descriptive in nature.

SAMPLING FRAMEWORK OF THE STUDY

The sampling framework of the study consists of determination of sample size and sampling procedure of the study.

The total number of questionnaires distributed in the self-administered survey was 120 sets. Purposive sampling method is applied in this research for selecting the sample. A form of non-probability sampling in which decisions concerning the individuals to be included in the sample are taken by the researcher, based upon a variety of criteria which may include specialist knowledge of the research issue, capacity and willingness to participate in the research. Some types of research design necessitate researchers taking a decision about the individual participants who would be most likely to contribute appropriate data, both in terms of relevance and depth. Based on the collected questionnaires, 32 sets of questionnaire were incomplete and 12 sets of questionnaires were not returned. Assumption was made that the respondents were either reluctant to collaborate or did not want to answer the questionnaire seriously. As a result, only 76 valid sets of questionnaires were available and then used for further analysis using SPSS software version 21. The data analysis methods carried out for this research was descriptive analysis, scale measurement analysis and inferential analysis.

Sources of Data

The present study is completely based on the primary data. The primary data was collected personally with the help of structured questionnaire. The secondary data collected from the books, journals, magazines and websites were used to form the theoretical framework of the study and the review of literature.

Development of the Study

The present study is completely based on the primary data collected from the general public and E-Waste Companies regarding E-Waste Management. A special care was taken to draft the questionnaire. The general public questionnaire was divided into seven parts. The first part of questionnaire includes the demographic profile of respondents. The second part of the questionnaire consists of four variables of Preference over selling waste to the waste collectors. The third part of the questionnaire includes of sixteen variables of harmful e-waste for the environment. The fourth part of the questionnaire includes of eight variables of reasons of increasing E-waste. The fifth part of the questionnaire includes of nine variables of useful method of disposal of E-Waste. The sixth part of the questionnaire includes of five factors with nineteen variables of ways to solve E-waste problems. The seventh part of the questionnaire includes of six variables of impact of E-waste Management to the local communities.

The E-Waste Companies questionnaire was divided into four parts. The first part of questionnaire includes the demographic profile of respondents. The second part of the questionnaire consists of nine variables of Problems in handling the E-waste. The third part of the questionnaire includes of nine variables of treatment and disposal options of E-Waste. The fourth part of the questionnaire includes of eight variables of impact of E-waste management on local communities/societies.

The relevant variables of the above said concepts were drawn from the review of previous studies. Based on the feedback from the pretest, certain modifications, additions, deletions and simplifications were carried out. The draft of the questionnaire was prepared to collect the data from both general public and E-Waste Companies.

FRAMEWORK OF ANALYSIS

Descriptive Analysis

Descriptive analysis is an important tool used to assess the socio economic implications of E-Waste management. As it is expressed in percentage, it facilitates comparison. This analysis is carried out socio economic implications of E-Waste management separately and suitable charts were also drawn for selected tables to facilitate the understanding of the reader.

OPINION OF THE RESPONDENTS

Ranking for Preference over selling waste to the waste collectors Factor

In this study,Preference over selling waste to the waste collectors consist of four factors that measure Electronic & Electricals, Plastic, Others and Media.

Table 1
Ranking for Preference over selling waste to the waste collectors Factor

Preference over selling waste to the waste collectors	Mean	Std. Deviation	Skewness	Kurtosis
Electronic & Electricals	4.26	.794	-1.252	1.653
Plastic	4.21	.924	-1.022	.147
Others	3.88	.906	-.385	-.692
Media	3.49	.932	.136	-.358

The above table shows that "Electronic & Electricals" is the topranked Preference over selling waste to the waste collectors factor with a mean value of 4.26, "Plastic" is the second ranked Preference over selling waste to the waste collectors factor with a mean value of 4.21, "Others" is the third ranked Preference over selling waste to the waste collectors factor with a mean value of 3.88 and "Media" is the fourth ranked Preference over selling waste to the waste collectors factor with a mean value of 3.49.

Ranking for Very High Harmful E-waste Factor

In this study,Very High Harmful E-waste consists of five factors that measure Brominated flame- proofing agent, Lead, Liquid crystal, Chrome and Copper.

Table 2

Ranking for Very High Harmful E-waste Factor

Very High Harmful E-waste	Mean	Std. Deviation	Skewness	Kurtosis
Brominated flame- proofing agent	4.11	.942	-.871	-.142
Lead	4.07	.926	-.592	-.691
Liquid crystal	3.98	.908	-.701	.349
Chrome	3.85	1.086	-.717	-.225
Copper	3.73	.936	-.108	-.960

The above table shows that "Brominated flame- proofing agent" is the topranked Very High Harmful E-waste factor with a mean value of 4.11, "Lead" is the second ranked Very High Harmful E-waste factor with a mean value of 4.07, "Liquid crystal" is the third ranked Very High Harmful E-waste factor with a mean value of 3.98, "Chrome" is the fourth ranked Very High Harmful E-waste factor with a mean value of 3.85 and "Copper" is the fifth ranked Very High Harmful E-waste factor with a mean value of 3.73.

Ranking for Strongly Harmful E-waste Factor

In this study,Strongly Harmful E-waste consists of three factors that measure Barium, Arsenic and Lithium.

Table 3

Ranking for Strongly Harmful E-waste Factor

Strongly Harmful E-waste	Mean	Std. Deviation	Skewness	Kurtosis
Barium	3.76	.844	-.303	.287
Arsenic	3.76	1.066	-.712	.078

Lithium	3.68	1.097	-.467	-.846

The above table shows that "Barium" is the topranked Strongly Harmful E-waste factor with a mean value of 3.76, "Arsenic" is the second ranked V Strongly Harmful E-waste factor with a mean value of 3.76 and "Lithium" is the third ranked Strongly Harmful E-waste factor with a mean value of 3.68.

Ranking for Moderately Harmful E-waste Factor

In this study,Moderately Harmful E-waste consists of three factors that measure Selenium, PCBs (polychlorinated biphenyls) and Silver.

Table 4
Ranking forF Moderately Harmful E-waste actor

Moderately Harmful E-waste	Mean	Std. Deviation	Skewness	Kurtosis
Selenium	3.85	.730	-.697	.705
PCBs (polychlorinated biphenyls)	3.65	.982	-.603	.460
Silver	3.57	1.150	-.323	-.523

The above table shows that "Selenium" is the topranked Moderately Harmful E-waste factor with a mean value of 3.85, "PCBs (polychlorinated biphenyls)" is the second ranked Moderately Harmful E-waste factor with a mean value of 3.65 and "Silver" is the third ranked Moderately Harmful E-waste factor with a mean value of 3.57.

Ranking for Harmful E-waste Factor

In this study,Harmful E-waste consists of three factors that measure Nickel, Cobalt and Mercury.

Table 5
Ranking for Harmful E-waste Factor

Harmful E-waste	Mean	Std. Deviation	Skewness	Kurtosis
Nickel	3.76	1.024	-.911	.259
Cobalt	3.71	.939	-.932	1.201
Mercury	3.70	.988	-.151	-1.051

The above table shows that "Nickel" is the topranked Harmful E-waste factor with a mean value of 3.76, "Cobalt" is the second ranked Harmful E-waste factor with a mean value of 3.71 and "Mercury" is the third ranked Harmful E-waste factor with a mean value of 3.70.

Ranking for Extremely Harmful E-waste Factor

In this study,Extremely Harmful E-waste consist of two factors that measure Zinc and Cadmium.

Table 6
Ranking for Extremely Harmful E-waste Factor

Extremely Harmful E-waste	Mean	Std. Deviation	Skewness	Kurtosis
Zinc	3.77	1.120	-.840	-.095
Cadmium	3.69	.963	-.188	-.494

The above table shows that "Zinc" is the top ranked Extremely Harmful E-waste factor with a mean value of 3.77 and "Cadmium" is the second ranked Extremely Harmful E-waste factor with a mean value of 3.69.

Ranking for Useful method of Disposal of E-Waste Factor

In this study, Useful method of Disposal of E-Waste consists of nine factors that measure Dismantling, Controlling, Incineration / burning the products, Recovery valuable materials, Dumping in the landfills, Segregation of ferrous metal, non-ferrous metal and plastic, Refurbishment and reuse, Recycling and Reuse.

Table 7
Ranking for Useful method of Disposal of E-Waste Factor

Useful method of Disposal of E-Waste	Mean	Std. Deviation	Skewness	Kurtosis
Dismantling	4.06	.921	-1.277	2.019
Controlling	3.96	.965	-1.130	1.665
Incineration / burning the products	3.95	.794	-.472	-.123
Recovery valuable materials	3.81	.897	-.669	.399
Dumping in the landfills	3.78	.917	-.032	-1.078
Segregation of ferrous metal, non-ferrous metal and plastic	3.73	.887	-.099	-.813
Refurbishment and reuse	3.66	.773	.057	-.509
Recycling	3.60	.820	.009	-.554
Reuse	3.59	.877	-.611	.806

The above table shows that "Dismantling" is the topranked Useful method of Disposal of E-Waste factor with a mean value of 4.06, "Controlling" is the second ranked Useful method of Disposal of E-Waste factor with a mean value of 3.96, "Incineration / burning the products" is the third ranked Useful method of Disposal of E-Waste factor with a mean value of 3.95, "Recovery valuable materials" is the fourth ranked Useful method of Disposal of E-Waste factor with a mean value of 3.81, "Dumping in the landfills" is the fifth ranked Useful method of Disposal of E-Waste factor with a mean value of 3.78, "Segregation of ferrous metal, non-ferrous metal and plastic" is the sixth ranked Useful method of Disposal of E-Waste factor with a mean value of 3.73, "Refurbishment and reuse" is the seventh ranked Useful method of Disposal of E-Waste factor with a mean value of 3.66, "Recycling" is the eighth ranked Useful method of Disposal of E-Waste factor with a mean value of 3.60 and "Reuse" is the ninth ranked Useful method of Disposal of E-Waste factor with a mean value of 3.59.

Table 8
Ranking for Company policy and legal provisions Factor

Company policy and legal provisions	Mean	Std. Deviation	Skewness	Kurtosis
Companies should make a proper and safe E-waste disposal policy	4.07	.834	-.434	-.713
Companies should re produce new product from E- waste	3.94	.889	-.398	-.706
Legal actions and penalties can do Proper management of E-waste	3.93	.914	-1.410	2.714

The above table shows that "Companies should make a proper and safe E-waste disposal policy" is the topranked Company policy and legal provisions factor with a mean value of 4.07, "Companies should re produce new product from E- waste" is the second ranked Company policy and legal provisions factor with a mean value of 3.94 and "Legal actions and penalties can do Proper management of E-waste" is the third ranked Company policy and legal provisions factor with a mean value of 3.93.

Ranking for Company responsibility on E-Waste Factor

In this study,Company responsibility on E-Waste consist of two factors that measure Identify the E-waste composition & hazardous content in E-waste and Guidelines for the electrical and electronic equipment manufacturers.

Table 9
Ranking for Company responsibility on E-Waste Factor

Company responsibility on E-Waste	Mean	Std. Deviation	Skewness	Kurtosis

Identify the E-waste composition & hazardous content in E-waste	3.89	.808	-.338	-.393
Guidelines for the electrical and electronic equipment manufacturers	3.62	.875	-.010	-.733

The above table shows that "Identify the E-waste composition & hazardous content in E-waste" is the topranked Company responsibility on E-Waste factor with a mean value of 3.89 and "Guidelines for the electrical and electronic equipment manufacturers" is the second ranked Company responsibility on E-Waste factor with a mean value of 3.62.

Ranking for Impact of E-Waste Management to the Local Communities Factor

In this study, Impact of E-Waste Management to the Local Communities consist of six factors that measure Socio-economic opportunities, Reduce Pollution, Community engagement, Protection of Human rights, Safe and healthy living conditions and Protection of Indigenous rights.

Table 10
Ranking for Impact of E-Waste Management to the Local Communities Factor

Impact of E-Waste Management to the Local Communities	Mean	Std. Deviation	Skewness	Kurtosis
Socio-economic opportunities	4.11	.942	-.871	-.142
Reduce Pollution	3.86	.893	-.364	-.644
Community engagement	3.65	.980	-.127	-1.008
Protection of Human rights	3.59	1.091	-.471	-.390
Safe and healthy living conditions	3.59	.880	.341	-.877
Protection of Indigenous rights	3.43	1.141	-.746	-.133

The above table shows that "Socio-economic opportunities" is the topranked Impact of E-Waste Management to the Local Communities factor with a mean value of 4.11, "Reduce Pollution" is the second ranked Impact of E-Waste Management to the Local Communities factor with a mean value of 3.86, "Community engagement" is the third ranked Impact of E-Waste Management to the Local Communities factor with a mean value of 3.65, "Protection of Human rights" is the fourth ranked Impact of E-Waste Management to the Local Communities factor with a mean value of 3.59, "Safe and healthy living conditions" is the fifth ranked Impact of E-Waste Management to the Local Communities factor with a mean value of 3.59 and "Protection of Indigenous rights" is the sixth ranked Impact of E-Waste Management to the Local Communities factor with a mean value of 3.43.

Conclusion

Currently, most waste management strategies are largely technical and focused on environmental aspects, leaving out underlying social problems and relevant solutions. The lack of public awareness regarding the disposal of electronic goods and inadequacy of policies to handle the issues related to E-waste enhance the problem in India. While the Government and the industry are unanimous on the view that E-waste needs to be efficiently managed from a social and environmental standpoint, there still is a need for them to mutually arrive at a consensus by understanding the practical and cultural realities on ground. Unless the informal sector is formalized or made to be part of a defined E-waste supply chain, it will automatically defeat the very purpose of what the Government and industry intend to achieve.

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