DIMENSIONS OF E-WASTE MANAGEMENT AND ITS BUSINESS OPPORTUNITIES

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Abstract

The present study examined the impact of various dimensions of E-waste management and its business opportunities in the Madurai District. The total number of questionnaires distributed in the self-administered survey was 750 sets. A purposive sampling method is applied in this research for selecting the sample. As a result, 576 (filled questionnaire) valid sets of questionnaires were available and then used for Multiple Regression Analysis using SPSS. A structured questionnaire was used to collect the data, while the multiple regression analysis was used to analyze the data. Hence, the study, therefore, concluded that the impact of various dimensions of ways to solve e-waste problems on the impact of e-waste management to the local communities is quite strong and positive.

Keywords: *E-Waste Management, Business Opportunities, Business Opportunities and Multiple Regression Analysis.*

JEL Classification: H12; L63; O32; Q53

INTRODUCTION

E-waste is a popular informal name for electronic products nearing the end of their useful life. Anything that runs on electricity/battery or has wired and completed its life is e-waste. Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, and refrigerators. E-waste is considered dangerous, as certain components of some electronic products contain hazardous materials, depending on their condition and

density. The unsafe content of these materials poses a threat to human health and the environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment, and batteries, if improperly disposed of, can leach lead and other substances into soil and groundwater. Electronic waste, e-waste, e-scrap, or Waste Electrical and Electronic Equipment (W.E.E.E) describes discarded electrical or electronic devices. There is a lack of consensus as to whether the term should apply to resale, reuse, and refurbishing industries, or only to a product that cannot be used for its intended purpose. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, though these countries are also most likely to reuse and repair electronics. Some of the categories include Mobile Phones, Computers, Servers, Telecom, TV, Calculators, Audio, Scanners, Printers, Air Conditioner, Microwave, Washing Machine, Cartridges, Military electronic, Motherboard, Alarm, Sirens, Automobile Catalytic Converter, Sensor, CD, and Security Devices.

REVIEW OF LITERATURE

Ashfaq A and Khatoon A (2014) referred that E-waste has been escalating rapidly with the rise of the information society. It is the fastest-growing sector of the municipal solid waste stream. Every year, according to the United Nations Environment Program (UNEP, 2005), 20 to 50 million tons of electrical and electronic equipment wastes are generated worldwide. E-waste generated in a few cities across the nation shows an alarming picture. Mumbai generates 11,000 tons of E-waste, Delhi 9000 tons, Bangalore 8000 tons, and Chennai 5000-6000 tons each year. The existing management practices related to E-waste in India are reasonably poor and have the potential to risk both human health and the environment. They provided an insight into various sources of E-waste generation, its composition along with health and environmental hazards caused by E-waste. They also discuss the national and international scenario of E-waste. **Dipankar Dey (2009)** has tried to identify the challenges in managing E-wastes in India. It also describes a few initiatives taken in the recent past to address the challenges and highlights a few concerns. A Brief Note on the findings: The pilot survey revealed that the main source of E-waste was scrap. Technological obsolescence was the other major source. **Okoye A and Odoh C (2014)** ascertain the people's level of awareness of the regulation, their mode of disposal of the E-wastes, and their understanding of the dangers inherent in improper handling and

disposal of wastes. Data for this study were collected through the distribution of 247 well-structured questionnaires. Likert Scale was adopted for the analysis of the respondents. The results revealed that awareness is critically low. Though the respondents have concern for their environment in various degrees, the majority disposes of their E-waste alongside municipal wastes without knowing the implications. An awareness strategy was designed for the sensitization campaign. **Chaurasia P K (2014),** the global market of industrial and electronic equipment is changed and continues to grow exponentially all over the world. With these grows, electrical and electronic waste management is increasing in the same manner. Developing countries face tremendous problems that are related to the generation and management of E-Waste, which are either from import or export illegally. There are a large number of harmful materials containing toxic substances that can harm health and the environment. It is a global problem; if it is not handled decently within time, then the global world is affected. In India, E-Waste management presumes the major problem. This problem is not only generated from its own E-Waste but also the import dumping materials from other developed countries. So they focused on the issues and impact of this emerging problem. It is also required to sharpen on private and government agencies to do needful solutions. **Ram Krishna and Saha S (2014)** approached made towards assessing the present situation of E-waste management globally as well as in India, considering the current regulations and guidelines. It is also a fact that the major part of the recycling of E-waste is being handled by the informal sector that has little/no knowledge about the consequences of exposure to hazardous substances. To address the issue of E-waste management in a sustainable method, the concept of EPR (extended producer responsibility) will be helpful if the regulations incorporate monitoring and penalty clauses. The reuse of EEE has greater environmental and social benefits than recycling as it increases the useful lifetime of the ICT equipment and enables greater resource efficiency and energy efficiency. In developing nations, it can help in uplifting the status of the informal sector with the help of education and employment. In addition to the technical, social and organizational aspects of the EEE-waste management system, it is also crucial to consider the economic factors, if the system has to be made financially viable and sustainable along with being socially acceptable. **Okoye A. & Odoh C (2014),** focused on how well-known exogenous and endogenous drivers impact on such cost items through collected empirical data of 6,616 Italian municipalities for a two-year period

and also developed four regression-based models to analyze the data according to cost items. Models are also reiterated using different data normalization: cost per ton of waste or waste per capita. Besides exogenous determiners of cost, such as altitude, population density, and coastal zone, results refer to both unsorted and sorted waste management cost items. It is found that the economies of scale are confirmed along with the critical role of adequate waste facilities that play a remarkable role in cost minimization. It was useful to Policymakers and regulators may benefit from such results when it comes to define allowed revenues and design the scope of municipal solid waste regulation.

OBJECTIVES OF THE STUDY

1. To study the various dimensions of E-Waste management and its business opportunities in the Madurai District.

METHODOLOGY

The study is basically an empirical one based on data gathered from the general public in the Madurai district. A sample of 576 respondents has been chosen for the purpose of the study. The primary data was gathered using the questionnaire method administered by a prefixed schedule in person with each respondent. For this study, the researcher used a well-structured questionnaire to collect the data from the respondents. The questionnaire related to various dimensions of ways to solve E-Waste problems and impact of e-waste management to the local communities. The researcher used multiple regression analysis to study the impact of various dimensions of ways to solve E-Waste problems on the impact of E-waste management to the local communities. IBM SPSS 21 version was used for statistical purposes.

RESULTS AND DISCUSSIONS

Impact of Various Dimensions of Ways to Solve E-Waste Problems on Impact of E-Waste Management to the Local Communities

Regression is the determination of statistical relationship between two or more variables. In simple regression two variables are used. One variable (independent) is the cause of the behaviour of another one (dependent). When there are more than two independent variables the analysis concerning relationship is known as multiple

correlations and the equation describing such relationship is called as the multiple regression equation. Regression analysis is concerned with the derivation of an appropriate mathematical expression is derived for finding values of a dependent variable on the basis of independent variable. It is thus designed to examine the relationship of a variable Y to a set of other variables X_1, X_2, X_3……X_n. the most commonly used linear equation in $Y=b_1 X_1 + b_2 X_2 +……+ b_nX_n + b_0$

Here Y is the dependent variable, which is to be found. X_1 , X_2 ,… and X_n are the known variables with which predictions are to be made and b_1, b_2 ,….b_n are coefficient of the variables. In this study, the dependent variable is Impact of E-Waste Management to the Local Communities; Independent variables are service quality they are Mandatory provision, Government provision, Sustainability provision, Company policy and legal provisions, Company responsibility on E-Waste and comfort are discussed as follows:

- Dependent Variable – Impact of E-Waste Management to the Local Communities (y)
- Independent Variable
    i. Mandatory provision (X_1)
    ii. Government provision (X_2)
    iii. Sustainability provision (X_3)
    iv. Company policy and legal provisions (X_4)
    v. Company responsibility on E-Waste (X_5)
- Multiple R value: 0.779
- R Square value: 0.635
- Adjusted R square value: 0.628
- F value: 60.738
- P value: 0.000

Table 1

Variables in Multiple Regression Analysis

Variables	Unstandardized Coefficients(B)	S.E error of B	Standardized Coefficients Beta	t-value	p-value
Constant	0.331	0.228	0.000	1.452	0.147
Mandatory provision	0.102	0.037	0.134	2.773	0.006**
Government provision	0.182	0.052	0.174	3.508	0.000**
Sustainability provision	0.060	0.046	0.055	1.308	0.191
Company policy and legal provisions	0.198	0.067	0.161	2.929	0.004**
Company responsibility on E-Waste	0.785	0.083	0.586	9.466	0.000**
Comfort	0.003	0.050	0.003	0.058	0.954

** Denotes significant at 1% level
* Denotes significant at 5% level

The multiple correlation coefficient is 0.779 measures the degree of relationship between the actual values and the predicted values of the Impact of E-Waste Management to the Local Communities. Because the predicted values are obtained as a linear combination of Mandatory provision ($\mathbf{X_1}$), Government provision ($\mathbf{X_2}$), Sustainability provision ($\mathbf{X_3}$), Company policy and legal provisions ($\mathbf{X_4}$), Company responsibility on E-Waste ($\mathbf{X_5}$) and Comfort ($\mathbf{X_6}$) the coefficient value of 0.779 indicates that the relationship between Impact of E-Waste Management to the Local Communities and the six independent variables is quite strong and positive.

The Coefficient of Determination R-square measures the goodness-of-fit of the estimated Sample Regression Plane (SRP) in terms of the proportion of the variation in the dependent variables explained by the fitted sample regression equation. Thus, the value of **R square is** 0.635 simply means that about **63.5%** of the variation in Impact of E-Waste Management to the Local Communities is explained, and R square value is significant at 1% level.

The multiple regression equation is

$$Y= 0.331 + 0.102\ X_1 + 0.182\ X_2 + 0.060\ X_3 + 0.198\ X_4 + 0.785\ X_5$$

Here the coefficient of $\mathbf{X_1}$ is 0.102 represents the partial effect of Mandatory provision on Impact of E-Waste Management to the Local Communities, holding the other variables as constant. The estimated positive sign implies that such effect is positive that Impact of E-Waste Management to the Local Communities would increase by 0.102 for every unit increase in Mandatory provision and this coefficient value is significant at 1% level. The coefficient of $\mathbf{X_2}$ is 0.182 represents the partial effect of Government provision on Impact of E-Waste Management to the Local Communities, holding the other variables as constant. The estimated positive sign implies that such effect is positive that Impact of E-Waste Management to the Local Communities would increase by 0.182 for every unit increase in Government provision and this coefficient value is significant at 1% level. The coefficient of $\mathbf{X_3}$ is 0.060 represents the partial effect of Sustainability provision on Impact of E-Waste Management to the Local Communities, holding the other variables as constant. The estimated positive sign implies that such effect is positive that Impact of E-Waste Management to the Local Communities would increase by 0.060 for every unit increase in Sustainability provision and this coefficient value is not significant at 1% level. The coefficient of $\mathbf{X_4}$ is 0.198 represents the partial effect of Company policy and legal provisions on Impact of E-Waste Management to the Local Communities, holding the other variables as constant. The estimated positive sign implies that such effect is positive that Impact of E-Waste Management to the Local Communities would increase by 0.198 for every unit increase in Company policy and legal provisions and this coefficient value is significant at 1% level. The coefficient of $\mathbf{X_5}$ is 0.785 represents the partial effect of Company responsibility on E-Waste on Impact of E-Waste Management to the Local Communities, holding the other variables as constant. The estimated positive sign implies that such effect is positive that Impact of E-Waste Management to the Local Communities would increase by 0.785 for every unit increase in Company responsibility on E-Waste, and this coefficient value is significant at 1% level. Based on the standardized coefficient, Company responsibility on E-Waste (0.586), Government provision (0.174), Company policy and legal provisions (0.161) is the most important factors to extract Impact of E-Waste Management to the Local Communities, followed by Mandatory provision (0.134) and Sustainability provision (0.055).

CONCLUSION

E-waste or Waste Electrical and Electronic Equipment (WEEE) are loosely discarded, surplus, obsolete, broken, electrical or electronic devices. The flow of E-waste is very rapid, causing threats to the human health, environment due to its toxic and hazardous attributes. E-waste is being produced by various sources in the country like Government sectors, commercial establishments, institutional sectors, research and developments, household and manufacturing sectors of the country. The above-mentioned sectors are free to handover the waste who is going to bid more for it, which may be formal recyclers or informal recyclers or any local E-waste collectors or a Kabadee.

REFERENCES

1. **Ashfaq A & Khatoon A (2014).** Environmental Impacts and Assessment of Electronic Waste management. *International Current Microbiology Applied Sciences*, 3(7), 772-779.
2. **Chaurasia P.K. (2014).** E-Waste Management Approaches in India. *International Journal of Engineering Trends and Technology*, 15(1), 21-24.
3. **Dipankar Dey (2009)**. Managing E-Waste in India: Challenges Initiatives and Concerns. *IEEE Forum; Venue: The Committee Room, 4th Floor of the Department of ETCE, Jadavpur University.* https://dx.doi.org/10.2139/ssrn.1511664
4. **Okoye A. & Odoh C (2014).** Assessment of the Level of Awareness of E-Waste Management and Concern for the Environment amongst the Populace in Onitsha, southeastern Nigeria. *Journal Environmental Protection*, 5, 120-134.
5. **Giacomo Di Foggia, Massimo Beccarello (2020).** Drivers of Municipal Solid Waste Management Cost based On Cost Models Inherent to Sorted And Unsorted Waste. Waste Management, 114, 202-214. https://doi.org/10.1016/j.wasman.2020.07.012

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