

Organizational Capabilities and E-Waste Management: A Theoretical Review

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Abstract: *Electronic waste is a problem of great magnitude in the modern world. The people in various spheres of life embrace the use of electronic devices to enhance various processes, hence, the obsolescence of the devices lead to the creation of a new waste category called e-Waste. The fast-growing consumption of e-products globally led to the fastest growing household waste. Presently, the world is experiencing unsurpassed industrialization with manufacturing and processing industries on the increase, hi-tech change that is driven by the need to improve effectiveness and efficiency. The growth of the international market for production and consumption of electronic and electrical equipment is increasingly rapid. Consequently, the e-waste has become one of the fastest growing types of waste that is produced in both the developed and developing countries. There are various international efforts to address the problem by attempting to galvanize policies and enforcement efforts that have not been fruitful so far. This paper attempts to increase the understanding of the gap between growth in the information and communication technology sector and the measures to combat the negative environmental issues brought about by increased electronic device usage. The paper examines past research on the e-waste issues and analyzes it to provide useful recommendations.*

Keywords: e-waste, recycling, ICT, management

1. Introduction

1.1 Background of the Study

The growth of the international market for producing and consuming electronic and electrical equipment is increasingly rapid. Worldwide generation of e-waste is approximately over 40,000,000 (40 million) tonnes per annum [21] and this is ascribed to increase in market infiltration of electrical and electronic equipment in developing countries, the growth of a substitute market in advanced countries, and a high rate of product obsolescence [28]. Indeed, these products are deliberately designed to have short lifespans, thus they are discarded frequently.

Generally, e-waste flows to from advanced countries to developing countries portrayed by deprived economies. According to Kalra [14] some gulf countries are frequently used as transshipment hubs for e-waste between developed and developing countries. Green Peace International posited that hazardous wastes are also being shipped to China illegally from developed countries like USA, Japan and Canada, despite the fact that Basel Convention prohibits international shipment of dangerous wastes. The intensification of this problem is not caused by the absence of regulations and laws, but because existing legal instruments are not enforced.

India created 4,340,000 tonnes of e-waste before the end of 2009 [10]. Notwithstanding numerous laws in India that protect the environment, no specific laws have been enacted against e-waste [10]. According to Toxics Link [25], e-waste freely moves into developing countries under the guise of free trade, thereby exacerbating the e-waste management problem in the developing world. Only 15% of discarded items are recycled, while the remainder is thrown into landfills [26]. Stakeholders in e-waste disposal have specific infrastructural and financial obligations to uphold. In the

cause of fighting against hazardous waste, most countries globally are signatory to numerous international environmental treaties, including the Basel Convention; Bamako Convention; Nairobi Convention; Stockholm Convention and Rotterdam Convention. Therefore, this research was to establish the effects of organizational capabilities on E-Waste Management.

1.2 Statement of the Problem

Globally exponential growth of ICT is underpinned by institutional efforts to improve on service delivery and enhance competitiveness and visibility in the international research. There is the apprehension for environmental impacts of these growing e-waste flows. Although devices are often no threat to users, it is well-known that inappropriate disposal of e-waste can upset responsive eco-systems leading to worsening of the environment and thus regrettable human health [22].

E wastes from inactive rudiments contain harmful elements including lead, cadmium, mercury and lithium [8]. These hazardous substances can escape during deplorable disposal and rudimentary recycling process thus posing a threat to the environmental atmosphere. Additionally, to its harmful effect on the atmosphere, investigators and scholars has linked e-waste to undesirable effects on human health, such as cardiovascular disease, DNA damage and possibly cancer of various categories. Therefore, there is huge gap that exists when it comes to e-waste management since knowledge about its full scope and also on how to correctly handle and dispose waste in an environmental friendly manner is limited. This study therefore sought to add to the already few existing literature on e-waste management by examining the organizational capabilities of E-Waste Management.

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2. Theoretical Review

2.1 Technology-Organization-Environment (TOE)

According to Tornatzky and Fleischer [24], organizational variables in research on the adoption of technology are the mindset about creativity, financial capability, the size of an organization, institutional knowledge, the sharing of information, the ability to learn and the support of the highest levels of management. The Technology-organization-environment (TOE) framework by Tornatzky and Fleischer [24] comprises three elements that affect the adoption of technology namely the environmental context, the organization context, and the technological context.

Rogers [20] also posited that innovation will go through five stages of the adoption process: Knowledge, Persuasion, Decision, Implementation, and Confirmation. Therefore, five perceptual characteristics of innovation i.e. relative advantage, compatibility, complexity, trialability, and observability were identified by Rogers and help to assess the adoption rate. At the same time as with the TOE framework, diffusion of innovations theory has also been widely used in current years in the field of information technology relevance research, such as web site adoption.

2.2 The Capability Theory

Grant [13] proposed the capability theory which states that a competitive edge is principally based on capabilities while capabilities themselves depend on resources. The author adds that resources alone do not contribute to the constant competitiveness of a firm, but that capacities have to be deployed as well. The importance of capabilities also suggests that firms can attain reliable management from their own capacity by applying their own capabilities systematically when they effect basic actions in the firm.

2.3 E-Waste Management

E-waste is consumer electronics and business electronics that are approaching the end of their operational lives. European Union regulations define e-waste as devices which rely on electricity to function appropriately; and devices used to generate, transfer and measure electric currents and fields. StEP [23] identified the challenges that developing countries face in managing e-waste. They state that e-waste is potentially lucrative if it is administered competently. StEP [23] in their publication posited that establishing effective e-waste management systems remains a considerable difficulty for developing countries, which is the principal destination for e-waste.

The requirements for education, creativity, teamwork and a regulatory framework [step] demonstrate that there is need for various governments across the world to acknowledge the problem of managing e-waste, and exhorted various governments to conduct academic studies to address the issue. Luther [17] examined the linkages between designing products and how they are composed and used; and how these factors influence the physical process of recycling, including separation of material. Kellenberg and Levinson [15] in his study, talks about waste or effort and the market

parameters in terms of potential size and growth, as well as steps in the recycling of e-waste in relation to both advanced nations and developing countries.

2.4 Resources at an Organizational Disposal

Organizational sound management of e-waste management is based on the three Rs principle, namely reduce, reuse and recycle. Management would reduce e-waste generation by increasing efficiency in manufacturing and maintenance; reuse electronic equipment by selling or donating devices that are still functional to other parties, and recycling any parts that are beyond repair. According to Hewlett-Packard (HP), the Global Digital Solidarity Fund (DSF) and the Swiss Federal Laboratories for Materials Testing and Research (EMPA) in 2014, [12] the bulk of computers, including obsolete computers, are in the hands of the private sector, which is therefore the largest generator of e-waste across the world.

2.5 Empirical Review

This section examines the findings of previous studies and compares them with the variables of the conceptual framework, with the aim of targeting gaps in the literature which the current study will address in order to contribute to knowledge on the topics of study.

2.5.1 Socio-economic factors and e-waste management

The rising growth rate of consumer electronics is buoyed by the insatiable demand for the most state of the art devices. The more simple, the more insubstantial yet the more complex the device is, the greater its desirability. Electronics manufacturers exploit this demand by launching constant improvements on previous devices, especially in smartphones. Outmoded computers can actually be considered as 'gold mines.' One metric ton of e-waste from used computers contains the equivalent amount of gold as 17 tons of gold ore [27]. Paradoxically, e-waste has lucrative; poisonous components, including elements like gold, copper, aluminium, iron and other metals, which constitute over 70% of e-waste, with the remainder mainly consisting of plastics, at about 28%. The remaining 2% contains the dangerous contaminants.

2.5.2 Effects of Human resource capabilities on the E Waste Management

The attainment of organizational objectives depends on skilled human resources and efficient management systems within an organization. Therefore, firms cannot carry out actions to realize their objectives without proper motivation and maintenance of a skilful workforce who possess the requisite intellectual capital. This view is proposed by Akroush [2], on the assignment of executing demanding strategic plan. The recent studies on management have reinforced the concept of a direct effect of organizational capabilities on organizational performance such as Wright et al., [29]. The results of such studies do not claim that the better the organizational capabilities, the better the performance, but that organizational capabilities have to be relevant and appropriately targeted so as to positively influence e-waste management. Human resource capability affects the management of firms. Management was measured

in terms of organizational effectiveness.

Chuang et al., [6] study scrutinized the relationship between human resource capabilities on management effectiveness, paying attention on the relationship between Human Resource Capabilities on organizational effectiveness. They concluded that increasing organizational core competencies, especially human resource capability, is the core factor of firm success. Therefore, it is proposed that the increasing application of human resource capabilities in developing and implementing strategies will result in increased effectiveness of e-waste management. Therefore, the study sought to find out the relationship between human resource capabilities and e-waste management practices. Cooper and Molla [7] provide evidence that the greater the stakeholders ability to create knowledge of sustainable use of information technology, the more likely that the firm will successfully implement recycling of e-waste, among other sustainability initiatives. Human resource management influences organizational knowledge creation capability, as it is significantly related to organizational management.

2.5.3 Effect of technological capabilities on the E-Waste Management

Druid [11] elaborates on the effect of dynamic capabilities on organizational management. In this concept, vibrant capability is implemented as refined procedures that are highly strategic, and able to incorporate, recombine and create innovative technology capacities that can effectively and positively mould e-waste management. Scrutiny of technology development in numerous firms is a downstream activity which is directed towards new creativity. There are numerous theories of technological innovation, including the Technology Acceptance Model (TAM) [9], Theory of Planned Behavior (TPB) [1], Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovation (DOI) [20] and the Technology-Organization-Environment (TOE) framework [24].

Due to the fast development of information technology and its characteristic, whether a single theoretical framework can

be applied to all the subjects is still debatable. Oliveira and Martins [18] also pointed out that it would be significant to merge more than one theoretical model in future studies in order to have a better thoughtful of the adoption of innovation technologies.

2.5.4 Effect of policy framework on the E-Waste Management

The Basel Convention came into existence in 1989 due to the widespread practice of dumping toxic wastes in Africa and other parts of the developing world. As manufactures and transporters sought cheaper alternatives to the now forbidden African dumping grounds, Eastern Europe became the target zone for dumping, as well as other locations in the developing world, where there was low environmental consciousness and deafening regulations were absent [4].

Among of the main emphases in the literature has been on the e- waste management. The use of waste electrical and electronic equipment as “ores” for precious metals and spare parts has also been addressed in the literature review [28]. The idea that the generator of waste is accountable for the product throughout its lifespan has also been considered [3]. Strategy oriented studies have called for formalization of informal recycling by providing it with formal recycling facilities through legislative, institutional or economic initiatives for an inclusive waste electrical and electronic equipment treatment system [16]; [19].

Waste electrical and electronic equipment literature emphasizes the differences between informal and formal recyclers of e-waste, especially by focusing on differences in their internal and external characteristics, specifically in technological, human resource capabilities, economic factors and policy framework criteria, in the actual process of recycling e-waste there may not be effective management of e-waste, regardless of the attributes of the person(s) recycling it [5].

2.6 Conceptual Framework

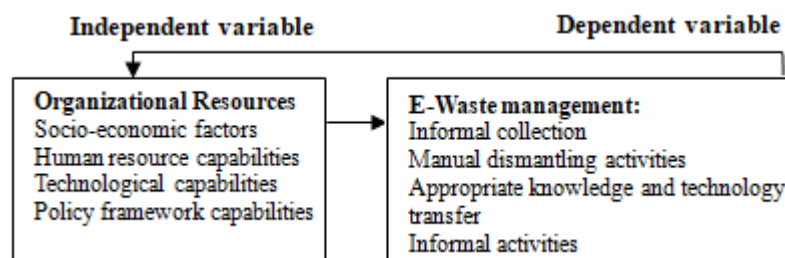


Figure 1: Relationship between Organizational Capabilities on the E-Waste and management

3. Results and Discussions

3.1 Socio-Economic Factors

The socio-economic advantages of extracting materials from e-waste are far greater than the process of prospecting for and mining raw materials and processing them into metals, which can then be part of the manufacturing process.

3.2 Human Resource Factors

The human resource capability of the organization is a considerable resource that determines the competitive advantages of the organization. In the perspective of a resource-based view, it can be assumed that human resource capabilities including skilled human resources, innovative human resources, human resource effectiveness, human resource commitment, and training competent human resource are factors that determine the competitive advantages of organizations concerned with e-waste

management.

3.3 Technological Capabilities

There were various gaps identified in awareness levels, technology to manage e-waste, financing, collection, disposal of e-waste, e-waste policy and collaboration. The study found that there is no clearly laid down technology strategies for managing e-waste. The technology strategies in the various countries across the globe does not provide sufficient framework to address the menace of e-waste management.

3.4 Policy Framework

There exists a gap in local policies as none particularly addresses the problem of e-waste, most policies address issues of waste in general or solid waste in particular. There also exists a gap in enforcement of both the local and international legislation regarding to e-waste and related waste. There is no local clear policy on importation of e-waste in the country even though the most countries has subscribed to international policies; enforcement of the convention has been left to respective countries to implement. Most of the countries have not enacted laws on procedure of implementation and enforcement of the international conventions.

4. Conclusion

In conclusion, investment to boost human resource capabilities will lead to successful attainment of its goals and objectives in e-waste management. Apparently there is a strong positive relationship between the degree of human resource involvement and the development and implementation of e-waste management. With the constant evolution of new technology and means of adopting it, the study concluded that there is a constant need to understand organizational adoption of technological innovation, its dimensions and attributes. The TOE framework of Tornatzky and Fleischer [24] has demonstrated that it is capable of providing insights for scholars and practitioners interested in the management of e-waste.

5. Recommendations

Establishment of e-waste management infrastructure, civic education, human resource development and resource mobilization are some of the key strategies encompassed by policy documents of various international conventions. E-waste management can be reinforced by capacity building and further efforts in research and development. The current skills in developing countries for handling e-waste are limited, yet these skills are a requirement for successful prevention of e-waste hazards for both environmental and human health.

The study recommend the needed resources for e-waste management as follows: Increase budgetary allocations for activities aimed at minimizing e-waste impacts in various countries; establish methods of resource mobilization from development partners; provide infrastructure and support systems for effective and efficient management of e-waste.

There is also need for stakeholder targeting so as to identify appropriate media for disseminating civic education (including print, radio, TV, social media, and the internet). Also, there is need for the development of e-waste awareness communication strategies based on targeted stakeholders, media and messages.

There is need for the establishment of a modern national e-waste dismantling and recycling facility. Such a strategically plant should be set up to provide a secure and environmentally conscious process for the sorting and separation of e-waste into reusable materials. As previously discussed, various countries have no problems in drafting laws, regulations and guidelines to address the problem of e-waste, however there is still absence of legislative and political drive to stringently enforce regulations to make sure that viable electronics are imported to developing countries. Technological capabilities go a long way in influencing the e-waste management. Thus, various organizations should take into cognizance the advanced technology for e-waste management, and further engage in high technological changes and improvements.

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