Management of Electronic Waste by Bulk Consumers: The Case of India's IT Service Sector

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List of Figures and Tables

List of Acronyms and Abbreviations

ASR- Automotive Shredder Residue
CEO- Chief Executive Officer
CER- Corporate Environmental Responsibility
CII- Confederation of Indian Industries
CSR- Corporate Social Responsibility
EEE- Electrical and Electronic Equipment
ELV – End of Life Vehicle
EOL- End of Life
EPR- Extended Producer Responsibility
GDP - Gross Domestic Production
GOI- Government of India
GTZ – German Technical Cooperation
HWMHR- Hazardous Waste Management and Handling Rules
ICT – Information and Communication Technology
IT – Information Technology
MAIT – Manufacturers Association of Information Technology
MoEF- Ministry of Environment and Forest
MSME- Micro Small and Medium Enterprises
MSW- Municipal Solid Waste
NASSCOM – National Association of Software and Services Companies
OECD- Organisation for Economic Co-Operation and Development
PCB- Pollution Control Board
STPI- Software Technology Parks of India
SEZ- Special Economic Zone
WEEE – Waste Electrical and Electronic Equipment

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Abstract

The global ICT revolution is adding a new stream of waste, known as electronic waste or 'e-waste': electrical and electronic equipment that has ceased to be of value to its owners. The recyclability of e-waste together with the presence of pollutants poses a waste management challenge. Developed countries have systems in place to address this challenge, but developing countries have only recently recognised the need to develop appropriate systems for e-waste management.

ICT consumers are key stakeholders in e-waste: it is they who decide whether and when an item is e-waste, and they form the link between producers and recyclers. Yet not much attention has been paid to their role. The limited research to date has focused on household consumers in developed countries, leaving a knowledge gap around bulk, organisational consumers in developing countries, despite their often being the largest single contributor to e-waste.

Acknowledging the growing challenge of e-waste management in developing countries and lack of research on bulk consumer response to this challenge, the present research aimed to understand e-waste material flows, management strategies and determinants relating to bulk consumers of IT in India. It focused on bulk consumers in India's IT service sector because that sector depends on electronic equipment for its operation and has been recognised to generate nearly 30% of the total e-waste in the country. The data for this research was collected between 2010 and 2011, at a time when preparations were underway for implementation of separate e-waste regulations in the country. Therefore, the findings of the research here draw attention to the practice for e-waste management in India before implementation of the new regulations.

In order to achieve the overall aims, a qualitative research approach based on multiple case studies was adopted. In all, 20 IT service organisations belonging to three different groups based on size namely, very large (VL), large (L) and small and medium (SM) were studied via multiple semi-structured interviews, direct observations and document analysis. Further source triangulation was achieved through interviews with representatives from other stakeholder groups: IT equipment producers, formal recyclers, regulators, industry association representatives, and representatives of various national and international organisations working on e-waste management.

A complex chain of material flow was identified, involving a significant number of stakeholders. Two further models – of e-waste strategy and e-waste strategy determinants – were developed through literature review and pilot fieldwork, and then verified via the main fieldwork. Three distinct types of e-waste management strategy were observed among the stakeholders. While the VLIT organisations and IT producers exhibited a proactive approach to e-waste management, the LIT organisations and formal recyclers exhibited a reactive approach to its management. The SMIT organisations ignored the challenge of e-waste and were indifferent to the management of generated e-waste. Various external (regulation, clients, peer pressure, brand and corporate reputation) and internal (corporate culture and leadership, financial benefits and corporate social responsibility) factors were found to play a role in determining the different types of e-waste management practiced by the stakeholders. Except for direct financial benefits all the identified factors had a strong determining role in the proactive approach to e-waste management. The reactive approach was chiefly driven by regulation and financial benefits associated with e-waste management. The indifferent approach was driven only by the financial benefits associated with disposal of e-waste.

A key determinant that was shaping the factors among the IT bulk consumers was institutional pressures mainly driven by the requirement of some clients for green practices; that requirement itself deriving from the nature of the value chains within which consumer organisations were located. Alongside the determinants, a set of enabling factors was identified (awareness, environmental management systems, and access and availability of formal recyclers) which helped explain the implementation of e-waste management practices. When the levels of these enablers were high the implementation of organisational e-waste management was proactive and when they were low, the approach to e-waste management was reactive. These enablers were absent in the organisations that were indifferent to e-waste management. From these findings, various challenges in the current system for e-waste management could be identified including: value expectation at the time of disposal of e-waste; patchy awareness about e-waste; lack of collection mechanisms; and regulatory shortcomings. Recommendations have been made about opportunities to incentivise and facilitate collection, enhance awareness, and offer regulatory support.

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Declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this of any other university of other institute of learning.

Copyright statement

Dedications

For my Mother **Saroji Subramanian** (1944-2008) who has always inspired me and believed in me. *Amma* to you, who is with me always

Yaa Devi Sarvabhuteshu Maatrurupena Samsthitaa |
Namastasyai Namastasyai Namastasyai Namo Namah ||

(To that Goddess, who is residing in all beings, in the form of the mother, I bow, salute, pray and prostrate to her!)

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1 INTRODUCTION

Information and Communications Technology (ICT) is synonymous with information technology (IT), but also includes integration of communication technology like telephone lines and wireless signals, which enable users to access, store, transmit, and manipulate information. ICT has been recognised as a force behind the new globalisation wave that has swept the world (Roy, 2005). ICT by enabling global connectivity and knowledge transfer has significantly contributed to the global economic growth. This economic growth is not just restricted to the developed countries but is also seen translated into the economies of the developing countries. And one such example of the contribution of this technology wave in the developing countries is the global recognition of India as the IT destination. From US$5.7 billion in 2001 (Moitra, 2001) IT has surpassed to US$70 billion industry in 2010 (Bhasin, 2010) and is still growing.

Despite the recognition of the positive impact of ICT on economic growth, its environmental impacts are not well understood and demand attention (Sui and Rejeski, 2002). According to Gartner (2007) the manufacture, distribution, and use of ICT systems generated about 2% of all global greenhouse gas emissions, which is equivalent to that generated by the aviation industry. Although the environmental impact of ICT draws attention to the wide disagreement among the researchers about its negative and positive effect on the environment (Berkhout and Hertin, 2004), studies on the environmental impacts of the production, consumption and disposal of ICT equipment have confirmed the negative impact of ICT (Mills and Huber, 2000; Matthews and Hendrickson, 2001; Plepys, 2002).

The unsustainable production and consumption of ICT equipment has manifested itself as the new global environmental challenge of electronic waste. Electronic waste is also known as e-waste, or waste electrical and electronic equipment (WEEE), or end-of-life (EOL) electronics. E-waste denotes electronic and electrical equipment, including all components, sub-assemblies, and consumables, deemed obsolete or unwanted by a user (Bhuie et al., 2004; Cairns, 2005). This introductory chapter presents the focus of this research that looks at electronic waste management in a developing country. Since e-waste is part of the bigger general waste, it first presents the growing global solid waste issue to establish the challenge of e-waste management (1.1). It then briefly presents the issue of e-waste (1.2) and the existing research gap in e-waste management (1.3). It then presents the focus of the present research (1.4) together with the aim and objectives (1.5). A brief discussion on the research approach (1.6) adopted is then given followed by the structure of the thesis (1.7) in the conclusion.

1.1 The Global Solid Waste Issue

Currently, world cities generate about 1.3 billion tonnes of solid waste per year and this is expected to increase to 2.2 billion tonnes by 2025 (The World Bank, 2012). According to the World Bank report, municipal solid waste generation rates are directly proportional to economic development and urbanisation (*ibid.,*). Industrialized nations are among the largest waste producers with the US and Canada topping the list with 2 and 1.7 kg of waste per person per day, respectively, approximately double that generated among the urban population in Latin America at 1 kg (Chung and Poo, 1998). According to Cotton et al., (1999), cities in low-income countries generate on average between 300 and 600 grams of waste per person per day. Although the per capita waste generation is low in the developing countries this problem is enhanced by the higher population density and absence of stricter regulations and facilities to manage them. Many cities in developing countries fail to collect significant proportions of the cities' household waste. According to World Resource Institute (1996), one to two thirds of the solid waste generated is not collected in the developing countries of Asia. UNEP-IETC (1996) reported that uncollected waste contributed to flooding, along with breeding of insect vectors and rodents that spread diseases in the developing countries.

The steady increase in per capita consumption makes waste management a serious problem both for the developed and developing economies. Global economic growth has brought about a change in consumer behaviour, which has resulted in a huge volume of waste generation. The change in marketing strategy from durability of products to convenience, easy availability and cheapness of goods has further helped in accelerating this change in consumer behaviour. It is becoming cheaper to replace faulty equipment than repair it, thus abetting proliferation of waste.

Apart from the growing quantity of waste due to changing consumer patterns, waste management practices where the generators of the waste are not involved in its management (also known as waste distancing) is another important cause for concern. According to Clapp (2002) three factors that promote waste distancing are viz. extremely large-scale modern industrial life style, where the increased levels of production and consumption distances the users from the disposal issue; economic globalization, leading to globalization of waste management industries; and economic inequality, whereby waste becomes a source of income and thus acceptable to the global poor. E-waste generation and management exemplify this effect of changing consumer behaviour and waste distancing practices (adopted in the developed countries) and are discussed further.

1.2 The Issue of E-Waste

The number of appliances put onto the market every year is increasing both in post-industrialized and industrializing countries, thereby contributing to the increased generation of e-waste globally (UNEP & UNU, 2009). E-waste is acknowledged as the fastest growing fraction of municipal solid waste and constitutes nearly 8% (Economist 2005 cited in Balakrishnan Ramesh et al., 2007). This e-waste, which is increasing every year, has been recognised as a major environmental impact of IT (USEPA, 2000). E-waste contains both toxic and valuable materials. On the one hand the presence of toxic substances makes it environmentally challenging to handle it, while the presence of valuable substance encourages an international trade in e-waste. The growing quantity of e-waste, together with its toxic nature has made the management of e-waste a global challenge (Puckett and Smith, 2002).

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In the developed countries, the increasing quantity of e-waste is attributed to higher cost of repair of electronic equipment together with the decreasing cost of equipment, which makes it economically viable to replace rather than repair. Planned obsolescence practised by EEE (electrical and electronic equipment) producers (Slade, 2006) has further enhanced the consumer's desire to replace products. Planned obsolescence is a marketing strategy that creates long-term sales volume by decreasing the useful life of technology, thereby increasing the rate of purchase of new technology. Lodziack (2000) further explains how this planned obsolescence of consumer products leads to more frequent purchases not out of personal choice but as a consequence of the products' purposefully limited durability, thus increasing the rate of consumption and ultimately the waste generation. Most often the e-waste thus generated in developed countries ends up in landfills or is incinerated. Puckett and Smith (2002) reported that the e-waste produced in the US ended in landfills along with other municipal solid waste. Similar behaviour was also observed in the European Union until a decade back (Schenkman, 2002).

With the decreased availability of landfill space and increased recognition of the toxic nature of e-waste, regulations have been promulgated to manage them. The promulgation of regulations has made it expensive to recycle e-waste in most developed countries and hence they have chosen the alternate cheaper route of managing this e-waste by exporting it to the developing countries of the South. The export of e-waste from developed countries to developing countries is further confirmed by BAN (2002), which reported that the United States e-waste recycling industry once declared that around 80% of the e-waste they received was exported into Asia, and around 90% of it went to China.

In the developing countries the increasing quantity of e-waste is not only due to the economic growth and related change in consumer behaviour, but also due to the import of these wastes from developed countries for recycling (Liu, 2006). Developing countries tend to view e-waste as a resource for income generation, as opposed to 'waste' owing to the availability of large-scale unskilled labour in the informal sector that is involved in the dismantling and recovery process of valuable metals present in them (Sinha-Khetriwala, 2004). This large informal sector, engaged in resource recovery from e-waste, does so by adopting environmentally unsound practices (Widmer et al., 2005). The nature of e-waste, along with the absence of national regulation to handle it in developing countries, together with it being looked upon as a resource for income generation, makes e-waste management a challenging issue in these countries.

The management of e-waste poses challenge both in the developed and developing countries and there is mixed opinion with regard to the movement of e-waste for recycling and management. Some researchers like Vasudev and Parthasarthy (2007) recommend that, since recycling of e-waste requires both labour-intensive manual segregation along with capital intensive technical processes for the separation of toxic waste, instead of a total ban in the trade of toxic e-waste, there should be monitored trade in e-waste between the developed and developing countries. They recommend that the e-waste generated from the developed countries should be transported to the developing countries where the labour force could be used for the first stage of e-waste recycling, which is dismantling and segregation. The toxic residues that need to be removed from e-waste could be then sent back to the developed countries where the technical facilities and know-how exist for their treatment. Such a trade in e-waste has also been argued to bring social and economic benefits for developing countries (Kahhat, 2008; Williams et al., 2008). However, BAN and environmental activist groups like Greenpeace are demanding a total ban in their movement, as they believe any kind of trade will be misused to accelerate the current problem of environmental damage. The context of e-waste will be explored in detail in the next chapter. Next attention is drawn to the research gap in e-waste management and the focus of this research.

1.3 The Research Gap in E-Waste Management

The above discussions indicate that management of e-waste is a growing global challenge. The literature on e-waste mostly focuses on the quantification of e-waste (Jain and Sareen, 2004; Yang et al., 2004; Liu, 2006; Dwivedy and Mittal, 2010), the need and ways to manage it (Lindhqvist, 2000; Widmer et al., 2005; Bandyopadhyay, 2008; Kahhat et al., 2008; Ongondo et al., 2011a; Ongondo et al., 2011b; Wath et al., 2011), the role of regulation in its management (Hicks et al, 2005; Sinha-Khetriwal et al., 2005) as well as the active role of the informal sector in its management in developing countries (Streicher-Porte et al., 2005; Liu et al., 2006; Chi et al., 2011) which causes environmental damage (Wong et al., 2007; Ha et al., 2009; Sepúlveda et al., 2010). There is also research on resource extraction from e-waste and associated environmental benefits (White et al., 2003; Chancerel et al., 2009; Huang et al., 2009). However, the challenges with management of e-waste continue to exist both in the developed and developing countries.

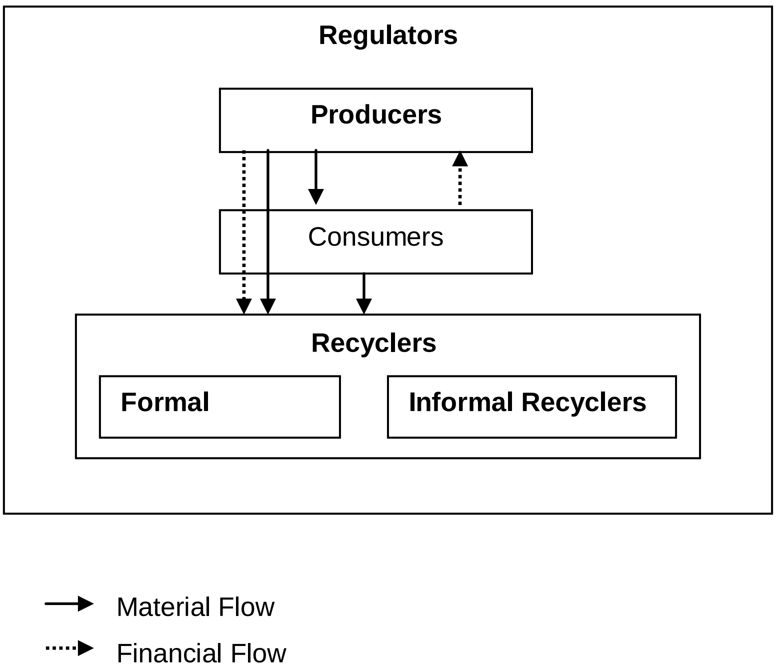
Most of developed countries recognised the need to manage this new stream of waste in the 1990s and have promulgated regional/national regulations in response. These regulations are based on the principle of extended producer responsibility (EPR), proposed by Lindhqvist (2000), where the responsibility for managing and financing e-waste recycling is shouldered by the producers of equipment. However, the developing countries of the South have only now woken up to this new challenge and are either still lacking in regulations or in the process of drafting and implementing regulation similar to those in the developed countries.

Although internationally, European Union (EU) has been one of the earliest adopters of this EPR-based approach to e-waste management (with practice nearly over a decade), it has not proved to be effective in tackling the problem of e-waste even in the EU (EU, 2008). Amendments to EU e-waste rules are being made to make e-waste management more successful. Under these conditions, adoption of an EPR-based western approach in the developing countries without closely investigating the existing practice for e-waste management there may not be useful in tackling the problems. This observation on the lack of usefulness of an EPR-based policy approach, without clear understanding of the developing country context is also acknowledged by researchers like Manomaivibool (2009).

The assessment of existing practices for e-waste management also becomes important in developing countries where, due to the economic opportunity that e-waste recycling provides, resource recovery from this waste has been taken up by the informal sector. Although research exists on e-waste management and the general material flow of e-waste in developing countries (Liu et al., 2006; GTZ-MAIT, 2007; Manomaivibool, 2009; Wath el al., 2011), this is based on data gathered from certain regions of the countries or on certain product types. The specific sources of e-waste generation and the interactions between these sources and the various stakeholders that results in the material flow have not gained sufficient attention in the existing research.

For a management process to be holistic and complete, it is not only important to identify the stakeholders, but also to involve them meaningfully. Although Lindhqvist (2000) proposed the use of the EPR-based policy for e-waste management where the onus of managing e-waste rests on producers, he recognised the importance of other stakeholders including consumers, recyclers and the regulators, for an e-waste management plan. Figure 1.1 represents the flow of material and money in e-waste management among the different stakeholders identified in the literature. The role of regulators is overarching as they delegate and monitor the roles and responsibility of various players in addition to providing them with any needed support. Those stakeholders that have gained the attention of researchers in the existing literature on e-waste are represented in emboldened text.

Figure 1.1 E-waste management structure recognised from existing literature



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From Figure 1.1 it can be inferred that the role of consumers in the management of e-waste has not gained much attention. The role of users and their participation is significant for the success of the system as they - as ‘generators’ of waste - serve as an important link between the producers and recyclers. The importance and participation of generators of waste in its management has been recognised to be important in waste management generally (Morrissey and Browne, 2004) and also acknowledged to be important in the management of e-waste specifically (Ogunseitan et al., 2009). This is important because when the generators of waste are distanced from its impacts, the generation of waste due to lack of recognition of its environmental impact by the generators is increased (Clapp, 2002).

Among the consumers (or generators of e-waste) there are two types, viz. household consumers and commercial/bulk consumers. Bulk consumers are registered organisations from both private and public sector who make use of electrical and electronic equipment. While the household generators’ response to waste management reflects an individual’s perspective, the bulk generators’ response reflects an organisational perspective. The little attention that consumers have received in the literature on e-waste management has mainly remained focused on household consumer behaviour, which is perceived to be more challenging (Nixon et al., 2009; Wang et al., 2011; Song et al., 2012; Dwivedy and Mittal, 2013). The behaviour and response of bulk consumers in managing e-waste have not gained sufficient attention to date. As bulk users of electronic equipment these consumers also generate bulk quantities of e-waste. If their behaviour and response to this waste were understood it would be easier, especially in developing countries, to draw these bulk quantities of e-waste to proper waste management stream. So, in order to gain a complete picture of consumer response to e-waste in developing countries it becomes essential to study both the household and bulk consumers here.

The above discussions draw attention to two main issues with regard to the challenge of e-waste management in developing countries, viz.

1) Need to understand the interaction between the various stakeholders in the absence of regulation, that results in the e-waste material flow in developing countries

2) Need to understand consumer response in developing countries to the challenge of e-waste management

1.4 Research Focus

India is recognised as one of the fast-growing economies in the world and is emerging as a leader in the field of IT-related services (Dalal, 2006). According to Bhasin (2010), the Indian IT-based service industry is a US$70 billion industry accounting for 5.8 % of India’s GDP and employing over 2.3 million people directly and eight million indirectly. This has also added to the e-waste generation in the country, which is estimated to be around 800,000t annually (MoEF, 2010). The IT sector alone generates 30% of all the e-waste generated in the country (Chawla, 2008). Nearly 95% of the total e-waste available for recycling in the country is handled by the informal sector (GTZ-MAIT, 2007). The presence of the informal e-waste recycling sector confirms the existence of e-waste management in the country.

Regulation is often cited as an important factor for the inclusion of environmental factors in an organisational response (Ghobadian et al., 1998). In 2009 during the commencement of this research, India was still drafting a separate e-waste regulation in an attempt to handle this growing waste problem in the country. The separate regulation for e-waste was implemented in 2012, so there was no regulatory requirement for the bulk consumer to manage the e-waste it was generating at the time of this research. However, at the same time the IT sector was beginning to pay attention to its environmental impact and attempting to manage the e-waste it was generating.

Having pointed to the importance of consumer participation for e-waste management and acknowledged the difference in the behaviour between household and bulk consumers, India's vast IT service sector - also a major generator of e-waste - offers the opportunity to investigate bulk consumer response to, and behaviour in, the challenge of e-waste management in a developing country. Investigating the behaviour of these bulk consumers would help in understanding the interaction between this group and other stakeholders and provide insight into the e-waste material flow directed by them. Apart from the opportunity to explore this large bulk consumer group, India is also generating increasing quantity of e-waste that is mainly considered to be handled by informal recycling sector (GTZ-MAIT, 2007; Wath et al., 2011) and is at the stage where e-waste regulations are being drafted. Thus India as a case country provides the opportunity to not only study the existing practice and interaction between the generators of e-waste and other stakeholders, that causes the e-waste material flow but also to explore bulk consumer behaviour in a developing-country context.

However, it must also be admitted here that the bulk consumers come from both public and private sectors and the difference in the institutional settings brings varying responses in them. Although this difference is acknowledged, this research remained focused on the bulk consumers belonging to the IT service organisations in the private sector who generate nearly 30% of e-waste in the country, to allow gaining a deeper understanding within the set time frame and limited resources.

1.5 Aim and Objectives

The aim of this research was to ***analyse the e-waste material flow and factors driving management of e-waste in the IT service sector in India, in particular the bulk consumer response to e-waste and suggest recommendations for their participation in its management.***

The objectives were

i. Develop a conceptual model of factors influencing e-waste practices among IT bulk consumers

ii. Evaluate the practices prevalent in e-waste management in the Indian IT service sector

iii. Identify the path of e-waste among the stakeholders to understand the material flow

iv. Analyse the factors determining the current practices for e-waste management

v. Analyse the challenges for participation in e-waste management for the stakeholders

vi. Recommend strategic actions that would enable the participation of bulk consumers from the IT service sector and enhance the management of e-waste based on analysis of current practice and opportunities available in the system

1.6 Research Strategy and Approach Taken

This research proposed to examine the bulk consumer practices and response to the challenge of e-waste. As there is no previous research on bulk consumer response, and also because the research on e-waste in India in general is limited more to material flow and challenges to its management due to the informal recycling practices (GTZ-MAIT, 2007; Manomaivibool, 2009; Wath el al., 2011), a deductive approach based on hypothecating was not feasible here. Also, an inductive approach that generalized based on empirical observations was inadequate due to its lack of ability to explain the observed behaviour. Given this, a retroductive strategy that combines both the deductive and inductive elements by enabling theory-evidence interaction for the understanding of social realities (as discussed by Ragin (1994) and Sæther (1998)) was adopted here for the present study.

Also, since the overall aim of this research is to gain an understanding of the bulk consumer response a qualitative approach which is more concerned with description, exploration, meanings and interpretation (Cook and Reichardt, 1979) was considered more suitable than a quantitative approach that is generally concerned with counting and measuring aspects of social life. The phenomenon (e-waste management) studied is closely associated to the organisational context, and so a multiple case study using the organisations in the Indian IT service sector, as recommended by Yin (1989), was taken. Data collection for this case research included semi-structured interviews with responsible personnel from the various organisations, and direct observations and analysis of documents in a systematic way. Triangulation to validate and make the findings robust was enabled through semi-structured interviews with other stakeholders, observations and document analysis from other sources.

1.7 Structure of the Thesis

The research process undertaken and the outcomes attained are presented through this thesis, which has nine chapters. The context and conceptualisation of this research is presented through chapters one to five, which formed the first phase of research that was mostly based on literature (except for the pilot study - Chapter 4, that used empirical data to test the preliminary conceptual model developed from literature). The findings based on empirical evidence, which constituted the second phase of the research, are presented in chapters six and seven. Analysis of the empirical evidence using research literature formed the third phase of the research and this is presented in chapters eight and nine. The first chapter presents the global challenge of e-waste management and the need for the research. It also presents the, overall aim and objectives as well as briefly outlining the research approach that is taken in this research.

The second chapter on the context of e-waste discusses in detail the nature, quantity, flow and environmental impacts of e-waste, along with the global regulatory mechanism. It also compares e-waste management with other waste management and draws attention to the unique nature of e-waste that makes it challenging to manage. Since the IT bulk consumers belong to organisations, the third chapter reviews the literature on corporate environmental responsibility to understand the organisational response to environmental impacts to develop the conceptual model of factors determining bulk consumer responses to e-waste management. In doing so it also explores the various theoretical lenses used to understand and explore organisational responses to environmental impacts and management. The fourth chapter is the methodological chapter and it presents the research approach taken to attain the overall aim together with the approach taken for data collection, validation and analysis. The fifth chapter presents the context of e-waste management in India and discusses the quantity of e-waste generated in the country, together with the prevailing practices and regulatory mechanisms in the country to manage the same. It also presents the special nature of the Indian IT service sector (research case), together with the system components that have not only favoured the growth of this sector in the country, but also has played an important role in shaping the e-waste material flow.

The findings are presented in two chapters. The sixth chapter is the first findings chapter and presents the e-waste material flow originating from the bulk consumers. It discusses the various system components and the interaction between the various stakeholders that explains the material flow and identifies the different level of e-waste management practice among the stakeholders. The seventh chapter is the second findings chapter and presents the manifestation and strength of different factors (identified in the conceptual model) determining the response to e-waste management among the stakeholders.

Chapter eight draws on the findings from the previous two chapters and discusses the role and strength of different factors in determining the e-waste management level in the organisations. It also draws from the wider theoretical discussion on organisational environmental response to understand the forces shaping the factors driving e-waste management in the bulk consumers. From Chapter six to Chapter nine (which is the last and concluding chapter), the challenges for participation of the stakeholders in e-waste management in India, based on the observations and analysis of data, are identified, although they are consolidated and presented in Chapter nine. The last chapter also presents recommendations to enrol participation of the bulk consumers along with the scope for future research.

2 CONTEXT OF ELECTRONIC WASTE

"If e-waste were not hazardous, it would still be a nuisance but it would no longer be deadly and destructive to human health and viable ecosystems. If the manufacturing was done cleanly without hazardous inputs and processes, it would be possible to overcome the worst of the high-tech environmental nightmare" — Jim Puckett in Exporting Harm: The High-Tech Trashing of Asia

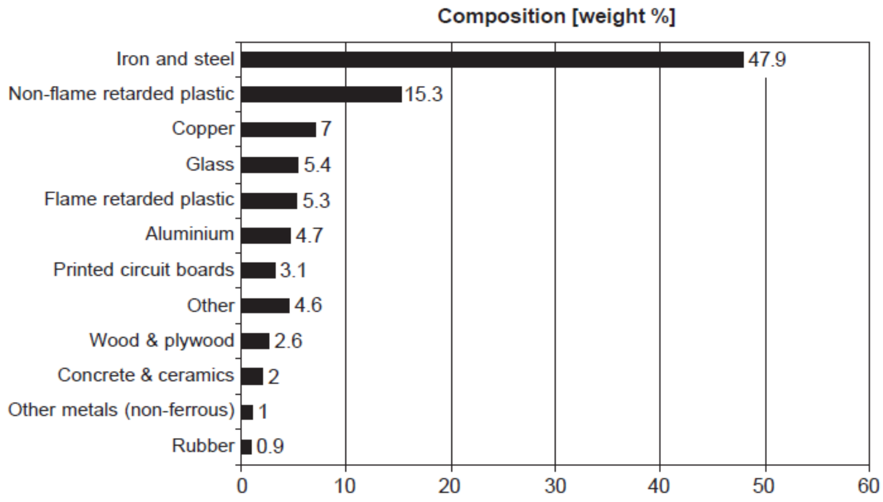
2.1 What is E-Waste?

Electronic waste or 'e-waste' in general refers to electrical and electronic equipment (EEE) that has ceased to be of any value to its owners. There is no standard definition for e-waste yet (Widmer et al. 2005). EU WEEE Directive 2002/96 (EU, 2002) defines EEE as equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1000 volts for alternating current and 1500 volts for direct current. WEEE is defined as EEE which is waste ('waste' means any substance or object which the holder disposes of) including all components, subassemblies and consumables which are part of the product at the time of discarding - EU 2002). E-waste encompasses a broad and growing range of electronic devices ranging from large household devices such as refrigerators, air conditioners, cell phones, personal stereos, and consumer electronics to computers, which have been discarded by their users (Puckett and Smith, 2002).

Although e-waste broadly refers to electrical and electronic equipment that have lost valuable use to the current user what encompasses e-waste that requires to be managed varies according to the regional and national legislations. For example, while EU WEEE recognises 10 categories of e-waste that ranges from large household equipment to toys, sports and medical equipment, the 'e-waste (management and handling) rules 2011' of India only recognises two categories viz. IT and telecommunication equipment and consumer electrical and electronics (MoEF, 2010a). Despite the wide and varied definition on what constitutes e-waste, globally it has been acknowledged that this is one of the fastest growing streams of waste that needs immediate attention.

This e-waste contains a diverse range of materials. Most studies examine five categories of materials in e-waste viz. ferrous metals, non-ferrous metals, glass, plastics and others. Iron and steel account for almost half the total weight of WEEE, followed by plastics (21% of weight), and non-ferrous metals including precious metals (13%, of weight of which copper accounts for nearly 7%). It also contains around 2.7% of pollutants (Widmer et al., 2005) (Figure 2.1). The presence of nearly 60% of recyclable materials like iron, steel, glass and plastic along with recoverable valuable metals like gold have made the global, transboundary trade in e-waste from the developed countries to the developing countries a profitable business (*ibid.*).

Figure 2.1 Typical material fractions in WEEE (Source: Widmer et al., 2005)



Despite opposition from NGOs world over, this global trade in e-waste between the developed and developing countries has been increasing annually (Kahhat et al., 2008). The recyclability of e-waste together with the presence of potentially toxic pollutants poses a waste management challenge in the developing countries, where the resources in these waste are extracted using archaic methods that cause damage to the workers and the environment (Liu et al., 2006). This e-waste that is potentially damaging if mismanaged is growing in quantity globally.

2.2 Mounting E-Waste

Many studies have attempted to estimate e-waste but these have not been accurate, due to the lack of comprehensive, available and reliable data on the e-waste generated. The challenge with estimation of actual quantity of e-waste has also been the difference in the estimation methods and basic assumptions (Widmer et al., 2005). Most of the studies on estimation of e-waste are based on the market supply method (Jain and Sareen, 2004; Yang et al., 2004; Liu, 2006), while some studies use end-of-life models (Matthews et al., 1997). Peralta & Fontanos (2006) expanded on the model of Matthews et al. (1997) to include certain assumptions of the reuse and recycle markets based on observations of the recycling and reuse market, and known practices among users, to estimate the e-waste generated. Lohse et al., (1998) is the most comprehensive as it covers the three basic methods for estimation of e-waste viz. consumption and use method, market supply method and the Swiss Environmental Agency's estimation based on the assumption that with every purchase of new equipment there is a replacement of an end-of life EEE due to saturation of households with such equipment.

Further, most studies on e-waste do not represent the entire range of e-waste, but focus on certain types like computers (Matthews *et al.,* 1997), television and computer (Jain et al. 2004), mobile phones (Scharnhorst et al., 2005). Apart from these individual studies, the Swiss Federal Laboratories for Materials Testing and Research (EMPA) (2008) is the only one that has done a preliminary review and estimation of e-waste in selected countries at an institutional level.
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Despite the difficulties in the estimation, there are studies that have attempted to give an overview of the sizeable amount of e-waste generated in the developed and the developing countries, which provide a glimpse at the enormity of the issue (UNEP & UNU, 2009).

The amount of e-waste generated is on the rise in both developed and developing countries. According to Greenpeace (2005a) it is estimated that globally, 20–50 million tonnes of WEEE is generated annually, of which Asian countries contribute approximately 12 million tonnes. In developed countries, the USA has by far been the largest producer of waste (about 2kg of waste/day/person) and this trend has also continued with its e-waste. According to US EPA (2007), 250 million tonnes of solid waste is generated annually in the country, of which e-waste constitutes 2%. Although this percentage seems low, the quantity produced is close to 2.5 million tonnes and is increasing. The developed countries of the EU are not far behind in this. WEEE, which constituted 8% of municipal waste in EU15, is estimated to grow 16–28% every 5 years (Dalrymple et al., 2007). Increased buying power and changing consumer behaviour due to economic growth, availability of cheaper electronic goods, and planned obsolescence are causing the rise in e-waste generation globally (Chatterjee and Kumar, 2009). A study by Culver (2005) showed that the average life span of a PC has decreased from 4-6 years in 1997 to two years in 2005 due to availability of newer, advanced and cheaper versions of PCs.

The growing quantity of e-waste is not limited to developed countries but is also becoming an issue in the developing countries of Asia (Terazono et al., 2006). Liu et al., (2006) studied the obsolescence of five main kinds of electronic appliances from urban households of Beijing, China and predicted that by 2010, 1.7 million units would become obsolete, just in Beijing alone. China has problems with not only huge volumes of domestically generated e-waste but also from the large quantities of e-waste imported for recycling and reuse (Hicks et al. 2005). According to Lin et al., (2001) the reasons for export of e-waste for processing from developed countries to China is the lower labour cost. In India, about 1.38 million personal computers were estimated to become obsolete every year (Agarwal et al., 2003). Recognising that this estimation of obsolete PCs in India is a decade old it must be acknowledged that this number has probably increased. It is predicted that the booming economy and population growth would further increase e-waste generation and make it challenging to manage (Sinha-Khetriwala et al., 2005). Dwivedy and Mittal (2010) modified Peralata and Fontanos' (2006) model of e-waste estimation by including the option to alter the model inputs according to the country, and predicted that 2.49 million tonnes of e-waste would be generated in India between 2007-2011. The Ministry of Environment and Forest, which is the nodal agency of the Government of India in overseeing the implementation of India's environmental and forestry policies and programmes, had projected only generation of 0.8 million tonnes of e-waste in the country for 2012 (MoEF, 2010b). According to Dwivedy and Mittal (2010), this projection by the nodal agency is low because it had only looked at TVs and computers.

The increasing quantity of e-waste in the developing countries is not only due to their increased domestic consumption but also due to the dumping of these wastes from developed countries (Ketai et al., 2008). Further, availability of cheap unskilled labour and weak regulations in developing countries make their environment conducive for informal recycling (Lin et al., 2001). In order to effectively manage the large quantities of e-waste generated both in the developed and the developing countries it is necessary to understand its nature.

2.3 Uniqueness of E-Waste

Understanding waste composition is important for waste management (Chung and Poon, 2001). Most types of solid waste have a specific origin; for example, household domestic waste originates from households; hospital waste originates from institutions like hospitals, end of life vehicle (ELV) wastes originate from individuals and so on. However, electronic waste, which includes a wide array of components from the small chip in the toys to large household domestic appliance, to mobile phones and computers has a wider source, ranging from individual domestic generators to large institutional generators. Apart from the wide source of origin of this waste, the nature of this waste is also distinct, as it comprises both valuable and hazardous components. The presence of valuable metals (gold, silver, and palladium) makes this waste promising for recycling, while the presence of toxic substances makes it environmentally challenging to manage it.

E-waste is often disposed with municipal solid waste (MSW) and is landfilled, as observed by Kahhat et al. (2008) in the USA where it has been predicted to be the fastest growing component of the MSW. Landfilling of e-waste is a global issue that is prevalent in both developed and developing countries (Ongondo et al., 2011a). Since e-waste is disposed with MSW, it would be useful to draw some lessons from MSW management. MSW management is also one of the most studied stream of waste with very many models developed to understand and manage it. The most prevalent waste management models for MSW are decision support models that use various methods like risk assessment, environmental impact assessment, cost benefit analysis, multi-criteria decision-making and lifecycle analysis. The initial solid waste management models were more focused on optimisation that looked at specific aspect of waste management like vehicle routing, transfer station sitting but, over time, these have evolved to focus around integrated waste management, with the concept of sustainable waste management (Berger et al., 1999). Although the waste management models have evolved, none have considered the complete waste management cycle, from the prevention of waste through to final disposal (Morrissey and Browne, 2004). Further, non-involvement of the people, who generate the waste, in a meaningful way in the decision making process has been identified as a major shortcoming of all the MSW management models (*ibid.*). Thus, from the literature on MSW management it can be drawn that it is important to involve the generators of waste for its sustainable management.

Another important waste that is competing for landfill space in the developed countries is automotive shredder residue (ASR). ASR is the waste generated at the end of automotive recycling of ELV. Due to the presence of certain toxic residues in ASR it has also been declared as hazardous, thus requiring special attention for its management. According to the European Commission, end-of-life vehicles account for between 8- 9 million tonnes of waste every year in Europe and are expected to reach 10-14 million tonnes by 2015 (EU 2000). 75% of this waste is generated in five member states (Germany, UK, France, Spain and Italy) of the EU25. The other major generator of ELV is the US where every year 15 million cars reach end of life (Pomykala et al., 2007). Among the developed countries in Asia, Japan generates 3.5 million units of ELV every year (Togawa, 2008). To tackle this growing volume of ELV waste, various national and transnational legislations have been made. This legislation is based on the principle of extended producer responsibility (EPR), where the manufacturers of the automotive are made responsible to manage the waste either through voluntary action or compulsory requirements.

Unlike MSW, the recyclability of ELV is high, like e-waste. Nearly 75% of automotive materials are profitably recycled via parts re-use, parts and components re-manufacturing and by the scrap processing industry (Pomykala et al., 2007). For an average car manufactured in the EU in 1998, the ELV consists of ferrous and non-ferrous metals (aluminium, copper, zinc, magnesium and lead) apart from plastic (PVC, polypropylene, polyurethane), rubber and glass (Kanari et al., 2003). The percentage of ferrous metal has been steadily declining over the years as the use of lighter metals in the vehicle increases the fuel economy. As more plastic and other lighter metals are used in the vehicle manufacture, it has increased the ASR. Thus the material in ASR is lost to recycling because of its nature.

The presence of a high percentage of recyclable material in e-waste makes it comparable to managing ELV. However, the similarity is limited only to the potential recyclability. Unlike vehicles that have a longer life of 12-15 years (Kanari et al., 2003), the life span of e-waste is much shorter. The average life span of computer for example has come down to 2-5 years (Culver, 2005). Thus the rate of generation of e-waste is higher. While the ELV problem is predominant in the developed countries, the e-waste problem is present both in the developed and developing countries as discussed previously.

The regulations for e-waste management are based on the principles of EPR, like the ELV in both developed and developing countries. Unlike the automobile sector, which has a definite product range and manufacturer in each region/country, the EEE range is wide and varied. Also there are numerous non-branded EEE, which become orphaned[1] e-waste at their EOL in the developing countries. The disposal of ELV by the end consumer, who is the generator of waste, can be easily monitored as the vehicle needs to be deregistered before it is dismantled for recycling and illegal dumping can be traced to the last owner. In the case of e-waste, it is very difficult to trace the owner of dumped WEEE and so the consumer responsibility is difficult to

[1] the producers of this equipment cannot be identified

[2] WBCSD set up in 1992, is an organisation led by chief executives of forward-thinking companies that galvanizes the
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monitor. This indicates that despite the presence of recyclable material in WEEE and ELV and use of an EPR based policy for their management, the application of learning from ELV management to e-waste management is limited. This further confirms the unique nature of e-waste and the inadequacies of applying other waste management models to manage e-waste.

2.4 E-Waste and Environmental Impact

Although the composition of e-waste is changing with changes in technology, valuable metals are still present in e-waste (1t of e-waste contains up to 0.2 tonnes of copper (Widmer et al., 2005)). Electronic waste contains precious metal 'deposits', 40-50 times richer than ores mined from the ground (GeSI, 2012). Extraction of the valuable metals from e-waste in an environmentally friendly way using systematic and scientific approaches like collection, dismantling, separation and resource extraction is already being carried out in the developed countries of Japan, Australia and the EU. The environmental benefits of resource extraction from e-waste include both reduction in carbon emissions (associated with primary production of these metals) and the direct benefits from avoiding green house gas emissions (e.g. recovery of ozone depleting substances from cooling and freezing appliances) (Magalini and Kuehr, 2011). The presence of valuable material in e-waste has resulted in recognition of the economic opportunity it holds to the informal sector already engaged in waste management in the developing countries (Chi et al., 2011).

Unlike the technologically sound and expensive resource recovery processes (thermal destruction and complex metallurgical processes) in the developed countries, the informal sector that is engaged in resource extraction in developing countries uses crude processes to recover recyclable and valuable metals. These crude processes result in the release of potentially toxic pollutants into the environment, thus posing serious environmental damage apart from affecting the health of the people involved in the process (Sinha-Khetriwal et al., 2005). These pollutants include substances like cadmium, mercury, lead, etc., that are highly toxic when burned or recycled in uncontrolled environments (Figure 2.2). It is the presence of these pollutants that has resulted in e-waste being included in the list of hazardous waste under the Basel Convention (1992) thus resulting in restriction in their movement across countries.

Various studies have been carried out to assess the emission of toxic substances from e-waste. Burning and dismantling activities are the main cause for occupational and secondary exposure to the toxics in e-waste. Polybrominated diphenylethers (PBDEs), polychlorinated dibenzodioxins and furans (PCDD/Fs) and lead are released during the recycling of e-waste, which pollute the air, soil and water (Sepúlveda et al., 2010). High levels of dioxins were also reported by Wong et al., (2007) in Guiyu, China where informal recycling is a thriving business. Although there is no strong evidence of lead leaching into the soil from the landfills with e-waste, Li et al., (2009) do not rule out the possibility of this migrating to the surrounding soil with changing conditions in the landfill. Apart from the release and exposure to dioxins during improper recycling of e-waste, trace elements (TE) like cadmium and mercury also pollute the air, soil and enter the human system (Ha et al., 2009).

Studies carried out to set environmental standards for human exposure to toxic compounds have identified dioxins as carcinogens (Travis and Hattemer-Frey, 1991). Dioxins also profoundly affect the endocrine and reproductive systems (Kogevenas, 2001). Further, a two year study on rats found that dioxins caused other serious problems like liver sclerosis, increased mortality, decreased weight gain, etc., thereby indicating high probability of similar conditions in humans due to dioxin exposure (Kochiba, 1978). Lead poisoning causes serious damage to humans and other animals, with the bioaccumulation of lead affecting the central nervous system; lead affects the cognitive development of children and infants (Ryan, 2004). Cadmium toxicity causes renal damage, while chronic mercury poisoning affects the central nervous system and kidney (Langford and Ferner, 1999).

This toxic effect of dioxins and other metals like lead, cadmium, and mercury, all present in e-waste, further indicates the potential damage that can be caused by improper handling of e-waste that releases these materials into the environment. The coexistence of potential environmental damage due to improper handling along with good business opportunity due to proper handling makes e-waste management a challenging issue.

Figure 2.2 Potential environmental contaminants arising from e-waste disposal or recycling (Source: Robinson, 2009)

Contaminant	Relationship with E-waste	Typical E-waste concentration (mg/kg)[a]
Polybrominated diphenyl ethers (PBDEs) polybrominated biphenyls (PBBs) tetrabromobisphenol-A (TBBPA)	Flame retardants	
Polychlorinated biphenyls (PCB)	Condensers, transformers	14
Chlorofluorocarbon (CFC)	Cooling units, insulation foam	
Polycyclic aromatic hydrocarbons (PAHs)	Product of combustion	
Polyhalogenated aromatic hydrocarbons (PHAHs)	Product of low-temperature combustion	
Polychlronated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs)	Product of low-temperature combustion of PVCs and other plastics	
Americium (Am)	Smoke detectors	
Antimony	Flame retardants, plastics (Ernst et al., (2003))	1700
Arsenic (As)	Doping material for Si	
Barium (Ba)	Getters in cathode ray tubes (CRTs)	
Beryllium (Be)	Silicon-controlled rectifiers	
Cadmium (Cd)	Batteries, toners, plastics	180
Chromium (Cr)	Data tapes and floppy disks	9900
Copper (Cu)	Wiring	41,000
Gallium (Ga)	Semiconductors	
Indium (In)	LCD displays	
Lead (Pb)	Solder (Kang and Schoenung, (2005)), CRTs, batteries	2900
Lithium (Li)	Batteries	
Mercury (Hg)	Fluorescent lamps, batteries, switches	0.68
Nickel (Ni)	Batteries	10,300
Selenium (Se)	Rectifiers	
Silver (Ag)	Wiring, switches	
Tin (Sn)	Solder (Kang and Schoenung, (2005)), LCD screens	2400
Zinc (Zn)		5100
Rare earth elements	CRT screens	

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2.5 E-Waste Regulations and Management

As concerns about the management of e-wastes have increased over the past years, global governance has responded to this with legislation to protect and mitigate countries from the impacts of e-waste. Various studies have emphasized the importance of legislation for proper handling of e-waste (Lindhqvist 2000; Bandyopadhyay 2008; Kahhat 2008). The Basel Convention of 1992 is the earliest international regulation that addressed the transnational e-waste flow. However, the transboundary movement of e-waste continued under the guise of recycling and so it was further amended in 1995 as the Basel Ban amendment to make it able to restrict the movement of e-waste.

The regulations that have been promulgated to manage e-waste are based on the principle of extended producer responsibility (EPR). "EPR is defined as an environmental protection strategy that makes the manufacturer of the product responsible for the entire life cycle of the product and especially for the take back, recycling and final disposal of the product" (Lindhqvist, 2000). It was Lindhqvist, who first proposed this environmental policy strategy to manage e-waste, covering five parameters to be considered when designing an EPR based e-waste management system, viz. legal regulation, system coverage, system financing, producer responsibility, compliance. He studied e-waste management in different countries through this framework and showed how these parameters were closely interlinked and play an important role in the effective management of WEEE.

By shifting the responsibility of financial and infrastructure burdens to tackle the waste from the municipality to the producers, EPR internalizes environmental externalities to a large extent. This linking of the manufacture phase of the product with its disposal by EPR encourages the manufacturers to go for better product design to enable easy upgrading and recycling according to Tojo (2005).

The Swiss ORDEE (The Return, the Taking Back and the Disposal of Electrical and Electronic Equipment) 1998 has been the pioneering legislation for e-waste management. The European Union's Waste Electrical and Electronic Equipment Directive (WEEE-Directive 2002/96/EC) which promotes collection and recycling of e-waste and the Restriction on Use of Certain Hazardous Substances in electrical and electronic equipment RoHS - Directive (2002/95/EC 2002b) are two important legislation pertaining to e-waste management in the EU countries. Many countries in Asia like Japan, South Korea, and Taiwan also have their own national regulation to tackle the challenge of managing e-waste (Ongondo et al., 2011). The adoption of EPR based approach to manage e-waste varies geographically and ranges from fully voluntary (Switzerland) to mandatory (EU) systems. Also, this policy approach in the developed countries has used market instruments like advanced recycling fees (ARF), deposit refund schemes, etc., to not only secure financial aid to operate such schemes, but also to enrol the participation of consumers. Despite such measures the dumping of e-waste from developed countries to developing countries continues.

Lack of regulation in developing countries that handle large volumes of e-waste imports is a serious challenge to its management. Many developing countries like China and India have initiated the process of drafting their e-waste legislation in line with the EU WEEE directive (Hicks et al. 2005; Arora et al. 2008). Researchers like (Lin et al., 2001; Manomaivibool, 2009; Meng Die Li et al., 2012) have argued that regulations in developing countries should be based on EPR policy taking in the local context. They have also recommended the need to mandate financial and collection responsibilities apart from legal responsibilities on producers in developing countries EPR policy for e-waste management to ensure proper e-waste treatment.

Market based instruments like ARF, tax credits, and deposit refund schemes that could be leveraged for participation of stakeholders in e-waste management in developing countries have been proposed by researchers while analysing the context in these countries (Lin et al., 2001; Yu et al., 2010; Wath et al., 2010; Wath et al., 2011; Meng Die Li et al., 2012). Also in these countries there is a large group of participants in the informal sector that make a living by resource extraction from this waste through primitive backyard recycling who cannot be ignored while developing an e-waste management system (Lin et al., 2001; Sinha-Khetriwala et al., 2005; Osibanjo and Nnorom, 2007). Yu et al. (2010) further proposed the integration of the informal sector with formal e-waste recyclers by involving them only in collection, for effective e-waste recycling in developing countries like China where informal recycling of e-waste is high.

From the discussions here, it can be drawn that the challenge of e-waste has brought responses for its management from both the developed and developing countries, in the forms of regulations and management practices. Also it can be noted that there is no dearth of research on e-waste management systems and practices in both developed and developing countries. Despite vast research literature in area of e-waste, its management continues to be a global challenge pointing to the need to explore this further. While this section presented the global e-waste management scenario, the specific scenario of e-waste management in India, which is the country of focus for this research, will be presented in more detail in Chapter 5, before presenting the findings.

2.6 Summary

This chapter has looked into the nature and extent of e-waste. By presenting the composition of e-waste and the environmental impacts associated with e-waste mismanagement, it has pointed to the increasing need to manage this fast growing global waste stream. By comparing e-waste management with other waste management streams like MSW, ELV and hospital waste, it has highlighted the unique nature of e-waste that demands special attention for its management. Having emphasised the unique nature of e-waste this chapter has also explored the existing e-waste management practices in the developed and developing countries. In doing so this chapter has presented the context of global e-waste issue, which would be useful in understanding the context of e-waste management in India (Chapter 5) and also the recommendations of the research presented in Chapter 9.

Chapter one had identified the gap in existing e-waste literature and pointed to the lack of attention to bulk consumer in e-waste management (1.3). The understanding on the nature of e-waste and the challenge to its management gained here, along with the acknowledgement of lack of research in bulk consumer response for its management, further strengthens the need for this research that aims to understand the bulk consumer response to the challenge of e-waste management in a developing country context. In order to understand the bulk consumer response, the next step would be to develop a conceptual model for the research that enables to explore and capture their behaviour. As e-waste is an environmental challenge, this task is taken up in the next chapter through review of literature in the area of environmental management.

3 ORGANISATIONAL RESPONSE TO ENVIRONMENTAL CHALLENGES

3.1 Introduction

Most of the environmental challenges that beset human today, from climate change to species extinction to pollution, are anthropogenic and businesses have an important role to play in combating them. As Perrow (1997, p66) said, "there are few significant man-made environmental problems (or woman-made ones) that do not have organisations behind them". Perrow also asserted that since organisations (especially big, bureaucratic ones) have such great power and influence, they deserve more attention as independent variables in studies of environmental damage. These thoughts lay the foundation for the current chapter. Natural resources and environment are seen as the limiting factor of future development (UNDP, 2003). As business sustainability is no longer confined to economic viability, businesses can no longer operate only for profit. The societal expectation of a business and its ability to match it has become important for its survival (Sethi, 1972).

In chapter one, attention was drawn to the importance of consumer participation in e-waste management, which has been recognised as a new global waste management challenge. The chapter further distinguished between household and bulk generators of e-waste and it was pointed that there is lack of research in understanding consumer behaviour (1.4). The bulk consumers belong to organisations unlike the household consumers. To understand the bulk consumer response to e-waste, which has been identified as an environmental challenge, it would be useful to look at organisational responses to environmental challenges and its management, which would provide a conceptual foundation for the research.

This chapter presents the development of conceptual model of factors determining organisational strategy for e-waste management that enabled in data collection for the research. The organisational response to any environmental challenge is determined by how the organisations view their environmental responsibility, which is in turn shaped by certain factors. Thus to identify the factors for the conceptual model it was useful to begin by studying the literature on the broader area of corporate environmental responsibility and then move to the more specific literature on environmental management. As corporate environmental responsibility has its origin from corporate social responsibility, the chapter begins by briefly tracing this origin (3.2) and emphasising its significance in businesses. The acknowledgement and response of business to this growing demand is then presented through a review of literature on business responses to the natural environment (3.3.1). To gain an in-depth understanding of business responses it first reviews the different theories that have been used to discuss the integration of environmental concerns in business (3.3.2) and then moves on to present the various strategies (3.4) adopted by business for integration of environmental response.

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With the insight gained on how organisations viewed their environmental responsibility the literature on organisational environmental management was explored to identify the various factors determining corporate environmental strategy (3.5). The literature distinguishes and classifies the various factors determining organisational environmental management as external (3.5.1) and internal (3.5.2) to organisation. This distinction was useful in identifying the various factors in the conceptual model (3.6). The review of relevant literature for developing the conceptual model also enabled a better understanding of factors determining the prevalent practice for e-waste management in the Indian IT sector that is discussed later in Chapter 8.

3.2 Corporate Social Responsibility in Business

The recognition of environmental responsibility in business has its origin from the recognition of social responsibility in business. This section, which explores the role of business in society, provides a foundation to understand the origin of business responses to natural environment. The roles and expectations of business have changed and come a long way from Milton Friedman's (1962), description of business in his book *Capitalism and Freedom*, where he wrote that, "there is one and only one social responsibility of business–to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud" (p6). This view of Friedman has been subject to considerable debate.

A major opposing view is, "It is a fallacy that business can prosper or indeed even exist without regard for broader social concern" (Sethi, 1972 p4). Many researchers in the field of management support the thoughts of Sethi (Carroll, 1979; Porter and Linde, 1996). Businesses today are under immense pressure from various groups to behave responsibly towards the environment and society. The World Business Council for Sustainable Development (WBCSD)[2] reflects the response and recognition of the importance of social and environmental responsibility for sustainable future of business. WBCSD defines corporate social responsibility (CSR) as, "the commitment of business to contribute to sustainable economic development, working with employees, their families and the local communities" (WBCSD, 2001). It can be seen that businesses have come a long way from pure economic responsibility in the 1960s to include social responsibilities in the 1990s. This change in business attitude has been a metamorphic one.

Although Bowen's (1953) *Social Responsibilities of the Businessman* is often cited as the first attempt to theorize the relationship between corporations and society, it was only the 1970 study on corporate social responsibility (CSR), commissioned by the Committee for Economic Development that reshaped the debate through its wider scope to examine the issue. This study resulted in the publication, *A New Rationale for Corporate Social Policy* (Baumol, 1970). In this publication Wallich and McGowan (1970) described why in the wider interest of business,

[2] WBCSD set up in 1992, is an organisation led by chief executives of forward-thinking companies that galvanizes the global business community to create a sustainable future for business.

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it was important for a business to be responsible for the society in which it operated. The underlying assumption was that, since businesses operated in the society, the deterioration of society would in turn affect the business through loss of their critical support structure and customer base (Davis, 1973). The consideration of CSR as a philanthropic activity of businessmen changed with the 1970 publication. The recognition of societal wellbeing as important for business survival led to recognition of CSR as playing an important role in tying this business-society interaction. However, it remained a conceptual notion with no clear theoretical framework to act upon.

The three-dimensional model of corporate social performance (CSP) by Carroll (1979) brought a theoretical framework by combining the three dimensions in CSP, viz. CSR, social issues and corporate social responsiveness together. This framework helped corporations to identify the strategic response to those social issues that were important to their line of business and thus act responsibly. Under this model, the social responsibility of business extended to include economic, legal, ethical and discretionary categories, with varying degree of weight assigned to each by the business. In response to these responsibilities, corporations could choose one of the four possible strategies of action viz. reactive, defensive, accommodative or proactive. However, this model was challenged by Wartick and Cochran (1985), who argued that the CSP model only discussed the approaches a firm could take, but not the processes which could be adopted to have an effective organisational CSR. Carroll's (1979) model was further modified by Wood (1991) to include various theories like organisational institutionalism, stakeholder management theory and social issues management theories, to form a practical model for managerial use in the corporations. Despite these modifications to the CSP model, lack of clear measurement of CSP and the benefits of engaging in CSR made this unsuccessful for its widespread application (Wood and Jones, 1995).

Since CSR represents social responsibility of business its effective application would not be practicable without identifying the stakeholders to whom this responsibility is extended. Lack of managerial understanding and knowledge in the identification of stakeholders and their needs was another serious issue with the application of CSR. The integration of stakeholder theory to the field of CSR helped overcome this problem, and brought about a major change in the direction of CSR theory and application (Lee, 2008). Stakeholder theory was developed by Freeman (1984), as a strategic approach to business management and it asserted that satisfaction of non-financial stakeholders was vital for a firm's success. Thus the integration of stakeholder theory in CSR brought a strategic perspective to it. This strategic approach to CSR was further strengthened by various management research studies that looked at integration of CSR in business using other theoretical frames like competitive advantage theory (Porter and Kramer, 2002), institutional theory (Jennings and Zandbergen, 1995; Jones, 1995) and the resource based view (RBV) (Hart, 1995; McWilliams and Siegel, 2001). Some of the research also explored the drivers for such strategic CSR. The various drivers for CSR identified in different research included corporate reputation, customers, competitors, regulators, civil society, media and globalization (Zadek, 2000; Porter and Kramer, 2002; Moon, 2007).

The application of stakeholder theory to CSR helped in identifying the different players and their roles for a good and practical CSR. This also led to the expansion of the CSR field to include new branches such as corporate environmental responsibility, affirmative action, global reporting initiative, corporate governance, etc. It can be seen that CSR has evolved from being an ethical obligation for business that was taken up on an ad hoc basis and as a philanthropic activity by its founders in the 1960s, to being strategic for business, where it is placed at par with financial considerations thereby erasing the duality between social good and business profitability in the 1990s. This transformation of CSR and its evolution is discussed in great detail by other researchers (Cochran, 2007; Frederick, 2008). Although CSR has branched to include different areas ranging from corporate governance to environment, to reporting, the branch that is important to this research, which looks at organisational response to a new environmental challenge, is the branch of corporate environmental responsibility (CER). The next section will look at CER in the light of its strategic adoption in business organisations and drivers that determine these strategies.

3.3 Corporate Environmental Responsibility (CER)

The worldview of the environment is a human construct, which is influenced by the cultural, political, economical and scientific settings (O'Riordan, 1971). This anthropocentric view of environment makes it challenging to identify and address the impacts to the natural environment caused by human activities. The rise of environmentalism and environmental regulations has led corporations to acknowledge the physical environmental base of organisational activities. The organisational environment is no longer limited to its economic, political and social context but it also includes the ecology of the planet, which provides the inputs for the business and takes in the waste (Smith, 1992).

Businesses depend on the environment for their resources, and hence in the sustained long-term interest of business it becomes essential for them to acknowledge their responsibility towards the environment. This recognition of the importance of natural environment for the survival of business has led to its strategic influence (McWilliams et al., 2006). The strategic role of integration of environment in business has been well researched (Porter, 1985; Shrivastava and Scott, 1992; Sharma and Vredenburg, 1998). These researchers have argued and showed how integration of environmental actions in the business strategy could provide long-term strategic advantage through development of unique firm capability and social recognition. Research has also looked at various drivers that bring about this strategic integration of environment in business and the strategic responses of business to its environmental impact (Roome, 1992; Henriques and Sadorsky, 1996; Bansal and Roth, 2000; Egri and Herman, 2000; Hoffman, 2000; Banerjee, 2001; Kagan et al., 2003; Subhabrata et al., 2003; Gunningham et al., 2005; Benito and Benito, 2006). Thus, environment has begun to play a significant role in the strategic planning and management of business. Acknowledging this, the section further presents the existing research literature on strategic influence of environment on business management that helped in developing the conceptual model for the research.

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3.3.1 Integrating environment in business

Recognizing the need for integration of environment in the business context, researchers have discussed the ways in which environment should be viewed so as to achieve this integration in the long-term interest of both the business and the environment. Although the dependence of organisations on natural resources for their functioning has gained attention, the early research on business and environment were 'anthropocentric' and mostly limited to the use, procurement or exploitation of these resources (Banerjee, 2001). Shrivastava's (1995) paper on the 'ecocentric' strategy was an attempt to overcome this anthropocentric approach. He proposed the 'ecocentric' approach where the businesses, by being responsible and taking due care of their environmental impacts, align the business interest with that of its natural environment. In his work he not only discussed in detail how organisations could adopt this approach but he also strongly advocated that only adoption of 'ecocentric' strategy would ensure the sustainability of firms.

The importance of environmental protection in the 'ecocentric' approach did not gain much popularity among businesses. Realising that prioritising environment over economic gains would never be successful in gaining the attention of business to the environmental impacts; Porter and Linde (1996) proposed a win-win situation for business and environment and advocated firms to adopt environmental strategy based on resource conservation. They argued that, since business operated in environment where the market demand and socio-political structure kept changing, by investing in proactive environmental techniques and pre-empting regulatory sanctions it could gain economic advantage through resource conservation. Through their emphasis on firms identifying and implementing their environmental strategy from an economic perspective, they supported the neoclassical economic theory, which was more welcomed by businesses.

However, this neoclassical economic approach to the environment was challenged by Walley and Whitehead (1994). They warned that not all investments by the firms to adopt an environmental strategy would prove economical. They argued that instead of focusing on win-win solutions, firms should focus on a 'trade-off zone', where environmental benefit is weighed against value destruction to shareholders. This focus on value could help the firms develop appropriate responses that could range from strategic to operational to technical, depending on managerial discretion. They also advocated that by adopting a shareholder value, rather than compliance, emissions or costs for environmental issues, the business could be sustainable in the long term.

3.3.2 Theoretical lens of environmental integration in business

Alongside these broad views about differing guiding principles that can relate environment and business, other researchers have investigated more specific organisational theories that can be used to understand this relationship and bring about integration of environmental response in business. This section looks at the application of popular organisational theories used in understanding this relation. The application of these theories also has roots in the field of CSR (see 3.2). The main theories discussed here include the resource based view (RBV), stakeholder theory and institutional theory. The application of these theories in enhancing the understanding of corporate environmental management is discussed further by first presenting the fundamentals of these theories and then moving on to discuss its application in the field of environmental management.

Resource Based View

Some researchers (Hart, 1995; Christmann, 2000) proposed the use of RBV to address the issue of integration of environmental response in business. The origin of RBV can be traced to Penrose's (1959) paper on theory of growth of firm where she drew attention to firm resources beyond those identified in traditional economics. She discussed that the firm's growth rested not only on its physical resources but also on the capacity of its management to realise the potential of these physical resources in a way that improves the firm's productive services. Wernerfelt (1984) applied this resource-based approach to look at strategic options available to business and renewed the interest in application of this theory to understand firm performance.

Barney's (1986; 1991; 1994; 1996; 2001; 2002) work of nearly two decades that explored the various aspects and application of this theory contributed significantly to its growth. He argued that it was important to recognise the difference between firm resources that provided economic rent and those that provided competitive advantage, for a clearer understanding and application of RBV in organisations (2001). Barney (1991) based his assumptions of firm resources on Ricardian economics and proposed that for firm resources to provide competitive advantage they had to be heterogeneous and immobile. He argued that if these resources were homogenous and mobile all the firms in the sector would have equal access to them thereby denying any competitive advantage. He also distinguished between 'competitive advantage' (which is usually short spanned) from 'sustained competitive advantage' (which is long standing) and described that for these resources to bring sustained competitive advantage they should be valuable, rare, imperfectly imitable and not substitutable. However, these characteristics of the resources that are described to be important to attain sustained competitive advantage have been challenged to be insufficient to explain it, due to lack of strong empirical evidence (Armstrong and Shimizu, 2007; Newbert, 2007), implying other factors must be considered when explaining this.

Grant (1991) distinguished between resources and capability and discussed how the firm's capability helped harness the value of resources to gain superior performance. He argued that it was important to understand the relationship between resources, capabilities and competitive advantage for adoption of a RBV approach to strategy formulation. According to him, for the resources and capabilities to bring competitive advantage, they should be durable, non-transparent, non-transferable and non-replicable. He further classified these resources as tangible and intangible (which also included people skills). Tangible resources included financial reserves and physical resources such as plant, equipment, and stocks of raw materials, while intangible resources included reputation, technology, and human resources (that also included culture, training and expertise of employees, and their commitment and loyalty). Further Prahalad and Hamel (1990) argued that the difficult imitability of resources provided opportunity for these resources to become a 'core competence' to the firms, and brought competitive success. Although RBV recognised the difference between possession and deployment of resources (capability), it treated them equally which Kraaijenbrink et al. (2010), argued as incorrect and recommended that RBV could improve by distinguishing the various types of resources within the firm.

The RBV researchers drew attention to the variation in firm level performance within a sector that could not be explained by the then popular strategy research that remained focused on exploring the opportunities and threats provided by the external environment of the firms. By drawing attention to the firm's internal resources that were both tangible and intangible they brought another perspective to strategy research. The researchers acknowledged these resources to be heterogeneous and immobile which helped in strengthening the internal focus in strategy. However, it must be noted that RBV did not totally ignore the influence of external factors on firm performance but, it proposed that while developing a firm's strategy these internal resources must be recognised and nurtured and applied, with due attention paid to the external environment (Russo and Fouts, 1997). They explored the complex nature and interaction of the tangible and intangible internal firm resources that played a vital role in identifying the opportunities and threats in the external environment while developing firm strategy.

Hart (1995) applied this RBV approach for integrating environmental management into business strategy. He hypothesized that innovative environmental strategies would lead to the development of firm specific capabilities, which could then provide competitive advantage to the firm. Sharma and Vredenburg (1998) had empirically tested the linkages between environmental responsiveness strategies and the emergence of competitively valuable organisational capabilities using comparative case studies. They found that firms with proactive environmental strategies had developed capability for stakeholder integration, higher order learning, and continuous innovation. Their findings confirmed that the resource-based view of the firm with respect to environment led to competitive advantage. Russo and Fouts (1997) also used a RBV framework in an empirical study that looked at the relationship between financial and environmental performance. They found a positive link between the two, which was however moderated by the growth of the industry. They also found that industry with higher growth had higher environmental performance and adopted beyond-compliance environmental strategy, while industry with lower growth only adopted a compliance strategy. This difference in adoption of strategy was found due to difference in the available tangible and intangible resource bases of the firm that further strengthened their finding. However, it must be acknowledged here, that the various research studies on application of RBV in integration of environment into business, focused on firm performance and the competitive advantage it provided and overlooked the firm activity impact on the natural environment *per se.*

Stakeholder Theory

Another theory that has been applied to understand and integrate the environmental response of business is stakeholder theory (Henriques and Sadorsky, 1996; Berry and Rondinelli, 1998; Henriques and Sadorsky, 1999) proposed by Freeman (1984) for strategic management. In fact it was the application of this stakeholder theory to the field of CSR that resulted in a new line of research that looked at organisational response to the natural environment (3.2). Although it was Freeman who proposed the stakeholder theory, the concept of stakeholders and their influence on business was not new, as various previous works discussed the impact of internal and external actors on firm behaviour (Key, 1999). According to stakeholder theory, the survival of the corporation depended not just on its stockholders, but also on various other stakeholders including its employees, customers, suppliers, etc. A stakeholder is defined as, "Any group or individual who can affect or is affected by the achievement of an organisation's purpose" (Freeman 1984, p 53). Freeman attempted to explain the relationship of the firm to its external environment applying this theory, so as to provide a framework for the firm to respond to it in a strategic manner.

In order to gain more useful insight on stakeholder influence on firms, various researchers have proposed different categorization of stakeholders. Freeman broadly classified them as direct and indirect stakeholders based on value proposition while Carroll (1991) and Mitchell et al., (1997) called them primary and secondary stakeholders based on the type of relationships they entertained with the firm. Mitchell et al. (1997) argued that the firm's response to stakeholder pressure was highly situational and determined by their perceived salience to the firm. So they distinguished the stakeholders based on their power, legitimacy, and urgency. Henriques and Sadorsky (1999) and Carter and Ellram (1998) categorised the stakeholders as internal and external groups based on their affinity to the firm's environment. Internal stakeholders include employees, shareholders, customers and suppliers of the firm (Henriques and Sadorsky, 1999), while external stakeholders include government, NGOs, industry associations and competitors (Carter and Ellram, 1998).

Stakeholder theory has been presented and used in a number of ways that include descriptive, instrumental and normative approaches. In the descriptive approach, stakeholder theory was applied to explain the characteristics and behaviour of firms (Brenner and Cochran, 1991; Clarkson, 1991). In the instrumental approach, stakeholder theory was used to explore the relationship between stakeholder management and firm performance (Cochran and Wood, 1984). In the normative approach, this theory was used to guide the function of firm to include moral and philosophical principles (Carroll, 1989; Marcus, 1993). Although different approaches have been used during the application of stakeholder theory, these different approaches have not been made explicit by most of the researchers which, according to Donaldson and Preston

(1995), has caused confusion about its nature and purpose. They further argued that these three approaches were nested, with the normative aspect forming the core, while its descriptive aspect formed the outer shell (that explained the firm's behaviour), which was strengthened by the predictive and instrumental value in the middle.

The application of stakeholder theory in strategic management literature has mostly remained centred around identification of stakeholders that are important to firms' operation and has limited itself to providing only a framework for firm response to the stakeholders. It has paid insufficient attention to the system within which business operate as it does not distinguish between individual, organisational and institutional environment of firm (Wood, 1991). Another major critique of stakeholder theory is its inadequacy in explaining the forces that these stakeholders exert on the focal firm that is the causal relationship (Key, 1999; de Bakker and den Hond, 2008).

Stakeholder theory with its strong grounding in ethical and philosophical principles has played an active role in integrating environmental concerns during firm strategy formulation. Arora and Cason (1996) found in their assessment of voluntary environmental programmes of firms in the USA that proactive environmental management was significantly influenced by consumer demand for green products and services and recommended that regulators must play an active role in bringing such awareness. Henriques and Sadorsky (1996) used an empirical study to illustrate the role of stakeholders in the development of the environmental plan by the firm. Their result indicated a positive influence of customers, shareholders, regulators and neighbourhood and community groups on firm's environmental response. Buysse and Verbeke (2003) used a stakeholder perspective to assess environmental proactivity of firms in Belgium and found that proactive environmental strategies had a deeper and broader coverage of stakeholders, unlike the pollution prevention strategies that prioritized the regulatory stakeholders. Berry and Rondinelli (1998) also argued the role stakeholders have played globally by exerting direct and indirect pressure on the firms to respond to environmental impacts. These research studies point to the valuable role and practical framework that stakeholder theory has provided in drawing the attention of firms to their environmental impact although they do not provide information on mechanism of such interactions.

Institutional Theory

As the popularity and ability of institutional theory to explain both individual and organisational action gained acceptance, this theory has also found its application in exploring business-environment interactions (Hoffman, 1999; Clemens and Douglas, 2006). The key argument presented by institutional theory has been that organisations are constrained by social rules that shape their structure and response (Ingram and Simons, 1995). As organisations do not exist in isolation and are influenced by their organisational field, institutional theory provides a direction to look at forces that lie beyond the organisational boundary to understand the response of organisations (Scott, 1995). 'Organisational field' refers to "those organisations that, in the aggregate, constitute a recognised area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organisations that produce similar services or products" (DiMaggio and Powell, 1983a p143). The organisational field influences the firm's behaviour either through coercive force, normative pressure or mimetic action (*ibid.*). The institutional theorists are keen to understand the process of 'institutionalization', *i.e*. how the institutional forces shape the response of organisations, which over a period gets embedded within the organisation and becomes institutionalized (Scott and Bruce, 1987).

According to Scott (1995) institutions rest on three pillars viz. regulative, normative and cognitive, which determine their response and behaviour. Regulatory norms bring coercive force to the organisations' response (Dimaggio and Powell, 1983a). The normative pressure on the organisation is its expected behaviour, which is defined by clients, peers, society, etc. The cognition of organisation to these regulative and normative pressures results in the mimetic behaviour seen in the organisation's response (Scott, 1995). D'Andrade (1984) further observed that social sanctions, along with pressure for conformity and values, act together to provide a directive force for the system. The institutional pressures on organisations over time will result in similarity of organisational structure and response which DiMaggio and Powell (1983a) refer as 'institutional isomorphism'. However, the fact that organisations are not passive receptors but are dynamic seems to have been overlooked here.

The emphasis on organisational isomorphism is one of the major critiques of this theory despite its ability to combine other approaches (Dacin et al., 2002). The dominance of organisational isomorphism indicates that this theory seems to assume the passive nature of organisations. Scott (2001) also drew attention to the lack of research on an equally important institutional phenomenon 'deinstitutionalization'. He defined it as "the processes by which institutions weaken and disappear" and emphasized its importance to understand institutional changes.

By providing an opportunity to understand the process of institutionalisation, this theory placed itself in a position to explore the concepts and functions of corporate environmentalism. Hoffman (1999) applied institutional theory to discuss the environmental response of firms. Using a longitudinal study of the oil and gas industry in the USA he discussed how institutional theory offered a framework to understand the progress from industrial environmentalism (1960-70; where firms did not pay much attention to environmental problems) to strategic environmentalism (1989-99; where, businesses recognizing the benefit of being environmentally proactive, began to integrate environment in their overall strategy) as seen in USA businesses. Jennings and Zandbergen (1995) demonstrated the usefulness of institutional theory in shaping the consensus on 'ecological sustainability' within a firm.

Delmas and Toffel (2004) used the opportunity provided by institutional theory to understand the influence of institutional pressures created by stakeholders on environmental management practice in the firms. Doh and Guay (2006) compared the environmental response of organisations in Europe and USA and discussed how the difference in the regulatory and

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normative institutional pressures brought differences in the environmental response of the organisations in the two regions. Darnall et al. (2005) looked at the various factors that influenced the strategic environmental behaviour based on institutional setting, resource-based view and environmental business performance. Their results supported the previous studies that institutional pressures and availability of resources steered the firm's environmental strategy.

Institutional theory provides an opportunity to capture both the regional and stakeholder pressure that shapes the environmental response of organisations. These regional pressures and their impact on organisational environmental response are important in this research as the bulk consumers who are the focus of this research, are in the IT service sector in India: an export oriented sector. Thus, it would be useful to draw attention to this ability of institutional theory further.

Global Production Network

The regional institutional pressure for environmental responsibility has been noted to create a demand for responsible behaviour of organisation's operation even outside the region (Doh and Guy, 2006). Global Production Network (GPN) that has its basis in institutional theory has been used to understand the transfer and impacts of such institutional pressures in geographic economic development. The GPN approach has developed from two previous chains of enquiry namely Global Commodity Chain (GCC) and Global Value Chain (GVC) (Coe et al., 2008). The value chain is a concept from business management that was first described and popularized by Porter (1985). A value chain is a chain of activities for a firm operating in a specific industry. It describes the full range of activities which are required to bring a product or service from conception, through the intermediary phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use (Kaplinsky, 2000). Value chain connotes the value addition of raw material to transform it into usable good through the participation of different partners in the chain. As the product passes through the various activities of the chain it gains some value. According to Porter (1985), value chain can provide competitive advantage to the firm but, to achieve this firm has to look at the overall value system beyond its own value chain. Value system is large stream of activities in which the firm's value chain is embedded.

Globalization, along with bringing significant economic change and growth, has also significantly affected the value chain and value system. The value system is no longer confined to national boundaries and has become global in a true sense. The industrial productivity has shifted to developing countries, while the core competences like innovation strategy, remains with the developed countries (Kuhndt et al., 2008). These extensions of value chain beyond national boundaries lead to a GCC framework of analysis. GCC analysis has been concerned mainly with examining power relations in global manufacturing industries along with exploring ways of upgrading the producers of these goods in developing countries (Gibbon, 2001). GCC has been predominant in analysis of governance structure with rather crude distinctions between buyer and producer driven chains. To overcome this crude and simple distinction used to understand global productivity, GVC came into existence.

The GVC framework looks at the value chain in three dimensions, viz. configuration of purchases and sales by actors in the chain, geographical extent of chains and governance in the chain (i.e. how the chain is coordinated and who does it) (Gereffi, 1994). As value chains are embedded in complex matrix of institutions and industries (Sturgeon, 2001), this institutional context has become the fourth dimension of GVC analysis (Humphrey and Schmitz, 2002; Coe et al., 2008). Although the institutional context has been incorporated in GVC analysis, the chain approach uses a linear interpretation of production system operations and value generation (that remains focused on market transactions) (Hess and Yeung, 2006). Also the institutional dimensions of the GCC/GVC analysis seem to be hijacked by its privileging of governance structures (ibid.).

The GPN framework has its basis in institutional theory. It allows the economic activity to be understood as a 'meshwork' of interconnected activity unlike the linearity of value creation in the value chain (Coe et al. 2008). The GPN framework emphasizes complex intra-, inter- and extra firm network involved in economic activity. GPN is defined as the globally organized nexus of interconnected functions and operations of firms and non-firm institutions through which goods and services are produced, distributed and consumed (Coe, 2009).

GPN analysis looks at three interrelated variables, namely value, power and embeddedness. Value refers to economic rent that can be realized through markets, as well as nonmarket transactions within GPN; power in a GPN is considered as the ability of one actor to affect the behaviour of another actor in a manner contrary to the second actor's interest; and embeddedness refers to the network structure, the degree of functional and societal connectivity within a GPN (Coe, 2009). GPN has also been recognised to provide an opportunity to study the impact of global production on the physical environment (Bolwig et al., 2010), although there is little empirical work in this area. The special nature of the bulk consumers (whose business is export oriented) here, and their response to a new global environmental challenge, i.e. e-waste, provides an opportunity to explore GPN further.

This section looked at theories that have been popularly applied to understand and bring about the integration of environmental response in business. The researchers used them to understand the causal relationship of environmental strategy formulation and management in organisations. In doing so these theories have played a role in pointing to various drivers for organisational environmental strategy, which will be explored further (3.4) to draw the conceptual model. These theories will be taken up again in the Discussion (Chapter 8) after the fieldwork findings have been presented to identify which, if any, can help provide additional analytical insights specifically on e-waste management. However, one more practical issue raised by work using these theories is that organisations differ in the approaches they take to integration of environmental concerns into business and this is explored in the next section.

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3.4 Environmental strategy in business

The variation in the strategic position seen among the organisations is due to their perception of environmental challenges. This perception in turn tunes the organisational response to environmental challenge and ultimately its strategic position. Thus, organisational environmental strategy and its response to environmental challenge are not mutually exclusive. In the current research the understanding of strategic position of organisations (to the challenge of e-waste) would further help in identifying and confirming the role of drivers for the same. This section therefore discusses the variation seen in organisations with respect to their environmental strategy. Businesses today view the natural environment as that leading to market development for new products (Donovan, 1991) or that, which brings about an organisational change in response to changes in market inflicted by them (Graham, 1990). This dichotomy between the ways business perceives the strategic significance of the environment is reflected by Steger (1990). Environmental strategy is a pattern in action over time intended to manage the interface between business and the natural environment (Sharma, 2000). Different researchers have described and discussed the positions organisations have adopted in response to growing environmental demands. These descriptions have lead to the creation of typologies to classify environmental positions (Steger, 1990; Roome, 1992; Hart, 1995) adopted by organisations. Different researchers have used different criteria to develop these typologies, which are discussed in detail below.

Steger (1990), through his large sample of European managers, developed four theoretical strategic positions that firms adopted in response to their environmental impact, viz. *indifference, offensive, defensive* and *innovative.* These theoretical positions were based on the exposure to environmental risks of operations and market opportunity that environmental protection provided to the firms. He observed that when environmental risks of operation and market opportunity were low, the firms adopted an indifference position. In contrast, when the environmental risks of operation and market opportunity are high, the firms adopted an innovative position to gain competitive advantage. Offensive position was seen adopted by those corporations that had low risk but considerable potential for environmentally-based growth, which however was not recognised. Corporations that had few opportunities but high environmental risk that could not be ignored adopted defensive position. He also argued that firms were able to deal with the complex problem of environment only when they had integrated environmental issues with their overall corporate strategy, indicating that lower environmental strategic positions also prevented the firms from decoding the complex problem of environment, thereby masking the competitive advantage it provided. Thus, the organisational perception of environmental challenge is governed by its exposure to environmental risk and the opportunities environmental protection provides, and this perception in turn affects its strategic position.

Hunt and Auster (1990) observed different firm activities in the USA and distinguished the organisations' environmental response based on the development of environmental management programmes and classified them into five groups as, *beginner, fire fighter,*

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concerned citizen, *pragmatist* and *proactivist*. The beginners ignored or failed to recognise their environmental responsibility and so did not have any environmental management program. The fire fighters responded to the environmental risk as and when required and took a defensive approach to their environmental responsibility. At the third stage were concerned citizens who although acknowledging the need to take up environmental responsibility did so by engaging a small but separate environmental management team within the organisation that operated independently. The pragmatists had a well-developed environmental management program that assessed the environmental impacts well but still it had not become a top priority in these organisations. At the final stage was the proactivist who had their environmental programmes well integrated with the overall activities of the firm and had become a top priority. Thus it can be drawn that the environmental strategic position is an indicator of the level of environmental response of the organisation.

Roome (1992) classified the environmental strategies adopted by firms mostly based on compliance to legislation. He recognised five strategic positions of the firm, with first three i.e. *non-compliance, compliance* and *compliance plus* set against the standards of compliance. The last two namely *environmental excellence* and *leading edge* were more practices that firms adopted when environmental management was recognised to be an important and integral part of business. Non-compliance was an approach often adhered to by companies that usually lacked long-term vision along with resource constraint and managerial inertia. The compliance strategy was more a reactive one, with reference to the legal requirements that needed to be fulfilled in order to stay in business. In adopting a compliance plus strategy, the firm took a proactive position and sought to integrate environmental management systems into the framework of its business strategy. The environmental excellence practice differed from compliance plus because these firms recognised the need for organisational change to attain this position. The leading edge strategy, at the highest end of the spectrum, was similar to Steger's concept of innovative companies, which set standards for the other businesses to follow. Roome (*ibid.*) further described compliance as a 'legislation push' strategy as the firms are forced to adhere it, while the compliance plus and beyond was a 'management pull' strategy, which is proposed by management to improve the environmental standing of the firm. Thus, when organisations take a 'compliance to legislation' approach to environmental challenge they take a minimalistic approach towards environmental challenges. It is only when they go beyond the legislative requirement that innovations happen with respect to environmental challenges.

Azzone and Bertelè (1994) explored the adoption of green strategies in the automotive sector in Europe based on the sectoral environmental context. They defined five different environmental strategies which were context-based on industry norms, public opinion and technology and called them *stable, reactive, anticipative*, *proactive* and *creative*. In a stable environmental context, environmental legislation is either absent or weak with no public awareness, which made environmental response more an operational one. Environmental response was also found to be operational in a reactive context, which however had stronger and dynamic legislations. In an anticipatory context, due to strong public awareness, legislation was found to be changing fast and responses provided a source of strategic advantage to the firms. The proactive context with high demand for green consumerism and the creative context with high public awareness about environmental problems coupled with lack of technological solutions provided the firms with superior opportunity to integrate their environmental response into their strategy. They (*ibid*.) concluded that firms could be successful only when they selected an environmental strategy that is consistent with the context they operate within. Thus, the organisation's strategic environmental position is context driven and is affected by not only its legislative environment but also by the market demand.

Hart (1995) developed a typology of environmental strategies based on a resource based view and described four types of approach adopted by organisations viz. *end-of-pipe approach*, *pollution prevention approach*, *product stewardship approach* and *sustainable development approach*. The end-of-pipe approach, which involved committing limited resources to attend to environmental issues of the organisation, reflected a reactive posture. He called the pollution prevention approach a cost leadership strategy where the firm invested resources to achieve regulatory compliance at lower cost through paying attention to the production process. Product stewardship approach is a product differentiation strategy to minimise the environmental impact during the product life cycle. He argued that only sustainable development approach, which required long-term vision, could provide sustained competitive advantage. Thus, organisational resource allotment to tackle its environmental challenge is not only an indicator of its strategic position but, it is only when sustained long term resources are committed for environmental challenges that competitive advantage through integration of environmental concerns could be achieved by the organisations.

The discussions above have drawn attention to the different typologies of environmental strategy adopted by organisations (Figure 3.1). Although different typologies of environmental strategies were developed over a period of time based on different criteria it can be concluded from the above discussions that these strategies broadly ranged from doing nothing to being proactive. The typologies of environmental strategies are seen to be similar to that used in identifying the organisational response to CSR discussed by Carroll (1979) (3.2).

Figure 3.1 Typologies of environmental strategy in organisations

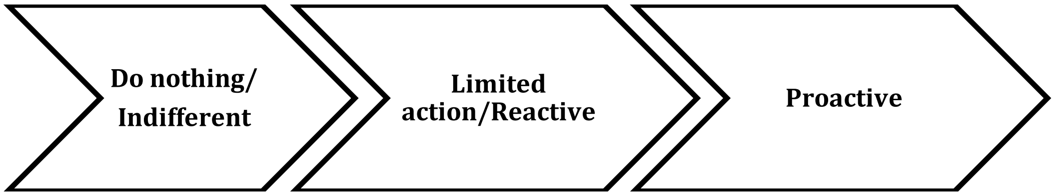
Organisational Environmental Impact (Steger 1990)	Indifference	Offensive	Defensive	Innovator	
Organisational Environmental management practice (Hunt and Auster 1990)	Beginner	Fire fighter	Concerned citizen	Pragmatist	Proactivist
Compliance to legislation (Roome 1992)	Non-compliance	Compliance	Compliance plus	Environmental excellence	Leading edge
Organisational environmental context (Azzone and Bertelè 1994)	Stable	Reactive	Anticipative	Proactive	Creative
Resource spent on environmental management (Hart 1995)	End-of-pipe approach	Pollution prevention approach	Product stewardship approach	Sustainable development approach	

Do nothing → **Be Proactive**

The typologies also suggest a continuum where the organisations are expected to progress in a linear process usually moving from non-compliance to excellence (Steger, 1990; Greeno, 1991; Roome, 1992). However, some researchers (Ghobadian et al. 1998; Azzone and Bertelè 1994) argued that the transformations of strategic behaviour of the firms need not be linear and are influenced by the changes in the external environment.

These typologies provide an understanding about the organisation's response to its environmental impact, which can also be helpful in identifying and understanding the organisational response to the challenge of e-waste management. The organisational response to e-waste management can range from doing nothing or being indifferent; to taking limited action in response to changing context; to taking a proactive stand (Figure 3.2). The positions taken by the organisations studied in the current research to the challenge of e-waste will be discussed in Chapter 6 after presenting the field data.

Figure 3.2 Organisational response positions to the challenge of e-waste



Although it is clear that the position an organisation adopts with regards to its environmental strategy is dynamic what causes this is yet to be properly explored. The next section will look at the factors identified in the literature that cause the organisational push for development and adoption of these various strategies.

3.5 Factors determining corporate environmental responsibility

Although research on identification of drivers for corporate environmental management and strategy is not uncommon, it is recognised that most of this research has been based on the environmental management practices expressed in the polluting industrial sector (Klassen and Whybark, 1999). Research in corporate environmental responsibility and management among the service sector is limited (Lynes and Andrachuk 2008). This section looks at the various factors identified in existing research (based mostly on the manufacturing sector) that play a role in determining the corporate environmental response so as to gain a useful insight into the identification of determinants of e-waste management practice in organisations.

Hunt and Auster (1990) observed that the choice of environmental strategy adopted by an organisation depended on the type of business, range of environmental problems, organisational size and complexity of corporate structure. Steger (1990) argued that the businesses chose their option based on their exposure to environmental risks and also the market opportunities from environmental protection. Ghobadian et al. (1998) contended that the strategic behaviour of the firms is influenced by various external, mediating and moderating factors. The factors external to firms lie outside the control of firms. They described mediating factors as those that intervened between the external pressures and the capability of the company to address the activities necessary to develop successful strategic environmental policies. These included leadership, corporate tradition and ethics. Further, moderating factors were described as those elements that constrained the company’s ability to act, like human resource availability, capital availability, etc. These factors affected strategic decision making for the environment.

Hoffman (2000) discussed the changing role of environment in business and the need to include it as a part of the overall strategy of business. He argued that environmental strategy development included merger of both social and technical aspects making it unique. He identified the various drivers of this corporate environmental strategy along with the competitiveness this brings to the business. The drivers discussed by Hoffman (2000) included regulatory drivers, international drivers, resource drivers, market drivers and social drivers. The organisations that aligned their response with respect to these drivers developed a strategic environmental response that provided them with competitive advantage.

Bansal and Roth (2000) looked at motivations for corporate ecological responsiveness and the factors that led to those motivations. They defined corporate ecological responsiveness as corporate initiatives that aimed at mitigating the firm's impact on natural environment. They found that firms were largely motivated by legitimacy (that included compliance to regulation and institutional norms), to a less extent by competitiveness and even less by ecological responsibility, although they concluded that ecological responsibility was slowly catching up in management and should not be ignored completely. Ghobadian et al. (1998) identified three important external factors viz. legal, market factors (which included the customers, competitors, suppliers and pressure group) and the societal expectation to play an important role in determining the environmental strategy adopted by the firms. Aragon-Correa and Rubio-Lopez (2007) emphasized the ethical aspect of environment and argued that apart from legal pressure, ethical responsibility and business opportunities also pushed firms to adopt environmental strategy. Among other external factors, Hoffman and Trautmann (2006) observed that perceived state uncertainty increased adoption of proactive environmental strategy through the increased allocation of firm's resources and its capabilities.

James et al. (1999) argued that along with the external factors recognized by literatures, various internal culture and capability linked factors associated with the firms also influence the strategic behaviour of the firms. Prakash (2001) also argued that external factors driving the firms to take beyond-compliance environmental strategy are not sufficient and it is equally important to look at the internal dynamics of the firm. According to him, the manager's perception of the external pressure that affected their response played an equally important role in determining the position adopted by the firms.

Benito and Benito (2006) found that apart from external factors and stakeholder pressure, company features also affected environmental proactivity. The company features, which are internal factors, included the size of the company, internalization, position in value chain, managerial attitude and motivation and strategic attitude. The external factors included sector specific pressures and geographic location. Stakeholder pressure was identified as an important determining factor, as stakeholders are also influenced by the external factors, which in turn could increase the pressure they exerted on firms. A positive and significant relationship between firm size and environmental proactivity was also noted by other researchers (Arora and Cason, 1996; Aragón-Correa, 1998).

Lynes and Andrachuk (2008) used the case of the Scandinavian airline industry to understand the firm's level of commitment to corporate environmental and social responsibility (CESR). They identified four systems that influenced the CESR, viz. the market system which depended on cost benefit analysis to the company; political–institutional system which depended on the political culture and system of the government where the company operated; scientific system which was affected by the available scientific knowledge of cause and consequences; and social system which depended on shared knowledge about the above systems. The motivations for environmental responsibility identified by them included economic benefits due to reduced cost achieved from integrating new technologies, regulations, brand image, stakeholder expectation of good corporate citizenship and industry pressure. These further confirmed previous studies on motivation (Correa and Lopez, 2007; Ghobadian *et al.,* 1995; Hoffman, 2000). While the factors discussed above are based on studies carried out in developed countries, Sangle (2009) made an empirical analysis of factors that influenced the adoption of proactive environmental strategies in India. According to him institutional pressures played the most significant role there, although managerial attitude, economic benefits and resource conservation were also significant.

The discussions above indicate that the factors driving organisational environmental management have their origin from diverse systems that include market, institutional, social and political contexts. The factors mediate these diverse system requirements, and in response to them the organisations chose their environmental position. The managers in the organisations act as an interface that both receive and respond to these system requirements. Having established the influence of factors, the next section will describe some of the key factors in more detail that will be helpful in conceptualizing the factors that shape e-waste management in organisations. From the discussions above it can also be inferred that the various factors that determine environmental strategy can be broadly classified into two groups, namely external and internal factors. External factors are outside of the firm's control, while internal factors are those that are within the control of the firm. The next section begins by first drawing attention to some of the key external factors and later moves on to some key internal factors.

3.5.1 External factors driving corporate environmental management

Environmental regulation has been identified as one of the important external factors affecting an organisation's environmental response (Ghobadian et al., 1995; Henriques and Sadorsky, 1996; Porter and Linde, 1996; Nehrt, 1998). The growing cost of environmental fines and cost associated with legal compliance has made regulation an important driver of environmental management (Cordano, 1993). According to Porter and Linde (1996), properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them and provide early mover advantage to the firms. Dowell et al. (2000) analyzed a sample of U.S.-based multinational enterprises and found that firms that adopted stringent environmental standards in line with global requirements performed better financially compared to those that adhered to weaker or lower standards required in developing countries. This further confirmed the proposition of Porter and Linde (1995) that higher environmental regulations provided competitive advantage to firms. Nehrt (1998) acknowledged the role of differences in international environmental regulation on early mover advantage of the firms that used environmental technology and proposed conditions under which the firms could continue to enjoy their early mover advantage. Ghobadian et al. (1995) in their review of environmental strategies of companies in the UK found that environmental issues were important in the corporate strategies, when industrial activity was environmentally degrading (like the petrochemical and manufacturing industries). They also found that regulatory demand was the most important motivator for development of environmental strategies in the firms. Further weakness or lack of regulations in developing countries has been often cited as an important reason for poor environmental quality and management in these countries (Hettige et al., 2000).

Market factors, which include: competitors, brand image and reputation, demand for green products, capital and labour, have been recognised as other important external factors (Ghobadian et al., 1995; Epstein and Roy, 1998; Lynes and Andrachuk, 2008; Lyon and Maxwell, 2008). As organisations are not islands, but operate where they have interaction with suppliers, customers, regulators and competitors (DiMaggio and Powell, 1991), external stakeholders also become part of such market factors (Goodpaster, 1991). The prominent market factors identified in the literature are discussed in detail below.

DiMaggio and Powell (1983a) discussed the role of ***peers*** in the institutional isomorphism seen in organisations. Field cohesion is the intensity and density of formal and informal interaction among the various groups like suppliers, customers, regulators and competitors (Bansal and Roth, 2000). Bansal and Roth (*ibid.*) have shown that industry associations promoted field cohesion, which in turn influences the behaviour and response of its member firms. In their analysis of oil companies they (*ibid.*) found that peers influenced the normative behaviour of the firms with respect to the organisational environmental management approach. Peers, through industrial associations, not only moulded the normative behaviour of the firms but also played a role in organisational innovations (Goes and Park, 1997). Lynes and Andrachuk (2008) found that as the airline industry was criticised for the environmental impacts associated with air travel, the industry associations played an active role in nudging the organisations in the sector to be environmentally responsible to overcome the negative image. The active role of industry associations when the sector is tainted with a negative image was also recognised by Pennings and Harianto (1992). These studies indicate that peer influence, which is enhanced through industrial associations, is one of the external factors determining environmental proactivity of the organisation.

Globalisation has resulted in supplies, operations and services extending beyond national boundaries. Although globalization has opened markets, it has also brought about a global demand for responsible business, especially in developed countries. This demand is also influencing business practices in developing countries through supply chain demands (Vachon

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and Klassen, 2008). The role of these global ***clients*** has become important in determining the environmental response of organisations (Sarkis et al., 2010). Delmas and Montiel (2007) discussed the role corporate customers played in ensuring compliance to environmental regulation in their suppliers. As corporate customers are increasingly using environmental questionnaires to screen their suppliers, client demand for environmental response is gaining importance in business (Lippmann, 1999). This client demand for environmental management is not only acknowledged in the field of green supply chain management but also in the field of environmental strategy. Thus globalisation and associated client demand for green products and services from those in developed countries to their suppliers in developing countries has been recognised to play a proactive role in altering the environmental response of organisations.

NGOs are external stakeholders that have been identified as playing an active role in determining the environmental response of organisations by drawing attention to the environmental impacts of the business (Henriques and Sadorsky, 1996; O'Rourke, 2005; Doh and Guay, 2006; Campbell, 2007). NGOs influence the behaviour of customers in the marketplace by articulating environmental concerns associated with business activity (Lundan, 2001). Buysse and Verbeke (2003) further empirically showed that reactive organisations considered environmental NGOs to be an important stakeholder compared to the proactive organisations, as the former were more concerned about the potential influence of NGOs on their corporate reputation. Globalisation and increasing global interconnection of social and environmental issues has stimulated NGOs to not only forge alliances among themselves but also adopt constructive business-NGO relationships (Fabig and Boele, 1999). According to Murphy and Bendell (1997) such business-NGO alliances were drawn up with the expectation of not only building better relations with NGOs, but in the hope of drawing attention only to the specific environmental issues and not the overall environmental performance of the business. The influence of NGOs in determining the social development strategy of the organisation is not uniform. Organisations with higher potential negative externality come under greater NGO pressure compared to others with lower negative externality (Rueda-Manzanares et al., 2008; Vachani et al., 2009).

Corporate reputation and brand image is an intangible asset of firms that can provide competitive advantage (Porter, 1985). It can act as a signal to the clients and community. Intangible assets such as image and reputation contribute significantly to overall organisational performance (Lusch and Harvey, 1994). Brand image has been defined as the consumer's mental picture of the offering (Dobni and Zinkhan, 1990). It includes symbolic meanings that consumers associate with the specific attributes of the product or service (Padgett and Allen, 1997). Company reputation has been broadly described as the long term combination of the stakeholders' assessment about ''what the firm is'', ''how well the firm meets its commitments and conforms to stakeholders' expectations'', and ''how well the firm's overall performance fits with its socio-political environment'' (Logsdon and Wood, 2002). Fombrun (1996) defined reputation as the set of perceptions held by people inside and outside a company.

While analysing the manifestation of company reputation, Greyser (1999) found that reputation played an important role among the customers in choosing one over the other when several companies' products or services were similar in quality and price. Fombrun (1996) also added that in conditions where there was lack of objective measurement of performance, organisations relied on their reputation to attract clients, as in the case of service sector. Enhanced environmental performance, apart from being a socially responsible action, has been recognised to help in building corporate reputation (Fombrun and Shanley, 1990; Klassen and McLaughlin, 1996; Waddock and Samuel, 1997; Miles and Covin, 2000). Dummett (2006) in his empirical study on corporate environmental responsibility in Australian firms, identified corporate reputation and brand as the second most important driver for corporate environmental responsibility after regulation. Thus, while environmental performance can enhance corporate reputation, corporate reputation was also seen driving environmental responsibility, making them mutually reinforcing.

The above discussions have pointed to the key external factors that have played a significant role in determining the environmental response of the organisations. These key factors were identified based on research that studied manufacturing firms based in developed countries, rather than e-waste producing service organisations in developing countries. To test whether these same factors will be applicable in this different context, they will be incorporated into the conceptual model that will be used as the test framework for this study. However, the external factors only form one part of drivers as literature indicates (3.3.4); organisations do not blindly respond to external stimuli, but are equally influenced by certain internal factors that guide their response. The next section will look at the role of key internal factors identified in the literature in determining the role of organisation's environmental response.

3.5.2 Internal factors driving corporate environmental management

The ***financial benefits*** associated with adoption of sound environmental management practices have been identified as drivers for integration into organisation's environmental response. A firm's finance is recognised as an internal factor that determines its strategy (Abd Ghani et al., 2010). Porter and Van der Linde (1995) argued that innovative pollution prevention technologies developed within the firm could provide cost advantages and so firms must develop environmental strategies to harness this advantage offered by such innovations. Stead and Stead (1995) empirically showed that polluting firms adopted process driven environmental management practices to reduce cost. Also it has been argued that pollution prevention and waste reduction bring resource saving and so cost advantage to firms (Hart, 1995; King and Lenox, 2002).

While the above researchers looked at the direct cost advantage that organisations gained through adoption of environmental management practices, others looked at the indirect financial gains that adoption of environmental strategies offered to firms. These researchers attempted to measure the relationship between a firm's financial performance and its environmental strategy

(Klassen and McLaughlin, 1996; Russo and Fouts, 1997; Waddock and Samuel, 1997; Stanwick and Stanwick, 1998; King and Lenox, 2001) to advocate the adoption of sound environmental practices; albeit, the results from this research is inconclusive, as some showed positive relationships between the two, while others showed none. However, the combination of literature which argues a potential link between environmental strategy and financial benefits, plus those cases which demonstrate such a link in practice, are together sufficient to show that the perception of potential benefits (both direct and indirect) will play a role in the adoption of environmental management and strategy in firms.

Organisational culture is defined as a complex set of values, beliefs, assumptions, and symbols that define the way in which a firm conducts its business (Barney, 1986). This corporate culture, which ranges from individually self-interested (agency culture) to fully other-regarding (altruist culture), influences the recognition and response of the organisation to its stakeholders (Jones et al., 2007). In line with this it can be taken that an organisation with a culture of self-interest that ignores the concerns for others would certainly fail to recognise 'environment' as one of its stakeholders and so ignore its environmental responsibility. On the other hand an organisation with an altruist culture, which considers all the corporate stakeholders, would view its environmental responsibility with most care. Handfield et al. (2001) rightly regarded this as a linking mechanism of the organisation's resources during consideration of environmental issues. Thus organisational culture has been regarded as one of the internal factors motivating organisations for developing environmental management strategies (James et al., 1999; Forbes, 2002; Howard-Grenville et al., 2008; Lynes and Andrachuk, 2008).

Leadership has also been identified as very important for proactive environmental responses of a business (Berry and Rondeneli 1998; Egri and Herman 2000). Leadership is defined "as the process (act) of influencing the activities of an organized group in its efforts toward goal setting and goal achievement" (Stogdill, 1950 p2). Managers with strong leadership quality were found to play a proactive role in environmental decisions of the firms (Egri and Herman 2000). This was also supported by Prakash (2001), who argued that power play and leadership among the managers within the firms make the firms adopt proactive environmental policies.

Leadership and culture are entwined where, on the one hand the founding leaders define the organisational culture, and on the other hand, the institutional context that influences the culture in turn affects leadership (Pettigrew, 1979). Evolution towards preventive environmental approaches demands that companies rely more on the resources of organisational involvement and learning, and organisational culture plays a vital role in this (Fernández et al., 2003). Shrivastava (1995) and Russo and Fouts (1997) further proposed that the organisation's strategic vision is considered to shape organisational culture, as an element in the motivation and involvement of workers in environmental issues. So, ***organisational culture and leadership*** not only act as a driver for environmental proactivity, but an organisation with a proactive environmental strategy will also have the culture and leadership acknowledging this.

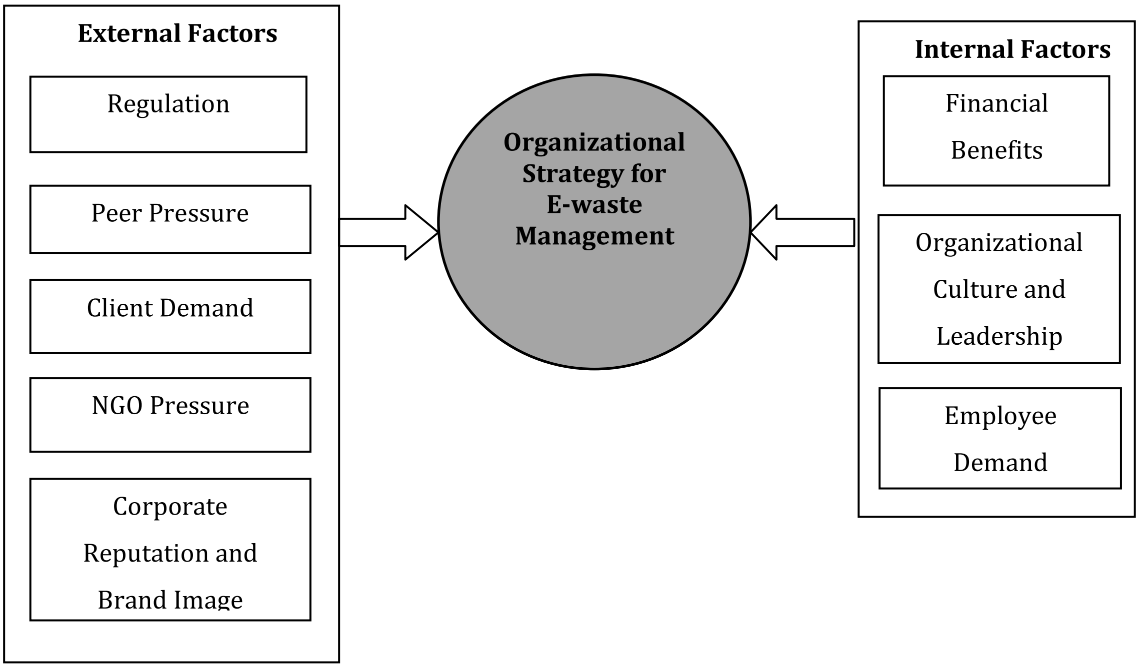
Employees have been recognized as another internal stakeholder who play a vital role in organisational response to the environment (Hart, 1995; Sharma and Vredenburg, 1998; Reinhardt, 1999; Madsen and Ulhøi, 2001). Madsen and Ulhøi (2001) carried out an empirical study on Danish firms to understand the influence of employees on environmental management practices adopted by firms. They ascribed the significant influence of employees to the context in Denmark where health and safety was a priority in the labour market. Since environmental management typically was situated in health and safety departments, the employees demanded a safer and cleaner environment. Reinhardt (1999) indicated that employees' preference for proactive environmental management made it harder for organisations with a reputation for ineffective environmental management to retain and recruit a highly educated and skilled workforce. Also, participation of employees is important for implementation of proactive environmental strategies and so they become a vital stakeholder group for adoption of proactive environmental responses by organisations (Nehrt, 1998; Sharma and Vredenburg, 1998). Thus, the ***employee demand*** for an environmentally sound workplace also plays a role in their choice of employment in an organisation and their role in implementation of environmental management practice point their role to be important in shaping the environmental response of the organisations.

The two above sections (3.3.5 and 3.3.6) present a discussion on some of the key factors driving the environmental responses of organisations. The key external factors are environmental regulation, peers, clients, NGOs and corporate reputation and brand image. The key internal factors identified are financial benefits, organisational culture and leadership and employees. These factors are drawn together to develop a conceptual model for this research that would help in understanding the organisational drivers for e-waste management. The next section presents the conceptual model in detail.

3.6 Conceptual Model for E-Waste Management

E-waste management is an environmental challenge and research on bulk consumer behaviour for e-waste management is lacking. As no previous research on bulk consumer response to e-waste management exists, it was challenging to develop the conceptual model. The first objective of the research was to develop a conceptual model of factors that determine the bulk consumer response to manage e-waste. The bulk consumers belong to organisations; therefore in order to conceptualise their response to e-waste issues, literature on organisational responses to environmental challenges were reviewed in this chapter. The conceptual model (Figure 3.3) constructed from the review of literature on corporate environmental management and strategy is presented in this section.

Figure 3.3 Conceptual models for e-waste management in organisations



Although three different theories that have been used to understand the organisational response to environmental challenges were discussed (3.3.2), the conceptual model constructed here has not aligned itself to one theoretical lens, as that would have resulted in narrowing the scope of factors. Most factors recognised under RBV, stakeholder and institutional theories are not mutually exclusive so, choosing any particular theoretical lens at this stage would result in failure to recognise certain drivers that may have significant influence on organisation's approach to e-waste.

Keeping this in view, the organisational strategy to the challenge of managing e-waste is recognised to be determined by certain factors, which are external and internal to the firm's environment. The grey oval text box (organisational strategy for e-waste management) is the focus of the research here (Figure 3.3). The rectangular box to the left denotes the external factors and is constituted of drivers that include regulation; peer pressure; client requirement; NGO pressure and corporate reputation and brand image. The rectangular box to the right denotes the internal factors and is constituted of drivers that include financial benefits; organisational culture and leadership and employees. Both these types of factors together are expected to influence the organisation's strategy to the issue of e-waste, which is denoted by the arrows. The factors recognised in this conceptual model were explored in the pilot fieldwork before embarking on data collection so as to understand the bulk consumer response to the challenge of e-waste management. The next chapter will discuss the research approach and methodology undertaken.

4 METHODOLOGY

4.1 Introduction

The previous chapters set the context of the research and looked at past research that enabled development of the conceptual model (Figure 3.3). This model identified the various external and internal factors that shape the organisational strategy to deal with e-waste. This chapter discusses the research strategy and methods adopted to achieve the aim and objectives of this research. The choice of an appropriate research strategy is important as it characterises the type of knowledge generated that enables attainment of the aim and objectives (Creswell, 2003). Cavaye (1996) pointed out that it was useful to distinguish between 'research strategy' and 'research method'. Research strategy is defined as "a way of going about one's research, embodying a particular style and employing different methods" (p 227). Research method is defined as "a way to systemize observation, describing ways of collecting evidence and indicating the type of tools and techniques to be used during data collection" (*ibid.* p 227).

This chapter begins with the discussion of research strategy (4.2) and then presents the thematic research questions posed to answer the objectives (4.3), which guided the structure of this thesis. The next section on research design (4.4) discusses the choice of qualitative research and the research design used to attain the overall aim. Research method (4.5) then presents in detail the various methods used to collect data for this research. The chapter then discusses how rigour in the research (4.6) was ensured, before presenting the findings of the pilot fieldwork (4.7), which amended the conceptual model and guided the data collection for the main stage of fieldwork. It finally concludes with the discussion of data analysis (4.8).

4.2 Research Strategy

This research seeks to understand the current practice for e-waste management among the bulk consumers in the Indian IT sector and the factors that determine it, so as to understand their response to the challenge of e-waste management. In doing so, it seeks to go beyond mere description of the practice (exploratory) and understand the reasons for such practices. According to Ragin (1994) all research has some deductive elements (as it is impossible to do research without initial ideas) and since social theories are imprecise and vague all research contributes to theory advancement (induction). Ragin described such a strategy of theory-evidence interaction for understanding of social realities as retroductive (*ibid.*).

A retroductive approach, which involves the construction of hypothetical models as a way of uncovering the real structures and mechanisms that are assumed to produce empirical phenomena (Blaikie, 2001) was considered appropriate for this research and adopted. This approach makes possible a research process that is characterized by the linking of evidence (induction) and social theory (deduction) in a continually evolving, dynamic process, thus overcoming the dualism caused by inductive and deductive approaches (Sæther, 1998). Sæther (*ibid.*) further argued that a retroductive research strategy, by not being tied to any particular discipline, was most suitable for understanding multi disciplinary research such as the environmental responses of organisations. Dubois and Gadde (2002) also recommended that such a strategy was useful where the objective was to improve understanding of an under-researched phenomenon, as in this case.

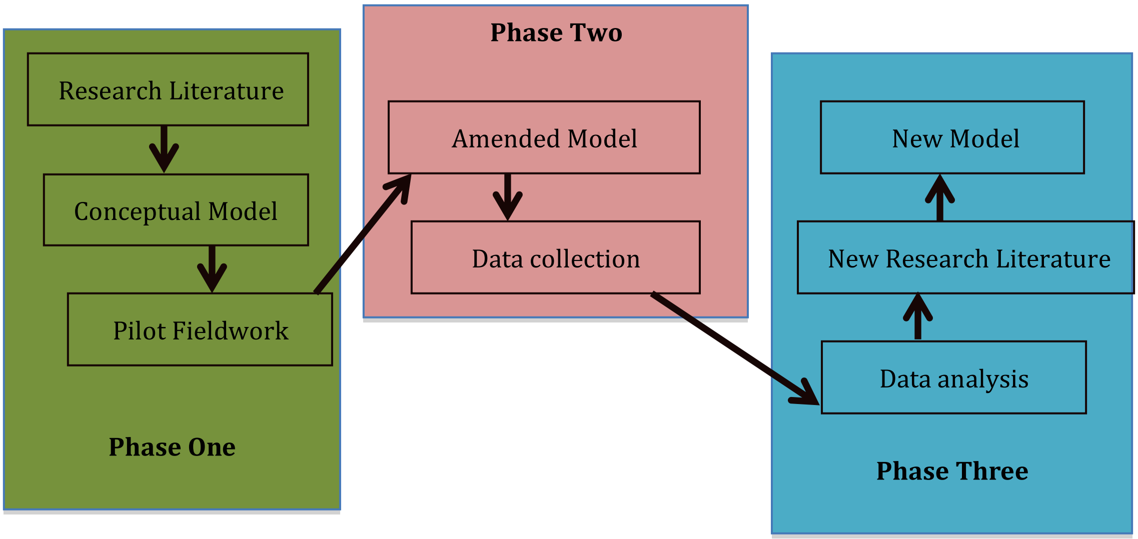
Based on a retroductive research strategy, the conceptual model (3.4) was developed through an initial literature review. In order to scope the factors shaping organisational e-waste strategy, the literature review did not limit itself to research on e-waste but also included research in organisational environmental response and environmental management in general. Eisenhardt (1989) recommended that such scoping using previous literature was useful to generate tentative constructs to focus data collection and then modifying them as empirical evidence is gathered.

The conceptual model thus developed was first tested in the field during the pilot stage (4.7) by adopting a qualitative approach. According to Maxwell (1992), pilot studies help to generate an understanding of the concepts and theories held by the actors in the field. Frankland and Bloor (1999) argued that piloting helps the qualitative researcher to concentrate data collection on required analytical topics. Such a preliminary testing of conceptual model, according to Sæther (1998), is useful in strengthening the analytical frame in a retroductive approach. The data for testing the conceptual model was collected using semi-structured interviews with members of bulk consumer groups, industry associations and personnel working in various national and international organisations related to e-waste issues in India. Also, various documents were collected during this phase to understand the context of e-waste management in the country. The documents gathered during this phase proved to be useful in gaining an insight into the e-waste context in the country. The pilot phase also provided the opportunity to refine the interview guides for further data collection. The conceptual model developed from literature, together with the pilot study used to test the conceptual model, formed the first phase of the research.

The analysis of the data collected during the pilot fieldwork resulted in amendment of the conceptual model previously developed from literature (4.7). This amended model guided data collection during the subsequent main fieldwork that formed the second phase of research. The interview guides (see 4.5.1) were altered to incorporate necessary changes before embarking on data collection. The main fieldwork included gathering data from semi-structured interviews, documents and observations. All three sources of data were then analysed to gain an understanding of bulk consumer behaviour. The outcomes of analysis were then compared with existing literature with the aim of theory advancement as suggested by Sæther (1998) and this formed the third phase of research (8.2).

Thus, the research aim was accomplished by using this retroductive strategy which began with the development of a conceptual model based on literature. This was tested and reassessed through empirical observations and then utilised to develop both understanding and explanation for the e-waste practices using analysis and synthesis of both evidence and literature. The retroductive approach and the phases of research are shown in Figure 4.1.

Figure 4.1 Retroductive research approach



4.3 Research Objectives

The overall structure of the research – and this thesis - was guided by the research objectives. A set of thematic points was then identified which would guide the researcher in the achievement of those objectives. Table 4.1 shows the link between each objective and its thematic questions together with the chapter of the thesis where they are discussed.

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Table 4.1 Objectives and thematic questions

Objectives	Thematic Questions	Chapters
1. Develop a conceptual model of factors influencing e-waste practices among IT bulk consumers	• What is the status of e-waste research? • How do organisations perceive and respond to their environmental impacts and what factors influence the corporate environmental strategy? • What can be learned from the above that can be used with respect to the practices regarding e-waste in the IT sector?	2 & 3
2. Evaluate the practices prevalent in e-waste management in the Indian IT service sector	• What is the status of e-waste management in India? • Who are the stakeholders that are engaged in addressing the challenge of e-waste in the country? • What is the structure and organisation of the IT service sector? • What is the general approach to e-waste management in India's IT service sector?	4 & 5
3. Identify the path of e-waste among the stakeholders to understand the material flow	• How is e-waste management being implemented in the organisation? • Who are the stakeholders engaged in the process of managing this waste generated by the bulk consumers and how does the material flow? • Is there an exchange of financial resources and tacit knowledge associated with the material flow? If so, how does it occur? • What is the implication of this material flow?	6
4. Analyse the factors determining the current practices for e-waste management	• What are the external factors for e-waste management in organisations? • What are the internal factors for e-waste management in organisations? • How do these factors affect e-waste management practice? • What are the forces driving the factors that determine the e-waste management practices in the bulk consumers?	7 & 8
5. Analyse the challenges for participation in e-waste management for the stakeholders	• What are the barriers for participation of bulk consumers in e-waste management that can be observed from the analysis of the data on? • What are the challenges faced by producers to fulfil their EPR requirement? • What are the challenges faced by recyclers to gain access to e-waste material?	6,7,8 & 9
6. Recommend strategic actions that would enable the participation of bulk consumers from the IT service sector and enhance the management of e-waste based on analysis of current practice and opportunities available in the system	• What opportunities exist in the system to overcome the challenges? • What system changes are required to overcome the challenges?	9

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4.4 Research Design

Research methods are commonly divided into quantitative and qualitative methods. While quantitative methods are generally concerned with counting and measuring aspects of social life, qualitative methods are more concerned with description, exploration, meanings and interpretation (Cook and Reichardt, 1979; Dabbs, 1982). The choice of any research method depends on assumptions regarding the nature of knowledge and the methods through which that knowledge can be obtained, as well as the fundamental assumptions about the nature of the phenomena to be investigated (Morgan & Smircich, 1980)**.**

The present research is both exploratory (what) and explanatory (how and why) in aiming to understand the behavioural response of bulk consumers to the challenge of e-waste, and therefore fill the research gap in e-waste management presented earlier (see 1.3). Given this context, a qualitative research approach that was multi faceted (Hogan et al., 2011) was used. Such an approach has also been identified to be more useful in understanding a social phenomenon that requires exploring and understanding (Taylor and Bogdan, 1984). This was used in preference to a survey- based approach because that would not provide the necessary depth of explanatory data. Also, a survey was thought likely to deliver a very poor response rate in part due to the limited exposure of e-waste as an issue, and for similar reasons because data gathering about e-waste would often require interactive explanations from the researcher, which a survey cannot provide.

The design or strategy of inquiry connects these specific approaches and methods for collecting data. Diverse strategies like direct observation of samples, case studies, introspection, etc. are adopted in qualitative research to enable data collection (Hogan et al., 2011). A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context (Yin, 1993; Yin, 2003). They are useful at exploring causal relationships thus, making them useful for exploratory, descriptive and explanatory research (*ibid.*). These abilities of case study research are essential to attain the research aim here, that seeks to gain an in-depth understanding of practices adopted at organisational level to manage e-waste. Moreover, the descriptions produced by case studies are also acknowledged to be useful in understanding the processes created and used by individuals involved in the organisation (Weick, 1995), which is needed for the present research.

A case study can be classified into different types based on its nature, purpose and degree of complexity (Stake, 1988; Yin, 1993). The present research looks at gaining meaningful insight into management of e-waste adopted in a particular stakeholder group, namely the bulk consumers. Understanding the response of the bulk consumer as a group is more important than understanding the response of any one particular organisation. So the nature of case study adopted in this research was instrumental rather than intrinsic as described by Stake (1988; 2005). The instrumental nature of case study led to a choice of multiple cases, to understand and cover different examples within a particular context. Although multiple cases have been criticised for compromise on depth of analysis (Dubois and Gadde, 2002), they have been proposed to be suitable for theoretical generalization (Eisenhardt, 1989) and in enabling the researcher to analyse data across cases, which ensures that the findings are not merely the result of idiosyncrasies of the research setting (Miles and Huberman, 1994).

In case study research, the next important thing after identifying its nature is to identify the unit of analysis or 'the case'. A case is defined as a bounded system by Smith (1978) and this boundedness is most important in understanding the case and designing it (Stake, 1988). The research gap (1.3) pointed to the dearth in research in consumer response (especially bulk consumer) to the challenge of e-waste. The bulk consumers of electronic equipment belong to both private and public sectors, and come from a range of industries. To control for as many external influences as possible and to help define limits for generalizing the findings the study was confined to a single industry as recommended by Eisenhardt (1989). The 'case', or the unit of analysis here was the IT organisation/company and their practice of e-waste management. The IT sector was chosen as the case sector because this sector relied completely on IT electronic equipment for its operation, thereby becoming a sector that constantly upgraded its operational equipment and so generating continuous volumes of e-waste. The Indian IT sector has gained a global recognition and has been identified as one of the steadily growing sectors in the country, with increasing contributions to GDP (NASSCOM, 2011). Also this sector is recognised to be generating nearly 30% of e-waste in the country (Chawla, 2008). Thus, the choice of Indian IT sector as the case sector provided the opportunity to not only explore the case of e-waste management in a developing country context but also, study the sector that generates single largest volume of e-waste in the country.

The IT sector organisations concerned were all members of NASSCOM (National Association of Software and Services Companies). NASSCOM is a premier trade body and chamber of commerce of the IT service industries in India. NASSCOM member base of over 1200 members constitutes nearly 95% of IT service industry revenues in India, and so the NASSCOM membership provided a good platform for initial identification of the organisations. It was essential to identify the cases beyond their membership status, and this was guided by the structure of India's IT sector. The Indian IT sector is pyramidal (Bhatnagar, 2006) with a large base of small companies (nearly 70%) and a narrow top (less than 10%) constituted by very large companies (NASSCOM, 2010). Research has showed that organisational resources play an important role in environmental responsiveness implying, firms with greater resources may have greater organisational capacity to adopt voluntary strategies of environmental responsiveness (Sharma, 2000). Since the Indian IT sector has a large base of small organisations compared to few large organisations at the top it was assumed that these organisations would have varying practices for e-waste management. So, in order to capture the response of bulk consumers as a whole, and to ensure complete representation of the IT service sector, all sizes of organisations were selected for this multiple case study design.

Industries are classified into different sizes based on, their investment in equipment (MSME, 2006), number of employees (EC, 2005) or gross revenue (NASSCOM, 2010) into large, medium, small and micro enterprises. In this research, the IT service organisations were categorized based on number of employees for the following reasons; i) this information was uniformly available; ii) e-waste is an end user waste and the quantity of e-waste generated from a bulk consumer depends on the number of people employed within an organisation, iii) the pyramidal nature of the Indian IT sector, and iv) the pilot study indicated that such a classification was useful in differentiating the practices observed in the field.

Therefore, the IT industry in this research was classified[3] based on number of employees as:

- ***very large*** (VL) organisation with over 40,000 employees;
- ***large*** (L) organisation between 1,000-40,000 employees;
- ***small and medium*** (SM) organisations between 25-1,000 employees.

A snowball strategy was used and the number of cases for each type of organisation was based on 'saturation' or sampling to the point of redundancy as recommended by Lincoln and Guba (1985). When interviews with an organisation in a particular group did not provide any new information and repeated those already gathered, further selection of organisations in that category was terminated. In total the sample consisted of ***five*** (from 7) very large organisations with over 40,000 employees, ***five*** (from 75-80) large organisations with over 5,000 employees, and ***ten*** (from over 500) small and medium organisations with less than 1,000 employees[4]. The number of organisations sampled under each group was representative of the group and relative to the group size.

4.5 Research Methods

After identifying the cases for the research, the next step was gathering of information or data from the cases to answer the research questions. Yin (2009) discussed six main sources of evidence or methods of data collection used in case study viz. documentation, archival records, interviews, direct observations, participant-observation and physical artefacts. He further recommended that these sources are complementary and a good case study would use a combination of these appropriately. In line with Yin's recommendation, data collection in the present research did not adhere to one source but took a multiple complementary approach and included interviews, document analysis, and direct observations, which were relevant and appropriate for this research.

[3] This is a specific categorization for this study that enabled comparability of practices among the Indian IT sector organisations. Also, this categorization is close to the NASSCOM classification based on gross revenue.

[4] The numbers in brackets indicate the total number of organisations in a particular group according to NASSCOM 2009 strategic review of IT-BPO sector of India.

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4.5.1 Interviews

Interviewing is defined simply as a conversation with a purpose of gathering information (Berg, 2009). Different researchers have classified the interview based on their structure as formal or informal (Fitzgerald and Cox, 2002), or structured or unstructured (Fontana and Frey, 1994). However, three major categories of interview can be identified viz. standardized (formal or structured), unstandardised (informal or nondirective) and semi standardized (guided-semi-structured or focused) (Merriam, 2001; Frankfort-Nachmias and Nachimas, 2007). The major difference between these is their strict affinity to the structure of approach. The issue of structure is important to the kind of data required by the researcher and the purpose of the interview (Mason, 1996).

Rubin and Rubin (1995) recommended that interviews in case study research need to be more fluid and conversational rather than rigid and structured. In the current research, which adopted a case study design of enquiry, a semi-structured interview approach was selected so that a specific list of topic areas could be covered in a given time. To improve the reliability of interviews, an interview guide was prepared as proposed by Silverman (1993). The interview guide broadly covered three main topics viz. current organisational practice for e-waste management, factors shaping these practices, and e-waste material flow. In order to cover these topics the interview guide included questions on, enumeration of organisational equipment that was considered e-waste, general practices adopted for their disposal, main drivers for adopting a particular e-waste management method, interaction with other stakeholders in the e-waste material flow chain etc. (see Appendix 1 for details). By adopting a semi-structured interview, which allows exploration of emerging topics (Eisenhardt, 1989), the researcher could investigate certain topics like choice of recycling partners, the difficulties in recycling and global influence on the practices more deeply. Since e-waste management requires the participation and interaction of multiple stakeholders who affect each other, the relationship of the bulk consumers if studied in isolation would not provide a meaningful insight. So, other stakeholders like producers, recyclers and regulators, were also examined in relation to their interaction with bulk consumers, which helped in triangulating the data. Separate interview guides were prepared for recyclers, producers and others. However, these interview guides also centred on the three broad topics identified for the bulk consumers but with suitable modifications around the points of discussion (Appendix 1).

The other important question regarding the interviews was the person to be interviewed? The interviewee should be in the particular line of enquiry so as to understand and respond correctly (Yin, 2003). During their research to identify the factors that influenced corporate environmental responsiveness, Sharma et al. (1999) found that managers acted as the centre of cognition within the organisation and their interpretation of environmental issues as threats or opportunities directed the environmental responsiveness of the firms. Sharma et al. (2007) found that environmental strategies generated by managers depended on their perception of the characteristics of the natural environment. This was also confirmed by López-Gamero et al.

(2010) and Berrone and Gomez-Mejia (2009). It can be inferred therefore that managerial perception plays an important role in determining the organisational responses to environmental responsibility.

Keeping in view the role of managers in shaping the organisational response to environmental impacts, semi-structured interviews were carried out with senior managers involved in the organisation’s corporate sustainability and environmental management initiative (in the case of very large organisations), or senior managers within the operations and facility management groups (in the case of large organisations) or managing directors (in the case of SME organisations). The choice of the managers was based on their awareness and role in organisational environmental management. Table 4.2 (a) and (b) lists the role of interviewees in the IT bulk consumer, IT producer and formal recycler organisations, respectively. The interviews were conducted during the pilot phase (October-November 2010) and during the main fieldwork (March-September 2011) (see Appendix 4 for dates of interviews). These interviews ranged from 30-120 minutes, and on average lasted for about 60 minutes. All the interviews were recorded (with the permission of interviewees) using a digital recorder and transcribed fully before data analysis.

Table 4.2 (a) Role of interviewees in the IT bulk consumer organisations

Role of interviewees	Organisations																			
	VERY LARGE					LARGE					SME									
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	6	7	8	9	10
Head Sustainability			✔		✔															
Facility Head		✔	✔	✔		✔	✔	✔	✔	✔										
Head administration	✔																			
EHS Head	✔					✔														
Asset Management Head	✔		✔		✔		✔													
EHS Manager	✔	✔																		
Facility Managers			✔		✔															
Asset managers					✔															
Managing Director											✔		✔	✔		✔	✔		✔	✔
Senior Manager	✔				✔							✔			✔			✔		✔
Finance Manager					✔		✔													✔

Table 4.2 (b) Role of interviewees in the IT Producer and Formal Recycler organisations

Role of interviewees	Organisations							
	Producers			Formal Recyclers				
	1	2	3	1	2	3	4	5
Head Sustainability	✔							
Facility Head							✔	✔
Head administration								
EHS Head		✔	✔					
Asset Management Head	✔		✔					
Facility Managers	✔							
Asset managers				✔				
Managing Director					✔	✔	✔	
Senior Manager		✔						

A purposeful sampling method was adopted as this is more common to qualitative research, and is also recommended when the research aims to obtain insights into phenomena/events (Miles and Huberman, 1994). The initial selection of case study organisations was partly opportunistic and interviewees were identified initially through personal networks and with the support offered by NASSCOM, which had an active 'Green IT initiative' programme that promoted environmental responsibility in the IT sector. Later, a snowball strategy was adopted where the contacts established during the pilot phase served as 'gate keepers' and helped access interviewees during the fieldwork phase from not only bulk consumer groups but also other stakeholders. Although snowball sampling is considered to be skewed to a particular group, this problem was mitigated by starting with an initial varied group (Tracey, 2012) so as to capture the challenge of e-waste management more completely, which was needed in this research. The initial contact with interviewees was made through email and telephone. After indicating their willingness to participate, they were all sent a 'participant information sheet' (Appendix 2) by email to brief them about the research aim and their selection as an interviewee, as recommended by Bernard (2000) and as required by University of Manchester protocols.

During the process of interviewing (initially to break the ice) general information about the organisation, its size, its operation and the role of the interviewee was discussed before moving on to the topics of research interest. This helped in establishing a comfortable environment for continuing the interview (Kvale, 1996). In the very large organisations, the initial interviewees were in senior positions and knew the topic of research interest quite well and were committed to their organisational environmental response. They guided the researcher to middle management staff involved in operations to gain a detailed understanding of the process and thus, helped in triangulating the information. Follow up interviews with the two large IT organisations contacted during the pilot phase was done at the time of fieldwork to cover some of the issues not discussed earlier. In the case of large IT organisations, which did not have advanced practices for organisational environmental response, the interviewees identified for the research communicated with various other organisational members either by phone, or met them personally together with the researcher to clarify and validate certain information at the time of interviewing. In the case of SME IT organisations, it was hard to get the attention of interviewees for the research topic as their practices were more rudimentary and *ad hoc* and the interviewees felt they did not know much about the issue. It involved using interviewing tactics (Bernard, 2000) like persuasion, persistence and reassurance that their information was crucial for the research. In total ***38*** semi-structured interviews were conducted with stakeholders from different IT organisations, covering **20 case study organisations** to understand the bulk consumer response (Table 4.2a).

In order to validate the information, semi-structured interviews were also conducted with members from other stakeholder groups. The IT producers in India can be categorized into multinational manufacturers, domestic manufacturers and assemblers. The assemblers were excluded from this study, as they did not supply electronic equipment to IT sector bulk users who are the focus of this study. ***Three*** IT equipment manufactures/producers (of the five contacted) that were very large organisations and also members of MAIT[5] agreed to be part of this research. These producer organisations were identified based on their market presence in IT equipment sector. Semi-structured interviews were conducted with senior managers involved in development and implementation of e-waste management practices in these producer organisations. Overall, ***seven*** interviewees from three producers organisation were engaged in semi-structured interview. The responsible personnel from the producer group were identified and contacted through the support offered by MAIT that was actively engaged in e-waste management in India.

Between the producers and users there is another group of stakeholders, namely the dealers. These dealers supplied electronic equipment mostly to the large and SME IT organisations and offered special deals to the bulk consumers. By sharing a part of their profit with the bulk consumers they influenced the material flow. ***Two*** dealers identified through the producers were also interviewed to validate the information provided by the bulk consumers (Table 4.3).

Formal recyclers who are recipients of e-waste from the bulk consumers were also included in this research to validate the information and gain a clear understanding of the material flow. ***Six*** semi-structured interviews with senior managers from ***five*** formal recyclers were conducted. The recyclers were identified and contacted based on the information provided by the regulatory authorities and information provided by the very large IT organisations.

In addition, ***five*** senior executives from two state pollution control boards, ***four*** senior executives from two industrial associations (NASSCOM and MAIT), ***three*** senior staff from two

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[5] MAIT is an apex not-for-profit body representing Hardware, Training, R&D & Hardware Design and other associated service segments of the Indian IT Industry and works to develop a global competitive Indian IT Industry, along with promoting the usage of IT in India and strengthening the role of IT in national economic development.

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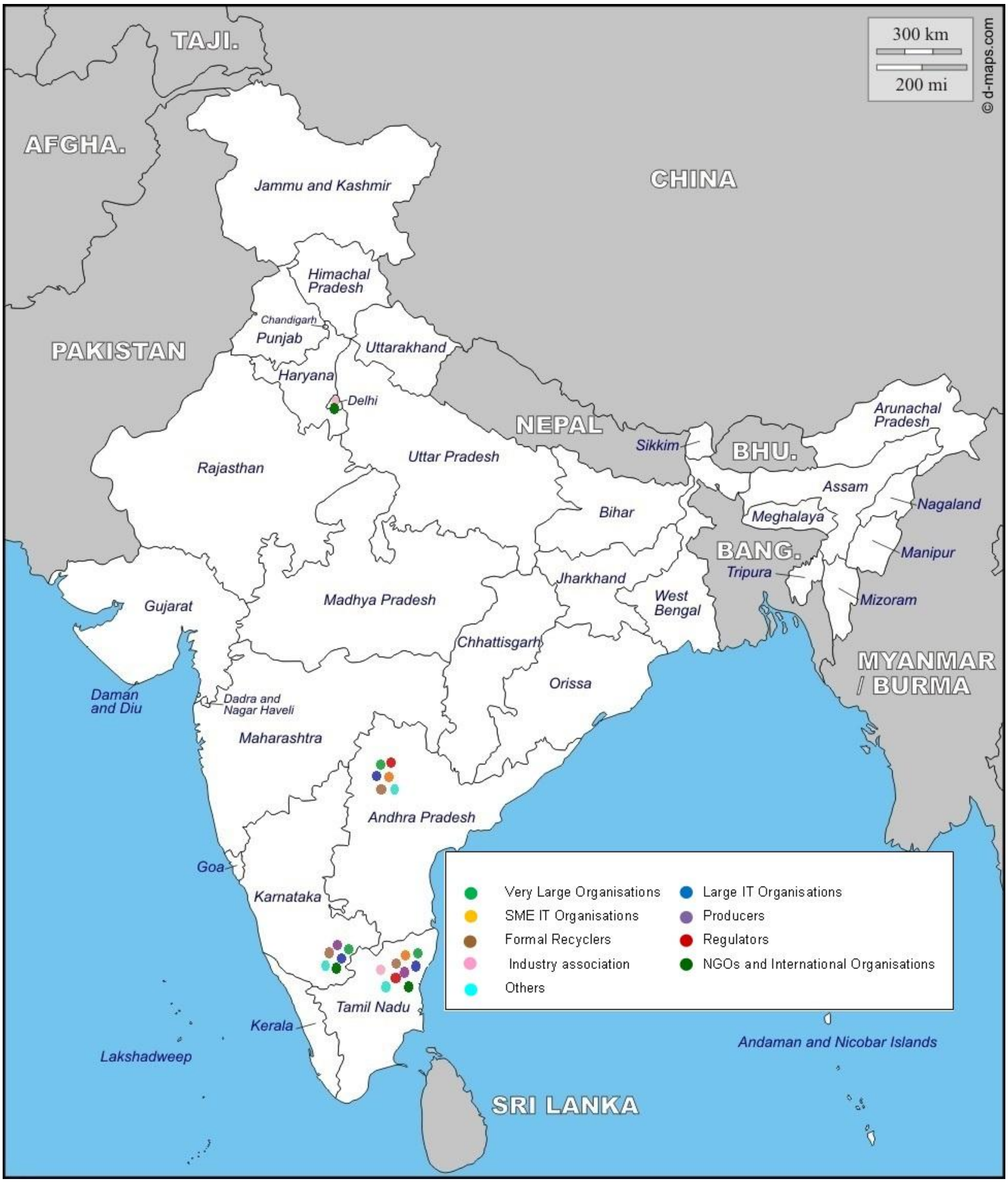
international organisations (GTZ and Greenpeace), ***four*** senior staff from three national NGOs (Toxic Link, Sahas and Centre for Sustainable Development) working on e-waste issue and ***one*** academician were also engaged in semi-structured interviews to validate the information provided by the bulk consumers. These non-industrial interviewees were contacted through personal and interviewee networks.

This research was bound within the formal sector, as the research on e-waste management in the formal system is limited (with most research focusing on the role of informal sector in e-waste management). However, it was noted during interviews with some bulk consumers (especially the small and medium IT organisations) that e-waste from these organisations also went into the informal e-waste stream. So, to draw a complete picture of e-waste material flow arising from the bulk consumers in the IT sector, ***two*** school authorities who were secondary users of IT equipment, ***two*** waste collectors and ***one*** refurbisher were also interviewed. These interviewees (from the informal sector) were contacted based on the information provided by the interviewees from bulk consumer organisations. In all ***37*** semi-structured interviews were conducted with members belonging to other stakeholder groups to validate and make the data credible. Appendix 3 gives a description of the organisations, however the names of the organisations and the identity of interviewees are withheld due to confidentiality. Table 4.3 summarises the number of organisations that were part of this research together with total number of interviews undertaken and Figure 4.2 shows the geographical spread of the organisations in the country.

Table 4.3 Summary of organisations and interviewees

Stakeholder Group		Number of Organisations	Number of interviewees
IT Bulk Consumer	Very Large	5	18
	Large	5	8
	SME	10	12
Producers		3	7
Recyclers		5	6
Regulators		2	5
Industry Association		2	4
NGOs and International organisations		5	7
Academicians		1	1
Others (dealers-2, schools-2, waste collectors-2, refurbisher-1)			7
Total Interviews			**72** (75-3) as three interviewees were part of both a very large IT organisation and a producer group)

Figure 4.2 Geographical distributions of organisations part of the research



4.5.2 Document analysis

Documents are recognised as a source of evidence and thus part of data collection and important for qualitative research (Prior, 2003; Yin, 2009). Documents in case study research include letters, e-mail correspondence, organisational reports, administrative documents, news clippings, websites, etc. (ibid.). According to Yin (2009), in case study research, documents play an important role in corroborating and augmenting evidence from other sources, particularly interviews.

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In this research, document analysis included news clippings, articles in electronic media, organisational annual reports, organisational sustainability reports, organisational websites, reports generated by various organisations like industrial associations, national and international NGOs and organisations working on e-waste issues in India, policy documents on e-waste, organisational presentations presented to the researcher by the interviewees, along with organisational internal documents (like e-waste policy, environmental policy, intranet, etc.) presented on site during the interview. Table 4.4 lists the various organisational documents that were used in the research. The organisational documents like vendor selection form, regulatory forms, etc., shown to the researcher at the time of interview by the interviewees, helped in validating and confirming the information presented from the interview. For example, when the interviewees mentioned that they verified the processes of the formal recyclers who took their e-waste, the examination of the vendor selection form of the organisation, which listed the various requirements and procedure for the vendor, confirmed this claim. Similarly, when the interviewee mentioned that client demands for environmental actions were on the rise, the examination of some of the request for proposal forms that detailed the environmental requirement, confirmed it. Further, verification of documents at the time of site visit also helped in determining the strength of the various factors shaping organisational e-waste strategy (4.8). The other documents such as those provided by NGOs and regulators, and news clippings and electronic reports, helped in understanding the context and status of e-waste management in India apart from validating the information provided by the interviewees.

Table 4.4 Types of organisational documents consulted

Organisations	Organisational Documents				
	Annual report	Sustainability report	External Website	Internal document (like EMS documents, e-waste policy, vendor selection form, regulatory form	Intranet
VL1	✔	✔	✔	✔	✔
VL2	✔	✔	✔	✔	-
VL3	✔	✔	✔	✔	✔
VL4	✔	✔	✔	-	-
VL5	✔	✔	✔	✔	✔
L1	✔	Not published	✔	✔	-
L2	✔	Not published	✔	✔	-
L3	✔	Not published	✔	-	✔
L4	✔	Not published	✔	-	-
L5	✔	Not published	✔	✔	✔
SM1	Not published	Not published	✔	-	-
SM2	Not published	Not published	✔	-	-
SM3	Not published	Not published	✔	✔	-
SM4	Not published	Not published	✔	-	
SM5	Not published	Not published	✔	✔	✔
SM6	Not published	Not published	✔	✔	-
SM7	Not published	Not published	✔	-	-
SM8	Not published	Not published	✔	-	✔
SM9	Not published	Not published	✔	✔	-
SM10	Not published	Not published	✔	✔	-
P1	✔	✔	✔	✔	✔
P2	✔	✔	✔	✔	-
P3	✔	✔	✔	✔	-
RC1	Not published	Not published	✔	✔	-
RC2	Not published	Not published	✔	✔	-
RC3	Not published	Not published	✔	-	-
RC4	Not published	Not published	✔	-	-
RC5	Not published	Not published	✔	✔	-

VL- very large IT organisation; L- large IT organisation; SM- small and medium IT organisation; P- IT producer; RC- Formal recycler

4.5.3 Observations

According to Yin (2009), since case study research takes place in a natural setting, direct observations made during the time of study also serve as evidence. These observations can range from formal to casual. In this research it was more an informal observation made by the researcher during the field visits for the purposes of interviewing. Some interviewees pointed to e-waste storage areas casually while walking through the facilities. The interviewees from the producer organisations also pointed to the hazardous waste notice board that showed the existing quantity of e-waste in the premises along with the quantity disposed most recently. Some interviewees from the recycler group gave a quick tour of the storing, sorting and segregation area for e-waste in their facility. These observations were entered in the field notes for later recollection and use. The interviews were mostly done face-to-face in the interviewee's facility. This provided the researcher with opportunities to observe the organisation's environmental response. The observations further added to strengthening the information and views provided by the interviewees on the topic along with enabling in determining the strength of the factors (4.8). Although most of the interviewees were open and allowed recording of the interviews, there was apprehension about taking photographs and so none were taken.

4.5.4 Challenges during data collection

The discussion on methods of data collection would be incomplete without drawing attention to some of the challenges experienced during data collection at the time of fieldwork. Selecting the case research organisations was not easy despite extensive document analysis and internet searches prior to embarking on research design, due to difficulty in gaining access to the right informants within the organisations and willingness of organisations and individuals to participate in the research. Several electronic mails and telephone calls had to be made before getting their willingness to participate. It was challenging to identify the right interview sources from these organisations, as the names and position of these sources were not readily available. The researcher did not just rely on the information provided by the 'gate keepers' contacted during pilot fieldwork, but also used personal networks to get the contact details of these interviewees so as to gain access to them. Using personal networks to gain data also meant extensive travel across the country to where access to information could be found. Although this helped in capturing the bulk consumer response across the country without restriction to a single city or state, this also resulted in more time spent gathering the data due to challenges in organizing the interviews. The data collection involved travelling between the four cities of Delhi, Bengaluru, Chennai and Hyderabad.

At the time of conception and implementation of this research, e-waste management was a seriously debated topic in the country and India was in the process of developing and implementing a separate new regulation to address this growing challenge (Mandal, 2011). So, the responses from the interviewees were also mixed. While the very large organisations, industry associations, regulators and NGOs were eager to share information and participate in the research, the large and SME IT organisations, formal recyclers and to some extent producer organisations were not very open initially and had to be persuaded to participate. Due to the highly competitive nature of recycling business, the researcher could gain access to recycling facility of only one formal recycler, although five formal recyclers had participated in the research through interviews. Anonymity and confidentiality was continuously ensured to win their trust. Despite relentless pursuit by the researcher, certain interviewees[6], whose inputs would have further validated the information gathered, could not be enrolled.

4.6 Rigour in Research

The quality of qualitative research has been a long argued topic in social sciences (Sandelowski and Barroso, 2002). The reliability of data and validity of the method is important to ascertain the rigour of any research. This section discusses how this was ensured in the present research. Reliability refers to the extent to which repetition of research will yield the same results, while validity refers to the degree to which the research measured the social phenomenon of its focus (Pole and Lampard, 2002). Triangulation is a process of using multiple perceptions to clarify meaning, verifying the repeatability of observations or interpretations (Stake, 1994), and is recommended as tool to check and achieve both validity and reliability (Long and Johnson 2000).

Denzin (1978) identified four basic types of triangulation viz. data triangulation, investigator triangulation, theory triangulation and methodological triangulation. Data triangulation in this research was achieved by interviewing multiple interviewees within the organisations apart from interviews with other stakeholders like producers, recyclers, regulators, academicians and NGO representatives working in this area, so as to verify and get an in-depth understanding of the phenomenon. Since the phenomenon examined in the current research has not been explored in great depth before, data triangulation reinforced and validated the information shared by the bulk consumers about their interaction with producers and recyclers. This helped in not only drawing a clear picture about material flow originating from the bulk consumers but also enabled in understanding the factors driving e-waste management among the stakeholders. Methodological triangulation was achieved through document analysis and observation. The organisational external and internal (where available) documents together with articles from press and other reports proved useful in validating the information gathered during interviews. Further, the observation of organisational practices for e-waste management at the time of site visit for interviews, provided useful first hand information that strengthened the data gathered. Figure 4.3 illustrates the achievement of data validation through multiple data collection approaches used in the present research.

[6] STPI Directors of two states were approached and despite calling on the telephone and in person, they refused to participate in this research. All the information about the STPI procedures and norms are from the official documents available in the public domain and those given by interviewees from the various organisations.

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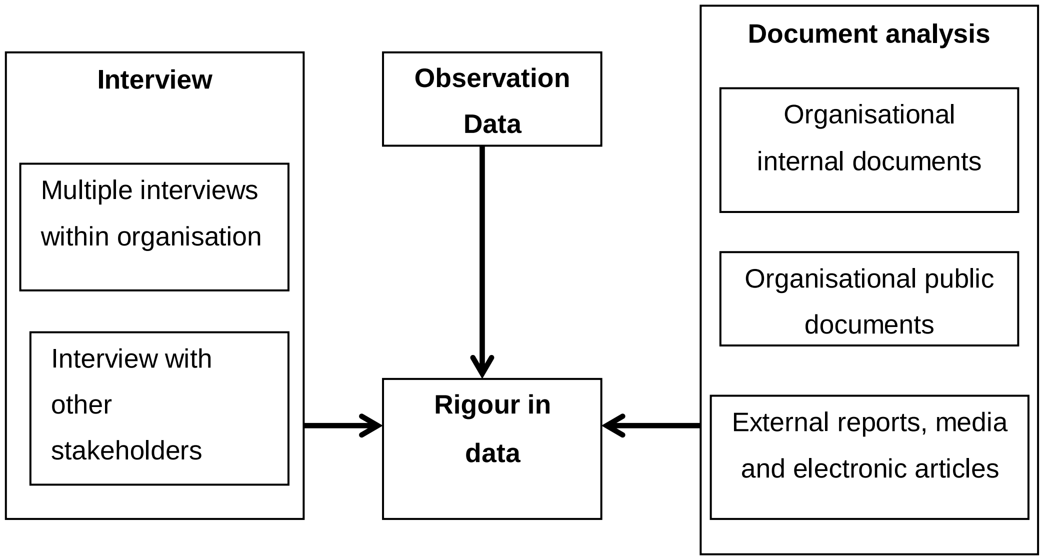
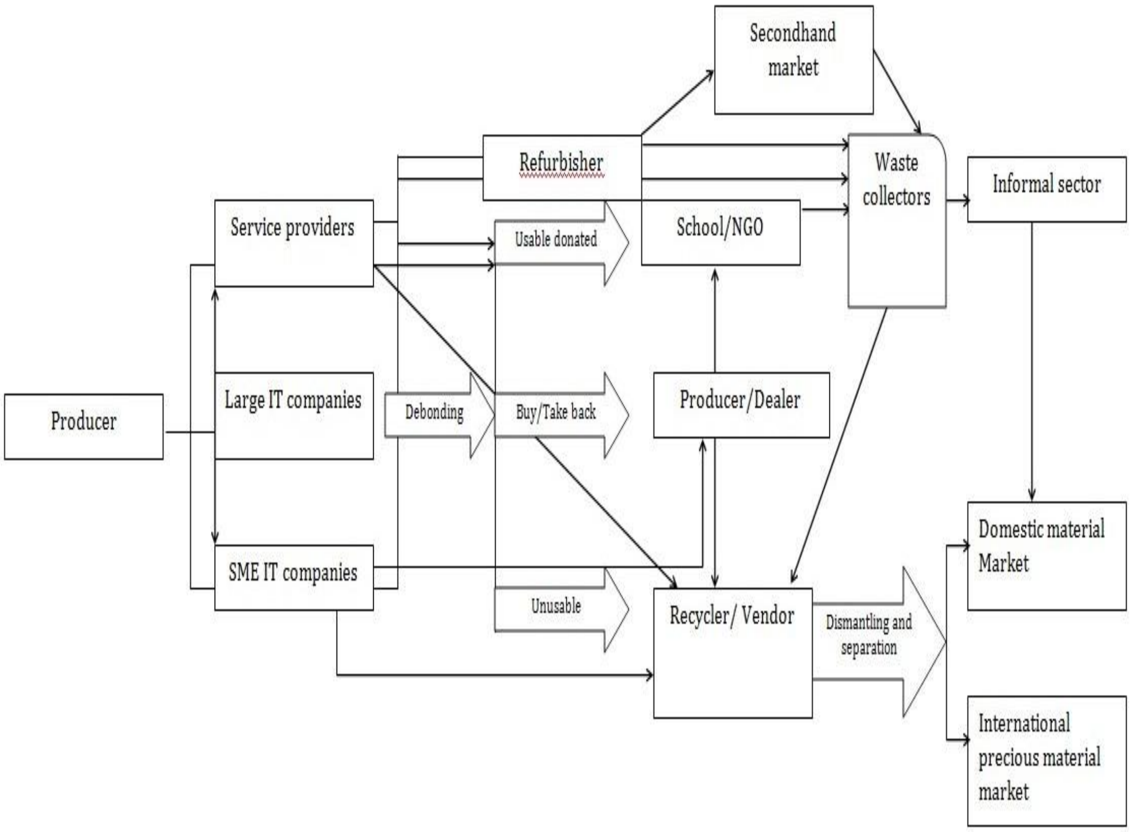
Figure 4.3 Multiple data collection approaches to attain research rigour



Internal validity, also referred to as credibility, refers to the establishment of cause and effect relationship (Lincoln and Guba, 1985). In qualitative research, where the data is collected from individuals through one-to-one interview, it becomes important to establish this credibility to overrule any assumptions by the researcher about causal effect and present evidence based findings. This was achieved by following two procedures. During the time of interviewing a simplified Structure Laying Technique (SLT) was applied (Appendix 5). SLT is a graphic representation of a subjective theory. Using this for qualitative interviews is similar to a confrontational question to validate the information gathered (Punch, 1998). The SLT in pure form requires two interview sessions within two weeks (Flick, 2009), which is challenging to apply in organisational research (Nolte, 2011). Following Nolte (*ibid.*) a simplified SLT was followed, where two graphical representations were used. Interviewees from each stakeholder group were presented first with a graphical representation of expected material flow of e-waste arising from their organisation, so as to understand and establish the process of e-waste management. This graphical representation of material flow for a particular stakeholder group was drawn by combining the information available in the existing literature on e-waste material flow in the country (Widmer 2005; Manomaivibool, 2009; Wath et al., 2010) and the information collected during the pilot fieldwork (Appendix 5). Figure 4.4 represents the expected flow of e-waste arising from the IT bulk consumers in general. Further, to establish the factors influencing the e-waste practice in an organisation, a second graphical representation of those factors identified by the interviewees during the interview was shown at the end of the interview. This second graphical representation was drawn based on information gathered in the pilot fieldwork. Any new information or modification to the graphical representations provided by the interviewees were noted in the field notes and later retrieved at the time of analysis.

After the interviews a second step to ensure credibility was taken by following Guba & Lincoln (1985), which was to take the data and interpretations to the sources from which they were drawn. The summary of the interview was sent to the primary interviewees by email with a request for feedback so as to ensure the credibility of the information. In all 18 emails were sent to interviewees belonging to various groups of stakeholders, however only three (2 very large organisation and 1 recycler) responded and affirmed the points discussed while the others did not respond either to affirm or deny the discussion summary.

Figure 4.4 Expected e-waste material flow arising from IT bulk consumers



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4.7 Pilot Study and Amendment of the Conceptual Model

The pilot study here helped in pre-testing (Baker, 1994) the factors identified in the conceptual model developed from the literature. During the pilot phase semi-structured interviews with senior managers from **two** very large *IT* organisations, **one** *IT producer* organisation and **one** *formal recycler* were conducted. Semi-structured interviews were also conducted with senior members of **one** *international NGO*, **one** *national NGO* and **one** *international organisation* (GTZ), which were all involved with e-waste management work in India. In addition, semi-structured interviews were also conducted with **one** *senior manager from NASSCOM* and **two** *consultants from MAIT*, **two** senior officers from *regulatory authority* (state pollution control board) and **one** *academician*. In all ***thirteen*** people from various stakeholder groups were interviewed during the pilot phase. These interviews proved to be insightful. It was noticed that while the very large IT organisations had some system in place for e-waste management and the large IT organisations were being sensitized to the challenge of e-waste, it was mostly the small and medium organisations that were a cause of concern, as they did not have any established practice to manage this e-waste. This clear differentiation in the practice for e-waste management among the different groups of organisation further confirmed the need to select cases of organisations of different sizes.

Although the literature review indicated the e-waste material flow, it was generic and did not specifically draw the flow of e-waste material from IT bulk consumers. The pilot study helped in drawing the material flow for e-waste arising from the bulk consumer (Figure 4.4). This material flow, with bulk consumers as its focus, pointed to the various stakeholders identified in the previous literature on e-waste material flow in India (Manomaivibool 2009, Wath et al. 2010 & 2011). However, a difference in the interaction between the bulk consumers (based on their size) with the various stakeholders became clear, which was not evident from previous research due to their generic description of e-waste material flow. The difference in the expected and actual material flow of e-waste that was noted here will be discussed in Chapter 6 while presenting the findings of e-waste material flow.

The pilot study also altered the conceptual model developed from the literature review. The analysis of data conducted during the pilot study revealed that not all factors identified in the conceptual model were recognised in the field. However, certain factors not recognised in the conceptual model were observed to be shaping the organisational e-waste strategy in the bulk consumers of IT organisations. This section presents the amended conceptual model based on analysis of the data gathered during the pilot fieldwork.

The interaction with other stakeholders in the e-waste management chain, namely the producers and formal recyclers, to validate and understand the bulk consumer response to e-waste management at the time of pilot work also provided an opportunity to observe the e-waste management in these stakeholders. This opportunity was seized and so although it was initially only proposed to study the factors determining e-waste management in the bulk consumers, it was decided to test the amended conceptual model developed for bulk consumers on these other stakeholders to see if it could be validated across the stakeholders involved in e-waste management (Chapter 7).

Five **external factors** were recognised in the conceptual model (Figure 3.3), of which four, namely *regulation, peer influence, client requirement* and *corporate reputation and brand image*, were observed in the field and identified by interviewees to be playing a role in the e-waste management strategy adopted in the organisations; NGO pressure was not identified among the bulk consumers of IT service sector although it was recognised by the producer organisations who lacked client demand for e-waste management. Of the three **internal factors** recognised in the conceptual model only *financial benefits* and *corporate leadership and culture* were recognised to be shaping the organisational e-waste strategy. Although the employees were seen more actively engaged in environmental and social causes within and outside the organisation, they did not demand for such avenues from their employers. Their participation and enthusiasm was more a reflection of the organisational culture. The interviewees from industry, universities and other groups like NASSCOM indicated that employee demand for organisational environmental responsibility had not emerged as seen in developed countries:

> "Regarding employment decision. It may be one of the factors though not the primary factor. Increasing they see it as a factor but not a deciding factor". – Facility Head VL2

Thus, *employee demand* for e-waste management as a prominent driver was not visible in the field, although employee participation and eagerness for organisational environmental responsibility was visible. Organisational culture and leadership has played a pivotal role in fostering such enthusiasm expressed by employees. The lack of manifestation of this factor as pushing for e-waste management in the field, despite its recognition in the conceptual model, can be attributed to the fact that the conceptual model was built from literature on environmental management drawn from developed countries and from industrial sectors where the occupational hazard due to environmental mismanagement is recognised.

Organisational culture and leadership have been shown to shape organisational CSR through managerial decision-making (Waldman et al., 2006). This was also noted here where the organisational CSR recognised environmental responsibility as one of the important pillars of sustainability due to the culture and visionary leadership in the organisation. The organisations donated functional equipment that was no longer useful within the organisation to secondary users, as part of their CSR programme. Also, some large organisations were establishing take-back routes for donated equipment at the end of their useful life as part of their CSR. Thus, although CSR was not a factor in itself that was driving e-waste management, it did shape the e-waste management practices in the organisations thus making it a supporting-factor. This only came to be noticed after the analysis of data from pilot fieldwork and was not identified in the initial conceptual model. The influence of CSR on the organisational e-waste management was also explored further during the main fieldwork.

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Further, during the pilot fieldwork it was noted that interviewees from organisations acknowledged that the presence of certain factors helped in the implementation of e-waste management policies and plans developed by organisations. According to Thompson (1997) a policy that lacks proper internal organisational resources or necessary external resources (if any) for its translation will not be effective, as a gap exists between the policy and practice. He further argued that until these variables are given equal importance, the business strategy would not succeed. James *et al.,* (1999) tested this in their survey of large UK companies where they found that until these organisations identified the purpose of their environmental policy, their values and motivation for this, and the resources needed to implement it, the strategic implementation of these policies would be questionable. These organisational mechanisms and resources that enable the organisations to execute their environmental plans were also noticed and recognised by the interviewees during the pilot fieldwork. These are called ***enablers*** in the present research. Three such enablers were recognised by the interviewees viz. ***environmental management system (EMS)***, ***awareness*** and ***availability and access to formal recyclers.*** The role of these enablers in an organisational response to environmental challenges is also recognised in literature on environmental management (Roy and Vézina, 2001; Boiral, 2002; Sharma et al., 1999).

An **EMS** acts as a framework to implement a proactive environmental strategy by helping organisations identify their environmental impacts (Daily and Huang, 2001). Organisations that have well defined and structured EMS are able to identify the organisational environmental impacts better (Ammenberg et al., 2002). An organisational EMS not only signals adoption of good environmental practice (Delmas, 2002), but, a *good* EMS can also help in implementing operational and procedural aspects required to attain environmental proactivity. Thus, organisations that had EMS would not only be able to recognise their environmental impacts (in this case regarding e-waste), but would also have an organisational mechanism to respond to them. The interviewees from the bulk consumer group acknowledged that e-waste management was recognised under their overall EMS and this provided the initial model supporting the enabling role of EMS as identified in literature.

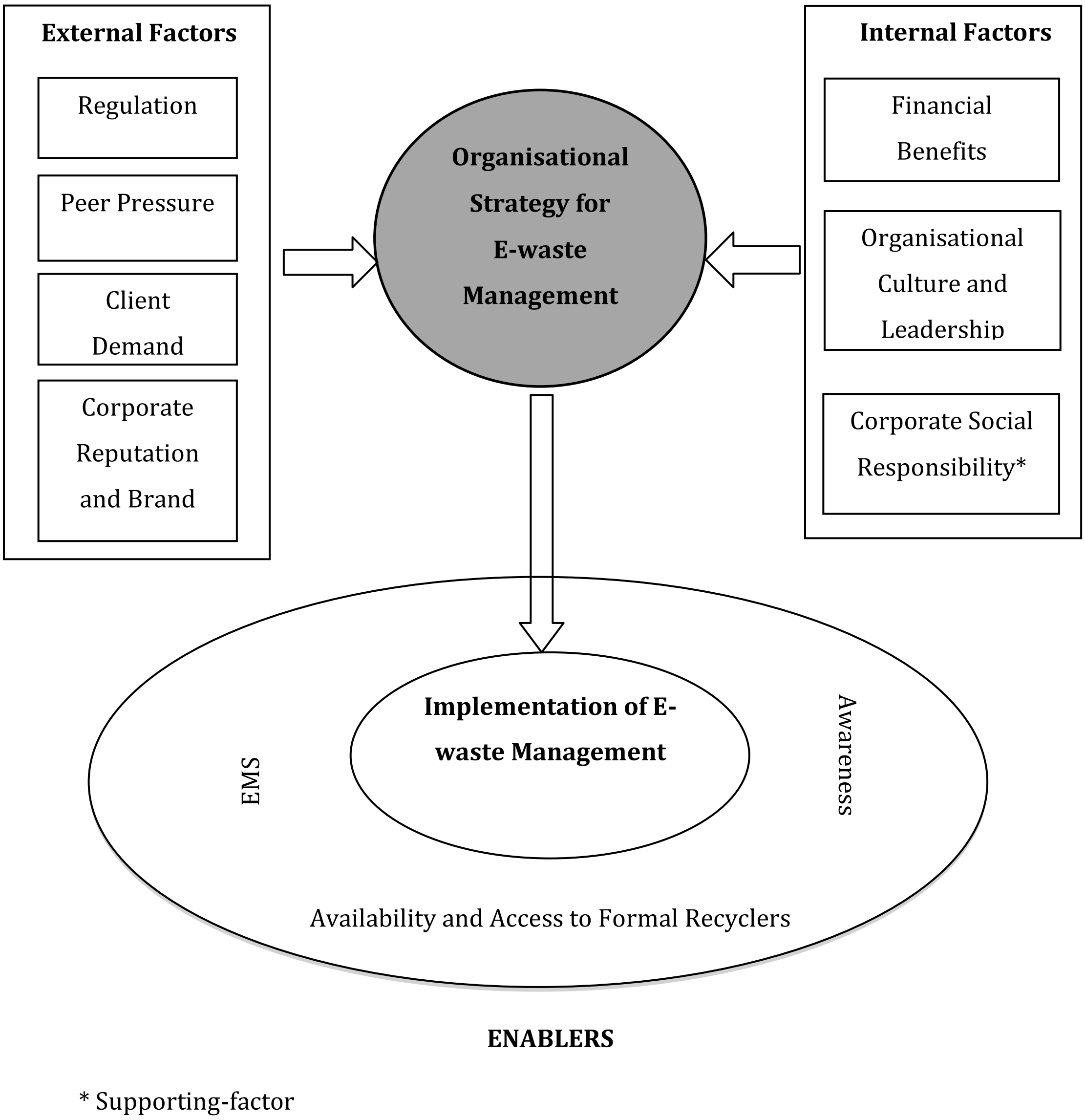
Awareness among employees increases proactive attitudes towards environmental management and also improves the participation of employees in achieving the goals (Wong, 1998). Environmental training plays a vital role in bringing this awareness, by acting as the channel for taking the knowledge about changing environmental regulations and pro-environmental corporate philosophy to the employees (Cook and Seith, 1992). Awareness among employees is also important for implementation of environmental management (Perron et al., 2006). Tarricone (1996) identified lack of awareness as one of the major impediments in implementing pollution prevention measures. Thus, organisational recognition about the challenge of e-waste is not only enabled by employee awareness, but awareness generation among the employees about the challenge of e-waste enables implementation of action plans. This was not only visible during the interviews conducted in the facilities of organisations that had developed mechanism for e-waste management, but was also acknowledged by the interviewees from the industry and others who had been actively engaged in building this awareness in their organisations.

Availability and access to formal recyclers was another important enabler for implementation of proper e-waste management in the organisations. The earliest formal recycler approved by the Central Pollution Control Board began operation only in 2005, according to the information provided by regulators. The bulk consumers acknowledged that until then they only could use the service provided by scrap dealers to dispose e-waste generated in their organisation. The interviewees from IT service organisations, and also from NASSCOM, further acknowledged the pivotal roles these recyclers played in handling the e-waste generated by the organisations. They also acknowledged that accessibility to these service providers was not uniform to all the sizes of organisation, making implementation of e-waste management practices challenging for organisations. Such external resource dependency of organisations and its influence on organisational response were acknowledged by Pfeffer and Salancik (1974).

Based on the information collected and analysed during the pilot fieldwork, the conceptual model was modified (Figure 4.5), to account for two levels of organisational response to the e-waste challenge, namely factors that were shaping the strategy, and factors that were helping in implementation of these strategies. The first/top level included the factors driving the organisational strategy for e-waste management, and the second/bottom level included the enablers that helped in implementing e-waste management in the IT bulk consumer organisations. In the first level instead of five ***external factors*** recognized in the early conceptual model the amended model had only four viz. regulation, peer pressure, client requirement[7], and corporate reputation and brand image. Only two of the three **internal factors** in the conceptual model were identified during the pilot work. ‘Employee demand’ identified in the conceptual model was not prominent and employee participation was recognised more to be the influence of corporate culture and leadership. The corporate culture and leadership also shaped the organisational CSR to recognise environmental responsibility. CSR in turn acted as a supporting-factor in shaping the organisational e-waste management. The amended model thus included two internal factors namely financial benefits, organisational culture and leadership and one supporting-factor namely CSR (also linked to the internal factor-organisational culture and leadership) identified during the pilot work. The role of ***enablers*** that helped in implementing the e-waste management practice of the organisations was identified only during the pilot work and so they formed the second level in the amended model. The three enablers identified include EMS, awareness and availability of formal recyclers.

[7] NGO pressure was however noted among the producers who lacked client pressure for e-waste management.

Figure 4.5 Amended conceptual model



4.8 Data Analysis

Qualitative research produces rich data that needs systematic analysis. Miles and Huberman (1994) provided a clear and systematic description of data analysis of interview data, which was useful in the present research. They recommended three stages in data analysis viz. data reduction, data display and conclusion. Data reduction refers to the process of "selecting, focusing, simplifying, abstracting and transforming the data that appears in written-up field notes or transcriptions" (Miles & Huberman 1994 p10). In line with this, each recorded interview was transcribed and coded for systematic case analysis.

A code is a label attached to a section of text to index it as relating to a theme or issue in the data which the researcher has identified as important to his or her interpretation (King, 2004). In this research the codes were descriptive in nature and based on the interview guide and research questions (Appendix 6). The codes described the organisational practices for e-waste, drivers for e-waste response, interaction with other stakeholders with respect to e-waste management and organisational characteristics. Although the initial codes were thematic, based on the topics in the interview guide, as analysis progressed new codes emerged that were especially useful in analysing the strength of various factors influencing organisational practice for e-waste management. The observations (which were included in the field notes) complemented the interview data. After coding of interview data, document analysis was done and extracts from the documents that complemented the field data were abstracted and matched with the codes. During the data analysis, as the practices and drivers for e-waste management in the bulk consumers began to emerge, they were continuously cross-referenced and compared with the information from other stakeholder and expert groups so as to ensure credible information was being generated. It should be noted that the data sources and information from the pilot fieldwork were also included as part of the overall data analysis; such practice in qualitative research is not uncommon (Teijlingen and Hundley, 2001).

The second stage of data analysis was data display. Miles and Huberman (1994, p91) define data display as “a visual format that presents information systematically, so the user can draw valid conclusions”. The coded data here were then displayed using Microsoft Excel along with the code definition, organisation and interviewee. The coded information from the documents was also displayed with the interview data. This display of the data helped the researcher uncover in a systematic and scientific way, both practices for e-waste management and the factors driving them. The display also made it easier to triangulate the information gathered from different sources and draw credible conclusions.

There were five groups of organisations namely, the very large IT organisations, the large IT organisations, the SME IT organisations, the IT producers and the formal recyclers. Differences in the practice and approach to e-waste management along with the differences in expression of factors among the groups were anticipated at the onset of research, due to the divergence in their business context. At the time of data gathering while observing the practices for e-waste management in organisations, it was noted that certain organisations had well defined organisational policy and practices to manage e-waste even when they did not have regulatory demands and disposed e-waste through formal recyclers. There were certain other organisations that were beginning to change the organisational practice for e-waste management in response to changing regulatory scenario of the country. There were also some organisations that were not aware of these changes and continued to ignore the challenge of e-waste management. The data analysis confirmed these observations. The similarity in the approach to e-waste management within a group of stakeholders was greater than the variations within them. Based on their practices and approaches to e-waste management the organisations were categorised as three types viz. proactive, reactive and indifferent (Box 4.1).

Box 4.1 Indicators of approaches to e-waste management

Proactive: e-waste policy; standard organisational procedure to handle e-waste; not limiting e-waste management to regulatory requirement; awareness and action to tackle the challenge of e-waste; top management commitment and active participation at all levels; presence of EMS; disposal of e-waste through organisation verified and licensed formal recyclers; lower value expectation from e-waste at the point of disposal

Reactive: No clear e-waste policy; Non-standard procedures to handle e-waste; e-waste management implemented in response to regulatory changes; limited awareness of the issue; no EMS; disposal of e-waste to licensed formal recyclers; higher value expectation from e-waste at the point of disposal

Indifferent: No e-waste policy; ad-hoc procedure to handle e-waste; no awareness of the issue; disposal of waste through informal sector; non-response to regulatory changes; higher value expectation from e-waste at the point of disposal

At the time of data gathering it also came to be noticed that although the factors shaping organisational strategies for e-waste management recognised in the conceptual model were emerging, they were not uniform even among similar organisations. The emerging phenomenon of the difference in the strength of factors observed during the interviews was confirmed at the time of data analysis. Previous qualitative research on drivers and motivations for organisational environmental strategy and management mostly focused on identification of drivers (Berry and Rondinelli, 1998; Hoffman, 2001; Buysse and Verbeke, 2002) and the strength of any relationship of these drivers were not explored beyond ranking them (Dummett, 2006). Due to the emergence of differences in the expression of factors recognised during data analysis, the current research went beyond identification of factors.

The coding for the strength of the factors was inductive. Such inductive coding that allows research findings to emerge from the frequent, dominant, or significant themes inherent in raw data is common in several types of qualitative data analyses and consistent with general patterns of qualitative data analysis (Miles & Huberman, 1994, p9; Thomas 2006). The strength of the factors was deduced based on the way they were described by the interviewees and organisational documents, website and other external data (where available). The generic descriptors of the factors were coded as ‘strong’, ‘weak’, and ‘absent’ based on the ‘proxy’ words used (Box 4.2). Apart from this certain descriptors also came to be associated with specific factors example, words like audit, check, verify were used by interviewees while discussing the role of clients in their e-waste management practices. These words indicated that clients paid particular attention to the organisational environmental management practices and therefore were strong drivers. Similarly words like responsibility, sustainability were used by interviewees while discussing the role of corporate culture and leadership in the organisational environmental management practice that pointed to the commitment of top management to organisational environmental response. Such specific descriptors of factors were therefore included when available

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Box 4.2 Generic descriptors of factors

Strong: Driver; Important; Significant; Essential; Required; Influential; Serious; Motivating; Large

Weak: Somewhat; Would/Should; Insignificant; Unimportant; Perhaps; Ad Hoc; Hardly; Small

Absent: Not; No plus not mentioned or not discussed

The factor strengths for individual organisations were then aggregated to produce single factor strength for each of the five organisational groups. The modal rating (strong, weak, absent) for each factor-group combination was used to produce aggregate strength (Table 8.1). Across all factors and groups, the aggregate rating represented the rating of at least 60% of the organisations within the group. For example while looking at the role of regulation in the e-waste management practice adopted by the organisations the analysis of data revealed that it was strong in all the five large IT organisations (100%), making the modal rating for this factor strong. But in the case of SME IT organisations the data analysis revealed that only six of the ten organisations regarded the weak role of regulation in their e-waste management practice, while it was not regarded to have any role in the remaining four organisations in this group. Therefore, the modal rating for this group (60%) pointed to the weak role of this factor in driving e-waste management among the SMEs.

The facilitating role of the enablers was confirmed based on their level of presence (high or low) or absence in the organisation along with the recognition of their role by interviewees in implementing e-waste management practice of the organisation. It must be emphasised here that defining and describing the strengths of various factors is not an attempt to vest hard-and-fast, quantitative, statistical properties into the data, but it is an attempt to capture and categorise the difference in the expression of these factors that was observed in the field.

4.9 Summary

This chapter discussed the research approach and method adopted in the current research. The research on bulk consumer response and role in e-waste management is new and therefore a retroductive research strategy that allows theory evidence interaction to build theory on under-researched topic was used. The retroductive research strategy led to the development of a conceptual model based on the review of literature. This model was pilot tested to identify the most suitable analytical frame to be used for data collection. This research study, which is both exploratory and explanatory, adopted qualitative methods which are advocated as most appropriate in understanding social phenomena; in this case the management of e-waste. This qualitative research was executed through a multiple case design. The cases included organisations from IT service bulk consumers of three different sizes (based on the number of employees). Data collection for the cases was done through semi-structured interviews, document analysis and direct observations. In order to validate this information, other stakeholders engaged in e-waste management were also analysed. The pilot testing of the conceptual model led to its amendment to include two levels from the initial one level. The two levels of the amended model distinguished between the factors determining the organisational e-waste strategy (level one), and the factors (enablers) that helped in the implementation of organisational response to e-waste (level two). This amended conceptual model was used for data collection. Data analysis included the analysis of the data from interviews, documents and observations. The interview data was transcribed and coded along with document and observation data. Microsoft excel was used to display and analyse these coded data to draw the conclusions.

The next chapter will present and discuss the context of the case study country - India and its e-waste scenario to provide a baseline for analysis and interpretation of the research findings.

5 CONTEXT OF THE CASE COUNTRY- INDIA

This chapter describes the ICT sector and e-waste context in India, the country selected for this research (4.4). Describing the context before presenting the findings (chapter 6 and 7) provides a baseline to facilitate understanding of the findings and conclusions (chapter 9). The IT service sector has been recognised as major contributor within the ICT group to India's economy, and the chapter begins by briefly presenting the growth and establishment of this sector (5.1). It then presents the various policy support received by the IT sector to foster its growth in the country (5.2). Section 5.3 covers the recognition of the operational environmental impacts of the ICT sector, before presenting the e-waste scenario in the country (5.4); setting out the quantity of e-waste generated and the mechanisms in operation for its management. Finally section 5.5 covers the regulatory framework in India to address the challenges of e-waste.

5.1 ICT Sector in India

The sectors contributing to the Indian economy are broadly categorized into agriculture, manufacturing and services. Of these three sectors, it is the service sector that has shown remarkable growth from contributing only 30.3% to GDP in the 1950s to 59% in 2011 (Economic Survey, 2012). The service sector is growing by 10% annually, providing one quarter of total employment with its increased share of Foreign Direct Investments (FDI) inflows and over one-third of total national exports (Union Budget 2011). The service sector comprises a large group of activities, ranging from sophisticated information technology services to the simple services provided by unorganised sectors, e.g. plumbing. Among the various groups in the service sector, the software and telecommunication industry that belongs to ICT category has been recognized as one of the five major groups.

The ICT sector is a major generator of e-waste and comprises software and hardware industries plus the telecommunication industry. The electronic hardware industry comes under the manufacturing sector and it contributes less than 2% of GDP despite its immense potential (ELCINA, 2008). It showed growth of 13.9% in 2011 although, according to industry sources (MAIT, 2012), this has been slowing down. The Indian telecom sector contributes 3% of GDP (FICCI 2011) and has steadily grown, and is currently ranked second in the world after China with a tele-density of 76.86% in 2011 and attracted 7.9% of FDI in service sector (Economic Survey, 2011). The third group is the IT service industry, which is recognised as a business service[8] and it constitutes four major sub-components viz. IT services, business process outsourcing, engineering services and research and development (ER&D) and software products. The revenue from this sector to GDP has steadily increased from 1.2% in 1997-98 to 6.4% in 2011-2012 (NASSCOM, 2012a). Although all three sub categories of ICT sector base their operation on electronic equipment and generate e-waste, here it would be useful to discuss

[8] Popularly referred to as IT and ITeS (IT enabled services) sector

the trends in the IT service sector, the case sector here, which is the highest contributor to GDP among the ICT sector.

The growth of the Indian software industry coincides with the period of liberalisation of Indian economy and the policy changes it brought. Some of the major changes that promoted the IT industry in India were elimination of duties on imports of information technology products and relaxation of controls on both inward and outward investments and foreign exchange. The dynamics and growth of the Indian software industry during the period of liberalisation, and the factors that helped its development in the country, are discussed by Heeks (1996).

The information technology service sector of India has drawn the attention of world to India in less than two decades. According to NASSCOM - India's quasi-governmental software industry promotion organisation - the IT related service industry aggregate revenue crossed the USD 100 billion mark in 2012 compared to no more than USD 150 million in the 1990s (NASSCOM, 2012b). This huge success of the IT service sector has been attributed to its cost effectiveness due to abundant talent and maturing service delivery (DEIT, 2009). The growth of the sector has led to tremendous pay-offs in terms of wealth creation and generation of high quality employment. In terms of size, it is the major services export category accounting for 41.7% of total export in 2010-11 (Economic Survey, 2012). Although the domestic IT service market is growing, the IT service export market is one of the most important reasons for the burgeoning growth of this sector.

The contribution of this sector has surpassed the contribution of both manufacturing and agricultural sectors. The worldwide IT service market size amounts to USD 819 billion and the Indian software industry captures 8.5% of this global share; it accounts for 6.4% of India's GDP, 14% of total export, 10% of India's service sector revenue and employs over 2.8 million people directly and 8.9 million indirectly (NASSCOM, 2012). The IT service sector employs nearly 31% of the population engaged in formal service sector employment (National Commission for Enterprises from Unorganised Sector, 2009). Within software and services exports, IT services accounts for 58%, BPO nearly 23% and ER&D and software products 19%. The USA accounts for nearly 60% of the share of Indian software export followed by Western Europe and Japan (NASSCOM, 2009).

Due to software exports contributing a higher percentage of business than domestic markets, the Indian software sector still hugely depends on MNCs, either as owners or mostly as buyers, for business (Bharati, 2005). The mode of operation of these MNCs is broadly classified as three types viz. captive offshore centres (direct subsidiaries of Western companies delivering services only for their parent company); firms of Indian origin (FIOs) (IT & BPO companies native to the subcontinent); multi-national IT & BPO companies (that have either bought FIOs or founded their own subsidiaries in India). The distribution of the size of the companies contributing to this sector is pyramidal in the sense that the top of the pyramid consists of fewer numbers of large companies, which include a mix of national and multinational players. The middle layer of the pyramid consists of a moderate number of medium companies while the bottom consists of large number of small companies (Bhatnagar, 2006). The largest five firms account for 32% of software export while the 2,900 smaller firms together own only 14% of the share (*ibid.*) and offer service to the domestic market. The growth of IT sector in India has been due to the continuous support by the various governments in power from the early 1990s to today. Changes in policy to facilitate the IT growth together with support in the form of infrastructure and allied services have immensely helped in the growth of this sector (4.4).

5.2 Institutional Support to Foster IT Service Sector

The fiscal measures taken after the economic reforms in the 1990s, by the Government of India and the individual State governments specifically for IT and ITES, have been major contributory factors for growth and nurturing of this sector in India. Department of Electronics and Information Technology (DEIT), GOI, has developed numerous industry promotion programmes ranging from infrastructure support, R&D promotion, to tax incentives to nurture this sector (DEIT, 2012). One of the major fiscal incentives provided by the Government of India, that has played a pivotal role in shaping the structure of Indian IT service sector, is the Export Oriented Units (EOU) viz. Software Technology Parks (STP), and Special Economic Zones (SEZ).

STPI (Software Technology Parks of India) set up in 1991, is an autonomous society under the DEIT and renders statutory services, data communications servers, incubation facilities, training and value added services to promote the software exporting community. The STP scheme is a pan-India scheme, with over 8,000 units registered (STPI, 2011). It has played a key developmental role in the promotion of software exports with a special focus on SMEs and start-up units. The exports made by STP units accounted for nearly 90% of the total software exported from the country in 2009 (DEIT, 2012). The STPI scheme is lauded as one of the most effective schemes for the promotion of exports of IT, and the benefits of the scheme that have facilitated growth are presented in Box 5.1. The strength of the scheme lies in it being a virtual scheme, which allows software companies to set up operations in the most convenient and cheapest locations, and plan their investment and growth solely driven by business needs. However, this scheme closed in March 2011 and similar alternative schemes are being discussed, particularly to support the STPI registered smaller organisations that have not developed under the SEZ umbrella.

Box 5.1. Benefits under the STP Scheme (STPI, 2011)

- Income Tax benefits under Section 10A & 10B of the IT Act up to 31st March 2011.
- Customs Duty Exemption on all imports.
- Central Excise Duty Exemption in all indigenous procurement.
- Central Sales Tax Reimbursement on indigenous purchase.
- All relevant equipment/goods including second hand equipment can be imported (except prohibited items).
- Equipment can be imported on lease/loan basis.
- 100% FDI is permitted.
- Sales in the DTA up to 50% of the FOB value of exports permissible.
- Use of computer imported for training permissible subject to certain condition that no computer terminals are installed outside the STP premises.
- Depreciation on computers at accelerated rates up to 100% over 5 years is permissible.
- Computers can be donated after two years of use to recognised non-commercial educational institutions/hospitals without payment of duty.
- Export proceeds will be realised within 12 months.

Another policy close to STP that promotes export orientation of this sector is the Special Economic Zone (SEZ) Act. In 2005, the SEZ Act was enacted by the Ministry of Commerce, GOI, with an objective of providing an internationally competitive and favourable environment for exports. A SEZ is defined as a "specifically demarked duty-free enclave and shall deemed to be foreign territory (out of Customs jurisdiction) for the purpose of trade operations and duties and tariffs" (DEIT, 2012, p1). The Act provides simplification of procedures through a single window clearance policy for matters relating to both central and state governments. The SEZ scheme offers similar benefits to SEZ units as for STPI units with respect to indirect taxes, with some minor differences in operational details. However, unlike the STP scheme, this scheme is ideal for larger industries and is not intended solely for the IT sector as is the STPI scheme.

As well as providing tax incentives and infrastructure support to the IT sector, in order to promote IT industry in the various states the respective state governments also have come up with state IT policy. The policy guides and promotes the growth of IT industry in the respective state through benefits like subsidised electricity, environmental regulatory exemption, etc. The environmental exemptions of IT service sector in the state IT policy (Box 5.2) further renders its recognition as a non-polluting industry by the state Pollution Control Board (PCB). Therefore, this sector is categorised as 'green' by most state PCB, and so benefits from environmental regulatory monitoring[9].

Box 5.2. State IT policy

"IT-ITES companies will be exempted from the purview of the Tamil Nadu Pollution Control Act"- (Tamilnadu, 2008)

"Exemption of Software Industry from the purview of AP Pollution Control Act, excepting the power generation sets" - (Andrapradesh, 2010a)

5.3 Greening of the Software Industry

The growing IT sector also means demand for power, water and other resources to run the facilities, and also generation of large quantities of waste ranging from paper to electronic waste. Although the worldwide manufacture, distribution, and use of ICT systems has been recognised to generate about 2% of global greenhouse gas emissions (Gartner, 2007) the environmental impact of this sector is not widely recognised in India. The IT service sector particularly carries a clean green image (interviews regulators R1, R2, 2011). However, with IT offering solutions to offset the effects of climate change through its products and services to various other sectors, it has begun to look at its environmental impacts.

The 'Green IT Initiative' is one such measure developed at the sectoral level by the IT industry association, NASSCOM. This initiative is focused on enabling the IT service industry in India to contribute to a better environment through technology, and adoption of environmentally friendly infrastructure, including reduced energy consumption and e-waste management (NASSCOM, 2009). This sectoral initiative has had a response at an organisational level by most of the very large organisations developing 'Go Green Activities'. These activities range from energy conservation, waste management, to sponsoring conservation activities, etc. Many large organisations also have implemented EMS to manage their environmental aspects and publish an annual sustainability report, which indicates the increasing environmental responsibility of this sector. The environmental response of this sector to the challenge of e-waste is the focus of this research and in order to clarify this response a discussion of the e-waste scenario in India and the current level of legislation follow in the next section.

[9] Although the IT sector is categorised as 'green' sector, in the case of large IT organisations that develop and own large infrastructure to carry out their operations, they are required to obtain environmental clearance from Central PCB for construction of these facilities.

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5.4 E-Waste Scenario in India

In India, with its booming economy and large population, together with its fast growing IT sector, the problem of e-waste is growing day by day. Between 1995 and 2000 the growth rate of the IT/consumer electronics sector reached 42% per annum in India (ToxicsLink, 2003). The Indian average growth of PC users between 1993-2000 was 604% against a world average of 181% (LRD, 2005, cited in Balakrishnan et al., 2007). According to MAIT (2007) the penetration rate is more than 22 PCs per 1000 people in 2007, compared to 0.7 in 1996. The obsolescence rate of PCs is about one in every two or three years (ToxicsLink, 2003). Dwivedy and Mittal (2010) adopted a modelling approach to estimate computer waste in India and indicated growth of e-waste at the rate of 7% per year. They have projected that around 41-152 million computer units will become obsolete by 2020. It should be noted that computers are just one of a range of equipment that becomes e-waste at their end of life. The total WEEE estimate in India by 2012 was expected to be around 800,000t (MoEF, 2010).

The e-waste stream in the country is rising three times faster than the municipal waste stream (Agarwal, 2009). E-waste is defined as waste generated from used electronic devices and household appliances which are not fit for their originally intended use and are destined for recovery, recycling and disposal (CPCB, 2008). Government institutions and the public and private sectors have been identified as the major contributors of approximately 70% of the amount (EMPA 2007). The IT service sector alone generates nearly 30% of e-waste in the country (Chawla, 2008). Manufacturers of components and assemblers and individual households are additional major sources of e-waste generation, although it is difficult to capture exact amounts and numbers of these contributors (EMPA, 2007). The problem of e-waste is further enhanced in the country by the import of waste electronic equipment under the guise of donation or reuse (GTZ-MAIT, 2007). E-waste recycling is largely limited to recycling of ICT equipment like computers, mobiles, etc., and included little household equipment such as refrigerators, washing machines, etc. (*ibid.*).

Of the total e-waste generated in the country, a large proportion is refurbished and sold in the secondary market, and so less than 5% is available for recycling (GTZ-MAIT, 2007). A study conducted by ELCINA (2009), assessed the e-waste trade value chain in India and identified the various stakeholders (Figure 5.1). These stakeholders include, the ‘generators’ of e-waste namely, the consumers of electronic equipment, the manufacturers and the retailers of electronic equipment and the importers of used equipment; the ‘aggregators’ who are engaged in collection and stockpiling activity which includes the second-hand and refurbishment market and the scrap collectors and; the ‘segregators’ who are engaged in dismantling and recycling. The informal sector becomes predominant in the last two stages namely aggregation and segregation, although recycling is also done by the formal recyclers. The distinction between household and business consumers of electronic equipment was also made in this assessment. According to this study, while the household consumers disposed material for reuse among friends and relatives, or sold it in second hand market, the business users mostly (48%)

returned it for part exchange during procurement of new material, and selling to recycling companies was very low (2%). Figure 5.2 represents the movement of e-waste from the bulk consumers in businesses in India (*ibid.*). The ELCINA report indicates that even the e-waste arising from businesses enter the informal sector through part exchange or buy back schemes.

Figure 5.1 Snapshot of e-waste trade chain in India (Adapted from ELCINA 2009)

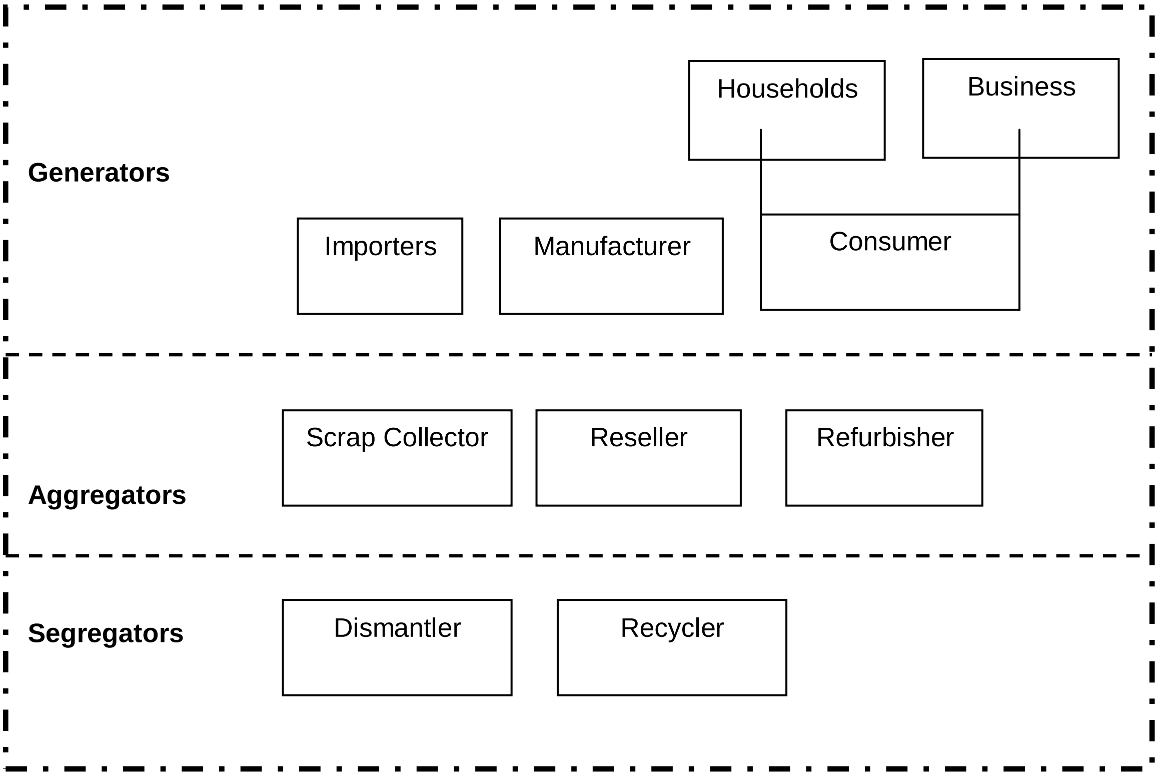
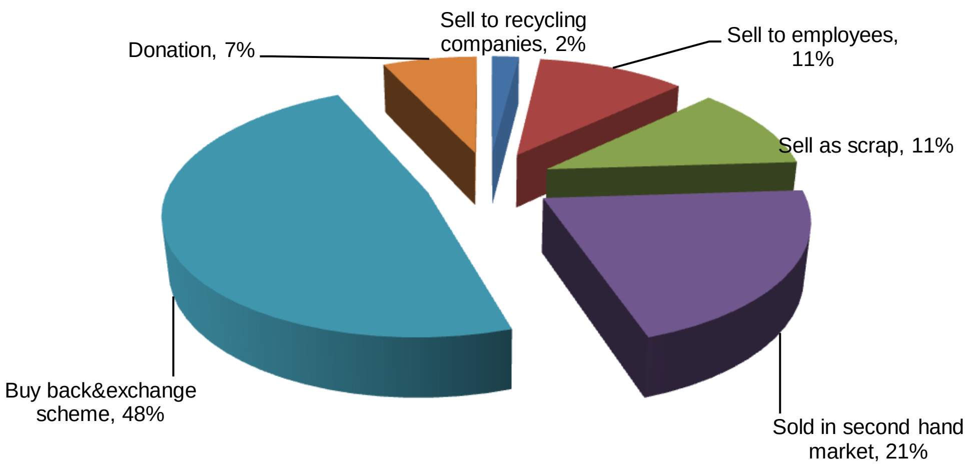


Figure 5.2 E-waste disposal method adopted by businesses in India

(Source: ELCINA 2009)



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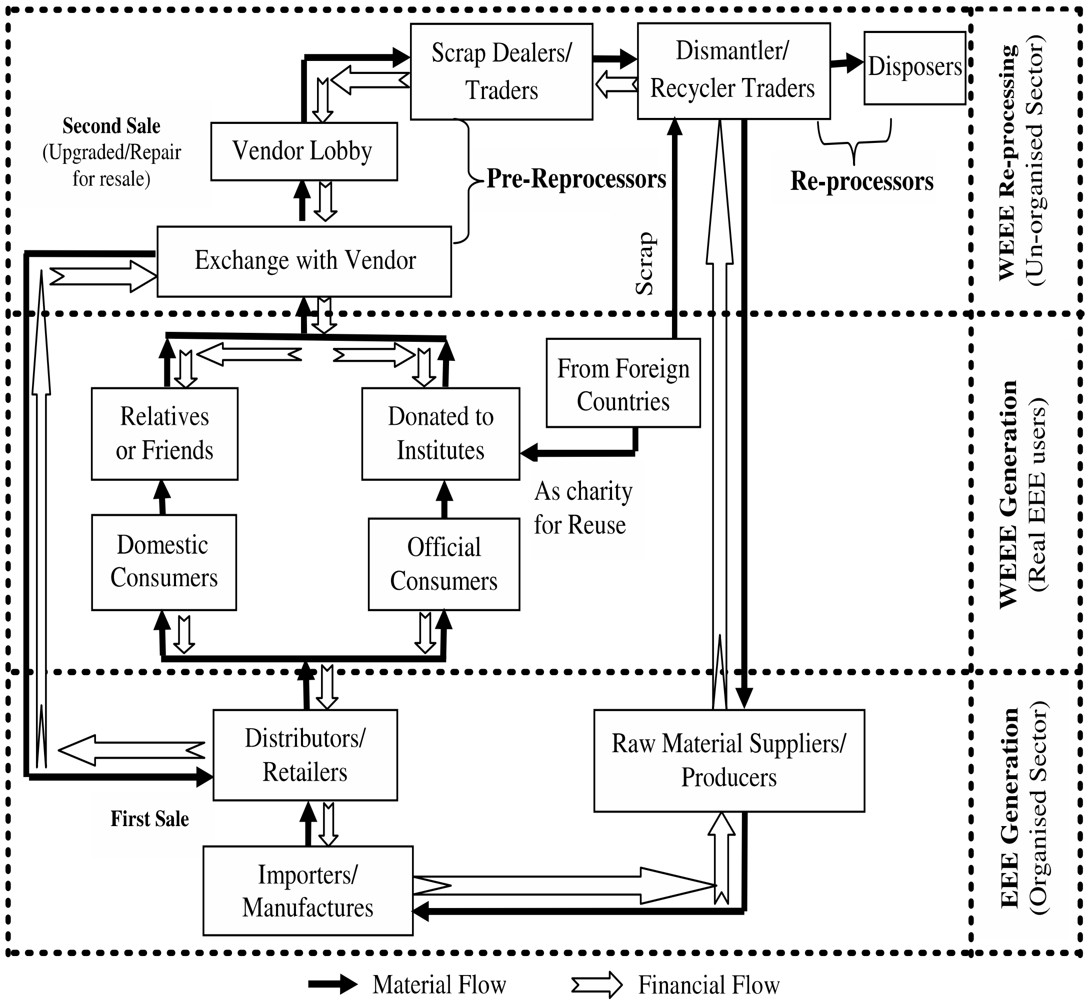
Manomaivibool (2009) and Wath et al. (2010, 2011) have also studied the overall material flow of e-waste in India (including e-waste arising from both domestic and institutional consumers) (Figure 5.3). These researchers also distinguish the household consumers from institutional consumers, and identify consumer participation as an important challenge in e-waste management. According to Manomaivibool (2009), despite large institutional users and producers being a source of material to formal recyclers, there is also movement of e-waste from institutions to household consumers and the second hand market for reuse. This movement of material, together with the non-participation of household consumers (in appropriate management of e-waste), increases the challenge of managing this e-waste (*ibid.*). According to Wath et al. (2010, 2011), the recycling of e-waste in the country happens in the un-organised sector that includes scrap dealers, dismantlers and disposers. Wath et al (*ibid.*) do not recognise the formal recyclers as a separate entity and include them under the category of dismantlers and recycler traders, reasoning that this group is only engaged in dismantling and not in resource extraction like the international recyclers.

Figure 5.3 Existing e-waste trade system flows in India (Source: Wath et al., 2010)



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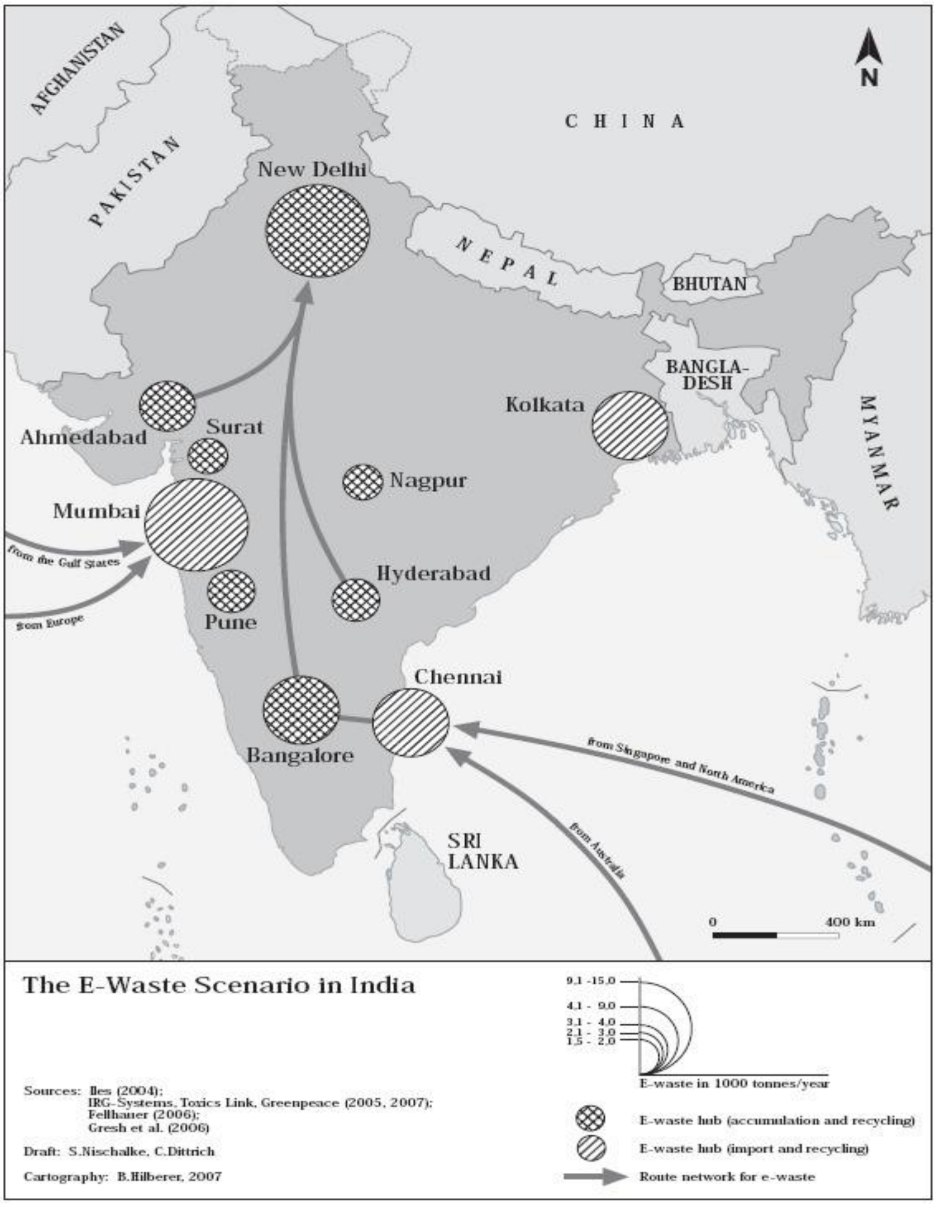
Thus, e-waste management in India has been largely left to the highly organised informal sector, which does the collection, segregation, dismantling and finally recycling until recently (Raghupathy et al., 2010). The informal sector engaged in waste recycling comprises of urban poor and rural migrants (Mitchell, 2008). The flourishing of the informal recycling sector has been attributed to the long history and presence of the informal waste sector (popularly known as *'Kabadiwalas'*), combined with the lack of specific regulation to tackle this (*ibid.*). The informal sector handles recycling of nearly 95% of the total e-waste that is recycled (GTZ-MAIT 2007). The recycling by this informal sector is done in a primitive way in backyards of businesses, which causes damage to health of these workers along with environmental damage and loss of valuable material due to their inefficient methods. Although studies on environmental and toxicological impact of improper treatment of e-waste is well recognised (Yang et al., 2004; Wong et al., 2007; Sepúlveda et al., 2010) not much data is available about its impact on recycling workers in India. The informal recycling happens in urban slums and outskirts and most workers in this informal sector are children who are prone to respiratory problems (Roche, 2010).

Delhi has been recognized as the major hub for informal recycling in the country (GTZ-MAIT, 2007). The informal sector in Delhi alone employs 25,000 people (Jain, 2006). The major sources of e-waste and the recycling scenario in India in general are depicted in Figure 5.4; it does not distinguish between the formal and informal recycling facilities in the country. Illegal e-waste imported from overseas enters the country from the port cities of Mumbai, Chennai and Kolkata. These cities function as import hubs but are also engaged in recycling. Other cities such as Bangalore, Hyderabad, Pune, etc., that are major hubs for IT service sector also serve as collection hubs and engage in recycling.

Figure 5.4 E-waste collection and recycling scenario in India (Source: Nischalke, 2008)



Currently, there are 23 formal recyclers in the country that have a license to process e-waste (CPCB, 2010), but they are not adequate to handle the quantity of waste generated (Raghupathy et al., 2010). Figure 5.5 indicates the locations of formal recycling operations in India that have been granted a license to operate from the CPCB[10] in 2010. The distribution of formal recyclers is associated with the distribution of IT service sector in the region, as indicated by the presence of seven formal recyclers in the state of Karnataka, the capital of which Bangalore has maximum number of IT service companies in India (1700) (Singla, 2008). This indicates that the IT service sector is a major source of material for the operation of these formal recyclers as identified by Manomaivibool, 2009. However, attempts to understand the material flow and treatment among the formal recyclers as not gained much attention due to e-waste recycling being in the realms of informal sector for a long time.

[10] The number of licensed formal recyclers may be different now, as the state pollution control boards have been authorized to grant recycling license subsequently

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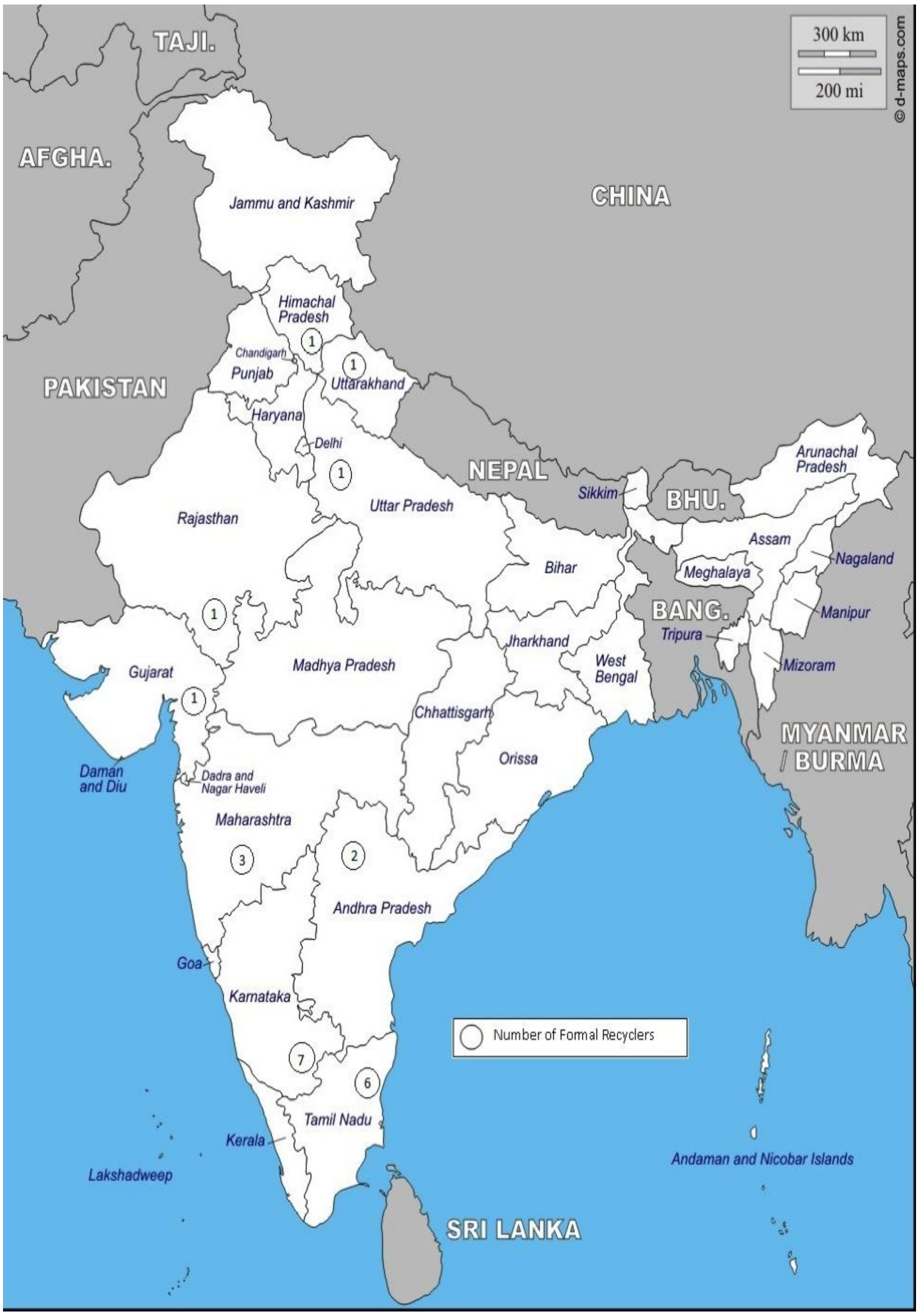
Figure 5.5 **Locations of formal e-waste recyclers in India** (Source: Compiled by the researcher based on information from CPCB)



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5.5 The Status of E-Waste Regulation in India

India's constitution makes provisions for protection and improvement of the environment:

> "Article 48-A enjoins the state to make endeavour for protection and improvement of the environment and for safeguarding the forest and wild life of the Country, while Article 51 A (g) of the Constitution, states that the fundamental duties of every citizen of India is to protect and improve the natural environment including forests, lakes, rivers and wild life and to have compassion for living creatures" (Constitution of India, 1950).

India has actively participated in, and ratified, many of the international environmental agreements into national regulations in the past. Despite such a history India lacked specific e-waste management rules until mid-2012.

E-waste is a mixture of both valuable material and toxic substances and due to this toxic nature it is tagged as hazardous material and is covered under the Basel Convention (2.5), which prevents transboundary movement of hazardous waste. In order to manage hazardous waste (HW), mainly solids, semi-solid and other industrial wastes which were not covered by the Water & Air Acts, and also to enable the authorities to control handling, treatment, transport and disposal of waste in an environmentally sound manner, the Ministry of Environment & Forests (MoEF, GOI), notified the Hazardous Waste (Management & Handling) Rules (HWMR) on July 28, 1989 under the provisions of the Environment (Protection) Act, 1986; further amended in 2000 and 2003. India is a signatory to the Basel Convention and in fact India had separate HWMR even before the Basel Convention came to force in 1992. Despite ratifying the Basel Convention, India is still facing large amount of harmful e-waste entering the country in the name of 'metal scraps' or end-of-life goods for donation (Puckett et al., 2002).

Due to the hazardous nature of e-waste, it was designated as non-ferrous hazardous waste under the 'hazardous waste management rules 2003' (MoEF, 2003) until May 2012. The HWMR mainly address the hazardous wastes that are in-process waste originating from a definite source. Under the HWMR the generator is responsible for proper collection, storage, transportation of the hazardous wastes for its safe treatment and disposal in their own premises or in a common treatment storage disposal facility (TSDF). The operator of the treatment facility is responsible for collection, reception, storage, treatment and disposal of hazardous wastes. Thus, the liabilities are fixed on the generator and operator of the treatment facility.

However, e-waste is not mainly process waste (although some waste is generated during its production) but is post-consumer end of life waste. Also, e-waste as such is not hazardous; it is the improper handling of e-waste during the extraction its valuable material that makes it environmentally unsafe due to the release of toxic components. Categorizing e-waste under hazardous waste rules fixes higher liability on the producers of electronic equipment and the recyclers of these wastes. Also, recycling is restricted in HWHR, while the potential for recycling is higher for e-waste due to the valuable components it contains. Recognizing the special nature of e-waste, MoEF developed Guidelines for Environmentally Sound Management of E-waste' in 2008, with the object of providing guidance for identification of various sources of waste electrical and electronic equipment, and to prescribe procedures for handling them in an environmentally sound manner (CPCB, 2008). However, these guidelines were not adequate to tackle the e-waste problem and the various stakeholder groups (especially environmental pressure groups like Greenpeace and BAN) engaged in e-waste management considered that it was essential to have a separate rule.

As the government was compelled to respond to the challenge of e-waste, the manufacturers of electronic equipment through the Manufacturer's Association of IT industry (MAIT) joined with GTZ, Toxic Links, Greenpeace and others in 2007 and initiated a consultation for seeking a separate e-waste policy from the MoEF. These consultation workshops, which included various stakeholder groups, ranging from national and local government departments to domestic and international manufacturers and recyclers, along with NGOs, resulted in the development of a draft policy in June 2009 (based on interview with MAIT consultant in Nov, 2010). The separate regulation to handle and manage e-waste in India, known as E-waste (Management and Handling) Rules 2011 came into force in May 2012 (MoEF, 2011) after a debate on the draft policy.

This new rule is based on the principle of EPR and has drawn heavily from the EU WEEE and RoHS regulations, despite caution sounded by researchers like Lin et al. (2002) and Manomaivibool (2009), about adopting an EPR-based policy without paying due attention to the context of developing countries. This rule applies to the producers, consumers, bulk consumers involved in the manufacture, sale, purchase, and processing of electrical and electronic equipment or component, collection centres, dismantlers and recyclers of e-waste. The producers are not only required to ensure restriction of certain hazardous compounds in their products but, in accordance with the EPR principle, are also required to manage both the manufacturing and the end-of-life waste of their products. The onus of establishing, financing and operating systems that enable environmentally safe handling of e-waste rests on the producers as recommended by researchers like Lin et al. (2002) and Manomaivibool (2009).

Some researchers, such as Wath et al. (2010, 2011), have explored the use of market-based mechanisms like advanced recycling fees (ARF) for consumers and tax credits for producers and recyclers for effective implementation of an EPR based rule in India and have recommended ARF as part of EPR for its effectiveness. The 'new rule' however, does not acknowledge such market-based mechanisms (9.1.5). The exemption of micro and small enterprises from the purview of this rule, the exemption of producers from collection targets (which would make monitoring difficult) and non-recognition of reuse and refurbishment, which in the Indian context is high, are some of the shortcomings of this rule. The implementation of this rule and the changes it will bring to e-waste management practice in the country waits to be seen.

The context of research has been set in this chapter, which has discussed both the contribution of the Indian IT service sector to the overall economy, and to the problem of e-waste in the country. It has also thrown light on the current e-waste scenario in the country and the current regulatory mechanism. In doing so it has set the stage to present the findings of this research. The next chapter will present the first part of the findings, namely the flow of e-waste originating from the bulk consumers.

6 E-WASTE MATERIAL FLOW

6.1 Introduction

The major stakeholders in an e-waste management system include the producers, consumers, and the recyclers (Lindhqvist, 2000). The interactions between these various stakeholders result in the flow of e-waste in the system. This flow of material is neither unidirectional nor cyclic; it is more dispersed and this is mainly due to the various system components (5.2, 5.3). This chapter presents the research findings on the flow of e-waste arising from the bulk consumers. As users of electronic equipment, the e-waste originating from the bulk consumers is an operational waste and they are not equipped to manage this on their own. This analysis demonstrates and discusses the interactions between the bulk consumers with two main stakeholders viz. the producers and recyclers who facilitate them to manage this e-waste. This interaction results in the flow of e-waste from the bulk consumers. Thus, this analysis allows to achieve Objective 3 - Identify the path of e-waste among the stakeholders to understand the material flow.

The material flow discussed here is based on observation and information gathered through semi-structured interviews with the responsible authorities in the various organisations belonging to the IT service, IT producer, and formal recycler groups (4.5.1). These observations and information were further triangulated and validated through multiple interviews from within the bulk consumer organisations and with the stakeholders involved in the material flow chain. Further, validation was made through information gathered from representatives in government regulatory departments, industrial associations and members of other international organisations and NGOs working in the field of e-waste management in India. The data are also supported by organisational documents (annual and sustainability reports), government reports, other relevant studies (reports from industrial associations, international organisations and NGOs) and field observations (see 4.5.2, 4.5.3 and 4.6).

This chapter is organised by the types of stakeholders, and begins with a discussion of primary users from the very large IT organisations (6.2), followed by the large IT (6.3) and the SME IT organisations (6.4), before moving on to discuss the IT producers (6.5) and the formal recyclers (6.6). The secondary users, who are in receipt of donations from the primary users, are included as part of the material flow discussions from the primary users and not dealt with separately. Each stakeholder section discusses the origin or source of the e-waste, the practice adopted to manage it, and links to other stakeholders in the material flow system. Comparison of the actual material flow of e-waste in each stakeholder group with that expected for that group (based on that noted from literature and pilot study) is also presented. This is followed by the interactions between the various stakeholders and the system components that influence these relationships (6.7). The chapter concludes with a synthesis of the material flow arising from the bulk consumers in the IT service sector and identifies the approaches and different levels of e-waste management practiced by the different stakeholders (6.8), before providing summary and key findings (6.9).

6.2 Practice in the Very Large IT Organisations

6.2.1 What is e-waste?

E-waste in the five very large IT organisations is broadly defined as electronic equipment that is no longer useful for the operations within the organisation. It includes laptops, desktops and servers and also other electronic equipment such as audiovisual equipment, all types of phones, calculators, etc. E-waste generated in these organisations is categorized, based on its functionality, into two groups, viz. material that is still functional and which can be continued in use by other low power users mostly outside the organisation, and material that has completely lost its functionality and cannot be used anymore. All the organisations in this group have seen an increase in non-functional e-waste in recent years as the average life of electronic equipment has decreased as observed by Culver (2005). This decreasing durability in hardware pushes these organisations, whose core operations rely on it, to replace such equipment more frequently.

6.2.2 Organisational policy regarding use of equipment

Interview and documentary data from the five very large IT organisations indicate that all have internal policies relating to the length of usage of IT equipment. These are usually 3-5 years for laptops, 4-5 years for desktops, and 7-8 years for servers. These internal policies are the starting points for e-waste entering the waste flow and so it is important to know what system components are shaping such policies.

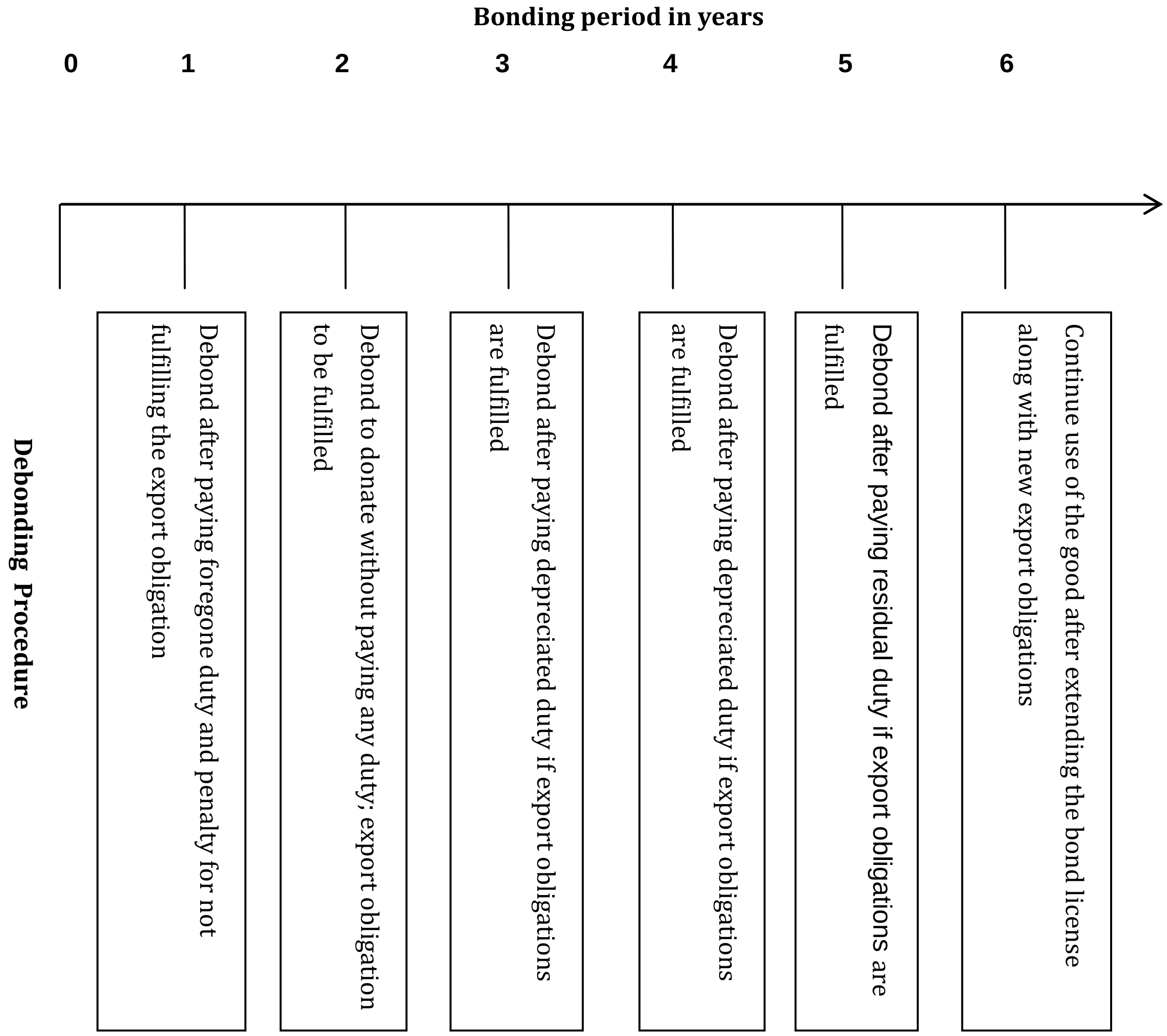
The very large organisations here operate from units that are registered under the Software Technology Parks of India (STPI) or Special Economic Zones (SEZs). Registrations under these schemes offer duty exemption and tax benefits to these organisations (5.2). These benefits also bring certain additional requirements with regard to the use and disposal of capital goods used in these facilities. IT equipment, like computers and computer peripheries, comes under the category of capital goods and these are required to be custom bonded[11] to benefit from duty exemption and to be used in these facilities. This custom bonding is regulated and governed by the Customs and Central Excise Department, Government of India (Central Board of Excise & Customs, 2011).

The bond period for capital goods like computers and computer peripherals is generally five years (Bangalore Customs, 2003) and is applicable to both STPI and SEZ facilities; the bond period for servers and printers is ten years according to most of the interviewees from the IT

[11] The warehousing of dutiable goods in a customs declared area on execution of a bond without payment of duty for a stipulated or required period is known as bonding of imported goods. The facility/location where these goods are installed is known as a private bonded warehouse.

sector as a whole. This bonding requires the bonded goods to be installed in a ‘private bonded warehouse’, and any organisations registered under the STPI/SEZ schemes are therefore regarded as a ‘private bonded warehouse’ according to the Customs and Central Excise rule. These goods cannot be moved from this facility until they complete their export obligation. In the case of failure to meet the export obligation these goods can be removed after paying the exempted duty and associated penalty. In all circumstance the goods have to be debonded[12] to be removed from the facility. The debonding procedure for removing the capital goods from the STPI/SEZ facilities is depicted in Figure 6.1.

Figure 6.1 Debonding procedure practiced to remove capital goods from STPI/SEZ facilities



Even capital goods that have fulfilled their export obligation can only be removed from the facility after payment of a debonding fee, which is actually the exempted duty. However the duty paid at the time of debonding is calculated based on depreciating value. The capital goods can

[12] Debonding is a procedure for removing the bonded goods from these bonded facilities, after applicable duty (which is also known as debonding fees) is paid.

still be used in these facilities beyond the bond period after extending their custom bonding license. However, extending the bonding license of used capital goods will limit the installation of new capital goods as all the facilities have a capital goods limit, which can be extended only with increased export obligation. So continuing to use functional computers after five years implies that these computers should help in meeting new export obligations associated with an extended bond license. Duty at the time of debonding is only exempted if the capital goods are physically destroyed in front of the customs official to render them unfit for further use. Even here, after destruction of capital goods, if the remains have scrap value, payment of duty applicable to scrap has to be made.

According to STPI/SEZ rules (STPI, 2011), the organisations are allowed to debond equipment that is less than two years old for donation without paying the bond duties. Debonding of capital goods is also allowed after three years of operation in cases where the export obligation has been met or the good has become technologically obsolete. In both these cases, the due duty needs to be paid. Usually the debonding process from STPI is longer and more demanding as separate application and clearance is sought both from STPI and the Customs authority. In the case of SEZ, this debonding is faster as it operates using a single application process. In the case of most of the IT equipment, the bond period (that attracts minimum debonding fees) is five years. As the removal of even obsolete equipment before the completion of the bond period attracts higher debonding fees, all organisations store obsolete equipment. Also, functional equipment continues to be used until the end of the bond period. However, functional equipment is debonded at the end of their bond period as that allows the organisations to bring in newer equipment for the operations to meet their export obligation. In the case of servers, where the organisational equipment policy is 7-8 years but the bond period is 10 years, the organisations simply store the obsolete servers until the end of bond period before debonding them.

In the IT service business technological advancement is constant and fast, and organisations need to upgrade their hardware equipment to support the demands of software and maintain effective execution of new projects:

> "There is an upgradation in the technology and the project needs that kind of upgradation so necessarily we go for it". (EHS and Facilities Manager VL2)

Usually newer software demands higher system requirements, such that even if the IT equipment is functional it still needs to be replaced with a higher specification so that compatibility can be achieved. This was confirmed by an interviewee from the producer group while discussing the higher obsolescence rate in IT equipment. "Newer Operating System will not work on older models" (Senior Product Quality Engineer P1).

Another reason associated with higher system requirements is non-availability of service for IT equipment after usually five years. Two managers from an asset management team of VL5 confirmed this,

> "After five years even if we wanted to continue to use the equipment by upgrading it, it is not possible as the product lines are usually discontinued and so it would be difficult for us to get parts. So we usually refresh every five years so that we can get continuous service".

This also confirms Culver's (2005) report that one of the main reasons for the decrease in functionality of computers is due to the shorter service cycle. Thus the internal policy on the average life of IT equipment among the very large IT organisations is shaped by the STPI/SEZ regulation of bonding, the advanced system requirements of newer software and the non-availability of service for hardware usually after five to seven years.

The equipment that is non-functional, or has passed its policy usage, was observed to be stored in designated areas (open racks in covered shelters or store rooms) within the facilities in these organisations. These according to the interviewees are disposed after ensuring that they have reached least book value, and also that an optimum lot for disposal is reached, as the debonding procedure is a lengthy process involving different external departments. As the facilities head of a very large IT organisation (VL4) said, "We have recently disposed 40-50t of e-waste that were stored over a long time now".

6.2.3 General procedure for disposal of used electronic equipment

All the very large IT organisations have either a separate e-waste policy[13], or e-waste is covered as part of their environmental management system which provides a framework to manage e-waste generated within the organisation. The disposal of e-waste in the very large organisations varies from centralised disposal (where approval from the Chief Financial Officer is needed), to location specific, which makes it difficult to project the overall quantity of e-waste disposed nationwide across the organisation. The disposal of e-waste is a coordinated task by the various groups in these organisations, which have large human and material capital dispersed in multiple locations. The disposal also involves coordination with external organisations such as customs and STPI authorities. The major groups within these organisations that are involved in e-waste management are the asset management team, procurement team, finance team, administration team and project team. These identified groups are based on their functionality and their specific title varies amongst the organisations studied in this research.

The asset management team is the owner of the IT assets in all the organisations here. It keeps a complete record of all the functional equipment in the organisation and offers internal service and maintenance. It is the first point of approach for the project team regarding requests for any IT assets and also in cases of failure or breakdown of such assets. The asset management team then checks the functionality of the equipment and makes the decision on extending its use either internally or externally (through donation), or scrapping it. In some cases, as a way to increase the functionality of IT equipment within the organisation, the asset management team

[13] In three of the very large IT organisations the e-waste policy was an internal document only, whilst the remaining two organisations made this available on their websites.

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also removes any functional part(s) for immediate or later use. The asset management team then coordinates with the administration team (which provides the logistics for storage) and also with the procurement team to initiate the process of debonding.

The procurement team verifies any offers for return[14], and also works with the finance team to ascertain the asset value and prepares the document for debonding. In three of the five organisations, the administration team also undertakes debonding and the asset management team also includes procurement. Once the debonding is done the procurement team informs both the finance and asset management teams to remove the assets from the register. The asset is then ready for donation or disposal. The environment health and safety (EHS) team helps in the identification of recyclers and also ensures appropriate regulatory requirements are fulfilled. All disposal of e-waste is location specific, although in some organisations centralized approval is sought.[15] All the different teams discussed above are observed to be operating at the different locations of the organisation but governed by the respective teams from head office.

6.2.4 Receivers of used equipment

All the very large IT organisations have internal policies for the maximum time of use of IT equipment (6.2.2). In some cases, when the project team is confronted with higher hardware requirements for a project, they demand an upgrade even before the recognised organisational policy for maximum use of the equipment. In these circumstances the organisations either find users with lower hardware demand internally until the organisational policy of maximum use is achieved, or donate the equipment if the export obligations are fulfilled. As an EHS and Facilities Manager of VL2 said,

> "You have used the system and after about two years the technology becomes obsolete and there is an upgradation in the technology and the project needs that kind of upgradation so necessarily here you have systems that are working but not really useful to the project team but can be used by other low power users in the organisation or donated to schools".

All of the very large IT organisations have extensive corporate social responsibility (CSR) activities and have created independent registered CSR wings to take up these activities. The EOL (end-of-life) functional equipment is usually donated to schools and NGOs, which are either identified by these CSR wings or through their employees' outreach activities. In two of

[14] The take-back options offered were mostly for printer cartridges, servers, batteries, etc. and usually did not include computers.

[15] While validating information on the procedure for disposal of e-waste generated from the very large IT organisations to formal recyclers, some formal recyclers indicated that even in the very large IT organisations with set procedures the material goes to informal recyclers as the person responsible in the organisation tries to make some financial gain. During follow up interviews with representatives of the very large IT group this point was raised and the response was, although it may have happened in the past when procedures were not as well organised and so handled by few people, it cannot happen now as the organised systems deal with many internal teams involving more number of people. It is possible the formal recyclers were talking from their previous experiences.

the five very large organisations the NASSCOM foundation[16] is also used as the receiver of donated equipment. Less than 10% of the IT equipment removed from the facilities of these very large organisations is claimed as going for donation.

All the very large IT organisations have been using the services of authorised e-waste recyclers (a new group of industrial organisation[17]) for disposal of non-functional electronic equipment. The authorised e-waste recyclers are identified either from the Pollution Control Board's (PCB) website or directly through the recycler approaching the organisation for material. The EHS team in the organisation checks the ability and status of these recyclers, particularly the license and registration from the PCB. The EHS teams of four of the five organisations here are now increasingly focusing on site verification and audit of the recycler's practices[18]. The local EHS team verifies the different formal e-waste recyclers available in and around their operating location and lists the recyclers with appropriate procedures on the organisation's intranet[19]. This list of organisation-verified formal recyclers from various locations is accessed by other teams within the organisation at the time of disposal.

6.2.5 Interaction between the very large IT organisations and the IT producers

Currently there is not much material (except printer cartridges and the like) flowing back from the bulk consumers of the very large IT organisations to the IT producers, although they do acknowledge that most producers offer free take-back. The very large IT organisations mostly procure the IT equipment directly from the producers at dollar rate (USD)[20]. For the producers the equipment becomes 'deemed export'[21] while for the bulk consumers it becomes 'deemed import' thus giving both duty exemption under the STPI/SEZ scheme. This duty exemption, which is introduced to promote favourable conditions for the growth of software industry in India, proves beneficial for users and producers equally[22].

[16] Donation through the NASSCOM foundation was confirmed during the interview with NASSCOM Director Chennai, who indicated that two of the five very large IT organisations donate their equipment in this way, and NASSCOM takes responsibility for identifying the recipients of these donations. Until December 2010, there was no system to track such donated equipment.

[17] An e-waste expert who was a former director in the Ministry of Environment and Forests, Government of India indicated that the first formal e-waste recycler in India was registered and authorised by the Central Pollution Control Board in 2005.

[18] The researcher accompanied the manager of VL1 during their site audit of a formal recycler and respondents from VL2 and VL3 showed the recycler audit form to the researcher during the course of interview.

[19] Such organisational lists on organisations' intranets were shown to the researcher at the time of interviews.

[20] A very small percentage (less than 1%) is bought from dealers on an *ad hoc* basis for their STPI or Domestic Tariff Area units.

[21] Transactions in which the goods supplied do not leave the country but, gain all the benefits of export goods are termed 'deemed exports'.

[22] The user receives about 30% tax benefit on export and 20% on import. So when the producer supplies the equipment directly to the user in dollar rates from their SEZ unit, they receive 30% benefit under deemed export and the user gets 20% benefit on material as deemed import. The user then develops and exports software that brings them 30% tax benefit as export, making it profitable for them to operate from such facilities.

However, there is a down side to this duty exemption, which hinders the material flow from the users to the producers. This is cited by all the very large IT organisations interviewed as one of the important reasons for not having a ‘take back’ option with the producers,

“…because of bonding it is not easy to give it back to manufacturers as we will have to pay duty”- Facilities head of VL4.

Technically there are two ways in which the bulk users can return their material to the producers. Either they can debond the goods by paying the duty and send it to the producer, or do a bond transfer[23] of the equipment to the producers. In the latter case, where the bonds are transferred, the new bondholder takes up the export obligation on the capital good. This implies that if the IT bulk consumers transfer the bond on used equipment back to the IT producers in SEZ, it would add to the export demand of the producers. Since these goods are end of life and cannot be used in any way in the production of new IT equipment from their facility or sold, this would only increase the export obligation of the producer without much benefit and so is not preferred by the producers.

The other option of debonding and sending the material back to the producers is not preferred by the bulk consumers from the very large IT organisations due to the cumbersome handling procedure and loss of any revenue. The producers’ take-back requires the user to tag the quantity of each of the different components, monitor, cable, etc., and their approximate weight and specify the package size so that the producer can arrange for its collection. As the producers do not have in-house recycling facilities they use the services of formal recyclers to handle this collected waste. The bulk consumers from very large IT organisations have direct access to these recyclers and using the recyclers’ facilities for material disposal is much simpler than the one offered by the producers. Since the recyclers’ processes are external to that of the producer, the bulk consumers here also understand the limited role of recyclers in closing the material loop. Thus the consumers see no environmental benefit in using the take-back offered by the producers. As the EHS manager of VL1 says,

> “There is nothing much there for us to give the systems back to manufacturers. It is only an additional step as they are also going to give it to the recycler I am giving. So why take a longer route? Also handing it to manufacturer there is added logistics of packaging and tagging. With the recycler it is more direct and we know their process and know they are abiding by the law”.

Apart from the cumbersome procedure associated with producers’ ‘take back’ where the user returns the EOL debonded goods to the producer, they are only offered ‘take back’ and not ‘buy back’, which implies that the equipment is taken back free of cost indicating the loss of any financial revenue from the material. The bulk consumers pay for debonding the goods, and when they use the services of formal recyclers the e-waste is usually auctioned or they negotiate a price for an annual contract; presumably at least partly covering the debonding fees.

[23] Bond transfer is procedure by which the bonded capital goods can be transferred from one STPI/SEZ unit to another after due permission from customs and excise department.

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The bulk consumers gain some value from the material while using the disposal service offered by the recyclers, as indicated by the EHS and Facilities Manager of VL2, “And I think price can be negotiated as the business of recycling is quite lucrative”. So for the user it is not an appealing position to return the material to the producer, which is cumbersome and non-incentivising.

The demand from consumers for eco-product design is still very low. Although the very large IT organisations are looking for RoHS compliant and energy efficient products during procurement, they are more keen on modular product designs for upgradation and space saving. As this IT Assets Head of VL1 says,

> “Most of the design changes in server enclosure and cooling towers today have gone from our end to manufacturers as a best option, which they have accommodated and made. We also discuss with them on our configuration requirement, like we said we wanted 4 memory slots of 2GB each so the PC can be upgraded and used longer and they have taken this from us”.

The above discussions indicate that the voluntary take-backs offered by the IT producers are not well received by the bulk consumers from the very large IT organisations due to procedures like STPI bonding and absence of incentive for users, that make it difficult and unviable for material transfer between the producers and bulk consumers. Although there is some interaction between the two on product design, the demand for eco-design from bulk consumers is minimal.

6.2.6 Interaction between the very large IT organisations and secondary users

The secondary users are mostly schools and NGOs identified by the CSR wing of the very large IT organisations. The very large organisations have been donating their EOL functional equipment for over 6-8 years. However, they did not have procedures in place to track and ensure that these donations came back, either to them or reached the appropriate waste stream (formal recyclers), for treatment at the end of their functional life.

The growing awareness about e-waste issues has made the very large IT organisations conscious about the possibility of e-waste originating from their organisation reaching backyard recycling through the recipients of their donations. Three of the five organisations have begun to take measures to ensure that the recipients either return the non-functional equipment to them or pass it to authorized recyclers. These organisations track the donated equipment by either asking for an undertaking from the recipients at the time of donation, or paying a nominal amount to the recipient to compensate for the expense incurred through disposal to the authorised recycler. Two of them also provide a list of organisation-approved recyclers to the donors to aid their participation. This practice of tracking the EOL equipment has been running for less than two years in the organisations that have started it. Also, the quantity of material reaching the secondary users from this group is declining due to less demand for these materials. As the facilities head of VL4 puts it, “Even schools and colleges are not willing to take old PCs”.

6.2.7 Interaction between very large IT organisations and formal recyclers

All the very large IT organisations dispose their non-functional IT assets through the formal recyclers. The procedure for debonding takes time due to involvement of other external organisations like STPI authority, Customs and Excise authority, etc. As a result these organisations stock up their obsolete IT assets until they reach a low debonding value, thus making it economical to take up the debonding procedure.

In the past, some obsolete equipment was destroyed and handed over to scrap dealers after paying the duty for the scrap value, to abide by STPI requirements. STPI did not specify any operating parameters for these scrap dealers leaving the choice up to the user, which resulted in e-waste material reaching the scrap market. However, this practice has changed among the very large IT organisations due to their improved awareness about the issue of e-waste and availability of the services of the formal recyclers to handle this waste.

All but one[24] of the very large IT organisations sells their waste to the formal recyclers. The organisations either use a tendering process or have annual contracts based on negotiated prices to sell the used equipment. In the case of tendering, recyclers are usually allowed to inspect equipment awaiting disposal before they quote for the tender. One of the key requirements of the recycler to be short-listed for a tender is their recycling license from the PCB.

Among the very large IT organisations, the PCB license for recyclers only serves as the minimum requirement. The formal recyclers are recent entrants in e-waste recycling (5.5). The very large IT organisations have been seeking proper e-waste recyclers since the mid-2000s, when the formal recyclers also started operation. In recent years, the number of formal recyclers has steadily increased, and very large IT organisations are unsure about the capability of regulators to identify recyclers who have environmentally safe operations. Four of the five very large IT organisations have now begun using their own evaluation through visits and site audits to assess the recyclers' processes and operation. In the cases where the formal recyclers operated from SEZ, the IT organisations prefer to use these recyclers, as they could do a bond transfer, which is quicker than debonding. This bond transfer between the user and the recycler is profitable for both, unlike the one with the producers. Since the recyclers' processes use EOL equipment as the input to their operations, this bond transfer brings the recyclers in SEZ import benefit along with export benefits harnessed from processed material.

The very large IT organisations tend to restrict refurbishment, part resale or donation of equipment of the materials that recyclers take from them. The most common reason cited for this is data security and the second is safe disposal of e-waste,

> "Refurbishing does not work with us. There is always the risk of data security there. We ensure degaussing of the hard disk before disposal. But to be on the

[24] One organisation gave its e-waste to the formal recycler for free as its top management, which acknowledged its role as generators considered itself responsible for its management, took this decision.

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> safer side we ask for the vendor to give us destruction certificate." (Sustainability director VL5)

> "But when it comes to recycling everything has to be recycled otherwise we could ourselves have given it to somebody else for some other use. We don't want it to reach the secondary market." (EHS and Facilities Manager VL2)

The recyclers are required to give a destruction certificate (a requirement under STPI/SEZ procedures) to these organisations for the material they receive for processing.

6.2.8 Regulatory influence on very large IT organisations

The IT sector is recognised as a non-polluting industry and categorized as 'green' in most Indian states (5.2). According to most of the interviewees from all the very large IT organisations, they have received little regulatory support either in terms of awareness or identification of formal recyclers. However, they all use the information available on the PCB website to check the licenses of the recyclers.

Since these organisations own very large facilities they are required to file information on air emissions and water discharges to the respective state PCB. Although e-waste management falls under the purview of HWMHR, the very large IT organisations do not have mandate to file any returns on this aspect to PCBs. Despite the absence of any environmental regulatory requirement with regard to e-waste generated, all the organisations examined here are now following voluntary self-declaration by filing the data on quantity of e-waste disposed from their facilities through PCB authorised recyclers to the PCB authorities,

> "I have that only for my purpose to show that I have used the authorized recycler. We don't need to file any return to PCB on the e-waste disposed as of now." – EHS and Facilities Manager VL2

This shows that regulatory influence on the material flow in these organisations is limited. This was further confirmed during the interviews with the regulators, who acknowledged that this group of the IT sector had better systems to manage e-waste and were keener to comply with all applicable environmental regulation than other categories of IT sector organisations. Figure 6.2 summarises the actual material flow arising from these very large IT organisations. All the five organisations here, procure electronic equipment for their operations directly from the IT producers (6.2.5). None of these organisations prefer the free take-back offered by the producers and so there is limited EOL material going back. All the organisations use the services of formal recyclers to dispose their EOL equipment (6.2.7). They also donate some material and three of the five organisations have more recently put in place systems to track this equipment's after use so that material from secondary users can come back to them to be disposed properly (6.2.6). However, the flow of e-waste from the secondary users to scrap collectors in the informal sector cannot be ignored. This material flow, identified based on data gathered for this research, is different from the expected material flow (Appendix 5 that was

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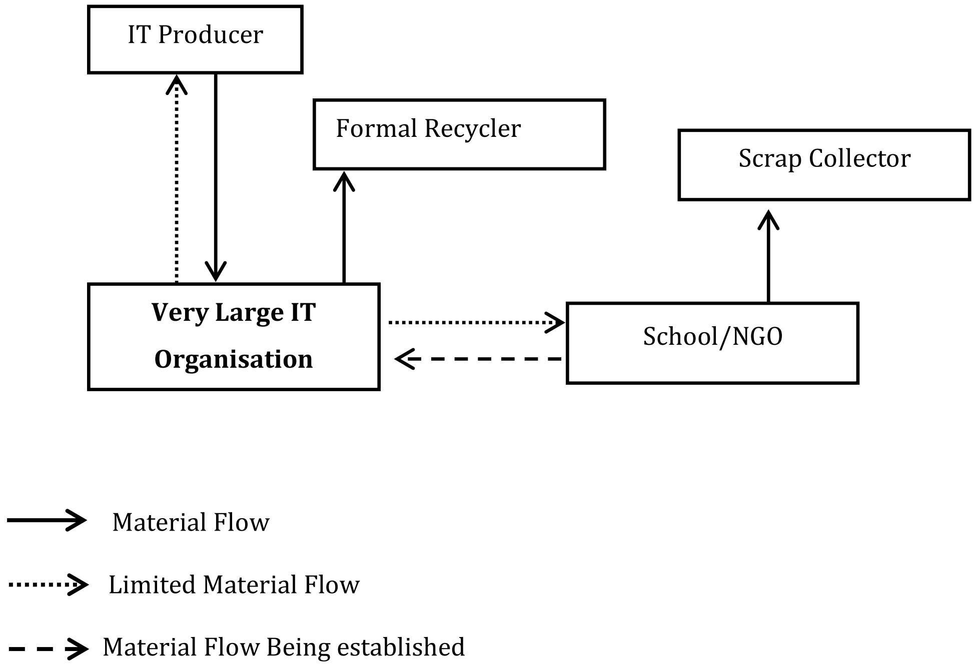
developed based on existing research and information from the pilot study) figures shown to interviewees to ensure rigour in research (4.6).

Figure 6.2 Actual material flow from the very large IT organisations



6.3 Practice in the Large IT Organisations

6.3.1 What is e-waste?

The large IT organisations here define e-waste as equipment that is non-functional and cannot be used by anyone; as opposed to the very large IT organisations, which consider only loss of functionality within the organisation to be the definition of e-waste. Thus functional equipment donated by these large IT organisations is seen as their way of extending the useful life of this equipment through secondary users. This fundamental difference in what is considered e-waste in these organisations lays the foundation for how the material flows from them.

6.3.2 Organisational policy regarding use of equipment

The five large IT organisations here do not have separate internal organisational policies for use of equipment. The organisations are also registered with STPI. As the STPI bonding rules are similar for all types of organisations, irrespective of size, equipment used in these organisations is bonded and used as discussed previously (6.2.2). However, after the bond period, the functional equipment continues to be used within the organisation, but from the non-bonded area[25] and by employees who do not have higher system demand. These organisations also have extensive 'cannibalisation'[26] of parts so as to extend the organisational life of equipment.

When the organisational system demand changes and the functional equipment need to be replaced, it is donated for prolonged secondary use as a social good.

> "When we say it is knocked off from books that means we cannot use it. They are absolutely useless. For other items for which we think it can still be used. Example, right now we are phasing out CRT and replacing with TFT monitors. The CRT monitors can still be used. We donate these to schools in slums so they can be used". – AVP L1

6.3.3 General procedure for disposal of used electronic equipment

E-waste has gained attention among these large IT organisations since 2010, mainly due to their growing organisational strength. However, none of the five organisations here have a separate e-waste policy and, except for one organisation, all lacked an EMS; this was recently set up and only related to one of the organisation's many facilities.

Although the organisations are usually in multiple locations none has centralized disposal mechanisms, or systematic identification of recyclers for disposal. The general practice in this group is donation of functional equipment after prolonged internal use, while non-functional equipment is stored and auctioned, usually to scrap dealers/vendors. It was observed that the storage facilities for this equipment is not well organised; IT equipment is stored with other office furniture and equipment, awaiting disposal. The disposal of e-waste and donation of functional equipment happens locally through the administration team, together with IT/asset and finance teams, without any set standard operating protocol. The assets are debonded after finances are verified to ensure least amount of fees are paid, and then stored until the debonding value becomes lowest. Once the assets are debonded, the non-functional ones are disposed through scrap dealers. However, since 2010 some changes have taken place and these organisations have begun to dispose their non-functional electronic equipment through registered formal recyclers. The functional equipment in all the organisations here continues to be donated without any effort to track these donations.

6.3.4 Receivers of used equipment

The employee strength of these organisations is low and they also used their equipment longer. Therefore the quantity of e-waste generated from these large IT organisations is also less.

> "There is not that many due to donation and the low strength of employees" - AVP of L1,

[25] These organisations had both bonded and non-bonded operating areas as they catered both to export and domestic market, and so to extend the use of functional equipment they debonded and moved the material to non-bonded area.

[26] Part cannibalisation means the functional parts from broken equipment are removed for part reuse in other equipment. This helped in extending the product life within the organisation.

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"Earlier the machines had longer refresh cycle". - Technology head of L2

Donations are undertaken either directly as part of their CSR, through employee contacts, or through direct approach from certain charitable organisations in all the five organisations. When equipment is donated, these organisations ensure data wiping and check its functionality; there is no further assistance, and so no return policy for this equipment is in place. Also the quantity of material donated is relatively small (less than 100 items/year in most cases) as the organisations make extensive internal use of the equipment before donation.

In the past, non-functional equipment was usually auctioned to scrap dealers/vendors by all the five organisations. However, as organisations in the large IT sector grow, they are increasingly faced with larger quantities of e-waste. This has made them aware of its problems and now four of the five organisations seek authorised e-waste recyclers for its disposal. Usually they only verify the PCB licenses of these recyclers and not visit their facilities or audit their operations. As with the vendors, material is given to the formal recycler who offers the highest value at the point of disposal. No restrictions are placed on refurbishing or part resale by these formal recyclers.

Large IT organisations have gained awareness about these recyclers from the state PCB and other similar state government bodies which organised awareness programmes on e-waste for the IT sector in 2012. Also their own growing concern about accumulating e-waste has played a role in the pursuit of formal recyclers. As Head of Administration in L3 says,

> "We have been giving it for the last 2 years. We stacked in our room. As our head count increased we needed space and started cleaning it up. Prior to that there was no disposal, it was either stored or donated".

6.3.5 Interaction between the large IT organisations and the IT producers

All the large IT organisations initially procured electronic equipment through authorized channel partners or dealers. However, with the growth in their businesses and relocation of their operations to SEZ, the requirement for IT equipment needed for their operations has increased and three of the five organisations now go for direct procurements from the producers to benefit from the duty exemptions. However, there is no flow of EOL equipment from these large IT organisations back to the IT equipment producers; one of the main reasons for this is again the STPI requirement of debonding (see 6.2.5). The senior manager administration L2 affirms this, "going through STPI route it is not feasible here to return the material". Also four of the five organisations are not aware of the free take-back offered by the producers since they had earlier routed the equipment through the dealers.

The producers' free take-back service was raised during the interviews but the interviewees from all the large IT organisations expressed non-preference for take- or even buy-back offered by the producers. In the case of buy-back options, these are routed mainly from the dealers, and are tied with procurement of newer equipment of the same brand with some discount. This

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is in line with rewards for customer loyalty and is not flexible. Interviewees from three of the five organisations viewed having buy-back with dealers that tied them to a particular brand, as restrictive and potentially not economically viable in the longer term,

> "We don't want to get stuck with one vendor. So we have to think about the buy-back". AVP Quality from L1

Take-back is also seen to have negative monetary impact, as it is free. In the words of an AVP administration of L4,

> "I think the manufacturer will be handling the waste better than the recycler. However, technically the auditor will raise a question as why I am giving my EOL for free when I can get some money from recycler".

The interviews with managers from large IT organisations reveal that these organisations are sensitive to cost, and so giving the EOL equipment for free to the producer does not fit with their organisational policy that considers this material to have value, which could be recovered by disposing it to scrap dealer or formal recycler. This was also confirmed by the regulators and interviewees from industry association.

6.3.6 Interaction between the large IT organisations and secondary users

After extensive internal use of the IT equipment (6.3.2) four of the five large IT organisations donate the still functional equipment to schools and other organisations. Donation is regarded as an action for social good with no attention to the possible limited functionality of this equipment. Organisations do not keep track of the material donated and their responsibility towards it ends once it leaves their facilities. The low level of awareness of the impact of e-waste is driving such practice in this group. The material donated therefore reaches the informal recycling stream through local scrap collectors[27].

6.3.7 Interaction between large IT organisations and formal recyclers

The quantity of e-waste generated from the large IT organisations is rising (based on interview with NASSCOM Director in Nov, 2010), which impacts the flow of material originating from them. During their early years these organisations used the electronic equipment for a longer time. The quantity of non-functional electronic equipment generated was relatively less and was disposed through scrap dealers/vendors, who are the supplier of material to informal recyclers (GTZ-MAIT, 2007). However, this practice has changed and now four of the five organisations have begun to seek formal e-waste recyclers to dispose their e-waste.

[27] Two schools that received these computers were contacted and asked about the status of the received equipment. The response to this was when the received equipment lost its functionality it usually was sold off to the local scrap collector who offered under Rs.500/- for a computer.

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All the organisations interviewed said that no recyclers[28] approached them. They know about the recyclers from various awareness programmes and information received from business associations. In all cases they have to seek the formal recyclers and await collection of e-waste at the convenience of these formal recyclers. The large IT organisations did not restrict the recyclers regarding part reuse or refurbishment of material collected from them.

6.3.8 Regulatory influence on large IT organisations

The large IT organisations usually operate from leased facilities and currently do not have environmental compliance even with regard to water discharge or air emissions. These organisations are not under the regulatory purview of PCB. This absence of any interaction with the regulators has further kept their awareness on environmental aspects of their operation low, as indicated by their low level of awareness of the impact of improper disposal of e-waste.

The new e-waste regulation in India was implemented in 2012 and, in preparation for this, the various state PCBs began awareness programmes to sensitize the bulk consumers especially those from the large IT organisations,

> "Recently APPCB conducted a workshop in which they told us about giving the material to APPCB approved recycler". - Facilities Head L3

This was further confirmed during the discussions with the PCB authorities.

> "We have been contacting IT companies (in the IT parks) and institutions to raise the awareness on e-waste". - Senior Engineer of a PCB.

Apart from these awareness programmes, the information provided on the PCB website is used by the large IT organisations to seek the services of authorized recyclers. They also used this to verify the licenses of the recyclers before handing over their material. Thus, the interaction between the regulators and this group currently is limited to awareness creation.

Figure 6.3 summarises the actual material flow arising from these large IT organisations. These organisations procure the electronic equipment for their operations through the dealers of IT producers, although three of them are also procuring it directly from the IT producers (6.3.5). There is no movement of EOL equipment from these organisations to the producers. These organisations have been using the services of scrap dealers until recently to dispose EOL equipment. However, four of the five are now beginning to use the services of formal recyclers, but do not restrict the formal recyclers from refurbishing their material (6.3.7).

This lack of restriction on formal recyclers allows movement of e-waste from the formal sector to the informal sector. Four of the five organisations also donate used equipment but do not have systems to track this equipment after use (6.3.6).

[28] When this was raised during the interactions with the formal recyclers they agreed that they went to the facilities of large IT organisations to collect e-waste only when they received a call from them as they focused on larger clients like VL IT organisations, public institutions and producers.

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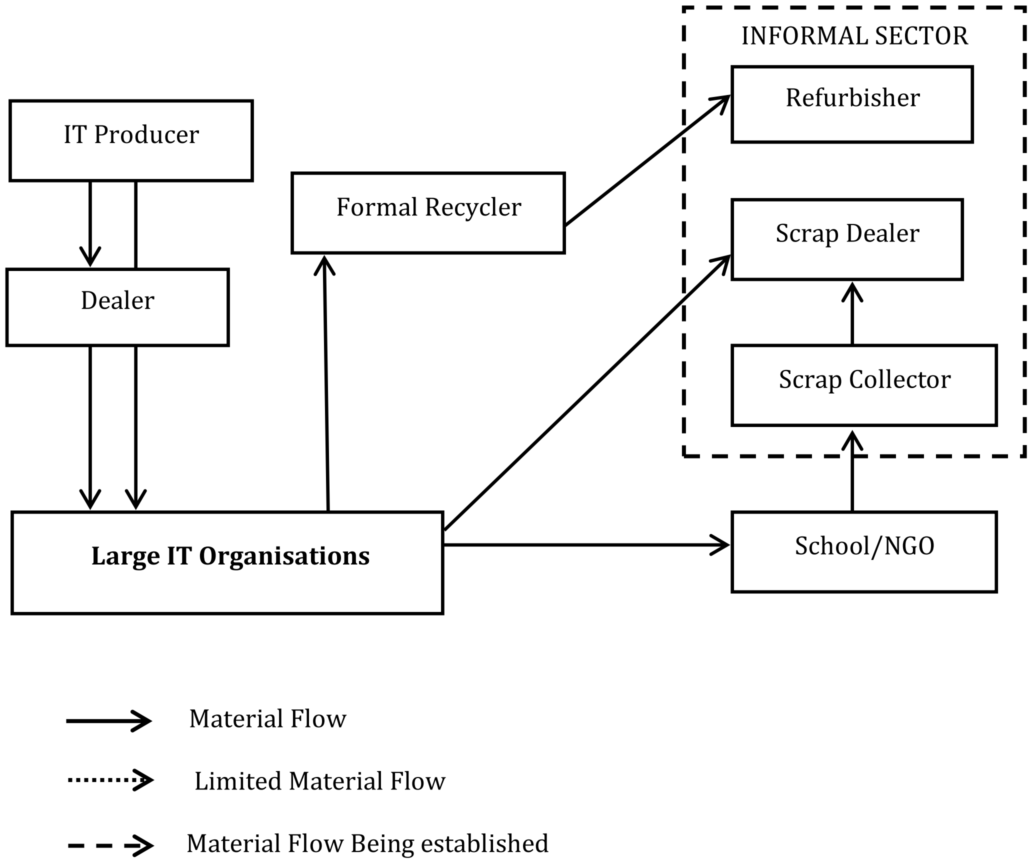
Figure 6.3 Actual material flow from the large IT organisations



6.4 Practice in the SME IT Organisations

6.4.1 What is e-waste?

The SME IT organisations operate from smaller and mostly leased facilities. E-waste for this group is non-functional IT equipment, mainly computers. Functional parts from the non-functional equipment are recovered for storage and later used within the organisation.

6.4.2 Organisational policy regarding use of equipment

The quantity of e-waste generated is influenced by the number of employees, the nature of business and the organisational policy on use of IT equipment. Hence the quantity of e-waste reflects not an absolute level but rather relative levels in terms of quantity generated per employee in the organisation. Being small organisations the SME IT organisations cater to both the domestic and export market. For these organisations, electronic equipment is a big part of their investment for their operation. Seven of the ten organisations leased[29] equipment at the time of their establishment as a way to reduce their overhead cost.

> "We don't buy if we don't need. Rental computers are taken so if we don't need it we can give it back"- Proprietor SM5

These organisations continue to lease equipment of higher functionality in cases of specific project demand. This hiring/leasing of equipment makes business sense for these organisations and also relieves them from handling e-waste. As these organisations gain export business they register with STPI. After this registration to STPI they procure IT equipment with duty exemption (from dealers) to be used in the custom bonded area of their organisation. Since they also cater to the domestic market they also have non-bonded areas in their facilities, where the equipment used are not duty exempted. They also need to abide by the custom bonding regulation for use and disposal of equipment (see 6.2.2). These organisations use their equipment to the maximum extent (by debonding and transferring the equipment to non-bonded area within their facility) and prefer to upgrade where possible rather than replacing functional equipment, which also points to their cost sensitivity,

> "Unlike the bigger players we try to get maximum value out of the equipment and only as a last resort we throw it out, when you cannot repair it or do anything about it". - Proprietor SM3

This cost sensitivity and attitude for maximum utilization of equipment has played a role in the absence of organisational policies that limit the maximum use of equipment. Although these organisations are cost sensitive, none questioned for this research used assembled IT equipment, as such products did not have good service and lacked exchange value according to the interviewees.

6.4.3 General procedure for disposal of used electronic equipment

All the SME IT organisations lack e-waste policies as their awareness about this issue is very minimal and they also lack EMS. This low awareness and lack of policy confirms the view about the sensitivity of SMEs to environmental aspects of their operations (Welford, 1994). Most organisations are less than a decade old, and initially started their operations using leased IT equipment, which they used for a longer time and had fewer employees. All this resulted in no, or small quantities of, e-waste generation in these organisations. Six of the ten organisations interviewed have not generated e-waste that requires disposal yet. However, the remaining four organisations in this group have disposed a small quantity of computers and printers, although not annually.

> "Not much. Less than 50. These were mostly computers and printers. But not every year". - Senior Manager SM5

[29] These organisations leased equipment not directly from producers but through service provider organisations that are in the business of leasing.

"Less than 100 systems/year"- IT head SM10.

Therefore, it is clear that the e-waste generated by the individual organisations in this group is low and varies depending on their business needs. Since the quantity generated *per se* is less within the organisations there is no systematic procedure for their disposal. In some cases it was observed that non-functional equipment awaiting disposal was left unattended or piled in any available space in the facility. The administration and finance groups within these organisations generally handled the disposal.

6.4.4 Receivers of used equipment

Six of the ten SME IT organisations donate used equipment, with decisions of what and how usually taken by the proprietor. The recipients range from the equipment going to individuals, to smaller organisations and schools known to the proprietor. These organisations, do not keep any track of this donated equipment.

Leased equipment is returned to the leasing organisations, whose representatives indicated during interviews, that the average life of such equipment was 5-6 years, after which the leasing organisations usually removed functional parts before disposal to scrap dealers. In some cases, organisations also lease the equipment for up to four years, after which the equipment becomes the capital good of the organisation that leased it. The latter approach is sought by some SMEs to help tide over initial investments,

> "Normally the life of a PC can be planned for 5-6 years. So in that process when old PCs get worn out we know how to cannibalize this properly as we are in this business unlike others. Since we are providing rental machines we have to support it. We usually dispose the scrap to scrap dealers. ... Leased machines are used mostly by start ups during their establishment phase". Senior Manager of a service-providing organisation.

Non-functional equipment is sold to scrap collectors or scrap dealers (belonging to the informal sector) who approach the SMEs. In some cases, equipment is returned to the dealers at the time of buying new equipment with concessions offered on the new products,

> "We replace it with new equipment and the seller takes it back. It is not like a buy-back agreement, we buy new equipment and ask them to take the old ones for which they give some cost". – Proprietor SM7

Being cost sensitive, all the SME IT organisations expect value for the equipment at the time of disposal,

> "They come and ask. It depends on the price. We sell it to whoever gives maximum price". Administration manager of SM2

Among the two larger SME IT organisations, that generate higher quantities of e-waste compared to the smaller ones, disposal of e-waste through tenders is similar to that seen in the other two groups. However, unlike the above two groups of bulk consumers, SMEs sell their e-waste to the scrap dealers and not to the formal recyclers. The scrap dealers are not invited to view the e-waste stored, but are usually told the approximate number of computers and other equipment to enable them to prepare their quotation.

6.4.5 Interaction between the SME IT organisations and the IT producers

None of the SME IT organisations procure their electronic equipment directly from the IT producers. They buy the equipment from retailers or dealers, and are not very aware of the free take-back offered by the producers. Since the retailers and scrap dealers offer some value for the non-functional IT equipment, either indirectly (through discount vouchers) or directly (through payment), they are not willing to use the free take-back services of the producers, even in the cases where they are made aware of it. In the words of an entrepreneur from SM6,

> "Also for monetary reasons I would like to give back my equipment to the vendor/supplier, so that I can get better value for the good".

The vendors who take the material are either scrap dealers or equipment retailers/dealers who pass it on to the informal sector. According to the information provided by the equipment retailers/dealers, who collect the non-functional equipment in return for the new equipment purchased by the consumer at a discount, it is sold mostly to the second hand market that works with refurbishing businesses. Although some IT producers have been asking the dealers to provide free take-back services for customers on their behalf, the shortage of space and associated expense of handling the collected e-waste has deterred these dealers[30] from actively promoting take-back offered by the producers to their customers. Hence the EOL equipment from the SME IT organisations does not go back to the producers.

6.4.6 Interaction between the SME IT organisations and recyclers

Despite small quantities of e-waste coming from individual members of the SME IT organisations, the collective quantity of e-waste generated from this group cannot be ignored, as this group constitutes nearly over 70% of the total IT sector in the country (NASSCOM, 2010). These organisations are small units usually located in large IT parks, which as a central collection location generates viable quantities of e-waste for the formal recyclers as these parks house many such units.

None of the SME organisations part of this research are aware of the formal recyclers, as neither the formal recyclers have approached them nor has the regulatory authority, or STPI authority, told them about these specialized groups involved in e-waste recycling. So the scrap dealer or collector buys the e-waste discarded from this group. Like the large organisations,

[30] Both the dealers interviewed confirmed this.

they do not restrict refurbishing or reuse of the equipment that the scrap dealers buy from them. As this IT manager of SM8 said, “They don't give us any destruction certificate and we don't put any restriction on what they can do with the material”.

As the large IT organisations begin to use the services of formal recyclers, it can be inferred from the above observation that the scrap dealers are now left to seek material only from the SME IT organisations. The scrap dealers have a good network of scrap collectors, which allows them to collect the small quantities of e-waste generated sporadically from the individual organisations in the SME IT sector. The scrap collectors and dealers offer higher prices than the formal recyclers (GTZ- MAIT, 2007), which appeals to the cost sensitive SME IT organisations. This higher price is possible as it can be recovered through part resale in the refurbishment market (*ibid.*). Thus the EOL equipment generated from these organisations ends up being handled only in the informal sector, which includes scrap collectors, scrap dealers, refurbishers and the informal recyclers.

6.4.7 Regulatory influence on SME IT organisations

The different state policies to promote IT in the region were discussed in Chapter 5.2. The exemption of the IT organisations from state PCBs’ purview for administrative ease is more understandable for SME IT organisations because of their smaller size. This exemption has resulted in no interaction of these organisations with the state PCBs, which has also added to these organisations not recognising the environmental impacts of their operations, like e-waste. During the interviews, even the PCB authorities acknowledged the low level of awareness in this group and the material from them reaching the informal sector, along with the challenge of bringing awareness to this group.

Figure 6.4 Actual material flow from the SME IT organisations

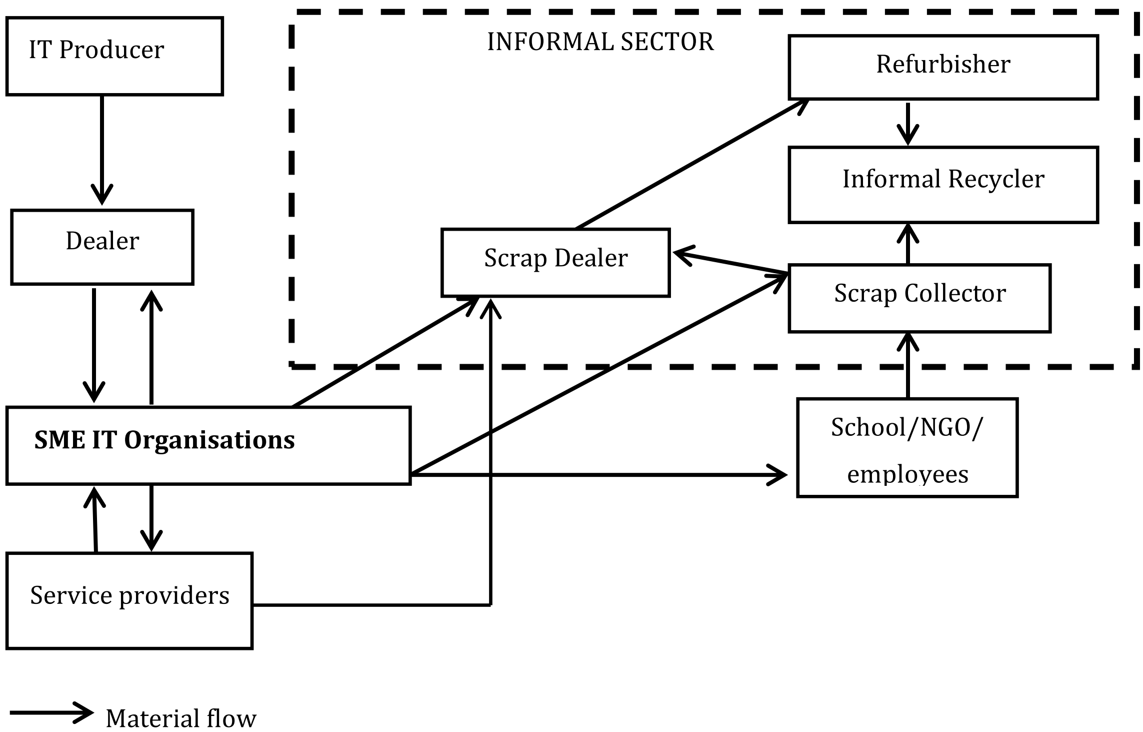


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Figure 6.4 summarises the actual material flow arising from these SME IT organisations. All the organisations procure the electronic equipment for their operation from the dealers or lease it from service providers and exchange it with them for higher models when they need replacements (6.4.5). As these organisations are price sensitive none of them opt for the free take-back offered by the producers and therefore no material goes back to the producers. All the organisations here dispose their EOL equipment through the services offered by the informal sector (6.4.6). Some of the organisations also did ad hoc donation of used but functional equipment.

6.4.8 Comparison of the expected and actual material flow of e-waste arising from IT Bulk consumer organisations

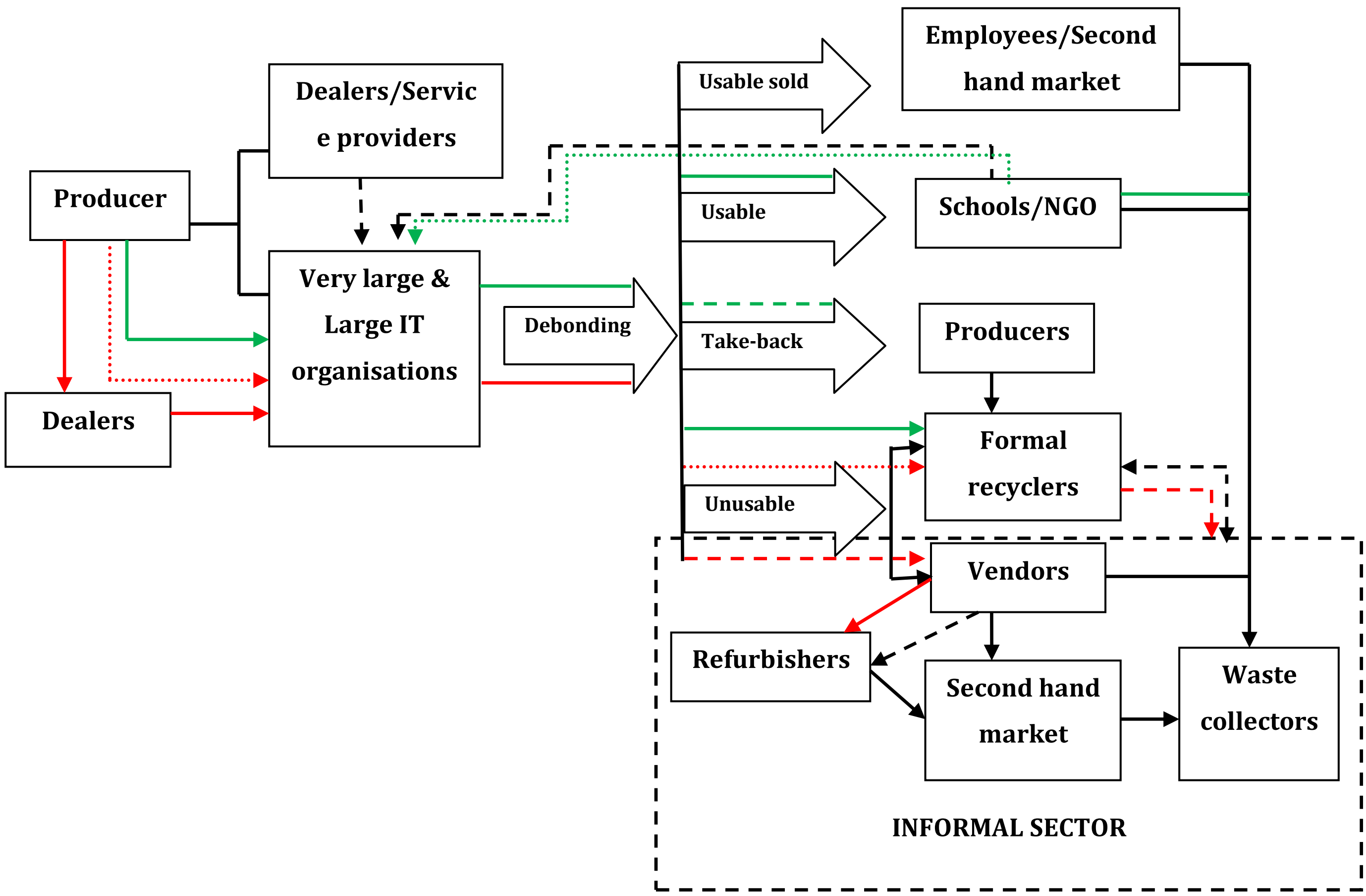
The information from past research together with that gathered from stakeholders (the different groups involved in e-waste management) during the pilot fieldwork, was used to prepare an expected e-waste material flow diagram for each different stakeholder group to be presented at the time of data collection during the main fieldwork (4.6). These diagrams were then used to establish the actual e-waste material flow present in the various organisations. This section highlights the differences noted between expected and actual flow of e-waste material among the IT bulk consumers.

The expected e-waste material flow drawn from literature predominantly used the works of Widmer (2005), Manomaivibool (2009) and Wath et al., (2010) apart from pilot data. According to Manomaivibool (2009) the large institutional users were major consumers of electronic equipment and so major generators of e-waste. He argued that at a practical level the e-waste generated by these users is easier to manage as it is in bulk. His study (in 2006-2007) examined e-waste management practice in some of the large IT organisations located in Electronic city, Bangalore (one of the major IT hubs in India). Manomaivibool (2009) found that there was movement of material from these institutions to household consumers (through employees who bought obsolete, but functional, equipment for personal use) and to the second-hand market. According to Wath et al. (2010), used equipment from institutional users also found its way to schools and other charitable institutions. Wath et al. (2010) further argued that e-waste recycling is mostly taken up by the informal sector. While Manomaivibool's (2009) study does not recognise the secondary users from charitable organisations and schools, Wath et al (2010) do not acknowledge the formal recycling sector involved in e-waste recycling. Nevertheless, both studies agree that there is movement of material from large institutional users to the second-hand market. Although this previous research does not define the size and characteristics of large institutional users, it was assumed for the current research that the very large and large IT organisations with over 1000 employees could be considered as large institutional users (due to the quantity of e-waste generated) for the purpose of analysing the e-waste material flow. Apart from these movements of e-waste pointed by the literature the data from pilot study also pointed to presence of service providers who supplied IT equipment to the bulk consumers (other than the producers and dealers). Figure 6.5 is a comparison of the expected and actual flow of e-waste material arising from the very large and large IT organisations. The black coloured arrows point to the expected flow of e-waste material arising from the large and very large IT organisations. The green coloured arrows point to the actual flow of material from the very large IT organisations, while the red coloured arrows point to the actual flow of material arising from large IT organisations.

The findings of this research indicate that e-waste generated from very large IT organisations reached the formal recyclers (6.2.7) with some functional equipment also reaching the secondary users from charitable institutions (6.2.6). The movement of material to household consumers through employees was not noted here. Also, the findings here did not indicate movement of e-waste from the very large IT organisations to the informal sector via the formal recyclers, due to the audit procedures in place (6.2.7). Only a limited flow of e-waste material was noted (dashed green line) from these bulk consumers to producers due to the reasons discussed previously (see 6.2.5). Also these bulk consumers have begun to track the donated equipment as indicated by the dotted green line (6.2.6). These differences in the actual material flow from the expected material flow may be due to the fact institutional consumers in past studies not being limited to only those from the IT sector as in the current research. Also, more recently, the IT sector has begun to pay more attention to the environmental aspects of its operation (Srivastava & Srivastava 2012), and so is responding to the challenge of e-waste. The global recognition of the challenges of e-waste has provided impetus to develop new approaches to management among the very large IT organisations, e.g. measures to audit the processes of formal recyclers, tracking donated equipment, etc. which have changed the flow of e-waste material arising from these very large organisations.

In the large IT organisations the actual e-waste material flow was close to the expected e-waste material flow. These organisations are procuring equipment directly from producers unlike in the past where they sourced it through dealers. However, no movement of material from organisations to employees or leasing of equipment from service providers was noted. The organisations here are limiting the use of services provided by vendors and other members of the informal sector involved in e-waste management (dashed red arrow). They have begun to use the services of formal recyclers (indicated by the dotted red arrow) for disposal of their e-waste, but there is still the challenge of identifying the correct formal recyclers whose practices are environmentally safe. These organisations did not restrict refurbishment of the disposed material, so the possibility of material reaching the second hand market cannot be ruled out as was envisaged in previous research (see 5.4). Also, these organisations donate used, but functional, equipment with no system to ensure its safe disposal after the secondary use. Under such circumstances the probability of this material reaching the informal sector is high, as proposed in the past research.

Figure 6.5 **Comparison of expected and actual e-waste material flow arising from the very large and large IT organisations**



Expected material flow

Expected possible material flow

Actual material flow from very large IT

Limited material flow from very large IT

Material flow being established in very large IT

Actual material flow from large IT

Limited material flow from large IT

Material flow being established in large IT

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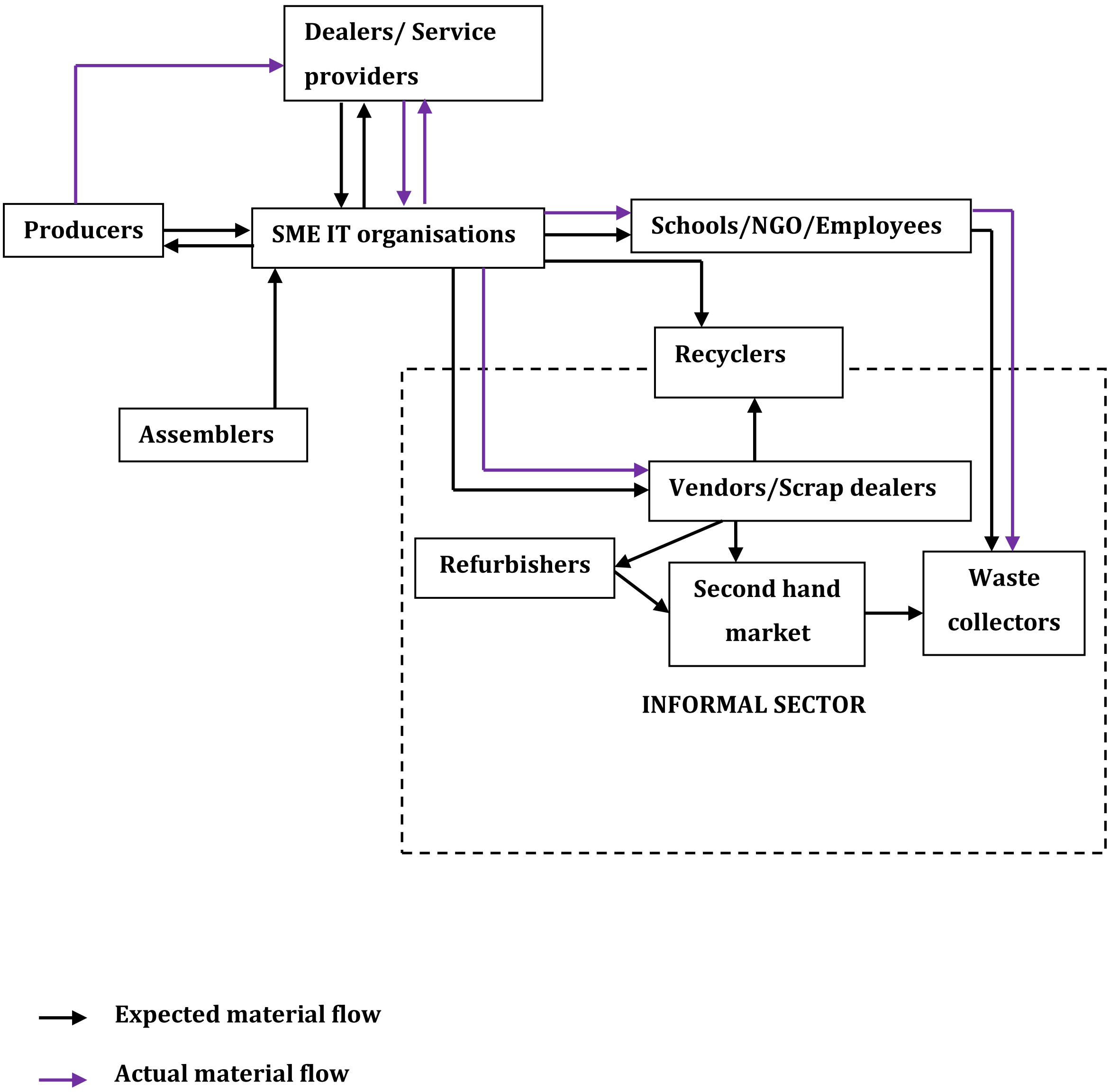
Figure 6.6 presents the comparison of expected (black arrows) and actual (purple arrows) material flow of e-waste arising from the SME IT organisations. In the case of SME IT organisations, which are more cost sensitive, the pilot fieldwork indicated that the probability of both leasing and procuring assembled equipment was higher among these organisations. This was factored into the expected material flow for these organisations. However, data collection showed that these organisations leased equipment during their initial years of operation, but did not use assembled products. This difference in the type of equipment used in these organisations from that identified in the pilot is attributed to the fact that the information about the SME IT organisations gathered at the time of pilot study was from interviewees in industry association and experts and not directly from the organisations. Also, these organisations did not procure material directly from producers and sourced it from dealers (6.4.5). Although, previous research (Widmer et al., 2005; Manomaivibool 2009) recognised the use of assembled products by some institutional users, this was not noticed is this study due to the poor service and low return for used equipment at the time of disposal. The disposed e-waste from these organisations is handled by the informal sector as expected. The e-waste material flow from commercial users to informal sector, proposed in past research (Widmer et al. 2005; Manomaivibool, 2009; Wath et al., 2010), is also applicable to these SME IT organisations; the reasons are discussed in Chapter 9. The differences in the material flow of e-waste arising from the IT bulk consumers will be explored in detail in Chapter 7.

Figure 6.6 Comparison of expected and actual e-waste material flow arising from the SME IT organisations



6.5 Practice among the Producers

6.5.1 Types of e-waste

Unlike the bulk consumers, the producers include components and parts of electronic equipment as e-waste, as well as non-functional equipment. The e-waste generated from the producers can be broadly divided into two types, viz. the waste generated during the manufacture of equipment in the factories, and the EOL waste collected by the producers. The producers are required to abide by the HWMHR and dispose e-waste generated from the manufacturing facilities to PCB licensed e-waste recyclers. They are also required to abide by the regulations under air and water Act and file annual returns of air emission and water discharge from their facilities. All the three producer organisations that participated in this research had certified EMS in place and systematic procedures to handle the e-waste generated in their facilities.

Manufacturing in India is assembly process rather than at a component level. The components are either imported or received from other manufacturers and are assembled using conveyor belts and automated tools with very little human handling that might result in breakage,

> "The manufacturing waste in computer is very less as it is more an assembling unit. Most of the components come from outside the country. ......Hardware business is cut throat today; the profit margins are low, so we cannot afford to have e-waste generated during the manufacture, as it would affect our profit margin". EHS head of P3

The e-waste generated during production in these factories is usually a few small components rather than large items like monitors or CPU. Apart from this, any electronic equipment that is used within the premises for administrative work and other operations also adds to the volume of e-waste generated,

> "…e-waste that can be generated from our factory is like chips, motherboard, keyboards, printed circuit boards, including the wires etc. I don't think we have till today faced e-waste like monitors coming out of the line". Head of EHS of P2

If one or a few components in a lot fail during production, they are disposed with the e-waste. However, if the whole lot fails it is sent back for replacement. Thus, the quantity of e-waste generated by the factories during manufacture is very minimal.

Globally the responsibility for managing the EOL waste - waste generated when the product has lost its useful life - is shouldered by the producer based on the principle of extended producer responsibility (EPR) (Widmer et al., 2005). In India, the new rule on e-waste implemented in 2012 is also based on the principle of EPR. At the time of the fieldwork, there was no regulatory requirement for the producers to take responsibility for EOL waste. However, all three producers in this study did mention EOL waste and discussed their EOL practices.

6.5.2 Procedure for handling e-waste

The e-waste generated within the factory premises, which also include faulty equipment returned by customer, is stored in a designated storage area within the facilities. Since all the organisations have EMS, the EHS departments ensure safe storage of e-waste in these facilities. The EHS departments also help in identification and audit of formal recyclers. Under HWMHR, the factories are required to place hazardous waste boards that detail the quantity of hazardous waste (in this case e-waste) stored within the facility at any given time along with details of last disposal. Such boards were observed in all the three organisations during visits to premises at the time of interviews. The EHS departments maintain the information on these boards, and also inform the recyclers about collection of the materials. Unlike the bulk consumers, the producers did not tender the material or bargain for price, but gave it to the recyclers whose processes and practice complied with their organisational requirements. The recyclers periodically collected the e-waste from the facilities.

All the three organisations mentioned their responsibility towards EOL equipment. Although producers in India did not have obligations to manage EOL equipment, all have developed a voluntary free take-back mechanism for the use of individual and bulk consumers. In the case of the multinational producers (MNCs), this voluntary approach is adopted in line with the changes in their parent group policy and practices adopted across the globe. In the case of the domestic producer, this voluntary approach is an extension of their corporate sustainability practice. The free take-back offered by the producers requires the customers to inform the producer about the waste for disposal, and also to pack the material for disposal (6.2.5). A specialized group within the organisation handles recycling together with the EHS team. The producers either engage logistic partners or use the formal recyclers directly to transport the material from the customer's facility to the recycling facility and also pay for this collection.

6.5.3 Interaction between the producers and bulk consumers

In the case of the two multinational producers, their client base includes both corporate and individual customers. Although they have adopted a voluntary EPR approach to their EOL products in India, not much awareness about this is present among their customers. They offer these services free of charge to all their users, but it is the responsibility of the users to request this service either online or by telephone and package the material for collection. As the EHS head of P2 said, "A client can go and log a call, and describe about the e-waste to be collected." The customers are not offered any value at the point of disposal. In some cases individual consumers receive a redemption voucher for a limited time for purchase of a new product of the same brand. The producer ensures proper processing of e-waste collected from the consumer's location.

Although the interviewees from both the multinational producer organisations confirmed their responsibility for EOL equipment and said that their organisations had mechanisms to collect the material, they refrained from going beyond this and did not want to disclose the volume of material collected and said it was "confidential and could not be revealed". This suggests that although they have some mechanisms, these being voluntary may not be rigorously followed or monitored. Hence, either the collection volume may be too low or organisations are not keeping track of the quantity collected, as there is no regulatory requirement. This further supports Manomaivibool's (2009) argument that globally performance of producers' take-back is far from satisfactory.

In the case of EU WEEE, the producers are required to take financial responsibility for the environmental impact of the products that they place on the market, specifically when those products become waste. In some countries of Europe, the producers, to partly offset the financial burden associated with e-waste management, have introduced advanced recycling fees (ARF). The consumers are charged an upfront ARF at the time of procurement of electronic equipment, which partly pays for the collection and recycling of e-waste (Sinha-Khetriwala et al., 2005). The most common practice in Europe has been the development of producer responsibility organisations (PROs). These PROs are funded by the producers (ARF feeds this fund) and manage the EOL on behalf of them (*ibid.*). In the absence of regulatory demand, such a financial system to manage e-waste is lacking and has resulted in weak implementation of this voluntary approach in India. Also, during the interviews, it was noted that none of the producers are keen to develop such systems in India. They did not favour ARF, as it would increase the cost of their products and so increase the already tough competition from cheap unbranded products in the market. In the case of PROs, the strong presence of an informal sector dissuaded them from developing such systems, as the material flow to PROs could not be ensured,

> “ARF is not in the model as it would mean increased price of the product. There is already lot of unbranded products in the market with lower price posing competition. ARF would only increase this competition” – EHS head P3

> "PROs are a good to handle EOL waste, but in India it is not very viable because people like to use the services of informal collectors and recyclers" - EHS head P2

In comparison, the system of collection and management of EOL equipment is better and more efficient in the domestic producer. This can be attributed to its customer base and operation model; it catered mostly for corporate clients. The producer’s own software division is its major corporate client apart from a small percentage of clients from other commercial establishments like banks, insurance companies, etc. Unlike the multinational producers, this producer does not service the consumer market. It also offers exclusive services and maintenance packages, unlike the MNC producers who offer services mostly as part of sales. As the senior product quality manager of P1 said, "95% clients are corporate clients. We don’t deliver much to the consumer market".

This domestic producer has closer and direct interaction with its customers and collects nearly 14 t/month of e-waste (Service Head). All the EOL equipment is collected and brought to a central location where it is tested[31] and the recoverable and reusable parts are removed for use in their service line. The remaining material is disposed to formal recyclers. It is easier for this producer to collect the EOL asset because of the type of client - mainly corporate organisations which usually go for a ‘refresh cycle’[32] that generates the bulk of EOL waste. The corporate

[31] Materials collected from clients are not regarded as e-waste until they are assessed in the central testing facility. They are transported from across the country as end-of-life assets to the facility where, after testing and recovery, the non-functional equipment and parts are together tagged as e-waste, to be taken by the recycler.

[32] Refresh cycle is a process where the consumer replaces all the IT equipment irrespective of its functionality with newer equipment to ensure unhindered operation.

nature of the clients also means closer interaction with them on product requirements and service that builds mutual trust for the organisations to return the used equipment knowing that data security would be assured,

> “We need to have an intimate relation with them, for them to believe us and give the material back to us”. Service Head of P1

This collection of used equipment brings value to their business due to their engagement in service business. Unlike the MNC producers who only offer take-back, this producer also offers buy-back as part of its service and maintenance to the clients. Thus, the equipment that is brought from their large corporate clients is tested and used for the clients in their service and maintenance,

> “We undertake buy-back from services point of view. ... We have programmes for promoting e-waste services through advertisements, videos and customer specific presentations”. Service Head of P1

The collection of EOL waste is better organized and efficient by the domestic producer than the multinational producers, due to its buy-back system and business model that allows closer interaction and trust building with their clients. The domestic producer also offers free take-back for all consumers even if they do not have service agreements. However, the uptake of this free take-back is limited, similar to the multinational producers.

The regulation of e-waste under the hazardous waste management rules in India is only applicable to the e-waste generated in the factory and not to the EOL waste (5.5). The voluntary mechanism provided by the producers in India, in the absence of regulation, does not facilitate or drive the collection of EOL for proper disposal. The low level of awareness among the consumers about the producers’ offered take-back mechanisms (6.3.5, 6.4.5) also indicates that producers have not taken seriously the need to raise consumer awareness that is important for the success of any take-back system. Also, the unwillingness of producers to disclose the quantity of EOL collected in the country, while their global site discloses the quantity collected worldwide, further points to the failure of the voluntary system. The efficiency of the domestic producers’ collection due to their buy-back unlike the free take-back offered by multinational producers further points to the role of economic incentive (that even the bulk users look for at the time of disposal of used equipment) in improving the collection rates of used equipment.

6.5.4 Interaction between the IT producers and secondary user

All three producers have undertaken limited donations in the past, but no longer do so (except one) as they see little value in donating used-equipment. The initial donations were not tracked completely and it was left to the recipient to bring it back for recycling. In one of the three cases where some donation still occurs, the recipients are required to return the products through the take-back service offered by the producer. Thus, the quantity of material to the secondary users from the producers is relatively small.

6.5.5 Interaction between the IT producers and formal recyclers

The formal recyclers processed the EOL materials collected by the producers and the e-waste generated from their factories. Of the three organisations, only one gave the e-waste generated in their facility freely to the recyclers. The other two charged a minimal amount (about 1USD/kg of e-waste), due to the financial system in these organisations that accounted for the cost of material in e-waste. However, the producers paid the recyclers for the logistics to transport the EOL material from consumers. Unlike in the EU, where the recyclers are offered a 'gate fee' to offset the negative recycling cost associated with e-waste recycling, no such financial support was offered to these recyclers. The producers are of the opinion that the presence of valuable material in e-waste would offset it,

> "Certain costs are retrieved during recycling. Battery and CRT are cost of operation. The retrieval of precious metals offsets the cost of other operations" – EHS Head P3

All the IT producers audited and verified the formal recyclers. The recyclers are selected based on intensive audit, site visits and verifications and not just on their license to operate from PCBs. The producers checked[33] the recyclers not only for environmental compliance but also verified other aspects like occupational health and safety, and also checked their downstream vendors (who received the segregated e-waste material from them) to ensure that the material did not cause any environmental damage. As the EHS head of P2 said,

> "We don't just select the vendors based on just PCB certification. We have our own criteria. … We audit them…. It includes everything, EHS, ethics, etc; we have contracted e-waste recycler audit to a third party agency".

The standards of these recyclers are expected to be higher than those prescribed by regulators, and that in turn drives the development of good recycling practice among the recyclers. In two of the three cases the producers worked with the recyclers to enhance and develop their processes. These producers also claim to have played a role in bringing international recyclers into the country and raising the standards of domestic formal recyclers. The head of EHS of P3 indicated, "Again execution of these plans was not easy in India as there were no recyclers. We have developed (…recycler) to a large extent in the last 4-5 years".

The quantity of material flow between the producers and formal recyclers is very low, making it less favourable for the formal recyclers to develop higher standards. In the current system, the bulk of e-waste that the formal recyclers receive from the producers is from their factories, which is relatively small, due to the factories being more assembly lines than manufacturing sites. Bulk consumers, especially those from the very large IT organisations, are the main source of e-waste (6.2.4, 6.2.7). The producers also acknowledge that there is a large volume of e-waste

[33] One of the interviewee from the producer group did show the audit form used to assess the formal recycler.

stored as the consumers lack knowledge and believe it to be valuable and so do not welcome free take-back offered by the producers,

> "…is basically because of lack of knowledge. 75-80% of people don't understand that it does not have or add any value". Head of services of P1

Thus, until the producers take their EPR seriously so that the EOL waste can be channelled to the formal recyclers, the relationship between the producers and recyclers will remain weak.

There is not much exchange of information in terms of training in dismantling or product recovery, refurbishment, etc. Unlike in some developed countries like USA and Australia, where producers certify their refurbished products for sale (Vorasayan and Ryan, 2006), none of the producers that were part of this research take up refurbishing activities, as they do not see it as economical or that wanted by their customers,

> "We did not do that because it is an unwanted competition away from business"- Service Head P1

> "Currently we do not have refurbishing of whole systems here. … If customers don't prefer to refurbish or resale then it has to go for recycling only. If the cost of refurbishing (transporting the material; labour to dismantle etc.,) overshoots the benefits of refurbishing then… it is a business decision depending on customer and value of refurbishment. Currently we do not have refurbishing programme." – Head of recoveries P3

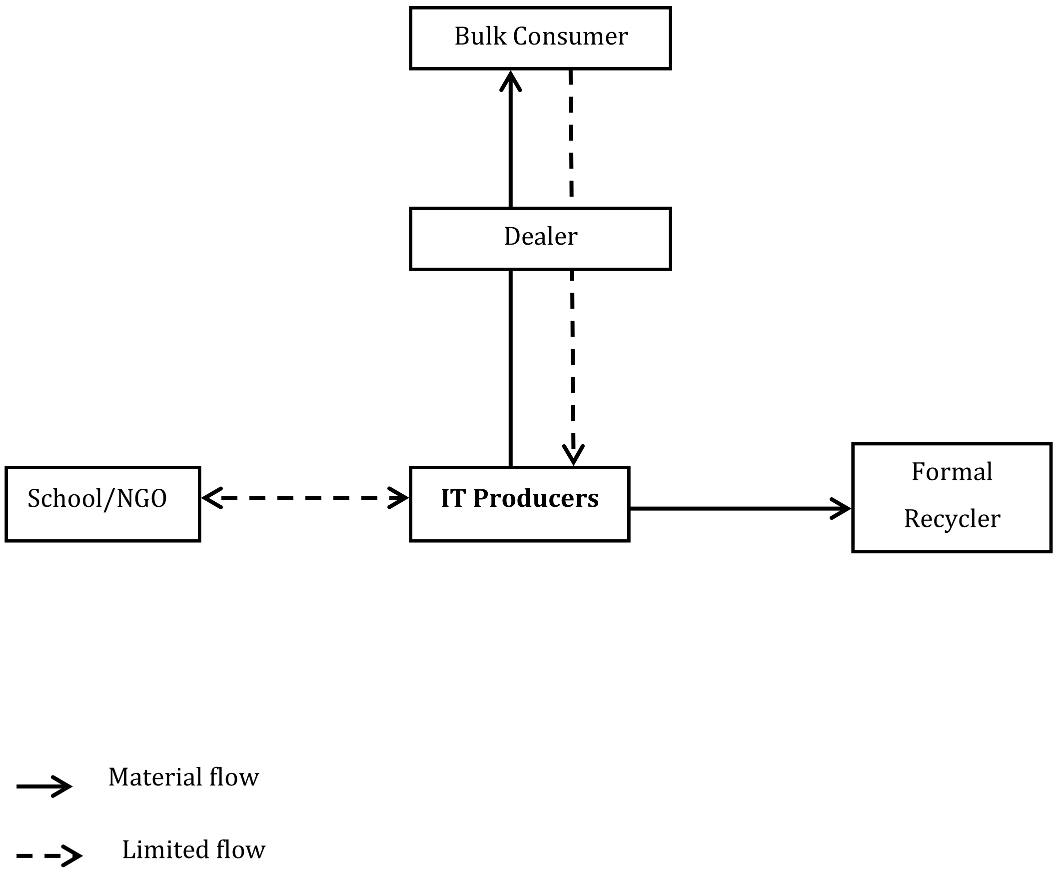
So, the three producers did not encourage refurbishment and parts recovery by partner recyclers. In some cases they give the recyclers a list of their products to enable easy segregation, but usually nothing beyond that. Even in the case of the domestic producer, who has extensive service business, partner recyclers are only encouraged to recycle. As the Service Head of P1 said, "We don't encourage recyclers to refurbish. It is only for recycling". The actual material flow initiated from producer, which is influenced by the other stakeholders, is represented in Figure 6.7.

6.5.6 Interaction between IT producers and regulators

The producers are required to appropriately dispose the hazardous waste (e-waste) generated at their facilities under the HWMHR (5.5). Until the late 1990s most of the IT equipment in the country was imported and so it was not until 2003 that this industry came under the purview of HWMHR. The absence of regulation to take responsibility for EOL equipment further reduced any potential interaction between the IT producers and regulators with regard to monitoring EOL waste. It has been the environmental NGOs like Greenpeace rather than the regulators that drew the attention of producers to the need to tackle EOL waste in line with changing global trends. Since the knowledge of these producers, with regard to their product and the way to treat it, was better than that of the regulators they did not select the recyclers just based on the

PCB license. Also, the producers through their association in India (MAIT) have been actively interacting with the regulators during the development of the new e-waste regulations in the country, so that their concerns about collection of EOL waste could be addressed appropriately.

Figure 6.7 Actual material flow from the IT producer organisations



6.5.7 Comparison of the expected and actual material flow of e-waste arising from IT Producer organisations

Manomaivibool (2009) has argued that, with respect to e-waste flowing from producers in India, it is easy to incorporate the production waste arising from EEE manufacture into the EPR system. He indicates (*ibid.*) that the presence of non-identifiable producers in the country and the grey market is a major challenge for an EPR programme in India. In discussing the material flow of e-waste, he adopted a generic approach based and traced the flow of material from all types of producers (original equipment manufacturer, grey markets, assembly shops, etc.) to users (both household and institutional consumers) and finally to recyclers (both formal and informal). The material flow therefore does not point to the EOL waste specifically. Similarly Wath et al (2010), do not pay much attention to the EEE generation stage and the producers, but have tried to capture the generic e-waste material flow arising from users.

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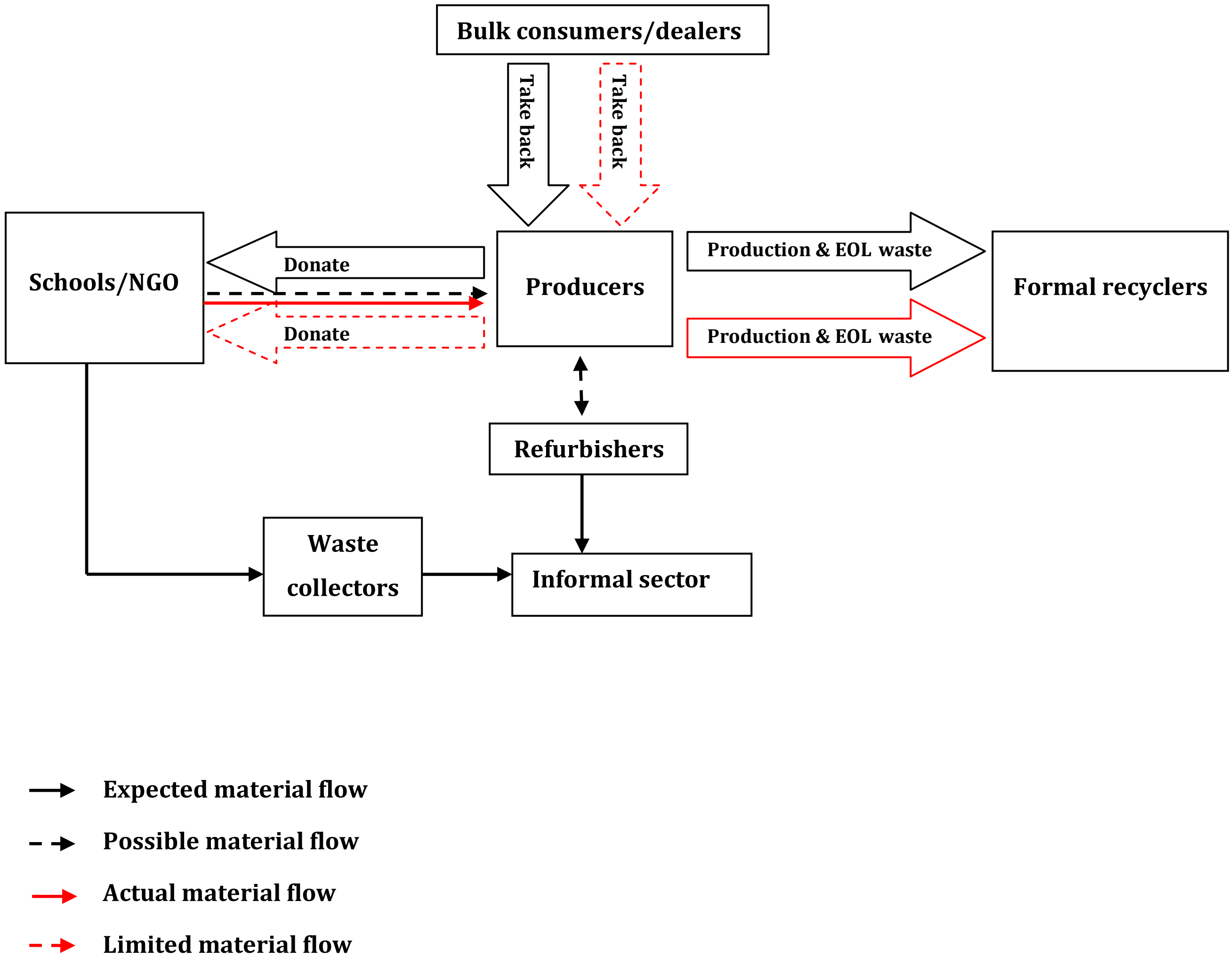
Data gathered during the pilot study revealed that the producers offered take-back options to the bulk consumers and dealers for the EOL waste, and the material flows back to them through this channel. Further, encouragement of refurbishing activities by the producers was mentioned by one interviewee from the regulatory group. These information were included in the expected material flow figures for e-waste arising from producers shown to various interviewees to ensure rigour in research (4.6). Figure 6.8 presents a comparison of expected (black coloured arrows) e-waste material flow and actual (red arrows) e-waste material flow arising from the producers.

Analysis of the data indicated that although the producers offered take-back, not much EOL material returned to the producers through this route (6.5.3) as indicated by the red dashed arrow. It was further revealed that producers did not encourage refurbishing, although the regulators encouraged this. The producers however channelized the e-waste arising from the generation of EEE and the collected EOL (whenever available) to formal recyclers. The flow of this material from these formal recyclers to the informal sector was not evident due vigilance of the producers (6.5.5). The donation of material from the producers for reuse was also limited and measures were taken to receive them back after use (6.5.4). Thus, the actual material flow revealed that the take-back offered by the producers to customers did not channelize the EOL waste to formal recycling as efficiently as intended.

Figure 6.8 **Comparison of expected and actual e-waste material flow arising from the IT producers**



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6.6 Practice among the Formal Recyclers

This section discusses the way e-waste is handled by the formal recyclers in India. The exploration of material flow in the informal sector was not undertaken (4.5.1) as the activities of this group in India has received considerable attention in previous research by Widmer (2005), GTZ-MAIT (2007) and Wath et al (2010 and 2011).

It begins with the source of e-waste for the formal recyclers, their procedures and processes to handle it, and their interaction with other stakeholders like regulators, secondary users and the informal sector. The interaction of formal recyclers with the bulk consumers and IT producers has already been discussed in the previous respective sections (6.2.7, 6.3.7, 6.5.5).

6.6.1 Definition and source of e-waste

It was observed that all the five recyclers interviewed for this research handled only IT equipment sourced mainly from very large IT organisations (6.2.7), although they also collect material from the producers (6.5.5), large IT organisations (6.3.3) and government offices. Household EEE, such as TVs and other white goods such as fridges, washing machines, or brown goods like microwaves, etc. did not enter their treatment facilities. It is estimated that India generates 800,000 t/annum of e-waste (MoEF 2010). Despite this large quantity generated, the absence of appropriate collection mechanisms diverts the material away from formal treatment channels. One of the serious challenges to formal recyclers is the availability of raw material (e-waste) for their processes (Sinha-Khetriwala, 2004). All the formal recyclers acknowledged that the informal sector poses a big challenge to them with respect to availability of raw material. The formal recyclers handled only 5% of the e-waste recycled in the country (GTZ-MAIT, 2007; Shanbhag, 2011). The new regulation on e-waste acknowledges the challenges posed for proper e-waste management due to this difference and has emphasized the need to bridge the formal and informal sectors. International organisations, like GTZ, and NGOs in the country are also working to enable this link.

6.6.2 Procedure and process among the formal recyclers to handle e-waste

All the five formal recyclers collect e-waste directly from the facilities of their clients. As the formal recyclers are covered under the HWMHR, they are required to follow transport emergency procedures, which require them to seal each container securely at the site of collection of hazardous waste. This seal is broken only at their recycling facilities to unload the EOL equipment. All the recyclers in the current research were engaged only in collection, dismantling and segregation of e-waste and currently were not engaged in precious metal recovery[34].

[34] Although two recyclers indicated that they were in the process of moving into this activity.

The most common recycling processes among the formal recyclers are manual dismantling and manual and semi-automated segregation, together with some mechanized processes for crushing and shredding. Handling e-waste by beginning with manual dismantling has been recommended as the best starting process for its treatment. This prevents mixing up the different constituent materials which otherwise reduces its value and increases the challenges in recovering material (Chatterjee and Kumar, 2009). The dismantled e-waste is separated into glass, copper, steel, aluminium, plastic, printed circuit boards, etc. The total content of printed circuit board in e-waste is 3-5% by weight, while metals, plastic, and glass, constitute the remaining 95-97% (Bernardes et al., 1997; Chatterjee and Kumar, 2009). The hazardous components like capacitors and batteries are also separated and removed at this stage.

The formal recyclers have approved downstream vendors who buy the separated material from them and come from a range of industries (aluminium, copper, steel, etc.). In the words of senior manager RC5, "The prices of these metals are based on London metal exchange rates. These metals are pure and go for direct use". The plastic, which is of different grades and types, goes to plastic recyclers where it is 'down cycled[35]' due to the mixing of different plastics. The glass in CRT monitors goes, after removal of the lead coating, to glass recyclers. The precious metals are embedded in the printed circuit boards of the computers and other electronics, and the usual practice among the formal recyclers is to separate these printed circuit boards, then shred and export them to recovery facilities in Europe. Where the recyclers have international partners, the shredded printed circuit boards are sent to their overseas refining facilities. These overseas refineries assay a sample of the individual lot and pay accordingly. The recovery of precious metals from e-waste is both technology and cost intensive, and the quantity of e-waste received by these recyclers is not steady. Although the quantity of e-waste generated in India is high, the lack of mechanisms to ensure it reaches the formal recyclers for proper treatment has discouraged these formal recyclers from investing in cost intensive resource extraction processes. As this senior manager from RC5 puts it,

> "Right now we are not extracting precious metal as there needs to be a regular inflow of raw material into the systems and is still a challenge for us now to get adequate quantity".

6.6.3 Interaction between formal recyclers and regulators

The formal recyclers are registered under the Hazardous Wastes (Management and Handling) Rules 2003. Although, initially, they were required to be registered with Central Pollution Control Board, this power now has been delegated to the respective State Pollution Control Board. The registration or license is valid for five years subject to certain conditions.

[35] Down cycling is the process of converting waste materials or useless products into new materials or products of lesser quality and reduced functionality.

The recycling facilities are required to obtain consents under the Water Pollution (Control & Prevention) Act, 1974 and Air Pollution (Control & Prevention) Act, 1981, as well as documented and monitored plans for risk management and EHS. Under the current regulation each authorized recycler is required to file the quantity of e-waste handled annually with the respective state PCB. The recyclers are given a 'passbook', which endorses them to handle a certain quantity of e-waste based on their capacity, which is assessed by the regulator. Each time they collect and process a quantity of e-waste, they are required to make an entry in the passbook. This passbook not only helps the regulators to verify the quantity of e-waste handled by the recycler, but also helps the recyclers' clients know if the recycler has the capacity to handle their e-waste.

Since the formal recyclers have to maintain their passbooks on e-waste collected and handled, they cannot technically process illegally imported e-waste in their facility. The five formal recyclers taking part in this research did not process imported e-waste. The current regulatory requirement for the recyclers is quite stringent. However, the lack of stringent monitoring creates a problem for efficient handling and affects the efforts for a good recycling practice even among the formal recyclers. The formal recyclers acknowledged that, due to this weak monitoring, some did not adopt appropriate methods to process the e-waste they received,

> "PCB is giving license to many recyclers who don't even have facility. Most of them don't have an up and running facility and after removing valuable materials discard it as junk file return to PCB and give destruction certificate to clients" – Country head RC4

> "PCB also lacks staff and so there are lacunae in monitoring". - Senior Manager RC5

The regulators also acknowledged the inefficiencies in the monitoring system they have in place to check the operations of formal e-waste recyclers; mainly due to lack of adequate staff, which makes it difficult to ensure that the waste was treated appropriately. In the words of a regulator,

> "There are lots of people. Regulatory authorities are there but we are not having so much manpower to police them. Entrepreneurs and public should cooperate with us to stop this from happening". (R1)

The limitation in regards to manpower, technical resources and ever increasing workloads, to carry out a purposeful monitoring by environmental regulators in India was also noted by Lohani et al. (1997). Thus, the possibility of material flowing from the formal recyclers to the refurbishers and second hand market, and ultimately to informal recyclers, due to the weaknesses in monitoring cannot be ruled out although this research could not find such practices in the five formal recyclers here.

6.6.4 Interaction between the formal recyclers and secondary users

Two of the five formal recyclers donated electronic equipment as part of their CSR, and told the recipients that at the end of its useful life the equipment ought to be returned to them for recycling. However, not much material has come back through this mechanism as yet. As this senior manager from RC5 says, "our CSR unit has undertaking with the donors. They track it. This system is about 1.5 years old. So far we haven't received any". While the country head of RC3 said, "If we do donate we put a sticker that after use when it becomes a potential e-waste to return it to us. There have been very few incidences where they call us back to give it back".

The formal recyclers also acknowledge that they do not receive EOL waste from the secondary users. They further confirmed that the materials donated to secondary users from primary users usually went to the local scrap collector and entered the alternative stream of waste treatment in the informal sector (6.3.6, 6.4.4). A senior manager from RC2 also disclosed that in some cases the scrap collectors encouraged the secondary users to seek donated IT equipment, which they later bought from them for a price and sold to the refurbishment market.

6.6.5 Interaction between the formal and informal recyclers

Previous research indicated that formal recyclers in India received only 5% of the collected e-waste and faced tough competition for material from the informal sector (Raghupathy et al., 2010). In this research, it was also noted that the formal recyclers received e-waste mainly from the bulk consumers in the very large IT organisations and the IT producers. However, the SME IT sector, which constituted over 70% of the total IT sector in India, disposed its e-waste mainly through the informal sector (6.4.6), which employs thousands of urban immigrants (*ibid.*).

The origin of informal recyclers in India is much older than the formal recyclers. In fact until 2005, when the first formal e-waste recycler was registered in the country, only the scrap collectors and scrap dealers handled e-waste. The informal sector network is dense and widespread across the country (5.5), and those engaged in e-waste management include scrap collectors, scrap dealers, refurbishers and remanufacturers and the informal recyclers engaged in backyard extraction of resources from e-waste. In the absence of proper collection mechanisms, and limited accessibility to formal recyclers, this informal sector provides the necessary service through its wide network to collect this e-waste. Although the practices of this informal sector cause environmental and occupational hazards, it provides livelihoods for a large number of people in urban and semi-urban areas (GTZ-MAIT, 2007). Recognising the potential of the informal sector, and the need to support the livelihoods of people associated with it, the new e-waste regulation also encourages establishing a nexus between the formal and informal sectors as proposed by Yu et al. (2010). Some organisations (GIZ, MAIT) are working to link the informal sector to the formal sector so that e-waste collected can be handled in an environmentally safe way. Under these circumstances it becomes important to understand the current level of interaction between these two sectors.

The formal sector acknowledges both the large collection network and the considerable knowledge built up over time of the scrap collectors, and sees the value they would bring to their own operations if integrated properly - Country Head of RC4, “The informal sector has knowledge about the material and network is very good”. Nevertheless, the formal recyclers find any integration challenging because of the lack of trust of the informal sector as acknowledged by the Country Head of RC3, “Informal sector looks at the formal sector with doubtful eyes”.

The informal sector demands high prices for its material from the formal recycler, because of the high price the waste collectors in the informal sector pay to the customers. However, the formal recyclers are unable to pay demanded high price. This is due to the high overheads of formal recyclers and the low recycling value of the material in real terms, as against the part resale value that scrap collectors and scrap dealers in the informal sector are used to. So the scrap collectors in the informal sector do not trust the formal sector as they believe that the formal sector is exploiting them.

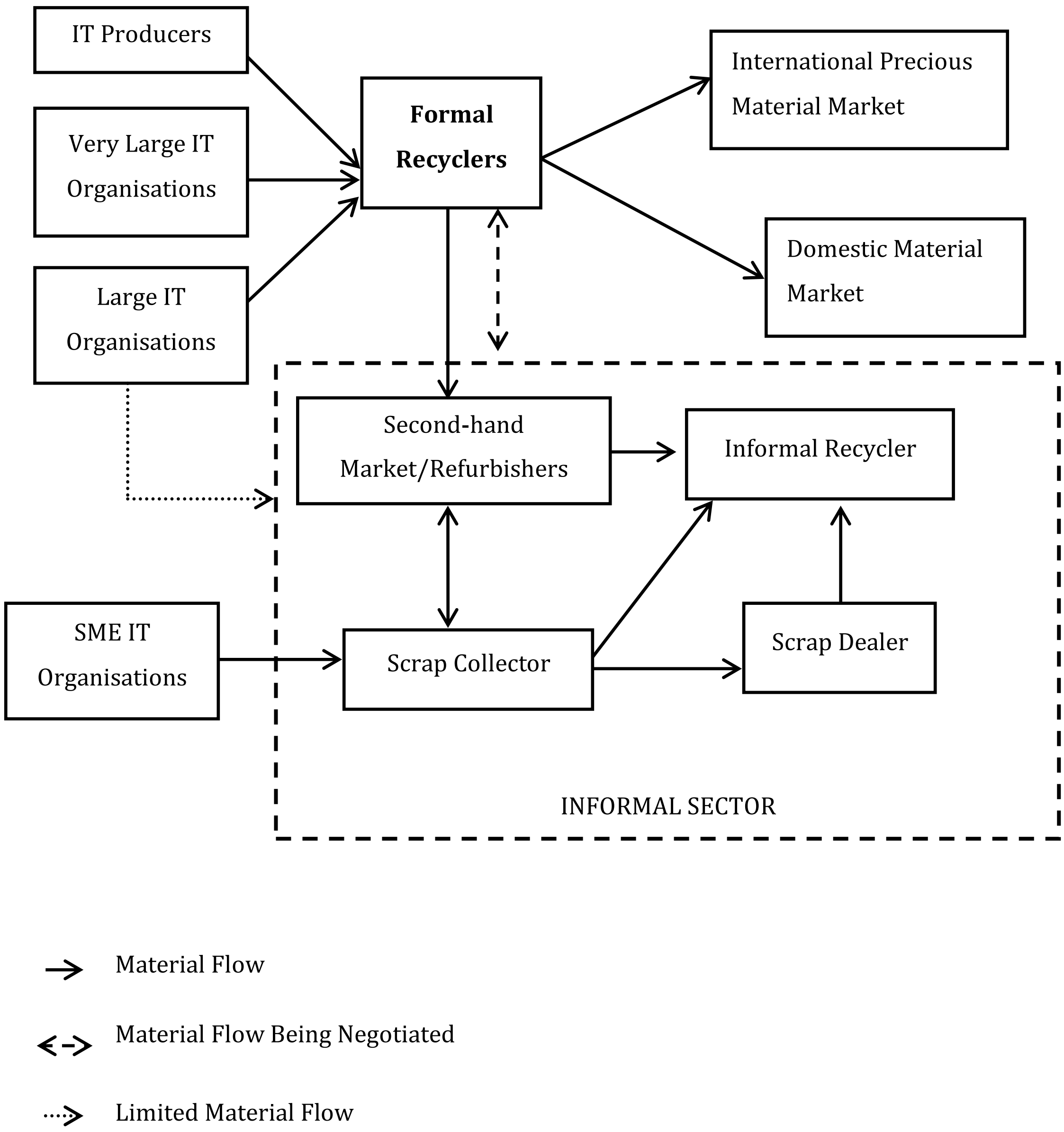
The formal recyclers reciprocate this lack of trust to the informal sector. In most cases the informal sector ‘cherry picks’ the material before selling it to the formal sector, by removing the valuable parts like printed circuit boards and copper windings from the collected e-waste before selling the material (that appears intact externally) to formal recyclers. This ‘cherry picking’ deprives the formal recyclers of the valuable metals, resulting in reduced value from their operations,

> “We would like to use their knowledge and network. But they demand high value for their material, which is beyond the recycling value for the material. Also they cherry pick the material before bringing to us”. - Country Head RC3

> “They are buying for Rs.2000/- and asking me for Rs.2500/-. It is difficult for us to pay that when we know the recycling value is less than Rs.1000/-.” Senior Manager RC2.

This lack of mutual trust makes it challenging for interactions to be developed between the two groups. However, this integration is important for effective e-waste management, as the informal sector is still a strong bridge between the consumers and formal recyclers. The actual e-waste material flow in the formal recyclers is represented in Figure 6.9.

**Figure 6.9	Actual e-waste material flow in the formal recyclers**



6.6.6 Comparison of the expected and actual material flow of e-waste in the formal recyclers

Figure 6.10 presents a comparison of the actual (green arrows) and expected (black arrows) material flow of e-waste from the formal recyclers. The expected material flow was constructed from information gathered during the pilot work and past literature. According to previous research recycling in India is dominated by the informal sector (Manomaivibool 2009, Wath et al. 2010; GTZ-MAIT, 2007), and the entire system of e-waste processing is based on a network existing among the collectors, traders and recyclers (Wath et al., 2010). The recycler/dismantler segregated and sold readily reusable and recyclable material (cable wires, plastic, glass, etc.) to

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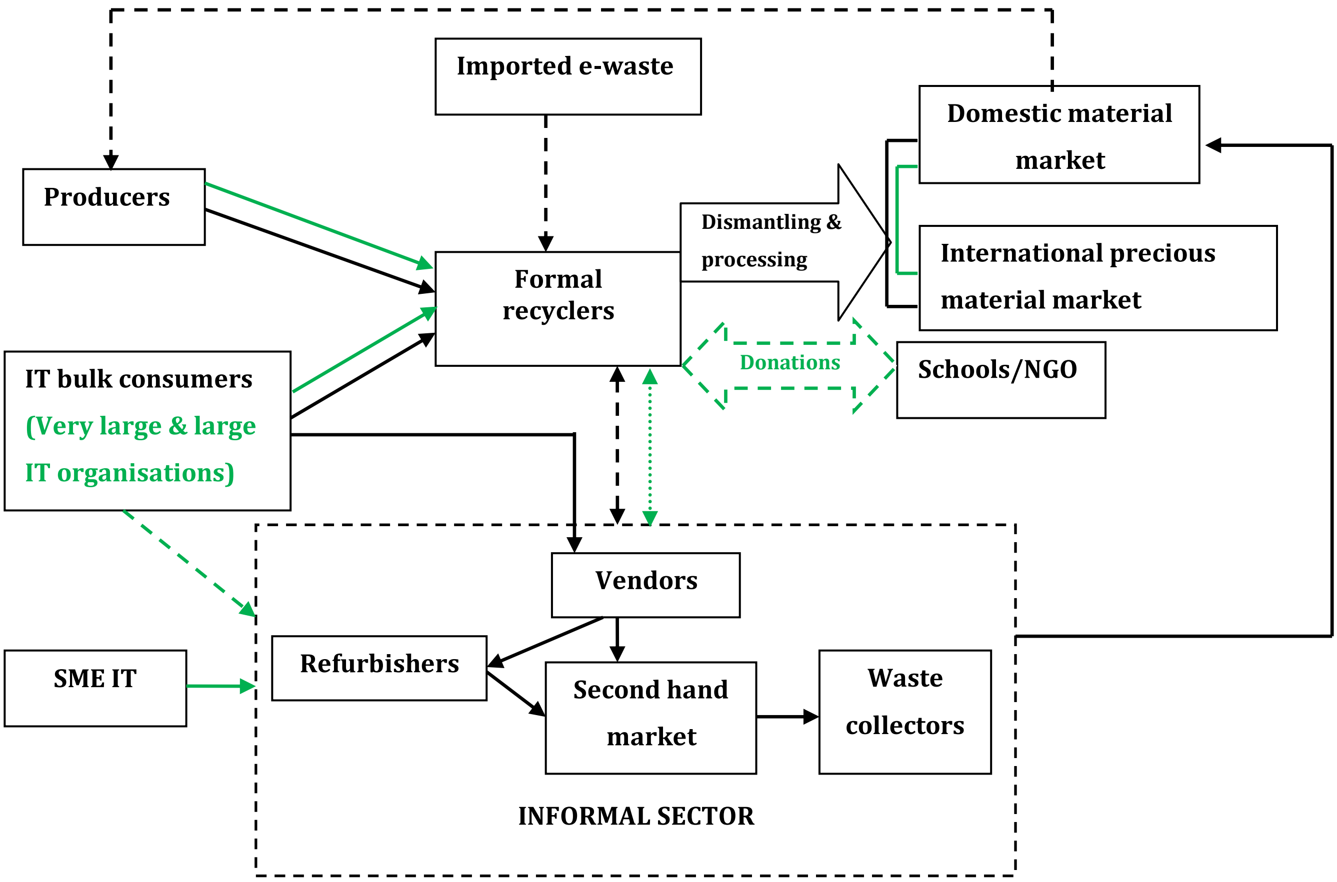
the domestic material market and used a ‘backyard process’ to recover valuable gold and silver (*ibid*.). During the pilot work interviewees from two NGO were of the opinion that the formal recyclers also handled imported e-waste to overcome the shortage of material for their operations and this was also supported by the GTZ-MAIT (2007) study. Except for Manomaivibool (2009), who recognised the formal recyclers and called them an ‘ATF’ (advanced treatment facility), there was no clear recognition of this group either from previous research or among most interviewees from the pilot work.

The data analysis, however, shows that e-waste recycling in India existed both in the formal and informal realms. The IT producers and very large IT organisations use the services of these formal recyclers. The large IT organisations have begun to use the services of these formal recyclers but there is still some material reaching the informal sector from them as indicated by the dashed green line. It is the SME IT organisations that use the services of the scrap collectors and feed the informal e-waste recycling activity. None of the five formal recyclers examined in this research handle imported e-waste and only depend on material coming from large institutions. They also do limited donation as part of their CSR and make arrangements to receive them back for disposal after its end use albeit the material thus received is limited. Negotiations are under way to bring the formal and informal sectors together to process e-waste in an environmentally benign way (dotted green line). Thus, with the increased generation of e-waste in the country and global pressure to manage e-waste without damaging the environment, the formal recycling sector in India cannot be left unnoticed

Figure 6.10 Comparison of expected and actual e-waste material flow arising from the formal recyclers



Expected material flow

Possible material flow

Actual material flow

Limited material flow

Material flow being established

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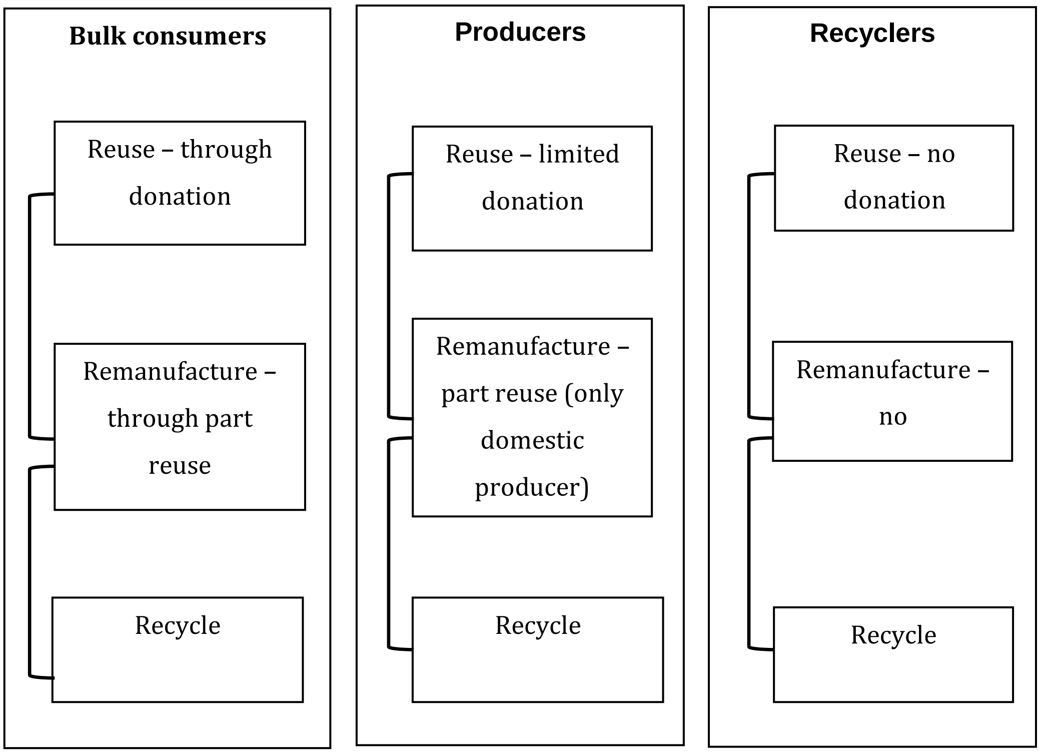
6.7 Outcomes of the Interaction between the Users, Producers and Recyclers

Before discussing the outcomes on overall material flow due to the various interactions discussed above, it is useful to know about the hierarchy of good e-waste management practice so as to understand the position taken by various stakeholders with respect to e-waste management. Cui and Zhang (2008) describe this hierarchy and indicate that the first option is reuse, either directly or after service, when the equipment's functionality is good. The next option is remanufacture through refurbishment, where the non-functional parts are replaced and the functionality of the equipment is restored, including parts recovery where the functional components are removed for reuse. Recycling is only the last option, when all the above options fail, where the various materials are recovered and finally the waste is landfilled or incinerated. Figure 6.11 presents the hierarchy of waste management exhibited by the various stakeholders from the current research.

Figure 6.11 Hierarchy of waste management exhibited by various stakeholders



The bulk consumers follow the theoretical hierarchy of e-waste management to some extent, although for reasons other than those of just pursuing the goal of effective e-waste management. All the bulk consumers in the IT sector donate their functional IT equipment when it is deemed unfit for their operational uses, thus increasing the useful life of the equipment. To some extent they also have in-house procedures that recover functional parts of equipment for later use, thus indicating in-house remanufacturing for increasing the functionality of the equipment (6.2.3, 6.3.2, 6.4.2). This in-house remanufacturing is more prevalent among the large and SME IT organisations than the very large IT organisations. Although the very large IT organisations restrict refurbishing of their e-waste given to the formal recyclers, the large and SME IT organisations do not restrict this (6.3.4, 6.4.4). Only non-functional equipment is disposed to formal recyclers or scrap collectors and these go into the recycling process. From the practices adopted in managing e-waste seen among the bulk consumers it can be concluded that e-waste management in these organisations begins when the IT equipment ceases to be functional for the organisational use. Thus, the e-waste management in organisations includes both donation and disposal.

In contrast, all but one of the producers that carried out donation in the past have recently stopped; they also did not support refurbishing (6.5.5). In the case of the multinational producers, although their corporate policy mentions refurbishing, they did not yet have refurbishing activity in India unlike elsewhere, as indicated by this Head of Asset Recovery of P3,

> "It is a business decision depending on customer and value of refurbishment. Currently we do not have refurbishing programme."

Even in the case of the domestic producer, they did not have direct in-house or externally approved refurbishing. However, their business model, that offers exclusive service, enables them to adopt part recovery for reuse in service. Thus, e-waste management among the producers primarily involves recycling of production waste, along with the small volume of collected EOL waste from consumers.

In the case of formal recyclers, due to restrictions imposed on them by their clients, they only directly adopt material recovery through recycling and do not have much donation or refurbishing activity. It is observed that e-waste management in the formal recyclers involves dismantling of IT equipment, segregation, and separation and sorting of the material to be disposed to appropriate downstream vendors domestic or overseas. Thus, reuse and remanufacture is more prominent among the bulk consumers than the producers and formal recyclers.

Despite not much emphasis on reuse and remanufacture among the formal groups like producers and recyclers, it has been noted that there is a good market for reuse, refurbish and recovery services in developing countries (Osibanjo and Nnorom, 2007). The two interviews with scrap collectors to validate the information gathered from formal sector indicate that the services of selling second hand and refurbished equipment, along with sale of recovered parts, are carried out in the unorganized sector as formal recyclers and producers refrain from this.

"We buy the old electronic equipment that comes for exchange with dealers and also from offices. We then sort these machines and remove reusable parts which we use in our refurbishment and service business...... There is a god market for second hand goods and service. After this we sell the scrap to people who recycle this." - Waste collector

Thus, the informal sector has used this market for reuse and refurbishment and has fared well in developing countries.

Producers are the creators of electronic equipment, which are used by the consumers, who generate electronic waste that is then treated by the recyclers. The overall material flow of e-waste and interaction among the various stakeholders that directs this flow is consolidated and depicted in Figure 6.12. For the producers, e-waste is a process waste whose safe disposal is more important than financial gains achieved by giving it into unsafe hands. For the bulk consumers in the very large and large IT organisations, e-waste is unwanted junk occupying valuable floor space, increasing the accidental risk of fire that could cause damage to human and other resources that needs to be safely removed from the facility. Financial value at the time of disposal is very small but still sought and that is why even the very large IT organisations do not prefer the free take-back offered by the producers[36]. However, for the recyclers, financial considerations have a major impact on the business. This e-waste is the raw material for their operation and they have tough competition with the informal sector and growing number of formal recyclers for the material. So, they have to offer competitive prices as most of their clients expect best price over environmental considerations of handling e-waste at the time of disposal, as,

> "Everyone looks at as best commercial prospects as first criteria and also environment as proposition, that if I give the material to him it has to be safe. If he is going to give me 15-20% more and says I will do this and that, it is enough for me. I will turn a blind eye." - Country Head of RC4

[36] Very limited material, mostly printer cartridges and printers, was going back from the very large IT organisations to the producers.

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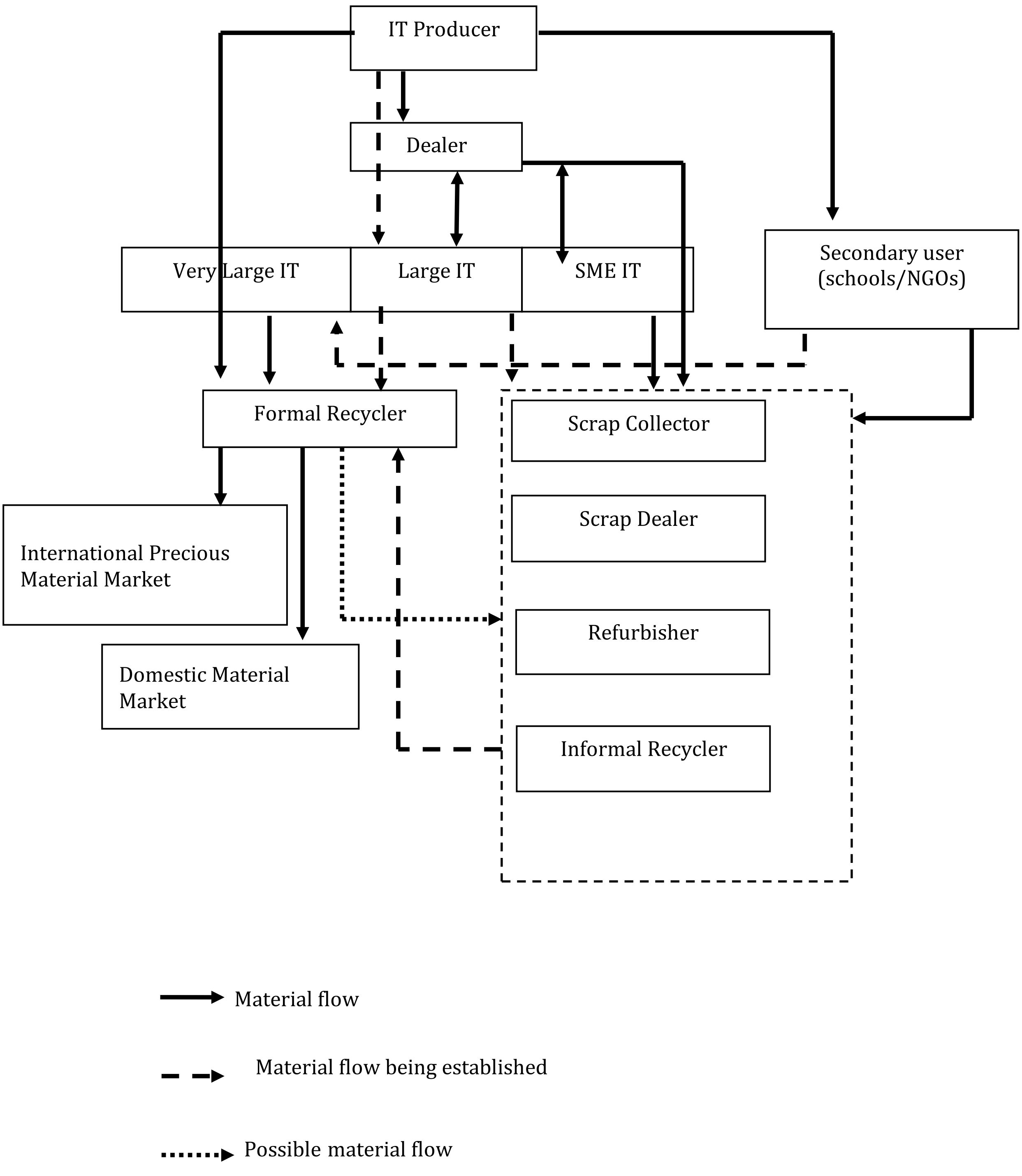
Figure 6.12 Overall material flow



While looking at the flow of material and money to the formal recyclers, it can be seen that the main source of material is from the very large IT organisations and the IT producers. The large IT organisations have now begun to use the services of these formal recyclers, who undertake extensive marketing to acquire their clients, so as to get a constant feed stock for their operations. The most common way for them to get this material is through competitive bidding,

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where the highest bidder gets the material. As the senior manager of RC5 says, "It is not a buyer's market, but a seller's market". Before they bid for the material they are usually invited to view the material. The bid, and payment, they make for the material depends on the quality of that material. Older IT equipment is more valuable than newer ones as they have higher quantities of precious metals in them, as this senior manager from RC5 says, "As years go by the quantity of precious metal in the computer is coming down so older equipment get higher bids…". The recyclers on average get between Rs.500-1000 (US$10-$20) [37] for every computer recycled through material recovery over and above the money spent on transport and payment made for the computer to the consumer. On average they pay between US$3-$5 to the consumer for each computer they get from them.

E-waste is a mixture of both valuable and toxic material. CRT monitors, CDs, floppy disks, etc., as part of the e-waste collected, have negative recycling values implying that they do not have much valuable material to be recovered from them, but the cost of treatment to safely dispose them is higher. However, material like printed circuit boards in e-waste has a positive recycling value implying that the value of recovered material is higher than the cost of recovery. The producers contend that presence of components with positive recycling in their products offsets the negative recycling value, unlike in EU where the producer responsibility organisations that manage e-waste management on the behalf of producers pay a gate fee to the recyclers to offset this negative value.

Formal recyclers in India bear the entire cost of recycling right from collection, transportation, to payment for material. Therefore, currently they only seek viable sources for the material to offset this, which are the very large IT organisations and other such organisations like government institutions, producers, etc. They do not approach the SME IT organisations in various private IT parks spread across the cities as the quantity of waste generated there fluctuates and they have tougher competition from the scrap dealers who pay higher prices than the formal recyclers. The scrap dealers/vendors are able to pay this higher price to the consumer at the point of disposal because they are not solely involved in material recovery through recycling, as are the formal recyclers. Scrap dealers focus more on part recovery that brings them higher values through the sale of these parts/components in the second hand and refurbishment market, and only after that do they sell the material to informal recyclers for material recovery through recycling. Since the informal sector is well established in the country, many international and national NGOs are working to integrate this informal sector with the formal recycling sector, which would not only maintain the livelihoods of the people working in the informal sector but would also help in bringing more material for safe recycling.

The registered and licensed formal recyclers are not allowed to carry out refurbishment in their facilities. They provide a destruction certificate to their clients and usually their clients require

[37] These values are indicative and based on information provided by recyclers who were willing to disclose this information.

these recyclers to destroy and recycle the EOL equipment received from them and restrict the recyclers from undertaking refurbishment or part resale. This emphasis from the clients, who are mostly very large IT organisations, stems from their concern for ensuring data security. In cases where the clients do not restrict the reuse of material, the equipment is either used for refurbishment or donated as part of the recycler's CSR activity. The clients who do not restrict the use of their EOL equipment are usually from large IT organisations and other non-IT organisations. Any of refurbishment undertaken is not done in the recycling facility but is usually done in a separate facility, which is an independent entity.

Refurbishment, or any kind of reuse of the EOL, also changes the dynamics of business among the formal recyclers. The formal recyclers currently bid for the material from their clients. The cost and profitability of recycling would be almost the same for them in the given circumstances where they have similar practices. However, sometimes among the formal recyclers, some of them quote very high prices for the same material as they divert the material to the refurbishment or components resale market to get higher profits. In these cases, the formal recyclers who strictly adhere to the legal requirement suffer a loss, as there is a system failure to implement a level playing field. In the words of one formal recycler, "The grey market is very big and more profitable than recycling market". Although restriction on material use by the clients would affect reusability and refurbishment of equipment, the lack of strict vigilance on the practices adopted by the registered recyclers encourages some of them to use unauthorized practices and channelizes the material away from the proper waste stream, as the monitoring mechanism, although present, is still weak.

6.8 Approaches to E-Waste Management

The previous sections discussed how the e-waste originating from different groups of IT bulk consumers viz., the very large, large and SME IT organisations moved in the system. It also discussed how this e-waste material flow was influenced by the practices of other stakeholders, namely the producers, recyclers and regulators with respect to their position towards e-waste management. These observations on e-waste management practice and interactions adopted by the different stakeholders, point to the differences in the approach to e-waste management (4.8). These differences in the approach to e-waste management are similar to that seen in the adoption of environmental strategies (3.4). The approaches to e-waste management, among the various stakeholders, ranges in a continuum from 'indifferent' through 'reactive' to 'proactive'. The level of e-waste management exhibited by the stakeholders is discussed here. Table 6.1 presents the characteristics of approach taken to e-waste management by organisations in the bulk consumer group. Although there are some variations in the practice adopted to manage e-waste by organisations in a group, these are less compared to the similarity exhibited within the group.

The **very large IT** organisations did not have direct regulatory requirements with regard to e-waste disposal and management. They had initiated their own procedures to manage e-waste, generally from around 2006, with their systems evolving over the years. Their organisational procedures are well defined, as are the roles of various personnel within the organisations. Four of the five audit the practices of the formal recyclers before entrusting them with their e-waste. As an indication of their higher awareness and organisational maturity to handle e-waste, three of the five organisations have begun to put in place systems to track the materials donated by them and channel it from the secondary users to a proper e-waste treatment stream (handled by formal recyclers). In 2006, these organisations developed an environmental initiative called 'Green IT', which focuses on energy conservation and other environmental issues like water and waste management. Apart from this initiative all the five organisations also have environmental management systems (EMS) in place and their e-waste management system is aligned under their EMS. The reasons for such environmental orientation will be discussed in the next chapter (7.2), but the adoption of EMS indicates that these organisations take environmental management seriously.

All the five **large IT** organisations here are increasingly challenged by the growing generation of e-waste in their organisations associated with their business growth. Four of the five organisations have now begun to take action to manage this e-waste and to use the services offered by formal recyclers. This practice among the large IT organisations started, in most cases, from 2010. One of the reasons for them to use the services of the formal recyclers has been due to the awareness programme organized by the regulatory authorities that has pointed to the challenges in e-waste management and their role in its management. The regulators have been playing their role in bringing awareness to these organisations (who are bulk consumers) about their responsibility towards managing e-waste appropriately. The organisations want to avoid any problems due to regulatory non-compliance in the future that might affect their business; so they are beginning to use the services of formal recyclers. These organisations do not check the reliability of the formal recyclers' process and accept the pollution control board license as a valid measure. All the five large organisations here only adopt minimal practices like using the services of formal recyclers, and do not have organised procedure for disposal of e-waste. These recent changes in their practice are in response to the anticipated regulatory changes.

All the ten **SME IT** organisations here take an ad hoc approach for e-waste disposal. They dispose their e-waste to scrap collectors who pay them higher prices than the formal recyclers. The organisations do not take environmental regulatory requirements seriously and believe that they can get away from compliance due to other overarching IT policies developed by the various state governments to promote the IT sector, which exempt them from environmental compliance. They also believe that because of their smaller organisational size, even with the implementation of the new e-waste rule, they would not be on the radar of the already overloaded and understaffed environmental monitoring authorities (also acknowledged by the regulators interviewed). Also, for these organisations, environmental management is not regarded important, as they are oriented towards survival of their business. They are not aware of the challenges in e-waste management. Due to the above factors these organisations do not take their responsibility towards e-waste seriously.

Table 6.1 Organisational characteristics and approaches taken to e-waste management in bulk consumers

Organisation	**Characteristics**															**Approach to e-waste management**
	E-waste policy	Organisational procedure			Disposal through informal sector	Auditing of formal recyclers selected for disposing e-waste	Measures to track donated equipment	Regulation			EMS	Awareness			
		Clear	Not clear	Ad hoc				Looking beyond regulation	Respond-ing to changes in regulation	Ignore regulation		High	Low	No	
VL1	✔	✔				✔	✖	✔			✔	✔			
VL2	✔	✔				✔	✔	✔			✔	✔			
VL3	✔	✔				✔	✔	✔			✔	✔			PRO-ACTIVE
VL4	✔	✔				✔	✔	✔			✔	✔			
VL5	✔	✔				✖	✖	✔			✔	✔			
L1	✖		✔			✖	✖		✔		✔		✔		
L2	✖		✔			✖	✖		✔		✖		✔		
L3	✖		✔			✖	✖		✔		✖		✔		
L4	✖		✔			✖	✖		✔		✖		✔		REACTIVE
L5	✖		✔		✔		✖			✖	✖		✔		
SME1	✖			✖	✔		✖			✖	✖			✔	
SME2	✖			✖	Not applicable		Not applicable			✖	✖			✔	
SME3	✖			✖	Not applicable		Not applicable			✖	✖		✔		
SME4	✖			✖	✔		✖			✖	✖			✔	INDIFFE-RENT
SME5	✖			✖	✔		✖			✖	✖		✔		
SME6	✖			✖	Not applicable		Not applicable			✖	✖			✔	
SME7	✖			✖	Not applicable		✖			✖	✖			✔	
SME8	✖			✖	Not applicable		✖			✖	✖			✔	
SME9	✖			✖	Not applicable		Not applicable			✖	✖			✔	
SME10	✖			✖	✔		✖			✖	✖		✔		

The regulatory requirement for **IT producers** in India, at the time of data collection, was limited to managing the e-waste generated from their manufacturing sites and did not include their responsibility for EOL products. The three IT producers in the study, however, had put in place a voluntary take-back system, albeit of questionable effectiveness and the reasons for this will be discussed later (7.4). The voluntary take-back of the MNC producers can be attributed to their global corporate policy for e-waste management, while that of the domestic producers can be attributed to their corporate social and environmental responsibility agenda. The producers also conduct rigorous audit of the processes and procedures of the formal recyclers. The rigour of these audits is due to their thorough knowledge about the material being processed. Also, the producers have played a role in bringing international recyclers into the country and pushing the domestic formal recyclers to adopt environmentally safe e-waste management practices as acknowledged by some of the formal recyclers. The existence of a voluntary take-back system in the absence of regulatory requirement and rigorous monitoring of the formal recyclers' practice by all the producer organisations indicate that they are serious about e-waste management.

When organisations adopted good environmental management practices in the absence of regulatory requirements, with the awareness and participation of various groups, including top management, they are regarded to take a proactive approach to environmental management (Roome, 1992; Henriques and Sadorsky, 1996). This was exhibited by organisations in two groups here namely the very large IT organisations and the IT producer organisations. Among the organisations in the very large IT group although there is certain variation[38] with regards to the management of e-waste management, overall they have similar approach which includes, using the services of formal recyclers, having e-waste policy and EMS and filing returns on e-waste to PCB in the absence of regulation. So, the well-developed e-waste management practice adopted by the very large IT organisations and three IT producers in the absence of regulatory demand to manage e-waste reflects this **proactive approach**. The factors that determine this proactive approach taken by the very large IT organisations and the IT producers to e-waste management will be discussed in the next chapter (7.2, 7.4).

The **formal recyclers** are covered under hazardous waste management and handling rules, and therefore are required to properly manage the e-waste they receive. However, the laxity in regulatory monitoring is well recognised by both the formal recyclers and the regulators who were interviewed. Despite weak monitoring by the regulators, all the five formal recyclers here are monitored by their clients for their practices, which has made them adopt appropriate practices for e-waste management. This appropriate practice includes proper transportation of material, maintenance of clear records of e-waste received and processed, along with safe operations for manual dismantling and segregation. However, due to high competition for material from the informal sector, incentive seeking clients and the struggle to maintain a continuous flow of material for their operation, none of the recyclers have moved to adopt advanced resource recovery practices that would benefit both their business and environment.

[38] 2 of the 5 VL organisations did not track the donated e-waste and one of this also did not audit the formal recycler.

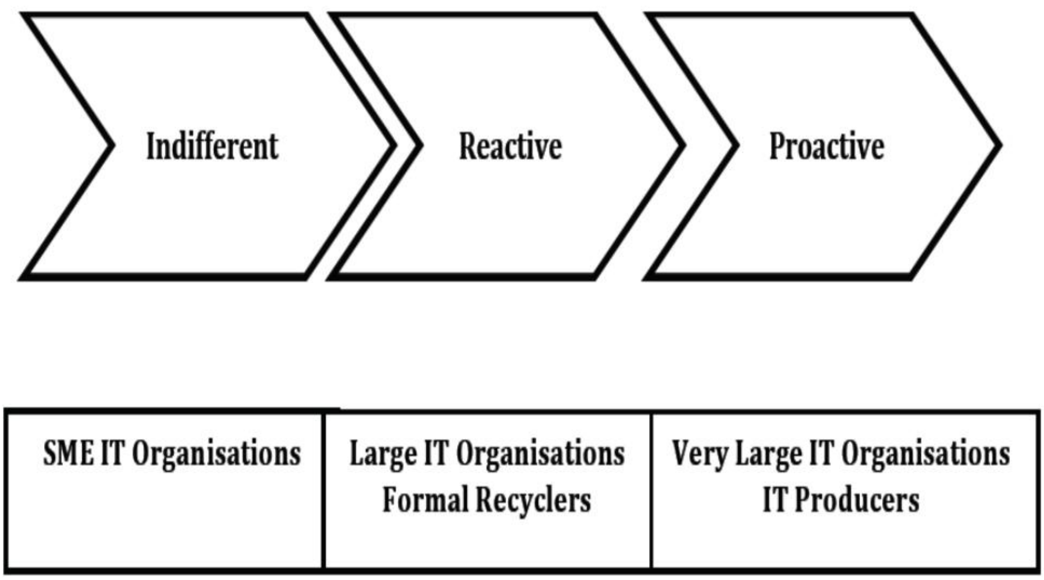
The formal recyclers also are therefore doing the minimum that is required by the law and their clients.

When organisations pursue environmental management at a minimal level, either driven by existing regulation or in anticipation of future regulation so as to avoid legal penalties due to failure to recognise the opportunity offered by good environmental management, they are regarded to be taking a reactive approach to environmental management according to Roome (1992). Thus, the minimal approach exhibited by the group of large IT organisations and formal recyclers towards e-waste management reflects this **reactive approach**.

According to Roome (1992), organisations that are unable to react to changing environmental standards for various reasons including economic constraints and lack of understanding of the significance of environmental imperatives to their business have a non-compliance approach to environmental strategy. Welford (1999) regarded such a non- compliance approach to environmental management as equivalent to an indifferent approach. Such an approach to environmental management is not uncommon in the SME sector according to Hutchinson and Chaston (1994) as it tends to be more business focussed. Thus the e-waste management exhibited by the group of SME IT organisations reflects an **indifferent approach**.

The level of e-waste management adopted by the various stakeholders is depicted in Figure 6.13. The next chapter will explore the various internal and external factors that determine the practice adopted by these stakeholders.

Figure 6.13 Level of e-waste management among the various stakeholders



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6.9 Summary

This chapter discussed the flow of e-waste originating from the bulk consumers in the IT sector and how the other stakeholders related to it. The nature of interaction between the bulk consumer and other stakeholders is affected not only by the size of bulk consumer, but also by the business model of producers and recyclers. The producers who focused their products for commercial sector and offered exclusive service and maintenance in parallel to sales were more successful in collecting and managing their EOL. The formal recyclers who focused on very large IT organisations and producers for their material, refrained from part resale and refurbishing, due to client restriction and focused only on recycling. Although in the hierarchy of e-waste management, reuse and refurbishing are preferred over recycling, recycling was more dominant here. The interaction among the stakeholders is also affected by the state policy to promote IT, which does not take into consideration the environmental aspects associated with promotion of IT industry. As a result of this lack of sensitivity to environmental aspects it has not only failed to recognize the need to manage e-waste appropriately but has also not played any role in addressing this.

Very large IT organisations have evolved in their practices with respect to management of e-waste which, not only included auditing the practices of formal recyclers but also putting in place mechanisms to track the donated equipment and playing a role in bringing awareness to the secondary users (6.2.6). However, it must be noted that they still did not prefer refurbishment and reuse despite those being environmentally better than only recycling. The large IT organisations are closely following them and are now using the services of formal recyclers to dispose their e-waste. The problem lies among the SME IT organisations that constitute 70% of the Indian IT sector. They are not aware about the need to properly manage e-waste. Neither the producers, nor the regulators have played any role in sensitizing them to the issues of e-waste. While the very large and large IT organisations are channelizing their e-waste to formal recyclers, the SME IT organisations continue to use the services of informal sector. Also, it must be noted that all the three groups of bulk consumers expect some value for the e-waste at the time of disposal, with the SMEs' expectation being highest compared to the other two groups.

The producers have voluntary take-back of EOL waste. This voluntary mechanism however lacks complementary components like awareness, convenient collection and incentive system, which make it not very effective in managing the EOL waste. In the case where the producer offers a buy-back, the material flow from the consumer to producer is better. For the formal recyclers, main source of material currently is the very large IT organisations and to lesser extent the IT producers (mainly factory waste). Recently they have been getting e-waste from the large IT organisations, but they are still short of material and the informal sector poses a serious challenge to them.

There is a strong presence of formal recyclers engaged in managing e-waste. However, the informal sector is still playing an important role in e-waste management in India. The informal sector has a good and large collection network that enables it to collect material from far and wide that is beyond the reach of formal recycling sector. The informal sector is vital for the economy as it employs a large number of people. So, eliminating this stakeholder from e-waste management chain is not only challenging, but also undesirable. However, it is important to integrate them with the formal recyclers to ensure environmentally safe management of e-waste. Recognizing this, the formation of partnerships between the formal and informal recycling sectors is being developed with active participation from various NGOs, international organisations and regulators.

E-waste was managed under the HWMHR in India during the time of data collection. This rule only focuses on the producers and recyclers. Even in the case of producers, the HWMHR only applies to the e-waste generated in their factory and not to the EOL waste. A separate rule to manage e-waste based on EPR, which also includes the role of bulk consumers was implemented only in May 2012. The regulatory monitoring under HWMHR has been weak and also the regulators have not been very active in bringing awareness on the issue of e-waste until recently. In preparation for the implementation of the new e-waste rule, the regulators are now organizing awareness programmes. These awareness programmes are more restricted to the large IT organisations and other public sector organisations. The regulators acknowledge the low awareness and lack of adequate monitoring that makes e-waste management a challenging issue.

Given the influence of different system components like regulation, availability of recyclers, access to collection mechanism, three distinct approaches to e-waste management are exhibited by the various stakeholders. Despite the lack of regulatory demand to manage e-waste, the very large IT organisations have evolved well-organized mechanism to manage their e-waste (6.2.3). The IT producers, for their part, have developed voluntary mechanisms for managing the EOL waste, albeit not very effective. Such advanced practice among these two groups, in the absence of regulation, indicates a proactive approach to e-waste management.

The large IT organisations have now begun to pay attention to the management of e-waste and are using the services of formal recyclers. This transformation is due to the increased quantity of e-waste generated, apart from anticipation of the new e-waste rule that would be applicable to them. The formal recyclers on their part are anticipating that this new rule, which recognises the role of bulk consumers in e-waste management would divert and channelize the material from the informal stream to them. They are taking minimal measures to comply with it. Thus, the approach of large IT organisations and formal recyclers to e-waste is reactive.

The SME IT organisations still lack awareness on the issue of e-waste. They have neither gained the attention of regulators, nor the producers or the formal recyclers, despite them constituting nearly 70% of the IT sector. The low awareness and lack of mechanisms to include them in the e-waste management agenda that is being developed has made them take an indifferent approach to this issue.

Understanding the material flow and the system components has helped in deducing the different approaches taken to e-waste management by the various stakeholders. The next chapter will explore if and how the factors identified from the literature and pilot fieldwork play a determining role in this approach to e-waste management in addition to the system components discussed here.

7 FACTORS DETERMINING E-WASTE MANAGEMENT WITHIN THE ORGANISATIONS

7.1 Introduction

The previous chapter looked at how e-waste generated from bulk consumers moved in the system and the interactions between the various stakeholders that influenced that flow. It also identified the difference in the approach to e-waste management adopted by the different stakeholder groups (Figure 6.13). Drawing from the responses of the stakeholders with respect to their e-waste management level, this chapter will look at factors that determine the responses of different stakeholders in managing their e-waste. It will also look at role of the enablers identified in Chapter 4 in shaping the e-waste practice adopted by the various stakeholders. By identifying the factors determining the current practices for e-waste management, it answers part of Objective 4 - Analyse the factors determining the current practices for e-waste management.

Before discussing the factors that determine e-waste management, it is important to define e-waste management in the Indian context. Waste management includes collection, transportation, processing, and monitoring of waste materials. E-waste management is propagated on the principle of extended producer responsibility as noted by Widmer et al. (2005) (Chapter 2.6). However, in the Indian context, observation and discussions with bulk consumers has shown that *e-waste management among the bulk consumers is defined as management of electrical and electronic equipment that has ceased to be of use to the organisations* (6.7). It includes equipment that is donated for reuse and that disposed for recycling.

This chapter begins with the analysis of responses by the different stakeholders when presented with the factors identified in the amended conceptual model, to understand the manifestation of these factors in organisations. It also discusses the role of enablers among the stakeholders, identified in the amended conceptual model. The analysis and discussion in this chapter are based on the information provided by the interviewees, various organisational documents and reports, together with direct observations. The three major stakeholders - namely the bulk consumers, the IT producers and the formal recyclers - come from different industrial settings and the influence of the factors may not be the same for all. Recognizing this difference, the chapter is divided into sections based on the different major stakeholder groups. Since bulk consumers from the Indian IT sector are the focus of this research, the chapter begins with the description and consideration of the factors influencing them (7.2, 7.3), and then moves on to discuss producers (7.4, 7.5) and recyclers (7.6).

7.2 Factors Determining E-Waste Management in IT Bulk Consumers

The bulk consumers in the IT sector include the very large, large and SME organisations. The following sections discuss the strengths of various external and internal factors in determining the responses of different organisational groups in the bulk consumer to the challenge of e-waste management. It begins with external factors viz. regulation, peer pressure, client requirement, corporate reputation and brand image, and goes on to discuss the internal factors viz. financial benefits, corporate culture and leadership and corporate social responsibility.

Regulation

Regulation or anticipation of regulation has been mentioned to be a very important driver for environmental response of organisations (Roome, 1992; Porter and Linde, 1996; Hoffman, 2000) and especially so for those whose operations are perceived to be more environmentally problematic such as manufacturing and petrochemicals (James et al., 1999; Banerjee, 2002). Adherence to regulation has also been identified to be one of the main drivers for adoption of green IT strategies in large organisations providing IT services, in developed countries (Harmon and Demirkan, 2011). Given these observations in the literature, the role of regulation in adoption of e-waste management practices in the IT bulk consumer organisations was further explored.

The Indian IT service sector is given many concessions to foster its growth in the country (5.2). One among these concessions is the exemption of IT companies from a State Pollution Control Board's (PCB's) monitoring for reasons of administrative simplicity; as mentioned in most state IT policy (Maharastra, 2003; Tamilnadu, 2008; Andrapradesh, 2010). This exemption functions well for those organisations that operate from leased facilities or if they are in the SME category. For the larger IT organisations that own their own large real estate facilities this environmental exemption of the IT policy does not apply, as these developments are categorised under 'Building and Construction Projects' that are required to obtain clearance from the respective state PCBs under the EIA notification (Ministry of Environment and Forest Notification, 2006). As a result of this EIA requirement, they are required to adhere to the national Water and Air Act and apply for permission from PCB. This also implies that they are required to file their annual emissions for water and air to the respective state PCB, whose authorities monitor their impacts on water and air. However, this requirement does not include the generation and disposal of e-waste. Thus, irrespective of their size, the IT service organisations in general did not have any binding regulatory requirement to manage the e-waste generated. Although there was no separate regulation for e-waste in the country at the time of data collection for this research, preparations were underway for the implementation of a new separate regulation. The new regulation on e-waste defines the role of bulk consumers and their responsibility in the e-waste management system and so the IT service sector will be covered under the 'bulk consumer' category (MoEF, 2010a).

All five **very large IT** organisations adhere to HWMHR voluntarily and have been giving their e-waste to PCB authorised e-waste recyclers from about 2006 despite no such regulatory demands. The analysis of the documents and websites of these organisations reinforced the importance of regulatory compliance expressed by the interviewees. These organisations are also filing their returns under the Air and Water Act and are therefore monitored by the regulators. The adherence to HWMHR regarding disposal of e-waste is a demonstration of the importance and respect for applicable regulation in these organisations. Also, the **very large IT** organisations are quite aware about the development of the new e-waste rule and their representatives have even participated as stakeholders in the 'bulk consumer' category in workshops organised during drafting of this rule (interview, NASSCOM Green IT Head). So, they are quite aware about the wider changing regulatory context with respect to e-waste apart from the importance of regulatory compliance,

> "We look at adherence to legislation to a great extent. E-waste is considered as non-ferrous metal waste under HWMHR. In adherence to that we follow whatever guidelines are there. Having a separate rule for e-waste will make it better to handle it and remove the ambiguities". (EHS Head, VL2)

However, it must be noted here that regulations only set a minimum standard for very large IT organisation to manage their e-waste, as indicated by the current practice adopted by these very large IT organisations. For example, verification of the recycling practices of the formal recyclers (6.2.7), which is much beyond the requirement of the applicable or anticipated rule.

Interviewees from all five **large IT** organisations that participated in this research indicated that regulation is an important driver for them to take up proper e-waste management. As of 2012, they did not have any environmental regulatory requirement (i.e. clearance or filing of returns to PCBs). All except one organisation was aware of the new e-waste rule and was using the services of formal recyclers for disposal of e-waste,

> "[the] law of the land is going to get implemented if not now but in two years". -Assistant VP Administration L4.

Also, the PCBs and other government organisations have been conducting awareness programmes on e-waste and the new rule for these **large IT** organisations (6.3.8).

Compliance with applicable regulations is also emphasised in the documents of these large IT organisations. However, these organisations view regulatory compliance as a challenge that they must abide by so that they are not caught in any unwanted situation that may risk their growth.

“As per requirement of STPI regulation, anything debonded for disposal as e-waste should go only to approved vendor (ELCOT approved). ELCOT says this vendor should be approved by PCB. So we cannot dispose it to anyone as that would cause us trouble. We have been giving it for the last 2 years[39]. - Head of Administration of L2

Through the information that the organisations in this group receive from regulators and industry associations, they are becoming aware of the new regulations on e-waste. They are working to improve their practices, by using the services of formal recyclers (6.3.7), to comply with future regulatory requirements. Hence anticipation of regulation has influenced their e-waste management practices.

As of 2012, e-waste management has not gained the attention of the **SME IT** organisations. However, six of the ten organisations interviewed during this research unanimously acknowledged regulation as an important driver, as indicated by different entrepreneurs,

“…. Also regulation would play an important role for us, as we don’t want to disregard regulatory compliance.” (SM1)

“Yes regulation would influence the practice here. When pressure is put, SMEs will definitely do something about it. But if it is at a cost of their business, then it may have a negative impact” (SM3)

However, regulation, or anticipation of regulation, has not influenced the level of e-waste management expressed by these organisations for two reasons. Firstly these companies lack awareness of the issue of e-waste, which they acknowledge to be important to initiate e-waste management action in organisation. Also, six of the ten organisations were not even aware of the new e-waste rule implemented in 2012. In the words of the Managing Director of SM9,

“Other than what we have read in papers and media, no one has come and told us. Generally the awareness about this issue is very low among the Small IT companies and so awareness would be the starting point of management for us”.

Secondly, because of their size, the SME IT organisations are exempted from monitoring by state PCBs and the new e-waste regulation also exempts them. Further, the interviews with regulatory authorities from two different state PCBs indicated that the SME IT organisations are high in number and spread far and wide making them difficult to monitor. Given their lack of awareness, and exemption from environmental compliance, along with lower levels of monitoring, regulation will not be a significant driver as mentioned by the participants.

[39] ELCOT a body under the Tamil Nadu IT Ministry involved in the development of e-waste policy for the state independently of the national policy since 2009 and so has been proactively interacting with various stakeholders. Hence, the ‘approved vendor’ clause in STPI stipulation as been interpreted as ‘ELCOT approved vendor’ only in this particular state.

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Literature indicates that environmental regulation is an important driver for the environmental strategy of large organisations when their activity is environmentally degrading (Ghobadian et al., 1995; James et al., 1999; Banerjee, 2002) and strict regulations can trigger innovation and provide 'early mover' advantage (Porter and Linde, 1996). These previous work are based on observations of polluting industrial sector in developed countries. Despite the operations of the IT service sector not generating any visible environmental damage, regulatory compliance is still regarded as important by all the groups of IT bulk consumers. However, the regulatory compliance transcends to include environmental regulations only in the very large and large IT organisations. It has triggered e-waste management under the applicable HWMHR among the very large IT organisations, while the large IT organisations are changing their practice in anticipation of the new regulation. This indicates that the role of regulation in bringing about environmental response is not only limited to the nature of industry operation but, as demonstrated here; regulation can also become an important driver for service industries where regulatory non-compliance could potentially damage their image and thus affect their business.

Views are divided on the role of regulation in adoption of environmental management practices in the SMEs. Some researchers have suggested a positive role of regulation on environmental management among SMEs, due to its ability to remove free riders and provide clear targets that could be achieved with regards to their environmental aspects (O'Laoire and Welford, 1998; Tilley, 1999; Zhang et al., 2009). Others found that regulations did not significantly affect the environmental management practices in SMEs (Eden, 1996; Petts et al., 1999) as they failed to foresee the environmental benefits of regulations and generally perceived its enforcement to be weak and which would not affect their business profits. The results here favour the latter view. Although the SME IT organisations view environmental regulation as important for e-waste management, the exemption from environmental regulation in general and low level of awareness on the issue and the perceived low enforcement, all act as barriers for regulation to be a driver for these organisations as noted by Patton and Worthington (2003) in SME service organisations in UK. Baylis et al. (1998) also observed similar contradictions with respect to driving role of environmental regulation among the SME manufacturing companies in the UK. Therefore it can also be drawn that regulations do not significantly influence the environmental management practices of SME sector both in developed or developing country.

From the above discussions on the influence of regulation on e-waste management practiced by the different groups of bulk consumers, it becomes clear that for the **very large IT** organisations, regulations are important but, only set the minimum standard for their e-waste management practice, and their level of proactivity in this regard is driven by other factors. Although regulation only sets a minimum standard, it has a **strong** influence on their e-waste management practice as, in general, regulatory compliance is considered important for their operations by all the five organisations. For the **large IT** organisations it is also a **strong** driver as acknowledged by all the interviewees and expressed through their recent initiatives to manage e-waste in anticipation of the new e-waste rule in the country by four of the five organisations. Although the **SME IT** organisations regard regulations to be important, the

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regulatory exemption, the low awareness on new regulation and low level of monitoring contradict this. However, regulation would play a role in bringing in the awareness, which would be the starting point for e-waste management practice for this group, and so it is only a **weak** driver in determining their e-waste management practice.

Peer pressure

Peer pressure on organisational behaviour is well recognised under institutional theory (Dimaggio and Powell, 1983a). Peer pressure can be described as the pressure exerted by the similar organisations in the same sector on each other. This has been identified as an important driver for adoption of environmental responsibility by business in developed countries (Ghobadian et al., 1998; Hoffman, 2000; Lynes and Andrachuk, 2008). This peer pressure was also identified to significantly influence the adoption of EMS in large service organisations (Lynes and Andrachuk, 2008).

The very large organisations have certified EMS, are aware of the practices with regard to e-waste in the sector and have similar practices for the management of e-waste, which have gained importance in the past 3-4 years. NASSCOM and CII[40] (Confederation of Indian Industries) are two important forums that recognize the pioneering efforts of organisations that are directly or indirectly linked to their business. Of the two forums NASSCOM is an exclusive forum for IT industry, while CII is an association for industries from all sectors. NASSCOM being an exclusive forum for the Indian IT service sector has played an important role through its ‘Green IT’ initiative, to draw the attention of this sector towards greening and its importance to future business. It also recognises green initiative efforts made by the organisations in this sector by initiating a ‘green award’ for this group. Thus, industrial associations like NASSCOM are playing a part through peer influence in pushing these organisations to being environmentally responsible, as noted by Kollman and Prakash (2002) and Waddock (2008), who found the significant role of peer pressure through industrial associations in the adoption of EMS.

The recognition by peers is also observed in their organisational documents. The interviewees from all five **very large IT** organisations acknowledged that peer practice is important to their business as they compete in the same market. However, contrary to the interviewees from four organisations, the interviewees from one of the organisations indicated that it did not influence their environmental actions, as they consider themselves to be leaders in environmental sustainability. They all acknowledge that knowledge about peer practices is shared through forums like NASSCOM and CII and this helps them to learn from each other. These words of two interviewees from two different organisations in this sector capture these views:

> “Peer pressure and other practices influence the practice among the IT companies. The information among the peers is shared through websites, NASSCOM and CII

[40] CII – Is a non-government, not-for-profit, industry led and industry managed business association with over 7100 member organisations, from the private as well as public sectors, including SMEs and MNCs.

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conferences. Recognition by these forums is a way of bench marking us apart from brand image". (Facilities head VL4)

> "We want to be leaders and responsible. So definitely if someone is doing then we also say why can't we also do this? We also share this with others. We have played our part and are also learning from our competitors. Awards in the forum bring recognition to the practices followed in the organisation and are also a way of knowing what the peers do". (Sustainability Director VL5)

Further evidence of peer influence on the practices demonstrating environmental responsibility in this group is the similarity in the time of development and publishing of their corporate sustainability report. Three of the five very large companies brought out their corporate sustainability report using the Global Reporting Initiative (GRI)[41] guidelines for the past three years, and one of the remaining two is working to do the same. Although Solomon and Lewis (2002), in their empirical study on the factors motivating corporate environmental disclosures did not find peer pressure to be significant, it cannot be ruled out here.

The **large IT** organisations are also active members of the forums like CII and NASSCOM and are growing and competing to reach the top league. According to the information provided by NASSCOM Director, they are constantly setting higher business targets and are focusing more on new areas of potential business niche creation. They are influenced by the practices among their peers and want to follow the path of the leaders. NASSCOM acts as a forum of knowledge sharing on latest business needs and global trends among the various members of the IT service sector. However, this peer pressure has not translated into their environmental responses at present. None of the interviewees in this sector acknowledged peer pressure to have influenced their green initiatives or e-waste management practices and when probed about the peer influence on this, they denied it had influenced their practices,

> "Not really much discussion among the peers on green initiatives. But from NASSCOM we got some circular on green initiatives broadly" (AVP Administration L4).

Although NASSCOM has played an active role through its 'Green IT' initiative in bringing awareness and action on the environmental front among the Indian IT service sector, it has not been successful in taking this peer influence on green practice to all members of the association and has remained more limited to very large IT organisations. This may be because the 'Green IT' initiative by NASSCOM had active members from only the **very large IT** organisations. This has made peer sharing effective for them compared to the **large** and **SME IT** organisations that see this as an activity for the leaders in the field who can afford it.

NASSCOM's influence on the **SME IT** sector's green practices is non-existent although these organisations are also affiliated to them. Despite the potential of peers and leaders to influence

[41] Global Reporting Initiative (GRI) is a non-profit organisation that promotes economic sustainability and produces one of the world's most prevalent standards for sustainability reporting.

environmental practices (through industry association) like e-waste management among these organisations, they have failed to do so, as these organisations do not look up for such support or assistance from peers, due to lack of importance of environmental management,

> "NASSCOM has different forums for different company depending on their size and the kind of work they do. Nearly 60% are smaller and medium companies. So these forums help in the companies talking to each other and sharing the information and mutual benefit but not on green issues. The small and medium companies are more interested to get information on how to develop and grow their business and look for such support and information. Generally greening issues are not a priority among us". (Entrepreneur SM3)

From the above findings it can be seen that although peer influence is present among the members of the Indian IT service sector, it is restricted mainly to business development, except in the case of very large organisations. The very large IT organisations compete in the same market, where environmental management is seen as added value to their service and so peer influence has brought about competitive isomorphic in these organisations. Hannan and Freeman, 1977 and Dimaggio and Powell, 1983a observed similar behaviour in organisations in devloped countries (irrespective of their sector) due to competitive business environment. This isomorphic behaviour is reflected clearly through the similarity of environmental management (which also included e-waste management) practices seen among the very large IT organisations. Thus, peer practice has a **strong** influence on e-waste management practice adopted by the **very large IT** organisations as demonstrated by four of the five organisations. The large and SME IT organisations are however not influenced by their peers with regard to their green practices or e-waste management. Thus, peer influence for e-waste management is seen to be **absent** among the **large IT** and **SME IT** organisations.

Client demand

Globalisation and the influence of supply chain demands that include client demand for environmental management were discussed (Chapter 3.3.2, 3.5.1). Client demand for social and environmental responsibility of processes is recognised to be increasing and becoming a major source of pressure as the organisations are growing (Preuss et al., 2005; Lee, 2009). The Indian IT industry is export oriented (Arora et al., 2001) and the domestic market share including hardware is only 33%, although the domestic share is now growing (NASSCOM, 2011). It provides services to a large group of clients ranging from manufacturing, to finance and other services. Customers or clients are very important for all businesses and even more so for the service sector where the interaction between the two is direct and first hand.

The Indian IT service sector began to grow and gain importance from the 1990s. The rise in global demand for sustainable behaviour from the business and the growing competence of the IT sector have played a vital role in the demand and expression of environmental and social responsibility of this sector, at least with respect to the very large IT firms. Environmental

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responsibility has now become important in the global outsourcing field, with ‘green’ clauses being added by Western clients to the outsourcing negotiation process (Brown, 2008). Green credentials are playing a major role in IT outsourcing decision-making and vendor selection globally (Dataquest, 2009).

All the **very large IT** organisations acknowledge that there is a growing demand from clients to know about the environmental initiatives of the organisation and, depending on the nature of the client’s business and geography, these activities sometimes are audited. Some interviewees also showed the client’s environmental audit questionnaire that they are required to complete. The Sustainability Director of VL5 puts this well,

> “The clients have started asking about the organisation’s environmental initiatives and practice during the RFP (request for proposal), while some even audit our practices”.

These **very large IT** organisations are responding to the global demand of their clients for environmental sustainability through their actions towards carbon foot printing, energy conservation and waste management. The very large organisations are experimenting in-house with various green initiatives for resource optimisation as they foresee opportunity to offer this as a future service to the clients,

> “Globally in companies there is huge budget allocation to these green initiatives as the level of awareness and its importance is recognised. Today we want to first clean up our house and then go to external customers to offer them green services. The market for green is growing.” (Facilities Head VL4)

According to the interviewees from various organisations, being green is recognized as adding value to their business. This client demand for being green has resulted in the development of a specific ‘Green IT’ initiative within these organisations, which is separate from their EMS. This initiative is also recognised and promoted by the industry association NASSCOM. This initiative focuses more on areas of energy conservation, which has gained significant attention of their clients. E-waste management is recognised under this initiative, although it has not gained significant attention. This is also confirmed by the head of the ‘Green IT’ initiative of NASSCOM, “The emphasis in green IT initiative has been more on energy conservation that are important in the current context of global warming and climate change”.

Thus, even though the clients have not directly demanded for e-waste management, it cannot be denied that the practice adopted by these organisations to manage their e-waste is a response for this client demand for responsible environmental behaviour. This has resulted in the development of EMS and e-waste management is part of this EMS. Further, by acknowledging and adapting to the client demand for being environmentally responsible they are also enhancing their brand value and reputation that brings business growth.

Among the **large IT** organisations, the influence of client demand on their environmental response especially regarding e-waste management is varied. Of the five cases studied only one mentioned that a new client has demanded a certified EMS for the facility where the client's operation is to be carried out. E-waste as part of waste management under EMS is carried out by this company (L1), by disposing it to a formal e-waste recycler whom they have identified from the regulator's website. Despite the lack of client demand, the remaining four[42] have also taken notice of their organisational e-waste problem and are using the services of formal recyclers recently.

While the **large IT** organisations are growing in size and aspiring to reach the top league, most of their clients are still cost sensitive, as indicated by the interviewees from three of the five organisations, "Honestly the clients will look for cost cutting/saving only, they have not asked us so far, not really on green front" - Head of Facility of L3. However, change in attitude of the client is anticipated with time and their growth, as AVP administration of L4 adds,

> "What I would like to comment here is it also depends on the client. If the client is big and also the pricing is big that allows various standards. That is not so in most business as it is very cost focused in most cases. However, with bigger clients and growing business this is bound to change".

Thus, client demand for 'green actions' although not present among all the organisations here, is acknowledged to be developing as these organisations grow. The anticipated organisational growth is expected to be accompanied with the change to business from bigger clients who are more sensitive to environmental responses and demand the same from their vendors.

The **SME IT** organisations get their business from smaller and cost sensitive clients. Being cost sensitive, their demands do not go beyond their absolute requirement, which is data security and they do not demand action on the green front. Both parties see green actions as a drain on resources as noted by Welford (1994) in the SME manufacturing sector in UK. These words from an entrepreneur of SM3 capture this,

> "Outsourcing of work happens for cost relative purposes. Because they may not have the skill or the money so they find somebody who has the skill set and cost effective. In this scenario they do not attach weight to the environmental prospects. It is more economics than green projects."

It can be seen that there is a difference in client demand on green practices in the organisations. The nature of the clients' business influences their demand for better environmental practices from their vendors. This means a client from an environmentally highly polluting sector, due to the nature of business is much more demanding on the vendor with regards to its environmental impact, than a client from an environmentally non-polluting sector,

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[42] One of the five organisations was a captive service provider and so it did not experience client demand.

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"Definitely, because the client was a major oil sector client and they wanted to audit our practices, we went for ...". (Facility Head VL4)

An interesting observation is that all of the **very large IT organisations** indicated that their European clients are far more demanding than their American clients with regard to sustainability, especially in areas of health and safety with some variation in environmental spheres. This demand from the client according to them has started in the last 2-3 years. As the Sustainability Head of VL3 further added,

> "Compared to other markets the Europeans are very very sensitive. When we talk to our European customers they are very serious about these things, how we manage our environmental impact and so on... About 50% of European clients ask for this, 5-10% audit this, 20% have questionnaires".

The nature of business and the geographic location where the Indian IT services are rendered is changing. Whilst it previously predominantly serviced the US market, service demands from Europe, Asia and the Middle East are now on the increase (IBEF, 2007). European businesses are regarded as more socially responsible compared to US businesses (Kagan et al., 2003; Welford, 2005; Doh and Guay, 2006). The EU, in contrast to the USA, has a separate regulation for e-waste management, thus it can be expected that the clients from the EU are aware and sensitized to the need for proper e-waste management. This also makes the large clients from the European region recognise their IT service providers as generators of e-waste. They therefore expect these providers to include e-waste management in their environmental management programmes, which is acknowledged by these IT providers as indicated by their efforts to manage e-waste.

These **very large IT** organisations, due to growing client demand, see environmental management as a force to be reckoned with and agree that their environmental practices are bringing value to their business. As the head of Administration of VL1 puts it, "Broader context global clients are looking at sustainability very aggressively. Today it is not affecting the vendor selection, but it will soon do so". Although most of client requirements focus on energy issues, they also include broader environmental good practices. Many (Arora and Cason, 1996; Banerjee et al., 2003; Benito and Benito, 2006) have observed that industries in sectors with higher environmental impact were more proactive than those in sectors with lesser environmental impacts, like the service sector. An interesting observation is that although the IT service sector in India carries a clean green image that exempts it from environmental regulatory purview or pressure from civil society, their large clients from developed countries coming from both manufacturing and service industries are applying green practice pressure on these service providers. The very large IT organisations consider good environmental management (including e-waste management practice) to bring additional value to their services. This kind of supply chain pressure for environmental management is not uncommon (Handfield et al., 2005), but what is important here is the transformation of a sector regarded as non-polluting to adopt greener practices due to this supply chain demand. The reasons for this client demand are further explored later (8.2).

Thus it can be seen from the above discussion that the influence of the client on e-waste management as part of environmental responsibility differs between the different groups of bulk consumers. These differences can be attributed to the sizes of the client organisations, the nature of the client business and the client's geographical location. E-waste management initiated and managed by the **very large IT** organisations is a response to this client demand for green practices. All the five organisations in this category experienced client demand for environmental responsibility and this has a **strong** influence on e-waste management adopted by the **very large IT** organisations. Among the **large IT** organisations, client demand for environmental management is not uniform. Although only one organisation in this group experienced strong client demand for waste management, the others recognise that in the future such client demand cannot be ignored and are already setting up certain environmental initiatives such as disposing e-waste through formal recyclers. Hence, the influence of client demand on **large IT** organisations' e-waste management is only **weak** at present. This client pressure for e-waste management is observed to be completely **absent** among the **SME IT** organisations as their clients are cost sensitive and did not demand practices not directly important for their business.

Corporate reputation and brand image

As previously discussed (Chapter 3.5.1), company reputation has been broadly described as the long-term combination of the stakeholders' assessment about the organisation's commitment and conformance to stakeholder expectations in a given socio-political environment (Logsdon and Wood, 2002). Whereas, brand image, which is more product oriented, is associated with symbolic meanings that consumers associate with the specific attributes of the product or service (Padgett and Allen, 1997).

While the literature distinguishes corporate reputation from brand image, the interviewees from the organisations did not distinguish between the two and often used them interchangeably. They associate brand image with perceptions of stakeholders about their organisation and their service quality. The discussions in this section acknowledge this lack of distinction, and so brand image and reputation are considered at par here.

Hemingway and Maclagan (2004) noted that the positive corporate reputation and image gained through ethical, environmental and social compliance is on the rise among businesses in general. According to Hart (1995) and Porter and Linde (1996) good organisational environmental management adds to the brand and reputation and provides competitive advantage to firms. Indian service organisations are realising the importance of brand to their business and are indulging in corporate branding to offer their services- be it aviation, banking, insurance, or information technology (Singh et al., 2011). For information technology companies, brand is useful in two ways. Firstly, it attracts new clients and secondly it helps get repeat business from the same customer (Bhandari and Suneja, 2010). The **very large IT** organisations compete in the same market for business, and their brand building through their commitment to quality, services and responsible behaviour has created an identity and reputation for these organisations among their customers and society. Brand value is recognised and discussed in all the five **very large IT** organisations' public documents and websites. It is recognised as an 'intangible asset' that is associated with the organisation as a whole and is not product specific. This further strengthens the importance of brand and corporate reputation in this group.

However, brand image can be a double-edged sword. It can help organisations gain new business while maintaining the old, but failure to recognise the organisation's environmental and social responsibilities can attract a negative brand image and equally affect the business (Lynes and Andrachuk, 2008). Interviewees from all the organisations here, recognise this association between brand image and environmental responsibility, for example,

> "We have been the earliest in the business of IT. We have our presence across the globe. We have a brand image that is directly linked to ... group of being responsible". (Head of Administration, VL1)

As all these organisations associate their brand and corporate reputation with environmental responsibility, e-waste management in these organisations also is an expression of this responsible behaviour,

> "… has been in the IT business for a long time now and has built an image for itself for quality and right practices. We extend these not only to our business but also related activities. In that sense I would say we take up sustainable practices to maintain that. E-waste is a part of this". (Sustainability director VL5)

In the **large IT** organisations there are differences with regard to the importance of brand image and corporate reputation to their business. Brand value and its importance for their businesses are addressed only by interviewees from three of the five organisations that are growing quickly in terms of size and range. Although these interviewees did not associate brand to include organisational environmental responsibility, interviewees from two organisations did mention brand as having played a role in the e-waste management practice they adopted.

> "Brand image and regulation come hand in hand and it has influenced our e-waste management practice". (Assistant Vice President L1)

> "We are part of [X] group and follow the [Y] procedures, so it is also our brand image that is driving us. Also we abide by regulations as part of our corporate commitment" (Head Technology L2).

Examination of the websites and organisational documents, such as annual reports, that did mention the importance of brand in these organisations, shows that brand in these documents is mostly associated with their product and services and not the organisation as a whole, as seen in the very large IT organisations. However, these documents point to the growing importance of brand image to them. The organisations that recognise the importance of brand for their business also have better evolved practices for e-waste management in this category. Abimbola and Kocak (2007) noted similar observations of competitive advantage of brand image by the fast growing and evolving organisations moving towards the top league in UK.

Brand image or corporate reputation did not gain any attention among the interviewees from the **SME IT** organisations, which did not have proper systems for e-waste management. Even when probed, none of the interviewees acknowledged it to be significant for their business and considered it to be important only for larger organisations,

> "The large companies are filing the returns (may be) because, they are more visible, in the eyes of the public, government, international community and for them brand is very important. So they need to live up to level of certain standards. That gives them lot of credibility when you sell yourself in the international market unlike us were we sell our services through our one to one interaction with the customer" (Director of SM5).

Wong and Merrilees (2005) observed similar low brand orientation among the SME service sector in Australia due to their assumption that brand building was futile at their level of business.

Porter (1985) while discussing competitive advantage of organisations described brand and reputation as signalling criteria, which are especially important for those organisations whose clients or consumers have difficulty in assessing the products such as the services offered by the IT sector (Burke, 1999). Despite the importance of brand, and its extension to include environmental responsibility offering increased value, this is not uniformly recognised among all the stakeholders. The inclusiveness of brand incorporating environmental responsibility, and its use as signalling criteria, is only recognised by the very large IT organisations. Environmental responsibility in these organisations has also broadened to include e-waste management. The inclusion of environmental responsibility as part of the brand acts as a signal of their 'proactiveness' to their clients (who were looking for environmental proactivity). For the large IT organisations, although brand and reputation are increasingly recognised as intangible assets, they are mostly associated with their product and, in most cases, did not include environmental and social responsibility as they did not experience such expectations from their clients. The importance of brand as an intangible asset providing competitive advantage is not recognised by the SME IT organisations.

Thus the importance of reputation and inclusion of environmental responsibility as part of brand depends on the size of the organisation and the stakeholder expectations. It has a **strong** influence on e-waste management practiced in the **very large IT** organisations. Although three of the five **large IT** organisations recognised the importance of brand image to their business and are working on brand building, it is more associated with product and customer satisfaction. This indicates that brand is growing in importance for these organisations, but its influence on environmental practices like e-waste management is only **weak**. In the case of **SME IT,** brand image did not exist as it was neither acknowledged nor recognised by the interviewees and so its influence on e-waste management practice is **absent**.

Financial benefits

All the bulk consumers only related to the direct financial considerations associated with e-waste management and did not link it to indirect financial benefits gained from intangible assets like reputation and competitive advantage over peers. Thus, the findings here on financial benefits only represent those associated with the direct costs and benefits of e-waste management to the organisations.

All the **very large** organisations own most of their facilities and do not have to spend much on additional warehousing costs associated with storing e-waste awaiting debonding and disposal. Although the warehousing cost is absent, the cost associated with safe storage of this equipment for health and safety reasons is not overlooked. Any potential fire would cause great damage too, as the volumes of IT equipment stored are high. As the Sustainability Director of VL5 indicated,

> "Yes, it is a challenge. We have to store not 100s, but 1000s. Because of STPI and SEZ norms all the equipment are bought at special price without excise and all are customs bond. The bonding period varies according to the type of the equipment. The bonding period can be 7-8 years but we may retire them in 4-5 years. We need to get approval from those agencies to take them out for donation or recycling. The paper work takes a lot of time. Every regional office has its storage space and we have to ensure they are safe".

The monetary value from the disposal of this equipment to the recycler is very meagre and is not considered to be significant by the organisations. So, "Financial factors are not important for us for e-waste disposal" (Facilities Head VL2).

This reflects the views of other interviewees from very large IT organisations. However, with one[43] exception, all the **very large IT** organisations disposed their e-waste either through tenders, where the highest bidder got the material as for VL1, or through negotiated price agreements with recyclers as for VL2, VL3 and VL4. In the case of negotiated prices, these did not impact the recyclers' profit and so the financial gain to the organisation through sale of used equipment was also low compared to tendering (as confirmed by the formal recyclers). Also, this group of stakeholders did not partake in the free take-back programme organised by the producers despite their direct association with them during procurement of equipment (6.2.5).

[43] This organisation's e-waste policy allowed it dispose the material without charging as it was recognised as waste with no material value.

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Thus, even though financial gains from e-waste disposal are not openly acknowledged, it has played a role, albeit a weak role in initiating the e-waste management practices in these organisations.

Four of the five **large IT** organisations operated from leased facilities, with rental charges proportional to leased floor space. So storage of used equipment generated within the facilities is a tangible cost acknowledged by all the interviewees from this group. Also they have been until recently in all the cases disposing their e-waste to scrap dealers and not specialised e-waste recyclers who offered them higher value at the time of disposal. The monetary value from the disposal of e-waste although small still is important to their book keeping system as the AVP Administration of L4 puts it,

> "However, technically the auditor will raise a question as why I am giving my EOL for free when I can get some money from recyclers".

Thus, these organisations are faced with two situations with regards to financial consideration for e-waste management. One, they need to dispose their e-waste periodically as its storage adds to their operational costs, and two they look for best price at the time of disposal of e-waste as they still consider it to have value. While the former consideration drives these organisations to dispose their e-waste, the latter drives the material into the hand of those operators who offer them best value and easy collection of the material. These operators however, not all the time adopt correct procedure for e-waste treatment. For these organisations the financial value of e-waste at the time of disposal is important and this affects the management and material flow of e-waste from their facilities.

The **SME IT** organisations look for maximum value at the time of disposal of even the small quantity of e-waste they generate, "We send it to scrap. These are general scrap dealers. They come and ask and we sell it to whoever gives maximum price". (Entrepreneur SM1). Nine of the ten **SME IT** organisations operated from small leased spaces. This limited space also means they do not have and cannot afford spaces to store used IT equipment. They are cost sensitive and so financial considerations of operation are very important to them. They do not have knowledge and easy access to facilities that offer proper treatment of e-waste and value at the time of disposal. So proper e-waste management is seen as a cost to them as it means time away from their core work requiring extra resources. The informal waste collector collects the waste from their doorstep and offers the expected value to them at the time of disposal of e-waste. Although storing used IT equipment increases their operational cost, they still did not prefer to give the material away for free. They dispose it through operators who give them highest value at the time of disposal, which is the informal sector. So it can be seen that financial considerations have a role in these organisations in diverting the e-waste for treatment and influencing the e-waste management adopted by them.

The financial considerations associated with e-waste management here refer to the cost associated with the warehousing of e-waste and the financial benefits sought by the stakeholders at the time of disposal (for the bulk consumers), and procurement (for the formal recyclers). This direct cost associated with e-waste management is quite different from costs recognised in the broader literature on environmental management, which represents the cost of compliance (Berry and Rondinelli, 1998) or cost associated with implementation of EMS (Hillary, 2004) that includes resource expended on development, training and audit of EMS (Wenk, 2005).

E-waste, by being a source of revenue, is managed differently by different bulk consumers. For the very large IT organisations where the revenue generated at the time of disposal of e-waste is insignificant, financial considerations only have a weak role in determining their approach. However, for the large and SME IT organisations which value the revenue generated at the time of disposal of e-waste, this alters their practice. Although the large IT organisations have begun to use the services of formal recyclers to dispose their e-waste, they seek better value for the e-waste at the time of disposal and only take minimal necessary measures (like checking for a license to operate) before disposal to formal recyclers. This is also true for the SME IT organisations that seek best value at the time of disposal of e-waste and so prefer to use the services of the informal sector that offers them a higher price for their e-waste. In general, waste management in organisations is considered as a way to reduce cost by not only optimising resource use but also cutting costs associated with its disposal (Shrivastava, 1995). However, the unique nature of e-waste (having extractable valuable material in pure form) and the value attached to it by the consumers in the developing country brings a new dimension to waste management. The findings here suggest that when the waste is considered to have value its management is significantly affected by the expected revenue it generates. However, the importance of expected revenue is also affected by the size of the organisation.

From the above discussions it can be inferred that although direct financial benefits are not openly acknowledged by the **very large IT** organisations, their influence cannot be overlooked as only one of the five organisation in this group gave away its e-waste material for free. But only has a **weak** determining strength on the e-waste management practiced by this group as the costs associated with its management and economic value recovered from disposal is low. However, direct financial considerations play a **strong** role in the e-waste management practiced by all the **large** and **SME IT** organisations as they are more cost sensitive. This is also evident from their disposal of e-waste material to highest bidder.

Corporate culture and leadership

Deshpande and Webster (1989) define organisational culture as “the pattern of shared values and beliefs that help individuals understand organisational functioning and thus provide them with the norms for behaviour in the organisation” (p 4). Thus it can also be constructed as the perception of the employees about the organisation. Leadership is also closely linked to the corporate culture. The founders and leaders within the organisation bring strong cultural identity to the organisation and influence it (Kasper, 2002).

The IT service sector is young compared to other traditional industrial sectors in India, and has created a culture for itself, which is different from the 'traditional' Indian companies. It has a flexible organisational structure and the work relation is informal compared to the 'traditional' companies (Upadhya and Vasavi, 2006). This flexibility makes the top management more approachable and open to employees. Also the average age of employees in the Indian IT service sector is 27-29 years (Mishra, 2011). These young and environmentally aware - on a global scale - employees also play their part in shaping the organisational culture. This employee enrolment in shaping the environmental response of organisation is seen strongly among all the **very large IT** organisations,

> "We have these youngsters in the recent years that are more aware than earlier generations. We call them 'millennials'. They are very aware. They want us to be responsible and want us to do these things." (Sustainability Director VL5)

In all the **very large IT** organisations, this attitude among the employees has strengthened their actions in social and environmental spheres. The employees also see their organisational commitments to these aspects and the emphasis on their importance by their leaders. The top management reciprocates this by identifying and supporting such causes brought by employees thus creating a circle of motivation and participation. As the EHS head of VL2 confirms, "We see passion in youngsters and we use that to bring in awareness and creating more ambassadors for sustainability".

Thus, the organisational culture has influenced the awareness on environmental issues among the employees.

Most of the **very large IT** organisations were started in late 1980s by groups of individuals that had foreseen the future of IT in the country. The importance of sustainability in business is well recognised by these leaders and they do perceive it to be important for the future of their business (Mozumder, 2009; Shanbhag, 2011b). Thus, sustainability and social responsibility issues come directly under the purview of top management. These leaders continue to drive these thoughts to their employees. As the Director of Sustainability from VL3 says,

> "Our challengers are not our competitors or even the government. They are internal. Green is taking leadership everywhere. It is not only with the products but a corporate wide Chairman's vision".

The managers and employees recognise the commitment of their leaders to sustainability and integrate them in the operational response to environment and society. These organisational commitments to sustainability and the importance for their business are articulated well by their leaders in the organisational documents. Thus responses of the **very large IT** organisation to manage their e-waste are influenced by their corporate culture and the leadership that commits itself to sustainability.

In the case of the large IT organisations, all the interviewees acknowledged their organisational leadership's role in steering their organisational growth. "Today we are heading to join the top tier, because of the drive and vision of our leaders" (AVP L1). The analysis of the annual reports of these organisations further confirmed that their business leaders are more focused on growing their businesses through higher value for customers. Interviewees from three of the five organisations acknowledged the social commitment of their leaders, which is recognised by the employees. In these organisations the employees volunteer to contribute to such causes. "Our employees volunteer and teach computing in some of the government schools in the city as part of our CSR activity" – Facilities Head L2. According to the interviewees from these three organisations environmental responsibility is gaining the attention of top management who are driving the development of EMS in the organisation. However, their documents reveal that the leaders only support social good and engaged in corporate philanthropy through their CSR activities. Although environmental responsibility is gaining the attention of top leaders (according to the interviewees) who shape the organisational culture, it is only recognised at the higher management level and so has not transformed the organisational culture, as demonstrated by the minimal response of these organisations to the challenge of e-waste.

While the IT flexible work culture can still be seen among the **SME IT** organisations, these are much newer and usually lack strong visionary leaders driving them towards sustainability. These organisations are driven to stay in the market by gaining business and so their leaders do not recognise their role in the business response to environment. Among the SMEs the level of environmental awareness is still low both among the top management and employees,

> "Unless you bring it as statutory requirement none of the so called leadership will pay attention to this. "Unless it is my passionate baby" like for WIPRO Premji, who was so passionate and converted the entire canteen to run from the energy generated by kitchen waste mechanism. That is the leadership he brought to the table. Not all people are like that". (Director, SM5)

These organisations lack organisational culture or leadership towards sustainability, which has further added to lack of proper e-waste management.

Previous research based on observations made in developed countries has shown that organisational culture that regarded environmental issues as an integral part of corporate identity helped in achieving superior environmental performance in organisations (Klassen, 1993; Russo and Fouts, 1997; Sharma, 2000; Fernández et al., 2003). Also research has shown that leaders were very important (irrespective of nature of business) in reaching the most advanced levels of environmental development (Azzone and Bertelè, 1994; Egri and Herman, 2000). Although organisational culture and leadership and its role in the growth of the Indian IT service sector has received previous attention (Arora et al., 2001; Paul and Anantharaman, 2004) its role in the responsible social and environmental behaviour of the organisations has not been examined. In this research, focusing on the Indian IT service sector, it is observed that the organisational culture and leadership in the very large IT organisations acknowledges its social and environmental responsibility and this influences strongly the environmental management practices adopted by these organisations. In comparison, when the organisational culture and leadership did not pay much attention to the environmental responsibility of the organisations, as in the case of large IT organisations and SME IT organisations, their environmental management is also minimal. According to Hillary (2004), such disregard for environmental management in SME organisations in UK stemmed from the belief of the organisational leaders that environmental management was cost drain on time and resources, which also holds good here.

Thus, the well developed practices for e-waste management seen among all the **very large IT** organisations has been **strongly** influenced by the sustainability vision envisaged by the leaders and organisational culture that recognised environmental responsibility. In the case of **large IT** organisations only three of the five organisations demonstrated some progressive corporate leadership, but this did not extend to include environmental responsibility fully. So its influence is only a **weak** one. In the **SME IT** organisations, pro environmental leadership and culture is completely **absent** and so it has no influence on the e-waste management practice in these organisations.

Corporate social responsibility

The corporate culture and leadership that is committed to sustainability has also shaped CSR in these organisations. Corporate social responsibility, which initially started off as philanthropic activity of the business owners, today stands as a force that needs to be acknowledged by business if it is to survive (Carroll 1991). In response to this expectation, the **very large IT** organisations report on the triple bottom line with three of the five very large IT organisations report using the GRI framework on sustainability. Unlike annual reports that only disclose the financial position of the organisation, these reports disclose the various measures taken by the companies in the areas of environment and society and are available to all on their company websites. These organisations have been, and are, the forerunners in taking the Indian software service to a global level. These organisations recognise societal expectations and respond to this by being proactive in their CSR efforts (Sivakumar, 2010 ; Sharma, 2011).

The **very large IT** organisations have had programmes and activities on CSR for a decade, and most have a foundation, which is a separate entity within the group that carries out their CSR activities. The CSR initiatives come directly under the purview of top management here and employee enrolment in these initiatives are recognised and encouraged by their culture. These organisations also take their environmental responsibilities seriously which are well integrated in their CSR agenda that recognizes environment as one of the three pillars along with society and business performance; as recognised by researchers who advocate that environmental and ecological concerns should be integral to the corporate sustainability and responsibility agenda

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(Throop et al., 1993; Shrivastava, 1995). All the organisations in this group consider their donation of used, but functional, equipment as part of their CSR activity. Due to the environmental commitment in their CSR they are also putting mechanisms in place to track this donated equipment as a way of ensuring responsible management of e-waste, which they associate with their social responsibility,

> "To keep in line with our CSR and sustainability commitment we also know that there is a period in which the system will become EOL for them and become useless even to the schools. These schools may be in far rural area. So, we have put mechanisms…" (Facilities Head VL2)

The lack of commitment to sustainability and environmental responsibility by the organisational leaders and culture has also influenced the CSR activities in the **large IT** organisations. The evaluation of CSR activities publicised on the websites of **large IT** organisations and interviews with the members of these organisations indicate that they lean more towards social activities like education and empowerment with little or no emphasis on the environmental front. Four of the five **large IT** organisations donate used IT equipment as part of their CSR, and regard this as an activity that helps in bridging the digital divide by reaching to a wider audience who cannot afford such equipment. This donation also reduces their inventory stockpile of IT equipment that are functional but no longer useful within the organisation and gives debonding benefits, as donating equipment exempts the organisation from paying the debonding duty (6.2.2).

> "Right now we are phasing out CRT and replacing with TFT monitors. The CRT monitors can still be used. We have our own CSR trust through them we give our support to schools and slums and donate these so they can be used. In this way we are enabling the reach of technology." (AVP L1)

> "Earlier we would debond and donate. There are two things with debonding. Either we debond and pay the duty if the required period is not complete, or debond and don't have to pay the duty if we are donating. So we chose the latter option." (Head of Facilities L3)

Although these organisations donate equipment as part of their CSR, they do not verify the receipts or ensure that the material reaching the recipients are disposed properly at the end of its use as environmental commitment in their CSR initiative is absent. This is also an indication of CSR being more a supporting-factor than a main factor that drives the organisational e-waste practices.

The organisational leadership and culture of **SME IT** organisations lacks environmental commitment, which is also reflected in their CSR practices. Six of the ten organisations in this sector have donated their used equipment as part of their CSR. Interview data and observations of the organisations indicate that CSR activities in these organisations are not well developed and are more ad hoc. Also, there is no commitment to sustainability under CSR in these organisations. This is not surprising, as the SME IT organisations are more growth focused and regard CSR as the game of larger players due to their lack of clear strategies like the large firms as observed by Jenkins (2004). However, by donating their used IT equipment they are not only trying to extend the useful life of these products (which according to them is a social good) but are also using it as a way to dispose equipment that is no longer useful to them.

Environmental concern is advocated to be one of the three pillars of CSR agenda (Throop et al., 1993; Shrivastava, 1995). This is now largely recognised by most organisations that have well developed CSR. Some research has even used the term CSR to discuss corporate greening (Fig, 2005; Tschopp, 2005) indicating it being a proxy for environmental response of corporations. The very large IT organisations have taken their environmental responsibility seriously and this is well integrated in their CSR agenda as indicated by the very large IT organisations' systems to track their donated e-waste which stems from their CSR agenda. In comparison, in the large and SME IT organisations the environmental concerns are yet to be integrated with their CSR. In these organisations donation of used IT equipment is ad hoc. The lack of any tracking mechanism for donated equipment in these organisations further indicates that once donated it is no longer considered part of the organisation's e-waste management practice.

Although environmental responsibility is considered an integral part of CSR in service industry (Lynes and Andrachuk, 2008), this research indicates that this may not always be true. The findings suggest that environmental concerns become integral to the organisations' CSR only when the organisational culture and leadership recognises and emphasises it and when there is demand for environmental proactivity, which improves business opportunity. Under such conditions organisations adopt a strategic CSR that is beneficial to both the organisation and its stakeholders (Burke and Logsdon, 1996). This is reflected here by the very large IT organisations that have well developed CSR that had integrated environmental responsibility and so recognised e-waste as an environmental aspect of their business. When this demand is weak or absent, and when the organisational culture and leadership failed to acknowledge environmental responsibility, CSR remained a philanthropic activity and failed to integrate environmental concerns; as seen in the case of large and SME IT that had adopted CSR on an ad hoc basis, which did not consider environmental responsibility integral to it.

Thus, the commitment to environment in CSR (shaped by the organisational culture and leadership) demonstrated in all the **very large IT** organisations is playing a **strong** role in determining the e-waste management adopted by these organisations, where e-waste management has extended to include tracking of donated equipment. The low emphasis on environmental responsibilities in the CSR of four of the five **large IT** organisations, along with the practice adopted by these organisations while donating their equipment indicates **weak** role of CSR in determining their e-waste management practice here. Similarly, the ad hoc donation of equipment as part of their CSR in all the **SME IT** organisations points to its weak influence on their e-waste management practice. Table 7.1 summarises the strength of various factors in the IT bulk consumer organisations.

Table 7.1 Strength of factors in the IT bulk consumer organisations

Organisation	Regulation	Peer pressure	Client requirement	Brand image	Financial benefits	Corporate culture and leadership	CSR
VL1	Strong	Strong	Strong	Strong	Strong	Strong	Strong
VL2	Strong	Strong	Strong	Strong	Weak	Strong	Strong
VL3	Strong	Weak	Strong	Strong	Weak	Strong	Strong
VL4	Strong	Strong	Strong	Strong	Weak	Strong	Strong
VL5	Strong	Strong	Strong	Strong	Weak	Strong	Strong
L1	Strong	Weak	Strong	Weak	Strong	Weak	Weak
L2	Strong	Absent	Absent	Weak	Weak	Weak	Weak
L3	Strong	Absent	Weak	Weak	Strong	Weak	Weak
L4	Strong	Absent	Weak	Absent	Strong	Absent	Weak
L5	Weak	Absent	Weak	Absent	Strong	Absent	Absent
SME1	Weak	Absent	Absent	Absent	Strong	Absent	Absent
SME2	Weak	Absent	Weak	Absent	Strong	Absent	Absent
SME3	Weak	Absent	Absent	Absent	Absent	Absent	Absent
SME4	Weak	Absent	Absent	Absent	Absent	Absent	Weak
SME5	Weak	Absent	Absent	Absent	Strong	Absent	Absent
SME6	Absent	Absent	Absent	Absent	Strong	Absent	Weak
SME7	Absent	Absent	Absent	Absent	Absent	Absent	Weak
SME8	Absent	Absent	Absent	Absent	Strong	Absent	Weak
SME9	Absent	Absent	Absent	Absent	Strong	Absent	Weak
SME10	Weak	Absent	Weak	Absent	Strong	Absent	Weak

7.3 Enablers for E-Waste Management in the IT Bulk Consumers

While e-waste management is determined by certain factors discussed in the last section, enablers help in implementing e-waste management practices in the organisations (4.7). These enablers, which were identified in the pilot study, were explored further during the data collection. This section presents the facilitating role of the three enablers viz. EMS, awareness, and access and availability of recyclers, in implementation of organisational e-waste management practice among the bulk consumers.

Environmental management system

An Environmental Management System (EMS) was observed to provide a framework for organisations in general to manage their environmental impacts by integrating environmental aspects of the firms with their organisational structure and operation (Roy and Vézina, 2001). It enables identification of the organisational environmental impact by taking into consideration not only legal requirements, but also other stakeholder expectations and environmental risks associated with operation (Alberti et al., 2000; Line et al., 2002). EMS also serves as a signal for good environmental management practice in the organisation in general (Delmas, 2002). These observations from past research that have studied the organisational EMS in developed countries also hold good for the case of Indian IT service sector.

All the **very large IT** organisations have EMS in place, which in most cases are certified. These organisations started their initial operations from leased premises, and over time their businesses grew to become today's top tier IT service organisations in the country. To accommodate this growth they started acquiring their own real estate space to construct their facilities. These spaces are huge and most often their construction and operation require clearance from the state PCB for discharge of water and emissions into air. With increased environmental liability, they are required to file details on water and air emissions annually to the environmental regulators of the respective states. As the Sustainability Director of VL5 said, "As we grew we started having our own facility so responsibility increased".

Moreover, this growth meant that they needed to have unified well-monitored systems in place that are well communicated to employees and external stakeholders. EMS proved to be a tool that provided opportunities for comprehensive understanding and action towards their environmental objectives that have become important for their business and brand image. Thus, EMS began to be adopted in these organisations. As the Facilities Head of VL2 said,

> "Many of these things were done without an EMS in place. But there was no consistency among the different units. So we wanted to make sure that everyone understands what the organisation stands for, what its vision is with respect to

environment and articulate to the stakeholders inside and outside the organisation. The clients also started asking us if we had EMAS/ ISO etc."

All **very large IT** organisations have an environmental policy. However, only two of the five organisations have a separate e-waste policy; in the others e-waste management is part of their EMS. EMS has helped these organisations to recognise the environmental impact of e-waste and the need to handle it safely that has led to the development of their e-waste management practice. Thus EMS provides the starting point, and also the necessary organisational resources like manpower and finance, to implement e-waste management. It can be inferred that having a well-developed EMS has played a definite role in e-waste management in these organisations, as the Head of Sustainability of VL3 said, "EMS offers a complete framework of measurement and has helped in managing the e-waste". A further indication of this is that e-waste targets and actions are part of EMS in most organisations.

Four of the five **large IT** organisations still operate from leased facilities, while one operates from its own smaller (compared to very large organisations) facility, and so do not have to obtain environmental clearance from state PCB for their operation. Therefore, there is no regulatory demand on them as such to manage their environmental aspects. Only one of the five **large IT** organisations has gone for certified EMS for one of their facilities. This is also quite recent and mainly due to client demand. With the changing regulatory requirement and developing client demand to manage their environmental impacts, these organisations are more likely to shortly go in for EMS. An EMS would also make these organisations identify the environmental aspects like e-waste and help them manage it better. Although these organisations are looking at e-waste management, they do not have structured operational approaches and dedicated manpower to do it well, as indicated by the level of e-waste management practice. The non-prevalence of EMS further supports the minimal and late adoption of practices to manage their e-waste.

The **SME IT** organisations completely lack EMS similar to SMEs in other sectors. These organisations do not see the importance of EMS for their business, as there is neither any regulatory or other stakeholder demand to manage their environmental impacts. The absence of EMS and lack of proper e-waste management in these organisations further strengthens the useful role of EMS in identifying the environmental aspects of their operation.

The very large IT organisations have certified EMS and have used the framework offered by EMS to identify environmental aspects of their operation like e-waste management. The certified EMS also signals their good environmental practice to their stakeholders (clients and regulators). In comparison, EMS is not prevalent among the large IT organisations which has a minimal level of e-waste management, while it is absent among the SME IT organisations which did not pay due attention to the issue of e-waste generated in their organisations. According to Hillary (2004), one of the key drivers for EMS in the SME sector was their customers. This requirement from customers for EMS is less for the large IT and absent for SME IT organisations. SMEs regard EMS as cost draining, which acts as a barrier for EMS

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implementation as identified by Kirkland and Thompson (1999) while analysing barriers to EMS in SMEs in Canada. Thus, these two together have resulted in low (large IT) and no (SME IT) presence of EMS in these organisations, which has further resulted in their minimal approach to e-waste management. The role of EMS in reducing environmental impact and its absence making it hard for the SME organisations to identify their environmental impact was also noted by Ammenberg et al. (2002) in their review of environmental management practices in the SME manufacturing sector. The visible presence of EMS in the very large IT organisations and their better e-waste management compared to lower prevalence of EMS in the large IT organisation and absence of EMS in the SME IT organisations and their poorer management of e-waste, points to the facilitating role of EMS in implementation of e-waste management in the organisations.

Awareness

Awareness plays a dual role in environmental management. It not only helps in the recognition of environmental impacts of firm specific activities, but awareness among the employees also helps in proper implementation of the environmental management plan devised within the organisations to manage their impacts (Boiral, 2002). Awareness about e-waste is quite varied among the different groups of the bulk consumers. The **very large IT** organisations have participated in workshops organized for the drafting of the e-waste regulation and so are quite aware about the problem of e-waste compared to the organisations in other groups. The existence of a separate e-waste policy or e-waste being part of their EMS is a further indication of the influence of this awareness on their e-waste management practice. These organisations, by being aware about the necessity to manage e-waste, are also playing their role in taking this awareness to a wider audience through their employees. 'E-waste recycling bins' for disposal of used small personal electronic equipment (like mobile phones, calculators, mobile audio players, etc.) of the employees were observed in many facilities at the time of visiting the facilities for interviews.

Thus, in recent years the level of awareness of e-waste among the employees has grown, although not all of them know about the actual process and measures taken in the organisation to handle this, as admitted by the interviewees. This improved awareness is further expressed by the growing maturity of their e-waste practice. The very large organisations are now restricting the donation of used IT equipment or putting in place systems to track the material that they donate so that it can be channelled to proper e-waste treatment facilities as indicated by the facilities head of VL2,

> "This process is less than a year old. Before we used to donate this but not track it beyond. We realized that if there was restriction of import of e-waste, by sending our EOL to schools we are also pushing our e-waste burden on them. We look at improving this as our awareness is growing".

Awareness about the impact of e-waste is less among the **large IT** organisations as indicated by the relatively recent change in their disposing practices for e-waste (from scrap dealers to formal recyclers). These organisations have not been involved in the drafting of e-waste rules in the country. The various state PCBs that are entrusted with the implementation of the new e-waste rule are organizing awareness programmes for this group of organisations recognising the increasing quantity of e-waste generated by them and the need to manage it well. This further indicates the lower level of awareness in this group along with it being an important starting point for these organisations to manage their e-waste correctly. This low level of awareness on the impact of improper handling of e-waste has also resulted in continued donation and lack of tracking of donated equipment from these organisations, as they do not recognise the impact of this practice on the overall e-waste management system. Further, they also do not pay any attention to recycling practices among the formal recyclers and hand over the e-waste to anyone with a license. Thus lower awareness on the issue has played a role in the reactive response of these organisations to the challenge of e-waste.

In the **SME IT** organisations, interviewees from only three of the ten organisations had some awareness of the issue of e-waste (but not environmental impacts of improper treatment of e-waste). The SME firms interviewed unanimously agree that awareness is important for them, and is the starting point for e-waste management. Most of them (eight of ten) are not aware about the new e-waste regulation that was implemented in May 2012. In the words of an entrepreneur SM6, “There is not much awareness about e-waste in this sector. We are not aware of the new e-waste rules”. This lack of awareness also has played its part in the lack of e-waste management among the SME.

In the case of the very large IT organisations, the level of awareness about the impact of e-waste and the need to manage it is high among the managers and top management. This awareness enables them to recognise the environmental impact of improper management of large quantities of e-waste generated by them. This awareness has also made these organisations develop systems to ensure that material going to secondary users through donation reach proper treatment facilities at the end of its useful life (6.2.6, 6.5.4). However, it must be noted that there is scope for further improvement in this awareness as these organisations do not yet completely understand the hierarchy of good waste management practice that emphasises reuse and refurbishment over recycling (6.7). As these organisations become more aware about the hierarchy of good waste management they could encourage reuse and refurbishment and so improve their e-waste management systems.

In the case of the large IT organisations, awareness about the impact of improper management of e-waste and the need to manage it is slowly developing. This awareness is playing a role in the observed change in their preference for using the services of formal recyclers over scrap collectors. The SME IT organisations are not aware of the impacts of improper disposal of e-waste and this is further adding to their choice of the informal sector for disposal of their e-waste. According to McKeiver and Gadenne (2005), this lack of awareness of environmental issues was not uncommon among SMEs in the service sector due to the belief that their business does not impact on the environment. From the above it can be inferred that awareness about the environmental aspects of operation enables environmental management in organisations in general as discussed by Perron et al. (2006). When organisations are aware of the environmental impacts of improper management of e-waste, they develop better practices for its management. The improved practice in turn improves the awareness among the employees who take it into wider society through their family and friends. Thus, awareness of e-waste issues facilitates adoption of practices in organisations to manage it, and confirms previous research observations on the importance of awareness in organisational environmental management.

Availability and access to formal recyclers

The availability of resources plays an important role in determining the environmental responses of organisations (Sharma et al., 1999). Since the organisations are embedded in a network of interdependencies they depend on external sources for certain resources (Pfeffer and Salancik, 2003). In the case of e-waste management, the organisations depend on formal recyclers to treat their generated e-waste. Although the IT organisations are the generators of e-waste they do not have the capability to treat this e-waste. As these stakeholders depend on external services provided by the formal recyclers, the availability and access to these formal recyclers has an enabling function in these organisations to take up proper e-waste management. During the fieldwork, it became clear that even well-structured e-waste management practices among the very large organisations, was less than five years old. On probing at this delay in adoption of e-waste management practice despite having EMS, it was revealed that this was due to lack of authorised e-waste recyclers in the country until 2005 that could handle the e-waste correctly. Interviews with regulators and information from Central Pollution Control Board website confirmed this; the number of e-waste recyclers is growing in the recent years and is 23 as of 2010 (CPCB, 2010).

The **very large IT** organisations acknowledge that the presence of growing numbers of e-waste recyclers, and their accessibility in recent years has helped them in handling their e-waste responsibly, as the EHS manager of VL2 confirms,

> "Initially there were less recyclers but now their number has slowly risen and that has made it easier for us".

This increased number of formal recyclers also means that these organisations that have facilities across the country are now able to dispose their e-waste to the recycler at the location without having to transport them to a central location as they had done in the past.

The **large IT** organisations are beginning to be aware of the issue of e-waste and the need to handle it carefully, but want to tackle it without affecting their profits and other operations. These organisations are looking for facilities to dispose it safely. The formal recyclers have not approached these organisations to market their services, as they have done with the very large IT organisations. As a result of non-availability of formal recycling services, all the five organisations had disposed their e-waste through scrap dealers, who approached them regularly. With growing awareness about the issue and the changing regulatory system, the large IT organisations are looking at the information provided in the regulator's website to identify and contact the formal recyclers. Four of the five large IT organisations are now disposing their e-waste through formal recyclers. They are price sensitive and so give their material to any registered formal recycler without ensuring if the operations of these recyclers are safe. They assume that all formal recyclers have similar processes that are safe. The quality of operations of these formal e-waste recyclers varies due to their price sensitive nature and weak monitoring system (6.6.3).

The **SME IT** organisations, in general, lack knowledge about formal e-waste recyclers. The current practice in all of the ten organisations is to give their e-waste to any scrap dealer who approaches them and offers the best price; the formal recyclers have not approached them. They have also not received any information about such authorized recyclers from any of the forums or regulatory bodies that could have shared this information. Since storage of non-functional equipment takes functional space, these organisations prefer to dispose without storage. Also, they are sensitive to the value paid for this material at the time of disposal. The scrap collectors approach them regularly and offer their expected price at the time of disposal of these materials. Therefore, they prefer to use the services of the informal scrap collectors in the absence of any collection mechanism with appropriate value offered by the formal recyclers. As these entrepreneurs put it,

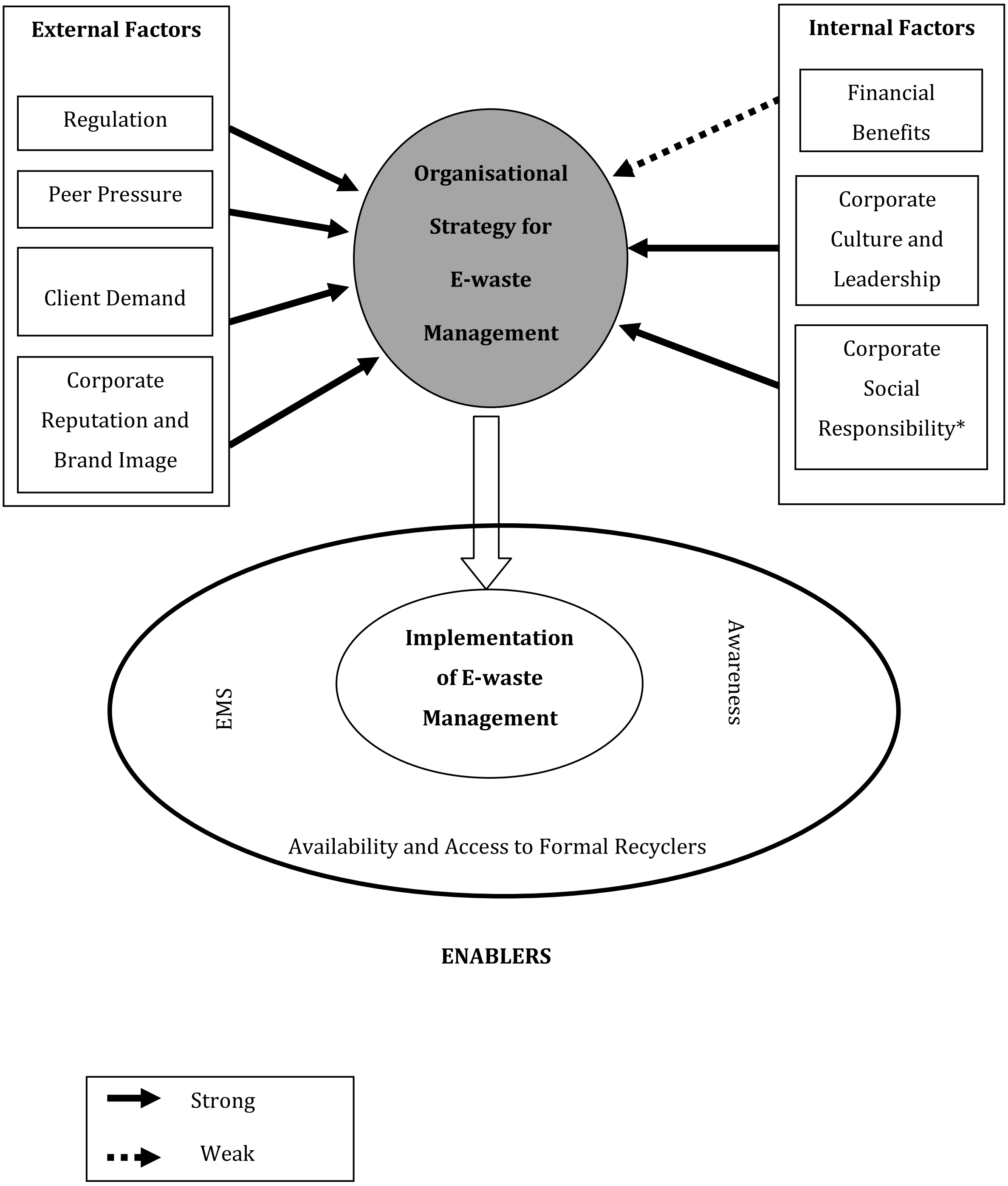
> "Proper regulations and facilities would also be helpful. Facilities means appropriate collection service of these waste from our locations." (SM4)

> "…Also it is important to provide services that would facilitate this". (SM7)

Access to the services of formal recyclers is also important for users. The formal recyclers approach the very large IT organisations and collect the e-waste from their facilities. The large IT organisations have difficulty in accessing the formal recyclers, whereas the SME IT organisations are not even aware of the presence of formal recyclers and so hand in the e-waste to the scrap collectors from the informal sector. Such a positive influence of availability and access of recycling facility on the behaviour of users was also noted by Taylor and Todd (1995), where they found that difficulties in accessing recycling facilities acted as an important deterrent in participation of household consumers in waste management. Thus, lack of access to formal recyclers is a hurdle for them to take up e-waste management. Therefore, it can be inferred that availability and accessibility of recyclers who can handle the e-waste well is a necessary facilitator for implementation of e-waste management practice adopted by the organisations.

The strength of factors and the role of enablers in determining the approach to e-waste management among the very large IT organisations, large IT organisations, and the SME IT organisations are depicted in Figures 7.1, 7.2 and 7.3 respectively. The bold arrows arising from a factor indicate that the factor had a strong influence on the organisational strategy for e-waste. The dotted arrows represent those factors that had a weak influence on the organisational e-waste strategy. The absence of arrows from any of factor denotes no influence on the e-waste management strategy of the organisation. The transparent block arrow connects the organisational strategy for e-waste management to the actual implementation of the practice. This implementation is facilitated through the enablers (EMS, awareness and availability and access to formal recyclers), represented in the large oval frame. It can be noted that in the Figure 7.3 there is a cross mark on the transparent block arrow, which represents the absence of enablers in the SME IT organisations, which has resulted in these organisations having an ad hoc indifferent approach to e-waste management. The influence of factors driving organisational e-waste strategy will be discussed in detail in Chapter 8.

Figure 7.1 Factors determining and enabling e-waste management in the very large IT organisations



* Supporting-factor

Figure 7.2 Factors determining and enabling e-waste management in the large IT organisations

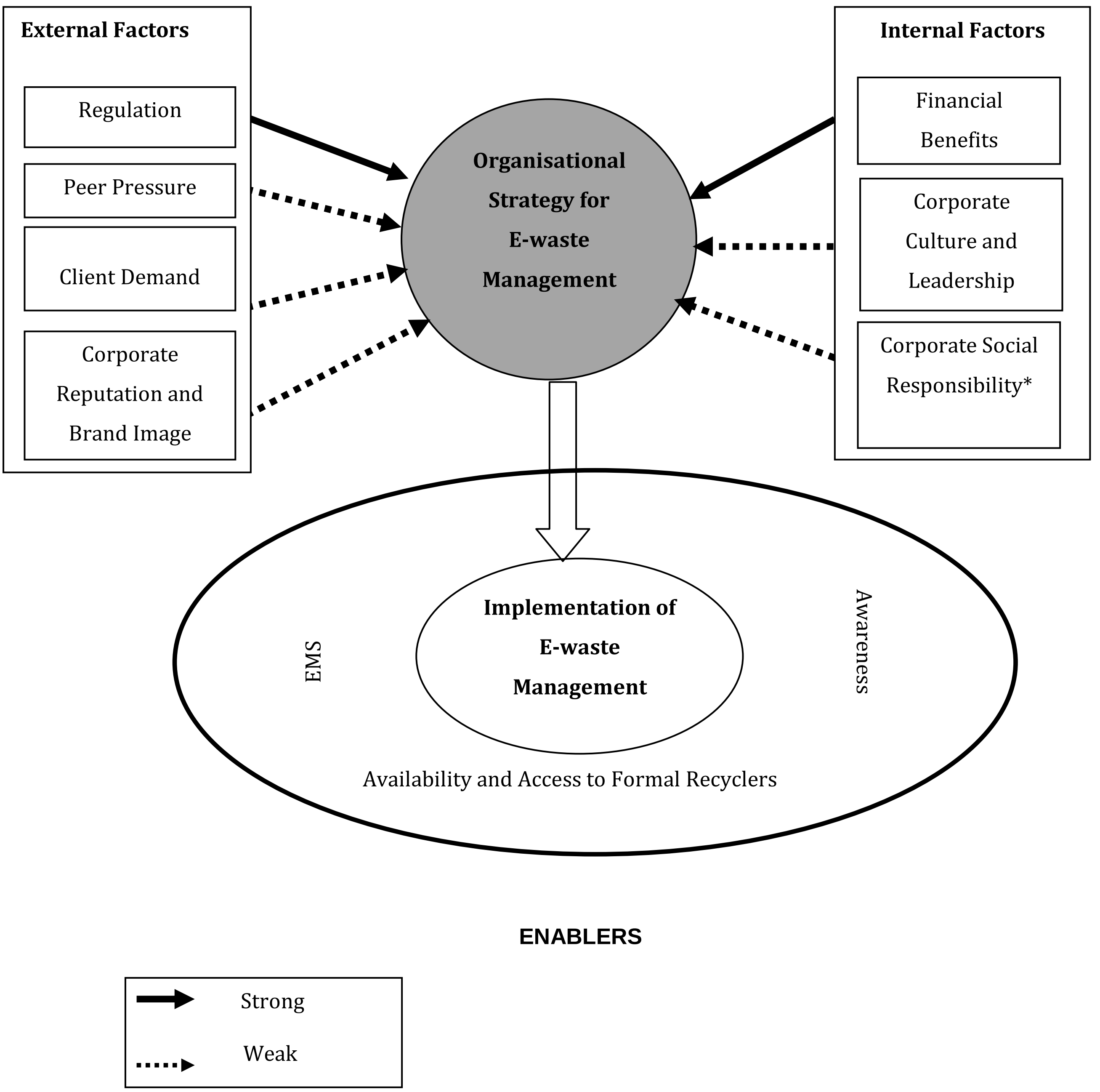


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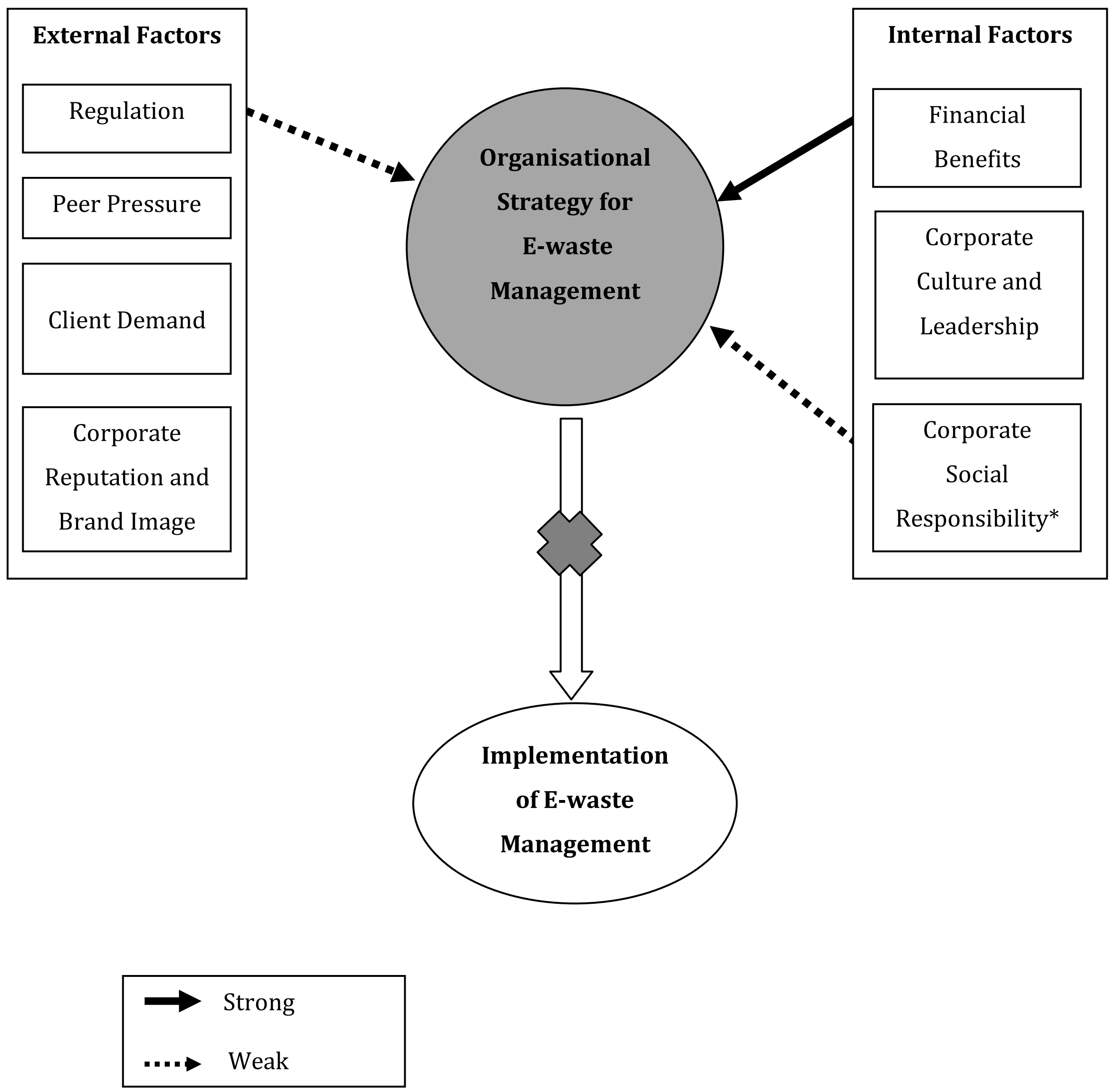
Figure 7.3 Factors determining and enabling e-waste management in the SME IT organisations



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7.4 Factors Determining E-Waste Management among the IT Producers

The IT sector bulk consumers are the focus of this research. However, globally there is emphasis on the IT producers to take up the responsibility for their end of life equipment. This global emphasis based on the principle of 'extended producer responsibility' has translated into various national and international regulations. Until May 2012 India lacked such regulations that emphasised the role of producers to manage the e-waste. The absence of regulatory requirement and increasing global pressure on producers to take up management of EOL waste influenced the Indian IT producers to initiate voluntary take-back mechanism (6.5.1). This section is a discussion on the factors that are influencing this sector to take up such voluntary initiatives for e-waste. The modified conceptual model developed for bulk consumers was also applied to the IT producers (4.7). Thus, the various internal and external factors influencing the **IT producers** to manage their EOL are classified similar to that discussed for the bulk consumers.

Regulation

Environmental regulations force corporations to maintain a minimum level of environmental responsibility (Zondorak, 1991) and it has been shown that it is an important driver for organisations to take up environmental issues for consideration (Henriques and Sadorsky, 1996). In contrast to the bulk consumers, who are exempted from any regulatory compliance with regards to e-waste at the time of data collection, the IT producers are not completely exempted with regards to e-waste and are covered under HWMHR from 2003 and monitored. However, the producer's responsibility for e-waste is only limited to that generated at the factories. The new regulation however necessitates producers also manage their EOL waste (5.5) in accordance to the international laws like RoHS and EU WEEE.

All the three producer organisations here are aware of the various international laws and anticipated similar laws in the country in the coming years. These organisations have directly, and through MAIT (Manufacturers Association of Information Technology Industry), played a proactive role in drafting the separate rule for e-waste in India. According to Okereke (2007) this kind of proactive measure demonstrated by polluting industrial sector provided leverage during policy development. Despite having played a role in initiating the separate e-waste rule, the producers are lobbying with the regulators with regard to collection quantity and mechanisms for implementing the EPR based e-waste rule (interview source former director MoEF). This lobbying has resulted in the absence of e-waste collection target in the new rule, despite its need being voiced by other stakeholders like civil society. The proactive and lobbying approach to regulation by the producers indicates their strategic approach to regulatory intervention. According to Reinhardt (1999) organisations take a strategic approach to regulation because regulation like tarrifs and other government interventions in the market, create rent or quasi rent for the organisations making them competitive and successful. In this case the proactive

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approach to regulation exhibited by the producers has helped them enhance their image among the social stakeholders like NGOs and help attain social legitimacy, while the lobbying has gained them time with regards to establishing collection mechanism to fulfil their EPR commitment.

All the three producer organisations have adopted voluntary measures to manage the EOL equipment even though regulations demanding this are not in place. Some researchers (Lutz, 2000) have viewed this kind of voluntary adoption as a strategy to forestall mandatory regulation, while others like Nehrt (1998) argued that adopting environmentally progressive policies could enable firms to develop strategic competencies and benefit from early mover advantages. Among the producers it is more the latter, as not all the producers in the country have voluntary take-back measures and by lobbying for regulatory intervention for management of EOL waste, the producers who already have systems in place would gain benefits through regulatory compliance levelling the playing field.

Analysis of the websites, annual reports and environmental policy statements of all the producer organisations emphasizes the importance of compliance to all applicable environmental regulations in area of their operation. From the interviews with the producers, the observation made in the field (monitoring by regulators, hazardous waste management board at the manufacturing facility etc.) and from the information drawn from their public domains, it is confirmed that regulation is an important driver for them to take up e-waste management. All the three producers included in this research had taken some measures to manage EOL waste in anticipation of the EPR based regulation in India. Thus regulation and anticipation of regulation plays a **strong** role for these organisations to take up e-waste management.

Peer pressure

All the three IT producers interviewed here have similar approaches to their manufacturing and EOL e-waste, and are quite aware about the practices among their competitors. Responsible environmental behaviour is monitored and ranked by international NGOs like Greenpeace. Greenpeace rates the IT producers on their ‘greenness’ (Business Standard 2009; GreenPeace, 2011) and the IT producers are quite keen to be rated well by them and work for it, as in the words of the Senior Product Quality Engineer P1 “Greenpeace evaluates the product beyond RoHS compliance and we have been in top 5 in the world over.”

The IT producers have been lobbying through associations like MAIT and CII for a separate e-waste rule in India to level the competing field as there is a large market for unbranded goods. Apart from enabling lobbying, these industrial associations also play a role in influencing practice among their members through awareness about peer practices. Such influence of industrial associations on firm behaviour and response was also noted by Bansal and Roth (2000), in their study that comprised multiple sectors across different countries. These associations not only bring peer recognition for the producers, which they value, but also help in sharing knowledge on best practice and knowing the current industry trends,

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> "We have recognition for general environmental practices not just specifically for e-waste by FICCI, CII, etc. What I understand is the big manufacturers have similar systems in place for e-waste management". -EHS Head P2.

This recognition gained from the NGOs and associations adds to their brand image and social recognition and so is important to them. The necessity to observe peer practices, as they are competitors, is also emphasized in their public documents. The time of introduction of voluntary take-back measures by the different IT producers in India and their e-waste management practices are similar. The influence of peers in environmental management and such voluntary initiatives was also noted by Anton et al. (2004) in 500 large companies in the USA.

The IT producers did not have a regulatory demand to manage their EOL in India at the time of data collection. However, they were under immense global pressure from NGOs, to manage their EOL in line with organisations in developed countries. Also, the new e-waste regulation in the country (not implemented at the time of data collection) required management of EOL waste by the producers. The absence of regulation at the time of data collection had resulted in the exemption of the participation of generators of e-waste. As a result it was challenging for the producers to implement EOL management in India in line with global expectations, without the active participation of generators of e-waste. The producers lack clarity with regards to managing their EOL waste. This lack of clarity has led them to adopt similar (mimic) voluntary take-back measures to manage their EOL. Dimaggio and Powell (1983a) noted such mimetic behaviour in organisations in general, when there was lack of clarity, and uncertainty with regards to the issue under examination. Thus peer influence has a **strong** determining role in the current e-waste management practice.

Corporate reputation and brand image

The producers of IT equipment are large organisations. Both the multinational (MNC) and domestic producers interacted during this research are well-recognised brands in the country. These organisations have different sales models to cater for individual and commercial clients. Marketing research has looked at the differing influence of branding on individual and business consumers (Fern and Brown, 1984; Gordon et al., 1993). Research on organisational buying behaviour indicates that intangible attributes such as reputation and image are important in business purchase decisions (Shaw et al., 1991). Hutton (1997), in his study on brand image in business buying using the case of office IT equipment, found that brand appeal was more significant with products that require greater service and support; and with individuals who are pressed for time or resources, and are concerned about the consequences of product failure on themselves and/or their organisation. This is true among the IT producers in India whose important business clients are the IT service sector for whom this equipment is the heart of their operations. The intangible attributes like reputation and brand, influence the buying decision of these business clients. The interviewees from the asset management team of VL5 confirmed the importance of brand and reputation in their procurement decisions for IT equipment, “We go for reputed brands that offer good service”.

Brand and reputation also become important for these IT hardware producers as they face stiff competition from their competitors due to falling product prices. The importance of brand for business from new clients and continued business from existing clients is not only acknowledged by the interviewees from all the three organisations, but is also emphasized in their annual reports.

The brand image and reputation that adds positively to their sales volume and business also brings some associated responsibility, including environmental responsibility. All three producers interviewed recognise this and have well defined EMS with e-waste being recognised under the EMS. Their facilities were ISO 14000 certified and so e-wastes generated in the factory are handled in accordance with the set operating guidelines mentioned in the EMS.

These organisations see corporate reputation and environmental responsibility as two sides of the same coin. While they accept that brand image brings in associated responsibility, they also use this responsible behaviour to enhance their brand value. Preston (2001) in discussing sustainability among IT producers recommended that the organisation should work to build their brand image on environmental sustainability. While EOL equipment is beyond the scope of their site-specific EMS, as these are generated at the user end, these organisations have extended a voluntary mechanism for managing this EOL equipment. The producers interviewed acknowledged this as a way for them to express the importance they attached to sustainability, to their clients and wider stakeholders, which also adds to their corporate reputation and brand image. This view among the producers is well expressed by the EHS head of P2,

> “The marketing guys do stress about our environmental programmes and practices with the customers, which makes them aware about our sustainable practices and adds positively to our brand.”

Thus, the inclusion of environmental responsibility as part of their brand acts as signal of their proactiveness to the environmental NGOs (who are closely observing them). In the case of MNCs this brand image and corporate reputation is linked to their overall global company policy. According to a study by Ruud (2002) on the influence of MNCs on environmental management in India, nearly 50% of the MNCs studied considered the standards set by the parent firm to be the most important influencing factor regarding local environmental practices in India. This is also reflected in the current study where the MNCs acknowledge this as an important driver. These words of an EHS head of P3, “We are committed to our policies which are globally consistent” capture it well.

The domestic producer interviewed is part of a large corporation. The corporate reputation of the manufacturing division is linked to the overall reputation of the parent organisation that includes different businesses. Corporate reputation is seen as important intangible asset for the entire group and this emphasizes its importance for the domestic producer. The services head and product quality engineer of P1 jointly acknowledge this while discussing about the actions taken by the organisation to improve the collection of EOL waste, in the following words:

> "We tell our customers this is what I am doing for some of my other customers with regards to their e-waste. … Many don't understand what the issue (e-waste) is? So we tell what the issue is? How it is happening in India and how can we work together. By offering this take-back we are not only bringing awareness about this issue among our customers but it also adds positively to our brand image and reputation as a responsible and sustainable organisation".

From the above discussions it can be drawn that corporate reputation and brand image has played a **strong** role in making these organisations take responsibility of their EOL waste. They view this as one adding positively to their brand image. The influence of corporate reputation as a driver for corporate environmental responsibility among computer manufacturers was also noted by Dummett (2006).

Financial benefits

Responsible environmental actions of the firms do not come without costs. Financial cost was seen to be a mediating factor that encourages/discourages the firms to take up corporate environmental responsibility (Lynes and Andrachuk, 2008). Like the bulk consumers the interviewees from the all the three producer organisations only recognise the direct financial considerations associated with the current practice for e-waste management. This direct financial cost is minimal. As the producers consider the negative value of recycling will be offset by the presence of precious metals in the e-waste, they did not pay the recyclers for the material disposed to them (6.5.5). However, of the three producers, only one gave the e-waste generated in their facility free to the formal recyclers. The other two charged the recycler a minimal amount based on weight for the material value of the e-waste as required by their accounting system.

All the three producers bear the cost of transporting the EOL waste from bulk consumers to the recycling facility whenever consumers avail their take-back option. Currently the quantity of EOL equipment for recycling collected by the producers however is very small, as the producers could not disclose even the approximate quantity of such waste they collected. So the cost associated with management of e-waste (those generated from their facilities and EOL collected by them) is only **weak** for the current practice adopted by these producers. However, with the implementation of the new e-waste rule in the country, which puts the financial responsibility of EOL on the producers as elsewhere, this cost would certainly grow strong and play an important role for the kind of practice adopted by these producers in the future.

Corporate culture and leadership

The domestic producer is part of a large and reputed corporate group in the country. This group recognises the importance of sustainability of society and environment for its business and the proactive measures it takes in this direction is widely acknowledged. The leadership in this organisation emphasizes environmental responsibility, which is recognised by all employees and so environmental responsibility is well integrated in their organisational culture. Thus the actions of this organisation to manage their e-waste are a natural extension of their corporate culture for responsible environmental behaviour. The interviewees from this organisation also acknowledge this.

Both the MNC IT producers operating in India have taken up e-waste management in line with their parental organisation practice. The interviewees from these organisations acknowledge that their voluntary take-back mechanism for EOL waste in India is in line with their global parental policy and culture that recognises the importance of environmental responsibility,

> "… has a culture of environmental care and responsibility. World over … has recycling system, though it is not unified system, but the process as such is almost uniform." (EHS head P2).

The organisational culture to respect the environmental and societal need is also expressed in their sustainability report and websites.

All the producers are working to reduce toxic materials in their product which is a further demonstration of their environmental commitment and recognition of importance of environmental responsibility for their business. This recognition and response also indicates the top management commitment for environmental leadership. The information drawn from the interviewees and the documents about the organisations in the public domain demonstrate a strong corporate culture and leadership in these organisations, which has played an important role in the organisational responses to environmental and societal demands. Thus, it has played a **strong** role in the current e-waste management practice adopted by these producers. The strong role of organisational culture and leadership that has integrated environmental responsibility as part of corporate identity is in line with that observed in past research carried out in developed countries (Klassen, 1993; Russo and Fouts, 1997; Sharma, 2000; Fernández et al., 2003; Azzone and Bertelè, 1994; Egri and Herman, 2000), where it has been observed and shown to help in achieving superior environmental performance in organisations.

Corporate social responsibility

Like the very large IT organisations, environmental commitment is well acknowledged in the organisational CSR of producer organisations that also brought their sustainability report. All the three IT producers have donated IT equipment as part of their CSR; this equipment is not new but mostly from their facilities. Two of the three producers do not donate anymore for reasons ranging from allegation of their donation being seen as way to deal with their e-waste, to recognition within the organisation of limited use of the donated equipment. However, due to the environmental commitment in their CSR, in all the cases of donation (past and present) the producers asked their receivers to return the equipment at the time of disposal after its use. They did not keep track of whether these materials returned as these donations were done either through their independent foundation or through external foundations. As a result it is likely that like the donations from the bulk consumers, these materials also end up in the informal e-waste treatment facilities.

The IT producers in India, under the applicable HWMHR regulation, are only required to handle the e-waste generated during production. However, all the IT producers in this study have initiated voluntary programmes for take back of EOL equipment even in the absence of such requirements on them. The interviewees acknowledged that this voluntary initiative stems from their corporate responsibility, "We have been talking about taking care of environment. We are committed that our products don't cause environmental damage". (EHS head P3)

Analysis of their public documents and websites also confirms that CSR activities in these organisations are long standing, well developed and recognised; environmental responsibility is well integrated under CSR. Due to the environmental commitment integrated in the CSR it has played a **strong** role in changing the e-waste management practices in all the producers like, adoption of voluntary take-back and their move away from donation of IT equipment. However, it must be acknowledged that these recent changes in e-waste management practice despite the long history of organisational CSR points to CSR being more a supporting-factor than a factor that has a direct impact on their practice.

Other factors

Recently, business clients have begun to demand energy efficient and RoHS compliant products from the IT producers. However, such client requirements for e-waste management are still absent for the IT producers. This is also one of the reasons for the weak uptake of these voluntary programmes from their business clients. However, this client pressure is replaced by the demand from civil society or 'NGO pressure'.

Indian activists of the international NGO Greenpeace demonstrated in 2005 in front of these IT producer organisations as part of their global demonstration on toxicity in electronic products, which were acknowledged by all the interviewees from the producer organisations (Greenpeace, 2005b; Srikanth, 2005). According to Welford (2000) increasing concern for the environmental and social conditions at offshore production locations in developing countries has resulted in NGOs and other stakeholders in exerting higher pressure on the MNCs to take up environmental responsibility. The demonstrations by NGOs here targeted both the domestic and the MNC producers to restrict the use of hazardous substances and take responsibility to take back EOL equipment. The NGO pressure on all producers, irrespective of their origin, is because globally the electronic industry is facing extensive pressure to design products that are eco-friendly and manage their EOL waste (O'Rourke, 2005), which is bringing a change in these organisations' response to e-waste management. These demonstrations served as a wakeup call for the IT producers in India.

The interviewees from the producer organisations do recognise that such demonstrations pointing to their insensitivity to environmental responsibility, affect their brand image, which they certainly want to avoid. In the words of the Senior Product Quality Engineer of P1,

> "They voiced that … is 'hazardous product'; … is 'Hell'. This happened to … office in front of the main gates. So, that is the trigger. We understood that the nature of requirement is going beyond. We started from there and have been moving ahead. Not that we didn't know before. It was the sensitivity of change requirement was felt then. We are now recognized by Greenpeace as number one in green product. But we did not do because or for Greenpeace. We hired a consultant to understand the process change required. It was more 'next time should not come like 2006' and negative brand image to be avoided at any cost".

The NGOs have been quite active and working with the government and producers in developing the separate e-waste rule in India. Thus, although the IT producers do not experience this client demand for environmental management or take-back of EOL equipment, they are being watched by environmental NGOs, who demand these organisations take responsibility for developing green products and manage them at their end of life; in line with the global pressure on the electronics industry as noted by O'Rourke (2005). In the context of this research it can be noted that other than the regulatory demand, the only other pressure on the producers for environmentally responsible actions is from the NGOs who were shaping their normative response. Thus, the **NGO pressure** here has replaced the client demand experienced by the bulk consumers and thus played a **strong** role in initiating the voluntary mechanism adopted by all the producer organisations. Table 7.2 summarises the strength of various factors in the IT producer organisations.

Table 7.2 Strength of factors in the IT producer organisations

Organisation	Regulation	Peer pressure	NGO pressure	Brand image	Financial benefits	Corporate culture and leadership	CSR
P1	Strong	Weak	Strong	Strong	Weak	Strong	Strong
P2	Strong	Strong	Strong	Weak	Weak	Strong	Strong
P3	Strong	Strong	Strong	Strong	Weak	Strong	Strong

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7.5 Enablers for E-Waste Management in the IT Producers

This section presents the role of enabling factors viz. EMS, awareness and availability and access to recyclers in e-waste management among the IT producers.

Environmental management system

All the IT producers have certified EMS for their factory sites and the e-waste management is part of this EMS. As discussed previously (7.4), regulatory compliance to applicable environmental rule is important for the producers and this is also recognised in their EMS. This EMS helps them to manage their environmental issues such as e-waste, generated during production in a right way. The role and usefulness of EMS is acknowledged by interviewees from the IT producer group, "It is significant. We have e-waste disposition policy and environment policy. EMS provides the overarching frame for e-waste disposition". (EHS head P3). This is further supported by the observation that the EHS team within the organisation had an important role in the management and disposal of e-waste.

This EMS is site specific and does not extend to cover the management of EOL waste generated at the consumer end. However, having an EMS that includes e-waste management as one of its target areas has helped them to extend the systems developed under this to e-waste collected from the consumers. Further evidence of this is that the IT producers use the same formal recyclers that handle the e-waste generated at their factories to handle those collected from consumers. Thus the influence of EMS, although only limited to the waste generated at their factories, has also helped them to channel their collected EOL waste to proper treatment facilities.

Awareness

The number of MNC IT producers is higher compared to domestic IT producers in India. The awareness and need for e-waste management was recognised much earlier in the developed countries with international regulations being formed from as early as 2003. Thus the MNC IT producers were aware much earlier about the issue of e-waste. The presence of industry associations like MAIT and CII has helped in taking this awareness from international to domestic IT producers. Also, environmental activist organisations like Greenpeace and Toxic-links have targeted the IT producers to take up their responsibility for managing their EOL products correctly. This has resulted in making the IT producers more aware of the need to manage e-waste, compared to other stakeholders. This awareness of the need to manage their EOL waste appropriately has played a significant role in the voluntary take-back mechanism offered by them. This high level of awareness among the producers was also acknowledged during interviews with the regulators and members of industry associations like NASSCOM and MAIT. The high level of awareness among the producers, that has facilitated them putting voluntary take-back mechanisms in place, further strengthens the role of awareness as an important enabling factor for effective e-waste management practice.

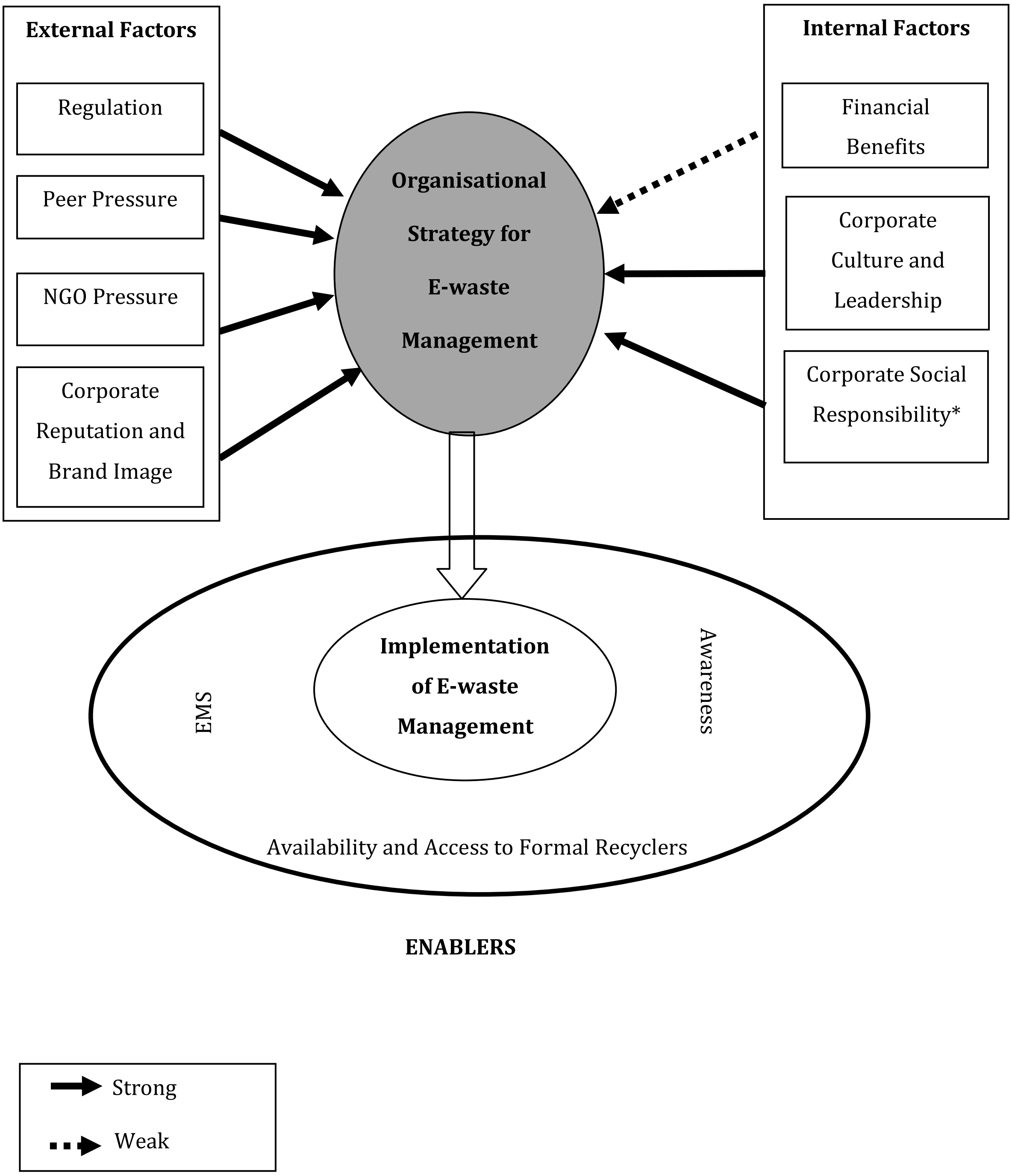
Availability and access to formal recyclers

Like the bulk consumers, the IT producers also do not treat the e-waste generated and collected by them and instead depend on outside expertise. However, having appropriate formal recyclers is more important to them because, globally, the liability of duly managing their EOL waste rests on the producers due to rules based on EPR principles. The formal recyclers in the country are relatively new (from 2005) and their process is not well developed; indeed they are more dismantlers than recyclers (6.6.2).

All the producers acknowledged that finding an appropriate formal recycler was a serious challenge for them when initiating e-waste management in India. It was also stated as one of the barriers for the MNC producers to carry out the operations similar to their parent office much earlier. As the EHS Head of P2 indicated, “Again execution of these plans was not easy in India as there were no recyclers”. The MNC producers also claim that they have played a crucial role in bringing certain global e-waste recyclers into the country and developing the skills and quality of domestic recyclers. Thus availability and access to formal recyclers has played a significant role in these organisations’ ability to implement their e-waste management practice.

The strength of factors and the role of enablers in determining the approach to e-waste management among the IT producers are depicted in Figure 7.4. The bold arrows arising from a factor indicate that the factor had a strong influence on the organisational strategy for e-waste. The dotted arrows represent those factors that had a weak influence on the organisational e-waste strategy. All the factors except financial benefits had a strong influence on the organisational e-waste strategy of IT producers. The transparent block arrow connects the organisational strategy for e-waste management to the actual implementation of the practice. This implementation is facilitated through the enablers (EMS, awareness and availability and access to formal recyclers), represented in the large oval frame.

Figure 7.4 Factors determining and enabling e-waste management in IT producers



* Supporting-factor

7.6 Factors Determining E-Waste Management Among the Formal Recyclers

The origin of the formal recycling business in India coincided with the demand for management of the growing quantity of e-waste that was especially being generated from booming IT service sector. As acknowledged by the IT producers and the IT bulk consumers, having formal recyclers, who could handle the e-waste without causing damage to environment and people, was a serious challenge in the initial years of e-waste management practice. These formal e-waste recyclers are regulated under the HWMHR from the time of their inception and are required to treat the e-waste they receive without causing environmental damage. The liability of breaching this requirement could ultimately result in cancellation of their license to operate by the regulatory authority.

Although only 5% of the total quantity of e-waste generated in India is available for recycling the number of formal e-waste recyclers is on the rise. The formal recyclers also experience severe competition for raw material from the informal sector, which process most of the available e-waste. The dearth of raw material for their e-waste processing has brought tough competition for raw material among these recyclers. This competition for material has resulted in some of the formal recyclers adopting substandard practices to handle the e-waste (Shanbagh, 2011a).

Although a PCB licence is required to operate as a formal e-waste recycler and PCB authorities verify their processes before granting a license, practice among the formal recyclers is not always consistent. Thus, among the formal recyclers there is a distinction between those recyclers who adopt safe practices abiding by the regulatory norms and the other formal recyclers who take advantage of the lax regulatory monitoring and adopt environmentally unsafe practices. This section looks at those factors that determine the e-waste management adopted by the formal recyclers. These factors are based on the amended conceptual model.

Regulation

This section focuses on the influence of regulation in determining the level of e-waste management adopted by the recyclers. To understand this it is first essential to understand the current regulatory demand on the recyclers and how it operates and manifests itself. The first authorized e-waste recycler in India was registered in 2005; prior to which there was no distinction between hazardous waste and e-waste recyclers. The formal recyclers are registered, as hazardous waste recyclers under HWMHR 2003 and this registration is valid for five years, subject to certain conditions. They are required to document and monitor risk management and EHS plans. Under the current regulation, each authorized recycler is required to file the quantity of e-waste handled annually to the respective state PCB (CPCB, 2008). As the formal recyclers transport the e-waste from their client's facility to their factory, they are also required to follow the transport emergency requirements under the HWMHR. In the case of formal recyclers, their operational recycling license from the regulators is important for their

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business as their major clients check this (6.2.7, 6.5.5) before giving them the material to recycle. Non-compliance with regulation would result in their losing the license and thus their business, and so regulation is an important driver for them due to the nature of their business as noted by Ghobadian et al., 1995 among the manufacturing sector in UK.

Despite such stringent regulation, the practices of these formal recyclers are debatable (Shanbhag, 2011a). The formal recyclers acknowledge that the regulatory mechanism is not very efficient as it lacks adequate verification of the recyclers at the time of granting license and stringent monitoring during their operation. The recyclers have to compete for material and the material reaches only those recyclers who can offer highest price to the consumer at the time of disposal (Bhowmick, 2011). This affects the quality of recycling practice among the formal recyclers. In the words of some of the recyclers,

> "The reason is though they have registered as formal recycler their activities are all not like a recycler, they are refurbishers and selling in grey market and so can offer higher price. Lot of recyclers are doing like that". - Senior Manager RC2

Although the recyclers recognise the weak monitoring, they welcome the new regulation for e-waste, which they anticipate would make regulatory compliance in handling the material easier, and also give them advantage over the informal sector by diverting the material from bulk consumers to them. They view the new regulation as one that would bring business advantage by levelling the field. Dummett (2006) in his study on drivers for corporate environmental responsibility in large national and multinational organisations in Australia also found that regulation was regarded as an important driver by electronic goods recycling organisations, as failure to comply would result in closure of their operations.

The formal recyclers here, also emphasize that unless the new regulation is implemented and monitored properly the material flowing to the informal stream and to formal recyclers whose practices are questionable cannot be stopped,

> "The informal sector will survive as long as the legislations are not implemented strictly. Lack of implementation of legislation is a serious problem in India." (RC2)

It must be noted that despite the possibility of material flowing from formal to informal recyclers due to regulatory lapses, the five formal recyclers that were part of this research have sound practices to handle e-waste and regulatory compliance is regarded important for their operation (as their clients also sought it) and it has **strongly** influenced their current practice to manage e-waste.

Client demand

The main source of material for the formal recyclers in this research is the very large IT organisations, with some material also coming from the IT producers. Both these clients did not just rely on the PCB license, but also audit the e-waste management operations of the formal recyclers to ensure that their material is handled properly. The recyclers here did realise the emphasis on proper e-waste management by their clients and abide by good practices to ensure the receipt of material for their operation from these clients,

> "They spend 3-4 days with us; check our methods and process and papers and documents. Yes, they do come and do detailed audit. Manufacturing and MNC companies do come to audit. About 30-35% of our clients audit us". (RC3)

Apart from auditing their process the clients also check their labour practices and also require them to have an occupational health and safety system (OHAS) in place. These client checks not only push the formal recyclers to handle the e-waste received by them appropriately, but also raise the ethical standards of their operation.

The client demand for proper environmental management is experienced strongly by all the formal recyclers, which plays a vital role in their adopting appropriate practice for managing the e-waste in spite of weak regulatory monitoring. Although supply chain management has been studied for waste recycling in industries (Dyckhoff et al., 2004; Hicks et al., 2005), these studies have mostly focused on material reuse or closing the material loop and not on supply chain pressure for management of operations in the recycling industry. The findings here indicate that supply chain pressure in the recycling industry can also extend to their operational practices, as indicated by the client audits of the formal recyclers (6.2.7, 6.5.5), which is further explored below.

In order to understand the reason for this client pressure on the formal recyclers, it is essential to understand the special case of the electronic industry and its link to recycling. In this industry the management of EOL is shouldered by the producers through various national and regional regulations. Despite the mounting pressure on electronic producers to manage EOL, due to dispersed supply chain, short life span of electronic goods and higher costs associated with collection, most producers prefer to outsource the recycling process which benefits them in the short term (Pagell et al., 2007). Although they outsource the process of recycling, they still need to ensure the EOL wastes are treated in a safe way as the liability of proper management of this waste continues to lie with them. Also as they are targeted and closely watched by civil society to take up the responsibility of managing these wastes, any mismanagement would tarnish their reputation and so pressure is exerted on these formal recyclers to handle their material safely.

The very large IT organisations, want to be recognised as responsible organisations. With growing client pressure on them to adopt green practices, they are taking this demand down to their service providers like the formal recyclers in this research. Furthermore, the formal recyclers are challenged with the need for a steady supply of material for their operation. Since the major sources of material for them are the very large IT organisations and IT producers, good client relations are very important to them. Heeding client demand for good e-waste management helps build client relations, which in turn helps their business as noted by Parisi and Maraghini (2010) in the case of new businesses. Therefore, in the absence of strict regulatory requirements, vigilant client requirement is playing a **strong** determining role in the adoption of better e-waste management practice among the formal recyclers.

Financial benefits

Despite the challenge for availability of adequate quantities of material for their process the number of registered recyclers is growing. The motivations for entering recycling business despite competition for material are the profitability they see here in the long run. There is a large quantity of e-waste in India. Depletion of global resources like precious metals, and rare earth metals, which are important for production of electronic equipment, is driving recycling to close this material loop (Srivastava, 2010). The formal recyclers see a future in this business as they forecast demand for recycled material. As these recyclers say,

> ‘There is money in recycling business’; ‘India has great potential for material’ (RC3);
>
> ‘Especially with depleting resources, future is going to be for recycling (RC5).’

The profitability and financial consideration that have made them venture into the recycling business also significantly influences their practice. Since competition is high and the price for the material offered to the consumer at the time of disposal determines their ability to remain in business, in order to survive they have to offer competitive price for EOL waste. Also, unlike in European countries where the recyclers are paid ‘gate fees’ at the time of collecting material for recycling that compensates for any negative recycling cost,[44] no such system is available in India for these recyclers. Thus the formal recyclers not only have to pay for the material but also bear the negative recycling cost associated with e-waste management.

Since financial considerations drive the consumers in choosing the formal recyclers, the interviewees from this group acknowledged that some formal recyclers offer higher prices to the consumers to sell the e-waste collected by them to the informal sector. This cost, associated with procurement of material, also makes the formal recyclers to look for viable and less price sensitive sources of material like very large IT organisations and IT producers in comparison to the large and SME IT organisations that are more price sensitive and do not generate viable quantity of waste periodically. Thus, the direct financial consideration associated with e-waste management **strongly** determines the practice of these formal recyclers.

[44] Negative recycling cost refers to the cost associated with properly treating material that is environmentally damaging, which incurs additional cost to the recycler without any associated gain e.g. CRT monitors.

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Other factors

The formal recyclers are a relatively new sector of industry in the country. According to Aldrich and Fiol (1994, p 650) organisations in new industrial sectors “without the advantage of sociopolitical will and taken for granted activity have to use personal and interpersonal resources they possess to interact with extremely sceptical customers, creditors, suppliers, and other resource holders, who are afraid of being taken for fools”. Thus, the external factors like peer pressure[45], NGO pressure and internal factors like brand image and corporate culture and leadership that are clearly manifested in the other stakeholders are not manifested clearly yet in these organisations or discussed by the interviewees. However, three of the five organisations make donation of electronic equipment as part of their CSR. The CSR in these organisations is more ad hoc and has not gained much organisational commitment. The recyclers do inform their recipients to return the equipment after its end of use, but this practice is relatively new among the formal recyclers (Chapter 6.6.4). Although CSR was not well organised in this group, donation of electronic equipment as part of their CSR activity indicates its weak influence on the e-waste management practice adopted by them. Table 7.3 summarises the strength of various factors in the formal recycler organisations.

[45] Only one of the five formal recycler acknowledged that they look at e-waste management practices in the peer groups. Three of the formal recyclers acknowledged that peer practices are not as important for their business as they have their niche of raw material and new sources are constantly created.

Table 7.3 Strength of factors in the formal recycler organisations

Organisation	Regulation	Peer pressure	Client requirement	Brand image	Financial benefits	Corporate culture and leadership	CSR
R1	Strong	Weak	Strong	Absent	Strong	Absent	Absent
R2	Strong	Absent	Strong	Absent	Strong	Absent	Absent
R3	Strong	Absent	Strong	Absent	Strong	Absent	Weak
R4	Strong	Absent	Strong	Absent	Strong	Absent	Weak
R5	Strong	Not available	Strong	Absent	Strong	Absent	Weak

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7.7 Challenges for Formal Recyclers

The previous sections (7.3, 7.5) looked at the enablers for e-waste management among the bulk consumers and IT producers. All the formal recyclers in the current research had EMS in place and being in the business of e-waste recycling were aware of the issues of e-waste and the need to manage them safely, which is indicated by their current practice. However, these formal recyclers are faced with certain challenges. It is essential to understand these challenges to gain a complete picture of e-waste recycling in India. These challenges also play a part in some formal recyclers' adopting unsafe practices and using the services of informal sector to dispose material collected for recycling. This section discusses the challenges faced by formal recyclers in India that influences the implementation of e-waste management practices in their organisation.

One of the serious issues in India with regard to e-waste management is that nearly 95% of e-waste is treated by the informal sector, causing damage to environment and the health of workers handling it. The formal recyclers are all severely challenged by the informal sector for material for their operations (Shanbhag, 2011a). The cause of this material challenge to formal recycling has much to do with origin of this waste and its handling in the past. It was not until the amendment of the HWMHR 1989 in 2003 that electronic industry was formally recognized as a generator of hazardous waste. Although the electronic industry was included in the amended regulation, there was no distinction between electronic waste and other hazardous waste recyclers. HWMHR is applicable to the generator of e-waste (electronic industry) and the processors of this waste (recyclers), but excludes the bulk consumers. As a result, although e-waste recyclers were registered with the CPCB under this rule, the volume of material they received from the electronic manufacturing industry was very limited (6.6.1).

The boom in the IT industry at the beginning of the millennium generated large quantities of e-waste. The very large players in the sector were struggling with growing quantities of e-waste that were being stored in their facilities. There was an urgent demand from these very large organisations in the IT sector to safely dispose this e-waste. This demand provided a market for the evolution of the formal recyclers in the India. Until then, e-waste was mainly disposed using the services provided by the scrap dealers. The scrap dealers sold these materials directly to the refurbishing and second hand market and after 'cherry picking' sold the remaining to the informal recyclers. Sometimes the informal recyclers directly got their material from the scrap dealers. The informal recyclers specialised in environmentally damaging backyard recycling of e-waste. This informal network of scrap collectors, scrap dealers, refurbishers along with informal recyclers that together constitute the informal sector is highly organized. With the arrival of formal recyclers in the scene, began the competition for material between the newly evolved formal recyclers and the established informal sector.

The availability of raw material (e-waste) for their processes is a challenge to the formal recyclers despite the huge quantity of e-waste generated. All the five formal recyclers acknowledge that the informal sector poses a big challenge to them with respect to availability of raw material for two reasons. The first is due to the high price they offer to the consumer at the time of disposal, which allows the informal sector to siphon off material. Informal recyclers operate with disregard of environmental and occupational health and safety, and their backyard processes for extraction of valuable metals like copper, gold and platinum are crude (GTZ - MAIT, 2007). This disregard for environment and health during their operation reduces their overheads substantially, enabling them to offer higher values for the waste at the time of collection, "The cost of recycling for them is not even 1% of the overheads and so they can offer high price to customers." (RC2)

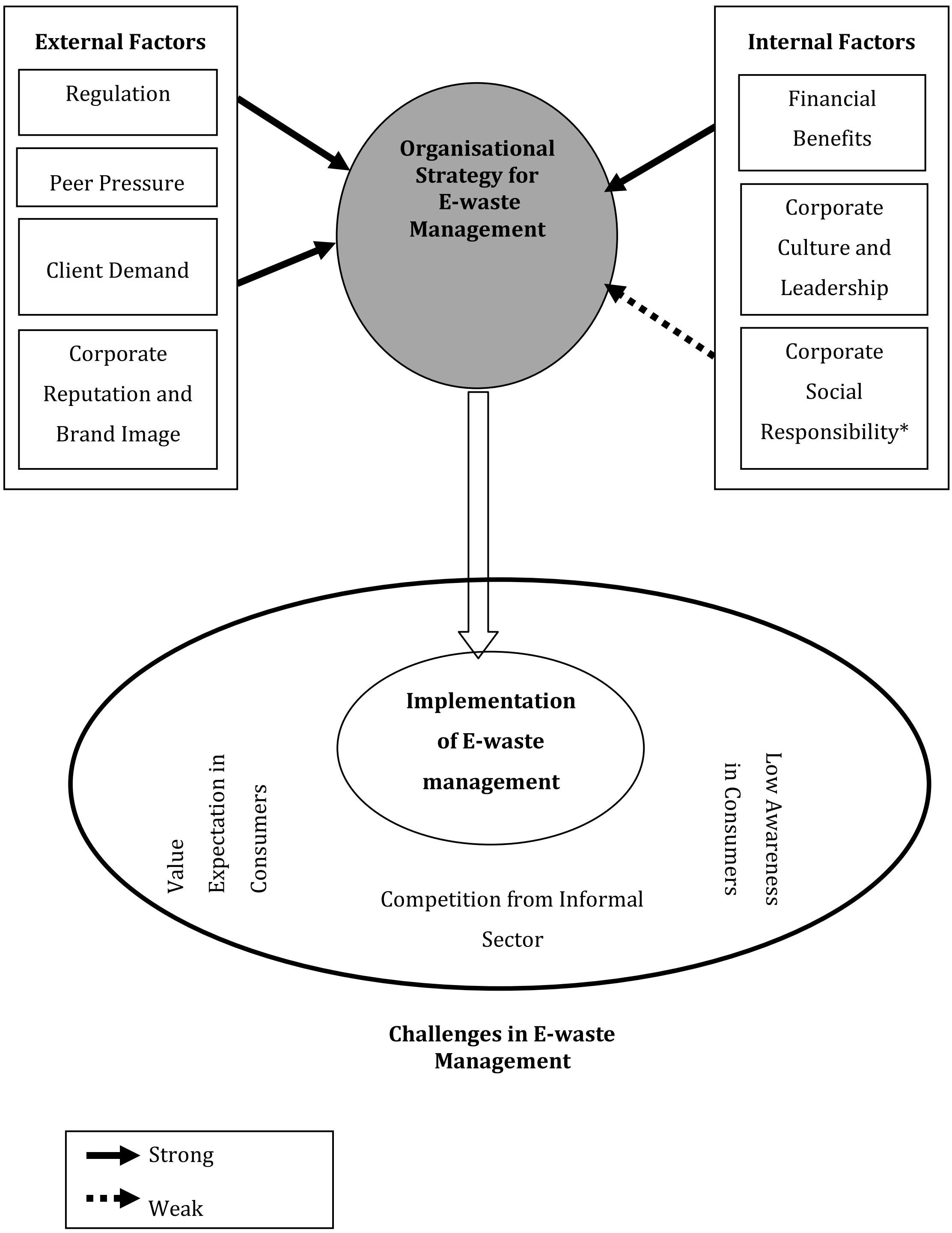
The second is their wide collection network and their knowledge of the quality of material that increases the collection rate in the informal sector. The collection network of the informal sector is embedded among the scrap collectors and scrap dealers whose network and collection system are the oldest and the widest (5.4). The informal sector is knowledgeable about the nature of material (6.6.5) and this knowledge of the quality of material is useful when bidding for the material from bulk consumers. Thus, due to their wider collection network and knowledge about the material, they are able to reach farther than the reach of formal recyclers for material. This ***competition*** for material between the formal and the informal sector poses a serious challenge for management of e-waste. Although international organisations and regulators have been trying to form an informal-formal bond, the dynamics between the two groups (see 6.6.5) means that the formal recyclers still do not receive material from the informal sector.

The formal recyclers acknowledge the high awareness levels regarding the need to manage e-waste properly among the very large IT organisations and the IT producers, who are currently their source of material. They also recognise that there is potentially a large quantity of e-waste among the large IT and SME IT organisations, which they are not able to tap into due to the low awareness on the issues surrounding e-waste management among these organisations, that makes them use the service of those e-waste recyclers that offer them better value but who may not follow appropriate practice (Chapter 7.3). Thus***, low awareness*** among the bulk consumers about the need to manage e-waste is further adding to their challenge of receiving material for their process,

> "The awareness is low among the consumers. They often store their e-waste and expect value during disposal. They don't understand that we cannot offer such high price as the recycling value is much lower"- (RC2)

Also, most of the bulk ***consumers expect value*** for their e-waste at the time of disposal. This incentive-seeking attitude of the consumers adds to the financial burden of the formal recyclers that has been previously discussed (6.2.7, 6.3.7). The competition from informal sector that offer higher value and have better network of collection and low awareness among the large majority of the consumers, along with incentive seeking nature of the consumers at the time of disposal of e-waste is posing a serious challenge to the approach of these formal recyclers by adding to the cost associated with the recycling process. The factors determining the practices for e-waste management among the formal recyclers along with the challenges are represented in the Figure 7.5. The bold arrows arising from a factor indicate that the factor have a strong influence on the organisational strategy for e-waste. The dotted arrows represent those factors that have a weak influence on the organisational e-waste strategy. The absence of arrow from any of the factor denotes that the factor did not have any influence on the e-waste management strategy of the organisation. The transparent block arrow connects the organisational strategy for e-waste management to the actual implementation of the practice. In the case of formal recyclers there are certain challenges that affect the implementation of the e-waste management practices in these organisations. These challenges namely, value expectation in consumers, competition from informal sector and low awareness in consumers are represented in the large oval frame.

Figure 7.5 Factors determining e-waste management in formal recyclers



* Supporting-factor

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7.8 Summary

This chapter discussed the strength of different external and internal factors in determining the e-waste management practiced by the different stakeholders. External factors like regulation, peer pressure, client requirement for greener practices have been growing in the past two years- all these shape their EMS and affect their brand image to include environmental response which have played a strong role in determining the e-waste practices among the **very large IT** organisations. Among the internal factors, corporate culture and leadership and associated supporting-factor CSR have a strong influence on their e-waste management practice, while direct financial benefits only have a weak influence in determining their e-waste practices. The presence of EMS, high awareness of e-waste and easy accessibility to formal recyclers have helped them to implement their e-waste management practices better than other bulk consumers in the sector, as reflected by their current proactive e-waste management practice.

For the **large IT** organisations, only regulation plays a strong role among the external factors in determining their e-waste management practice. External factors like reputation and brand image along with client pressure have weak influence, while the influence of peers in determining their e-waste management is absent. With regard to internal factors, only direct financial benefits have strong influence in determining their e-waste management practice. Corporate leadership and culture and CSR as internal factors have only weak influence on the current e-waste management practice of these organisations. EMS is still not very prevalent in this group and the level of awareness of e-waste is low. Large IT organisations also do not have ready access to formal recyclers like the very large IT organisations. This has made the implementation of e-waste management more challenging for them as reflected by their current minimal approach to e-waste management that is more reactive.

Amongst the **SME IT** organisations, external factors like brand image, client requirement, and peer pressure do not have any influence on their e-waste practice. Regulation has only a weak influence in determining their approach to e-waste management. Among the internal factors, direct financial benefits have a strong influence, while CSR is weakly influencing their current practice for e-waste management. Absence of EMS and low awareness on e-waste and non-accessibility to formal recyclers has further made it challenging for these organisations to properly manage their e-waste as reflected by their indifferent attitude to towards e-waste and lack of its management.

For the **IT producers** the external factors that have strongly influenced their practice for e-waste management are similar to those of the very large IT organisations. They include brand image; regulatory requirement, peer pressure and NGO pressure which has replaced the client pressure seen earlier among the very large IT organisations. The internal factors that have been recognised to be strong in adoption of e-waste management seen among the producers are corporate culture and leadership and the associated supporting-factor - CSR. Although direct financial benefits only had a weak role in determining the current practice for e-waste management adopted by the producers, it cannot be ignored that in the future with the enforcement of EPR based e-waste regulation in India, it would become important in determining their practice with regards to managing the EOL waste. With regards to the enablers for e-waste management, presence of EMS and high level of awareness among the producers has helped them take-up their responsibility for e-waste management by developing voluntary mechanism to handle EOL waste. The absence of appropriate formal recyclers in their initial years had a significant impact on their delay in adoption of e-waste management similar to their global policy.

The factors that determine strongly the level of e-waste management among the **formal recyclers** are regulatory requirement, client requirement and financial benefits. Of these financial benefits and client requirement is more significant in influencing the level of practice adopted by the different formal recyclers. This is mainly because the findings indicate that formal recyclers who were audited by their clients had appropriate practice for e-waste management and did not divert the material received for processing to the informal sector. Also, those formal recyclers who offered higher price to their clients received more material, but to compensate for the higher price they paid, they adopted inappropriate practice and disposed of the material through the informal sector. The laxity in regulatory monitoring has created a loophole despite stringent regulatory requirement. The formal recyclers are challenged by stiff competition from the informal sector, low level of awareness among the consumers who look for incentive at the time of disposal that affects the practices for e-waste management here.

This chapter presented the manifestation and strength of the various factors determining e-waste management along with role of the enablers in various stakeholders. The next chapter will be a discuss on the role of varying strengths of these factors in determining the different levels of e-waste management that was observed in the stakeholders along with the forces shaping the factors.

8 DISCUSSING THE FACTORS DETERMINING ORGANISATIONAL E-WASTE MANAGEMENT

It was seen in Chapter 6 that the level of e-waste management adopted by the various stakeholders ranged from ‘indifferent’ through ‘reactive’ to being ‘proactive’, and these are comparable to typologies of environmental management adopted by organisations. Chapter 7 demonstrated the variation that existed in the strengths of the various internal and external factors and presence of enablers among the stakeholders. This chapter, which is the further analysis of the factors identified in Chapter 7, completes achieving Objective 4, which is, ‘to analyse the factors determining the current practices for e-waste management’.

This chapter is divided into two parts; firstly section 8.1 draws together the findings from the previous two chapters and discusses the influence of the factors and enablers on the type of e-waste management adopted by the various stakeholders. The second part (8.2) explores these factors further using the theoretical lens developed in Chapter 3.3.2 so as to gain an understanding of the forces shaping the factors among the IT bulk consumers, who are the focus of this research. Wherever available and applicable, the literature on Indian IT sector has also been used to support and explain the behaviour of this sector.

8.1 Levels of E-Waste Management

This section firstly discusses how the varying strengths of factors have played a role in determining the level of e-waste management seen among the organisational stakeholders. It also later presents the relationship between enablers and the level of e-waste management exhibited by them. The strengths of these factors among the various organisational stakeholders are shown in Table 8.1[46].

The broader literature on environmental management and strategy recognised both the cost associated with implementation of environmental management programmes and the indirect financial benefits it offered (Shrivastava, 1995; Porter and Linde, 1996; Sharma, 2000a; Hillary, 2004). Although the organisations only related to the direct financial benefits associated with e-waste management, the indirect financial benefits of good environmental management that improves business performance cannot be ignored. The financial benefits to business performance through improved brand name, client relation and regulatory compliance brought by adoption of good environmental management practices in the organisation has been well recognised in the literature (Porter, 1985; Berry and Rondinelli, 1998; Sharma and Vredenburg, 1998; Aragon-Correa and Rubio-Lo´pez, 2007). In line with this recognition the indirect financial benefits brought by the factors like brand and corporate reputation, client requirement/NGO pressure, peer pressure and regulatory compliance along with the direct financial benefits has been brought together to be recognised broadly as financial drivers.

[46]This table is a consolidated table drawn from the information presented in Tables 7.1, 7.2 and 7.3 in Chapter 7.

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Apart from financial perspectives it has been argued that organisational environmental response should also be recognised from a socio-ethical aspect (Shrivastava and Scott, 1992; Shrivastava, 1995). Leadership and organisational culture contribute towards the social capital of an organisation (Rob and Zemsky, 2002). They influence each other and enable expression of the socio-ethical dimension of firms (Bass et al., 1993). As leadership and culture bring out the ethical dimensions of organisations, CSR also represents social, legal and ethical dimensions of firms (Carroll, 1979; Joyner and Payne, 2002). Thus the factors, corporate culture and leadership and CSR have been grouped together as the socio-ethical drivers. This grouping of the various internal and external factors into two broad categories of drivers- ***financial*** and ***socio-ethical*** - will enable understanding of both the economic and ethical aspects of e-waste management in organisations in developing countries. This categorisation will also enable understanding their role in the levels of e-waste management seen among the various organisational stakeholders and thus would enrich the literature on environmental strategy.

Table 8.1 Strength of factors determining e-waste management in the organisational stakeholders

	Factors	**Organisational Stakeholders**				
		Very Large IT	***Large IT***	***SME IT***	***IT Producer***	***Formal Recycler***
FINANCIAL DRIVERS	Regulation	Strong	Strong	Weak	Strong	Strong
	Peer Pressure	Strong	Absent	Absent	Strong	Absent
	Client Requirement	Strong	Weak	Absent	-	Strong
	NGO Pressure	-	-	-	Strong	-
	Brand Image/Reputation	Strong	Weak	Absent	Strong	Absent
	Financial Benefits	Weak	Strong	Strong	Weak	Strong
SOCIO-ETHICAL DRIVERS	Culture and Leadership	Strong	Weak	Absent	Strong	Absent
	CSR	Strong	Weak	Weak	Strong	Weak
	Level of E-waste Management	**Proactive**	**Reactive**	**Indifference**	**Proactive**	**Reactive**

'-' Indicates not relevant to the stakeholder

8.1.1 Proactive level

The level of environmental management is described as proactive when organisations adopted good environmental management practices, with the commitment of top management and good operational practices, in the absence of regulatory requirement (Roome, 1992; Henriques and Sadorsky, 1996). Such a proactive level of e-waste management is seen among the stakeholders from the **very large IT** organisations and the **IT producers**. The proactive level of e-waste management adopted in these organisations has been described previously (6.8).

Both these stakeholders are large organisations compared to the other stakeholders. Previous research that explored environmental proactivity in developed country context (Aragón-Correa, 1998; Henriques & Sadorsky, 1999; Álvarez Gil et al., 2001), has shown that larger the size of the organisation (both manufacturing and service), higher their level of proactivity towards the environment due to various reasons like availability of slack resources, exposure to environmental pressures from stakeholders due to visibility etc. The findings here confirm this relationship between organisational size and environmental proactivity even in a developing country context. Apart from organisational size, both the financial and socio-ethical drivers have played a strong determining role in the proactive level of e-waste management. However, it must be noted that the direct financial benefits associated with e-waste management only, generally has a weak influence on their practice compared to the strong influence of other factors that brought indirect financial benefits to the organisations.

Regulatory compliance has a strong role in determining their proactive approach to e-waste management in all the very large IT organisations and IT producers (refer Table 7.1 and Table 7.2; Section 7.2 & 7.3), as non-compliance would not only attract fines which would in turn harm their business but would also damage their reputation. These organisations recognise the value that adoption of good environmental management offers, and so use regulation only as a minimal standard in the adoption of organisational e-waste management practices. For these organisations brand and reputation are important as they use them as 'signalling criteria' for their business as suggested by Porter (1985). Along with improved service and product quality, these organisations also adopt responsible behaviour towards the environment, as part of their brand building to signal their environmental proactivity to their stakeholders. Therefore, brand and reputation also have a strong role in determining their proactive approach to e-waste management.

The business environment of both the very large IT organisations and IT producers is highly competitive. Good environmental management is sought by the clients in the case of former and civil society in the case of latter. Responding to these demands has become important for business growth of these organisations. Thus, client and NGO demand (Table 7.1 and 7.2) has a strong role in the organisational e-waste management practices of all these organisations. Also, the highly competitive nature of their business and the demand for environmental management from their important stakeholders, make it necessary for them to watch closely the

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environmental practices among their peers to retain their business as observed by Lynes and Andrachuk (2008) in highly competitive industry sector. Thus, peers also have a strong influence on the approach taken by these organisations to manage their e-waste.

These organisations have strong leadership and a culture that values and recognises environmental responsibility. The recognition of the need to manage the operational e-waste (in the case of very large IT organisations) and the EOL e-waste (in the case of IT producers) in these organisations is strongly influenced by their leadership and culture. Such role of culture and leadership in environmental and social proactivity of large organisations in general, has also been recognised by Sharma (2000) and Lynes and Andrachuk (2008). This strong culture has played a role in recognition of environmental responsibility in their CSR agenda as observed by Ubius and Alas (2009), who noted a strong relationship between corporate culture and level of CSR internationally, across orgnisations in sectors ranging from services to manufacturing. The CSR in these organisations also recognises the negative impact of donation of used electronic equipment and has put appropriate measures to ensure their safe disposal after secondary use. Thus, it can be observed here that the socio-ethical drivers have also played a strong role in determining the level of e-waste management in these organisations.

The findings here show that in the case of e-waste management, it is not only the economic benefit of environmental management argued by Porter and Linde (1996) that has played a role in adoption of such proactive practices, but also socio-ethical drivers that are recognised to be important (Shrivastava and Scott 1992; Shrivastava 1995) have also played a part. Thus when the organisations regard the value of indirect financial benefits over direct financial benefits associated with e-waste management, and when they have strong socio-ethical drivers, they adopt a proactive level of e-waste management. Further the strong influence of indirect financial benefits and socio-ethical drivers has also played an important role in these organisations adopting EMS and having a higher level of awareness of environmental responsibility. These have in turn helped these organisations to recognise the impacts of e-waste and have facilitated the implementation of such proactive level of e-waste management with the availability of formal recyclers.

8.1.2 Reactive level

When organisations pursued environmental management to a minimal level, either driven by existing regulation or anticipation of future regulation, and do not recognise the opportunity offered by good environmental management they are regarded to be taking a reactive approach to environmental management (Roome, 1992; Hart, 1995). Such a reactive approach to environment was seen in the **large IT** organisations and the **formal recyclers** (6.8). In the reactive approach to e-waste management, only the financial drivers have a strong influence on their practice as the socio-ethical drivers were weak among these stakeholders. Among the financial drivers, the direct financial benefit associated with e-waste management has a prominent role in determining their e-waste management practice. All the large IT organisations give their e-waste to the recyclers who offer the highest value. The formal recyclers also only approach those bulk consumers who generate larger quantities of e-waste and were not very price sensitive about the material they give (6.7).

With regards to the indirect financial benefits, both these stakeholders recognise the importance of regulatory compliance and associate it with their brand image and reputation. In the case of the large IT organisations, non-compliance is seen as something that would create unwanted difficulties for their operation and affect their reputation, which would in turn affect their business and growth curve. In the case of the formal recyclers, this non-compliance would result in the cancellation of their license to operate. This would further, tarnish their reputation among their clients (very large IT organisations and IT producers) who have a proactive stand towards e-waste management. So, both these stakeholders are reacting to regulatory demand and are taking end-of-pipe approaches that require doing the minimal (6.8). Such end-of-pipe approach that required minimal change has been recognised as a reactive approach to environmental management in the literature (Roome 1992; Hart 1995; Welford 2000).

The large IT organisations did not as yet have strong client demand for being 'green', which also has played a role in their brand building only focusing on product quality and cost, and not recognising environmental responsibility. The lack of client demand has played a role in these organisations not recognising the value of adopting green practices (that is considered to be increasing the cost of product). Since these organisations did not recognise the value in environmental management, they also did not observe the peer practices for the same. Hence, the role of peers in adoption of e-waste management is absent among the large IT organisations. This finding also confirms the positive influence of supply chain demand on adoption of environmental management seen in wide range of sectors from manufacturing to services, across the globe (Handfield et al., 2005; Vachon and Mao, 2008). The formal recyclers did have client demand to adopt safe environmental practices to manage e-waste. However, being a new industrial sector there are not many formal recyclers (5.4) and due to limited demand for recycling, the supply chain pressure is limited to ensuring minimal safe practice for e-waste management.

The findings on e-waste management in these organisations confirm that they did not see the opportunities in being green (Hart 1995). This lack of recognition of opportunity provided by green practices is further promoted by lack of supply chain pressure visible by the absence of client demand (large IT) or minimal client demand (formal recycler). This low supply chain pressure has played a part in the failure of brand image and reputation to encompass an environmental response. Furthermore, the weakness of socio-ethical drivers has also played a role in the organisations not recognising the opportunities offered by good environmental management practices. Thus, when the organisations respond only to direct financial benefits and regulation, and when the supply chain pressure in low along with weak socio-ethical drivers, they take a minimal reactive approach to e-waste management. The weak influence of indirect financial and socio-ethical drivers has also played a role in the low level of EMS and awareness among the large IT organisations. These along with the lack of easy accessibility to formal recyclers have made it hard for these organisations to recognise and implement e-waste management practices.

8.1.3 Indifferent level

When organisations are unable to react to changing environmental standards due to various reasons including economic constraints and lack of understanding of the significance of environmental imperatives to their business, they take an indifferent approach to environmental management (Roome 1992; Welford 1999). An indifferent approach to e-waste management is taken by the SME IT organisations as they did not care much about the issue of e-waste. In these organisations, only the direct financial drivers have a strong influence on their practice to manage e-waste (7.2). The social-ethical drivers are also weak, which further adds to their failure in recognising the indirect financial benefits associated with good environmental management.

These organisations, like the SME sector more generally, did not recognise the advantage of being green and consider environmental management unnecessary for their business and which would increase their resource expenditure (Merritt, 1998; Simpson et al., 2004). This attitude of the SME IT organisations to environmental management is understandable here, as they have neither client nor regulatory demands to manage e-waste, and hence did not recognise any advantage of being green. However, O'Laoire and Welford (1998), recognised regulation to be playing a role in the adoption of environmental management in the SMEs in developed countries. Although regulations are considered important for e-waste management by the interviewees, the observations of SME IT organisations response to e-waste in the field and analysis of the regulatory system suggest that regulations only play a weak role in determining practice due to weak monitoring. Given this context the indirect financial benefits of being green is lacking for these stakeholders.

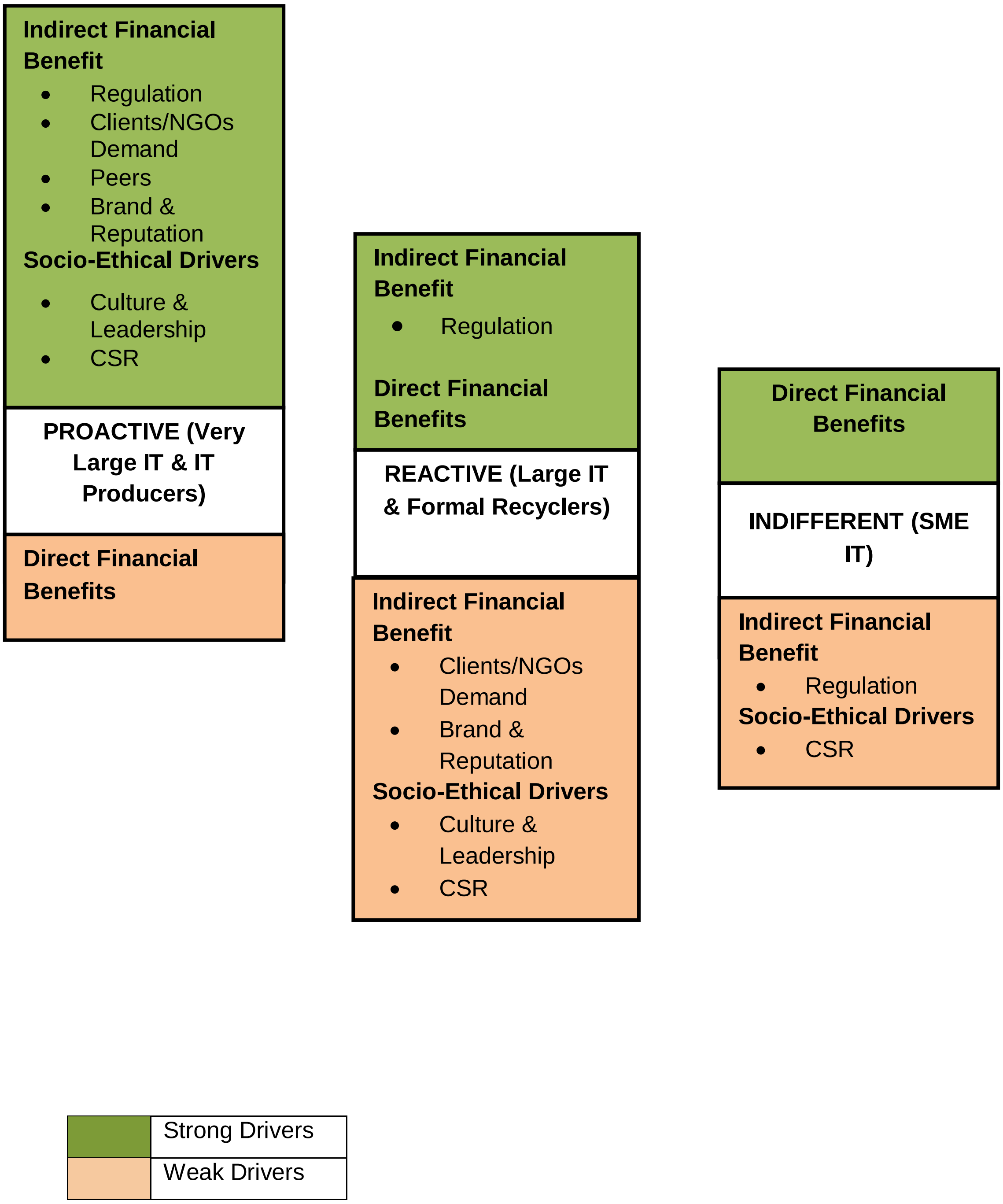
As they are more cost sensitive compared to the other stakeholders, it is only the direct financial consideration in terms of the cost associated with e-waste management that is determining their e-waste management practice. Since they attach more value to e-waste at the time of disposal, they hand their e-waste to the informal sector that offer a higher price, further confirming the strong determining strength of direct financial considerations. CSR in these organisations is also weak and ad hoc and did not recognise organisational environmental responsibility. This, apart from being a reflection of the lack of culture and leadership that values environmental responsibility also highlights the weak role of the socio-ethical drivers in determining their e-waste practice. Also lack of awareness, absence of EMS and lack of access to formal recyclers has made these organisations continue with their current indifferent level of e-waste management.

8.1.4 Summarising the role of factors and enablers on organisational e-waste practices

The findings from this research indicate that e-waste management in the organisations is mostly determined by financial considerations (direct and indirect). The indirect financial benefit through improved business manifests through acknowledging the client demand for environmental management. This acknowledgement in turn influences the brand building to include environmental responsibility and observing peer environmental practice (in this case, for e-waste management). When the organisations recognise the indirect financial benefits and advantages these provide over the direct financial benefits, these determinants play a strong role. Even in the absence of regulatory requirements, organisations adopt a proactive approach towards e-waste management. In the cases where organisations only see weak or no indirect financial benefits through green actions, the direct financial considerations determine their reactive or indifference approach to e-waste management. Previous research (Nehrt, 1996; Porter and Linde, 1996; Bansal and Roth, 2000; Saha and Darnton, 2005) has also shown that financial benefits, both direct and indirect, play an important role in adoption of environmental management in organisations.

Figure 8.1 presents the strength of the factors in determining the organisational approach to e-waste management. It can be seen that the largest organisations perceived greater indirect financial benefits over direct financial benefits of e-waste management and adopted a proactive approach to manage it. This is in line with the observations made in previous research (Aragon-Correa 1998; Russo & Fouts, 1997), where it was observed that the larger the size of the firm irrespective of the sector, the higher the level of environmental proactivity. The socio-ethical considerations were also strong here, unlike the large IT, SME IT organisations and formal recyclers. This confirms the role of leadership and organisational culture in shaping the ethical response (CSR) of organisations (Waldman et al., 2006a) and determining the organisational environmental strategy (Ghobadian et al. 1998; James et al. 1999). Thus, it is not surprising that the indirect financial benefits like peer pressure, client/NGO demand and brand and reputation, together with strong socio-ethical considerations like corporate culture and leadership and CSR have determined the proactive approach to environment among the very large IT organisations and the IT producers. The organisations here are increasingly aware of the problems associated with e-waste management and their role in it. Their organisational EMS further recognises the issue of e-waste and they also have access and availability to formal recyclers. This higher level of enablers helps in implementation of the proactive practice for e-waste management. However, the role of socio-ethical factors in increasing the level of awareness and the role of indirect financial benefits in establishing organisational EMS cannot be overlooked. In the organisations that are chiefly driven by direct financial considerations and where drivers for indirect financial benefits and socio-ethical drivers are weak - the large IT organisations and formal recyclers - the approach to e-waste management is reactive and minimal. Awareness levels are weak, with low recognition of the benefits of organisational EMS in these organisations. Added to this are the difficulties in access to and availability of formal recyclers. The low levels of enablers have further made the implementation of e-waste management challenging, pushing the organisations into a minimal response. In the case of organisations that take an indifferent approach to e-waste management, like the SME IT organisations, only the direct financial benefits determine their e-waste management practices. Other than regulation playing a weak role, the other drivers for indirect financial benefits are absent. Similarly, the socio-ethical drivers like corporate culture and leadership are absent in these organisations, and CSR also is weak. Finally, the absence of enablers in these organisations further contributes to the lack of implementation of e-waste management in these organisations.

Figure 8.1 Drivers for organisational e-waste management approach



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Therefore, it can be concluded that the adoption of e-waste management approaches by the bulk consumers in India (the focus group of this research) is driven by certain factors, as also observed by Hass (1996) and Ghobadian et al., (1998) for organisations in developed countries. The organisations that are proactive are driven by their recognition of the indirect financial benefits of environmental management and strong socio-ethical drivers. In the case of large IT organisations that are adopting a reactive approach, presently only regulations and direct financial benefits are strong drivers. These organisations are responding to the regulatory change and did not yet strongly recognise the indirect financial benefits associated with e-waste management. However, it is seen that one of the large IT organisation (L1), which has a strong client demand for environmental management, not only recognised the importance of environmental management and indirect financial benefits associated with it, but has better organised practice for e-waste management compared to other organisations in the group. The SME IT organisations lack both regulatory and client demands to manage e-waste, and so fail to see the indirect financial benefits of environmental management. They also lack socio-ethical drivers. This has resulted in their adopting an indifferent approach to e-waste management. Therefore, it is most likely that when the influence of the factors (that drive indirect financial benefits and socio-ethical drivers) becomes stronger for the large and SME IT organisations, they will also change their approach to e-waste management. Following this evaluation of the role of different factors in shaping the level of e-waste management taken up by the various stakeholder groups, the next section analyses the forces driving these factors that were shaping the organisational behaviour for e-waste management using a theoretical lens.

8.2 Forces Shaping Factors for E-Waste Management in Bulk Consumers

This section explores the forces driving the factors that shape the response among the bulk consumers from IT service sector that are focus of this research. In understanding the forces shaping these factors in expression of organisational e-waste management practice, it is useful to turn our attention to the various theories that have been used to explore and understand the organisational environmental response. Three theories viz. RBV, stakeholder theory and institutional theory were discussed (3.3.2) as popular theories used to understand and describe an organisation's environmental response. The theories proved useful in the identification of factors that drive the e-waste management practices among the bulk consumers of IT service sector.

Resource-based view (RBV) takes the perspective that valuable, costly-to-copy firm resources and capabilities provide the key sources of sustainable competitive advantage (Hart, 1995). According to RBV such resources include both tangible (financial reserves and physical resources) and intangible (corporate reputation, brand image, organisational culture, employees) ones. However, Prahalad and Hamel (1990) while supporting RBV of firms had emphasized the importance of identifying, managing, and leveraging "core competencies" for competitive success of firms. Since technological solution is the core area of their IT business, innovations hard to mimic in that area could become a resource that would provide competitive advantage to these firms as noted by Prahalad and Hamel (*ibid.*).

As users of electronic equipment, e-waste is only an operational waste for these organisations, which have no in-house value beyond its functionality during operations. Also they have to depend on external agencies (producers or formal recyclers) to manage it. RBV's focus has remained mostly in the management of, or response to, those environmental aspects, which have the potential to provide competitive advantage to the organisation (Hart, 1995). Although environmental management is becoming important, at least for the very large IT organisations, it is still only seen as a value addition to their services that a client desires. These organisations are however sensing market opportunity from their clients for green IT services and pre-empting the competitive advantage it could offer, as recognised by Lieberman and Montgomery (1988). As a result they have started 'Green IT' initiatives that presently look at in-house ways of cost reduction through green building, energy conservation, and emission reduction along with development of software tools to monitor them. E-waste management, which does not offer much financial or service advantage, although part of this, has not gained predominance under this initiative.

According to RBV, for a resource to have enduring value, it must contribute to a firm capability that has competitive significance and must be rare and/or specific to a given firm (Reed and Defillippi, 1990; Barney, 1991). Although 'Green IT' initiatives are recognised to bring competitive advantage, recognition of e-waste management under this initiative is low. Thus, developing a unique management approach in the organisation for this waste may not bring competitive value to them, as it is an operational waste that has to be managed by external agencies. In the current context of e-waste management practice adopted by the IT bulk consumers the resource based view of competitive advantage that has its founding in neoclassical economics and looks for win-win scenarios for environmental management is not sufficient to understand or explain the behaviour of firms. E-waste management is proactively taken under their waste management approach that signals their responsible behaviour, which gets them social recognition as a responsible business.

Stakeholder theory that has its basis in normative principles and ethical grounds has also proved to be useful in understanding and describing the organisational response to the environment (Henriques and Sadorsky, 1996; Berry and Rondinelli, 1998; Henriques and Sadorsky, 1999). According to Freeman (1984) stakeholders are any group or individual who can affect, or is affected by, the achievement of the organisation's objectives. The firm's response to the stakeholder pressure is determined by their perceived salience to the firm, which is determined by their power, legitimacy, and urgency (Mitchell et al., 1997). Thus stakeholders can influence the practices of an organisation via direct/indirect pressure.

The findings of this research indicate that stakeholders have played an influencing role in the e-waste management practice adopted by the firms in the IT sector. The key stakeholders that have played a role here include the clients, peers, regulators, corporate leaders and suppliers like IT producers and formal recyclers. Despite stakeholder theory having provided a useful framework for identification of the stakeholders who have influenced the e-waste practice in the organisations it is not adequate in exploring the dynamic, causal mechanisms by which stakeholder expectation influences organisational response to environment. This lacuna in the stakeholder theory has also been acknowledged by de Bakker and den Hond (2008) while reviewing the usefulness of stakeholder theory in understanding business society relationships. As Mitchell et al. (1997) acknowledged the role of stakeholders is highly situational and dependent on a number of variables. This then nudges us to move beyond stakeholders to understand the situational context that has played a role in shaping the response of IT organisations in managing their e-waste.

Since organisations are not islands and are influenced by their institutional setting, ***institutional theory*** has been explored to understand the drivers for environmental response of organisation (Hoffman, 1999; Clemens and Douglas, 2006). The institutional pressure on the organisation is exerted by those in its organisational field and includes suppliers, resource and product consumers, regulatory agencies, peers, and wider community. This theory thus provides an opportunity to not only integrate stakeholder concerns but also provides an opportunity to move further and capture the pressure they exert on organisations that generate a response from them.

Environmental aspects of the IT sector although present are not readily visible giving the IT service sector a clean green image. The energy consumption and associated green house gas emission from the IT sector is now getting recognised as the environmental impact associated with this sector (Guha, 2010) and this was also seen elicited in the organisations here through their 'Green IT' initiatives. The IT service sector is a major generator of e-waste in India (5.4), but the role of this sector for its management has not gained much attention (as indicated by the exemption from environmental regulations - 5.2) distancing the users. The IT users' 'Green IT' initiative seen in this research, which prioritises energy conservation over e-waste, further reaffirms this distancing. Although e-waste management is being taken up (and in some cases even proactively e.g., very large IT organisations) it is aligned more with responsible behaviour and social approval and is part of their EMS, which is driven by the client and compared with the peer practice due to the highly competitive environment.

However, environmental management is considered as 'added-value' to their service at least among the very large IT organisations due to the increasing client demand. According to Selznick (1957) when goals and procedures of organisations transform into value beyond technical requirement of the organisation's task, institutionalisation occurs. So, environmental management is getting institutionalised in these organisations and the similarity of e-waste management practice in each of the groups further confirms this. Globalisation and associated supply chain pressure from clients in developed countries and their influence on organisation's environmental response is also captured by institutional theory (3.3.2). This ability of institutional theory is especially useful here due to the unique export oriented nature of the Indian IT sector whose clientele comes from developed countries, where the institutional pressures for environmental management are higher. Also, this theory allows the exploration of organisational environmental response beyond competitive advantage, i.e. it enables consideration of an organisation's environmental impact holistically without exploring only those that provide competitive advantage. This aspect of institutional theory is especially useful in the case of e-waste management, which is seen as much a responsible action as one that adds to competitiveness. Thus, institutional theory is in a better position to explain the role of factors in the current behaviour of bulk consumers to the issue of e-waste management.

Institutional theory acknowledges that organisations are affected by social characteristics of its participants as well as by the varied pressures imposed by its environment (Scott, 1995). According to Scott (1995) institutions are systems that consist of cognitive, normative and regulative structures that provide stability and meaning to social behaviour. The organisational field influences the firm behaviour either through coercive force, normative pressure or mimetic action (*ibid.*). The findings of this research indicate that the organisation's field, which includes the clients, peers, producers, recyclers and regulators, has influenced the adoption and implementation of e-waste management practice. While the producers and recyclers have influenced the material flow, the clients have played a major role in initiating e-waste management practices in the organisations along with drawing attention to peer practice in its management, due to the weak role of regulators with respect to e-waste challenge (5.5).

Due to the 'clean green image' of the IT service sector there is no local regulatory coercion or societal expectation for them to be environmentally responsible thus granting them not only regulatory but also social legitimacy with regards to their environmental impacts. Thus the institutional pressures for them to adopt e-waste management practices from within the country are absent. However, the IT service organisations being export oriented are responding to the challenge of e-waste depending on their size and the nature of their clients and the demand these clients put on them with regard to environmental management. The clients exude normative pressure on their service providers that is directing these organisations to adopt e-waste management.

The institutional forces identified by Dimaggio and Powell (1983b) are capable of offering an explanation to the similarity in the practices adopted to manage e-waste among the different groups in the IT service sector. Although the regulative pressure to coerce the organisations to manage their e-waste is absent, the client pressure for responsible environmental actions, which varies among the three groups, has played a definitive role in determining their responses to e-waste management. This client pressure has brought in competitive isomorphic behaviour in the very large IT organisations. This has also translated to similarity in the approach to environmental management as exemplified by their management of e-waste. As the competitive field of the organisations is similar the client demand is creating a normative pressure among the organisations. The cognition of these organisations, which is shaped by the leaders (Campbell, 2007), interprets this normative pressure for environmental management that has translated to their taking up actions to manage the e-waste. When this normative pressure is weak or absent, and when corporate leadership and culture that recognises the importance of environmental responsibility is lacking, the organisations also have weak recognition of their environmental responsibility or fail to recognise their environmental responsibility as expressed by their reactive (in the case of large IT) and indifferent (in the case of SME IT) approach to e-waste management.

A majority of foreign clients of the Indian IT sector come from geographic regions where environmental regulations are stringent and where the societal pressure for responsible environmental actions from the organisations is high. Such institutional pressures on these clients then seem to drive their clients to demand an environmental response from their service providers. However, the institutional pressure for environmental responsibility is not uniform in all the developed countries and is higher in countries from Western Europe than North America (Baughn et al., 2007). Doh and Guay (2006) have discussed the role such institutional pressure exerted on the organisations and how the difference in these institutional pressures brought difference in the environmental response of organisations in Europe and USA. The differenece in the institutional context that brought about the change is also observed in this research as demonstrated by increasing client demand for green practices with the growing clientele from Western Europe (7.2). The export oriented nature of the IT service sector which carries a 'green image' and the change in its environmental orientation in response to the client pressure draws our attention to globalisation and the opportunity it provides to leverage environmental benefits in developing countries (3.3.2).

Globalisation has created a production network and the governance in this network steers the global economy (Gereffi et al., 2005). However, it is argued to have brought environmental degradation in the developing countries where in order to lower the production cost and attract foreign direct investments (FDI) the governments externalise environment by neglecting to enact or enforce environmental regulation (Stewart, 1993). 'Race to bottom' and 'pollution haven' are some of the most popular terms associated with environmental degradation due to globalisation. But this argument of environmental degradation associated with globalisation has been challenged by others like Drezner (2000), who contend that FDI encourages transfer of environmental technologies from developed to developing countries. Christmann and Taylor (2001) have shown empirically that globalization has brought environmental self-regulation to firms in China. Aaronson (2003) had also noted that the impact of 'standard-setting' institutions and non-governmental organisations in developed countries were shaping corporate initiatives in developing countries. These debates and investigations have been based on manufacturing sector. The findings of this research, which has focused on a sector that is considered environmentally benign in its operational territory (5.2), indicate that this impact of globalisation is not just limited to manufacturing sector but can also extend to include service sector like IT.

The interpretations from the current research on e-waste indicate that it is the normative and cognitive response of the firms to the normative pressure created by their clients that is seen determining their response to e-waste management. In other words the response of organisations to the issue of e-waste is due to continuous exchange of information between the organisation and the various entities in the organisational environment due to their berthing in the network model of production. According to the network model, the various actors are conditioned by the action of others and the totality of the network conditions the actors (Hakansson and Snehota, 1989). Hence, the effectiveness of an organisation (including its environmental response) is based on interactive behaviour in the network. Global Production Network (GPN) provides a framework to capture the role of these non-firm institutions and the extra firm network that shapes the response for e-waste management among the IT service sector.

GPN analysis looks at three interrelated variables namely value, power and embeddedness. Value refers to economic rent that can be realized through markets, as well as non-market transactions within GPN (Coe, 2009). Value is further distinguished and examined under the process of value creation, enhancement and capture. Globalization of production network has resulted in the geographic spread of value creation, enhancement and capture that has affected the regional economic development (Coe et al., 2004). This transformation of value is also observed in the Indian IT service sector due to its participation in GPN that has transformed it from being low end service providers to value added R&D service providers (Parthasarathy and Aoyama (2006) Grote and Täube (2006).

In the case of productivity from the IT service sector the economic value capture happens in developed countries although value creation and enhancement happens in the geography of developing country (Parthasarathy and Aoyama, 2006). Looking at value in non-market transactions like environmental management and improvement, from the research here, it can be noted that 'environmental value' capture takes a different path. In the absence of strict environmental regulation, and regional institutional pressures, the organisations could continue to externalise environment from their production. However, the findings of this research indicate that environmental management has been recognised as a 'value-add' in the business of IT service providers due to its emphasis and recognition by the clients (see 7.2- Client demand). This in turn has brought about organisational transformation in these service providers with regards to environmental management. The 'environmental value' unlike the 'economic value' is created in developed geography but enhanced and captured in the geography of the developing country as reflected through good environmental management practices in the case of very large IT organisations that experienced strongest client demand for it.

Power in a GPN according to Coe (2009) is considered as the ability of one actor to affect the behaviour of another actor in a manner contrary to the second actor's interest. The evolution of the Indian software industry has led the service providers to move from offering cheap low end programming skills to offshore turnkey service provision that demands a wider range of skills going beyond programming, such as project scheduling, quality assurance, and productivity standards (Parthasarathy and Aoyama, 2006). However, as these service providers have improved their skills with respect to their core competence, other value added services like environmental management are becoming important for their business. Despite the service providers' transformation to turnkey suppliers that relieves them from captive production, due to highly competitive environment of their business and with the threat of business moving to other low cost countries, value-adds are becoming important for their business as acknowledged by interviewees from all the very large IT organisations. This view of the very large IT organisations is captured by,

> "In request for proposal (RFP) these things are coming up more often. We see these as a force to reckon with due to the global competition and so environmental practices have certainly become value add to our business." – (Facilities Head, VL2)

Thus the clients continue to hold the power on these service providers despite their transformation in their core competence to high-end service providers.

Hess (2004) discussed the concept of embededdness and its role in global economic production and growth where he described embeddedness as the social relationships between both economic and non-economic actors. He recognised three dimensions of embeddedness viz. societal, network and territorial embededdness. Societal embeddedness signifies the importance of where an actor comes from, considering the societal (i.e., cultural, political, etc.) background. Network embeddedness describes the network of actors a person or organisation is involved regardless of their country of origin. Territorial embeddedness considers the extent to which an actor is 'anchored' in particular territories or place. The embeddeness not only looks at inter-firm relationships but also broader institutional networks that also include non-business actors like government and non-government agencies that are spread geographically in the production network (Coe, 2009).

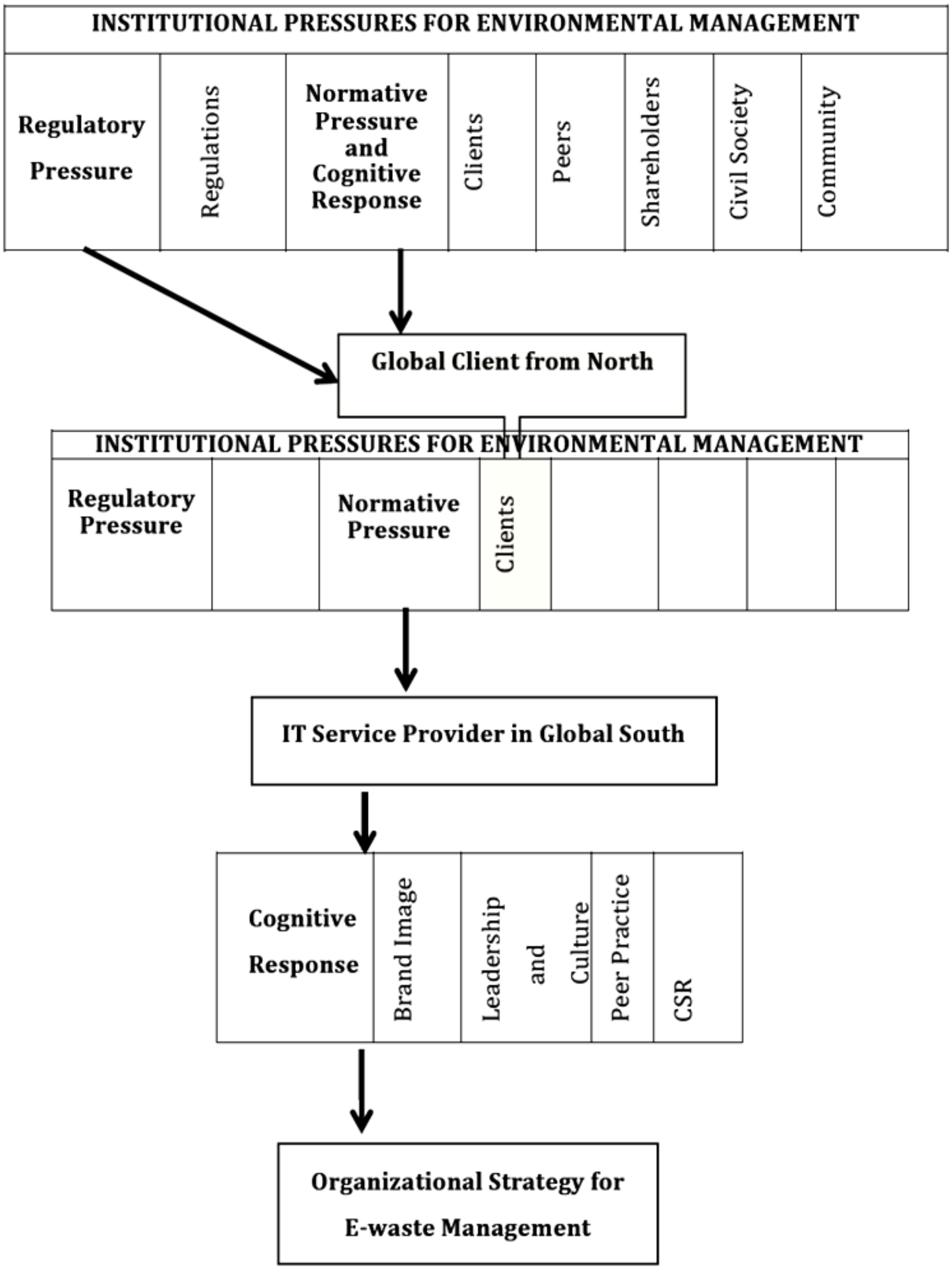
This embeddedness creates the institutional pressure and response of the organisations. In this case it can be seen that the clients from the North due to their societal embeddedness recognise the importance of environmental responsibility. This societal embeddedness brings in the regulative and normative institutional pressures on them. The network embeddedness of the service providers with the clients transfers the institutional pressures from North to South, thereby making environmental management important for their business. This is also transforming the territorial practices for environmental management. This territorial transformation is demonstrated in the present research through development and implementation of separate e-waste rule in India and development of new business ventures in formal e-waste recycling.

The varying levels of e-waste management practices influenced due to the nature of clients further confirm this influencing role of global production network. The very large IT organisations have stronger global client demand (7.2) for environmental best practices that also translate to e-waste management. The large IT organisations are just beginning to experience this client demand and wherever this is strong the organisations also have better practices for e-waste management. In general the group of large IT organisations as a whole are slow and reactive in their approach to e-waste management due to weaker client demand. The SME IT organisations, which completely lack this client demand, did not have any system for environmental management as indicated by their poor e-waste management practices.

The highly competitive environment and intangible nature of their service business makes client demand important for this sector. The client demand for environmental management not only has a direct impact but, this indirectly has also leveraged other factors recognised in this research, namely importance to environmental regulation, brand and reputation and attention to peer practices. The normative pressure from the client has resulted in the manifestation of corporate leaders to recognise the importance of environmental management for their business. This has shaped the organisational culture and played a role in the organisational CSR recognising environmental aspects like e-waste management as reflected in the case of very large IT organisations (7.2). This has also played a role in going beyond the direct financial benefits associated with e-waste management.

Figure 8.2 shows how the participation in GPN by the IT service sector has brought in institutional pressures that are shaping the response for e-waste management. It shows that the coercive force of territorial regulation in drawing response to challenge of e-waste management is absent for the bulk consumers in the IT service sector in India (due to regulatory exemption for managing e-waste, 5.2 & 5.4). The main institutional pressure for the bulk consumers (only those from very large organisations) to respond to the challenge of e-waste comes from their clients. This client demand is the only normative pressure on the IT service providers as they also lack demand for e-waste management from the local institutions like civil society, employees, community, etc. (7.2). The normative pressure from the clients shapes the cognition of these organisations through its leaders and culture that recognises the importance of environmental management for their business (7.2). Due to this cognition the organisations associate environmental management as part of to their brand building and CSR exercise (reflected here through association of e-waste management as part of environmental management). This client demand also draws the attention of organisations to peer practice due to the highly competitive nature of their business environment. So, the institutional pressure that is driving the IT bulk consumers is actually the normative pressure coming from their clients. This in turn can be traced to the non-firm institutions and the extra firm network of the clients.

Figure 8.2 Institutional pressures for environmental responsibility translating to e-waste management in IT service organisations



Although the clients did not particularly demand safe e-waste management, they looked for good environmental management practices in their service providers and even audited their practices (7.2). According to most of interviewees from the very large IT organisations this changing client demand is due to environmental management becoming mainstream for global businesses.

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> “It has been growing since the last 3 years. Post Y2K where India actually got much bigger contract. Around that time the environmental debate was also out in the open. It became kind of mainstream as opposed to what it was earlier. Definitely supplier management meant - suppliers need to be responsible. No matter if you supply equipment or services. Just from around that time I think we had this push from our client.”- Sustainability Director VL5

This global change in environmental management can be attributed to regulatory changes across the globe that brought in coercive pressure and demand from civil society that brought in normative pressure to international organisations as observed by Doh and Guay (2006), across all sector of industries in developed countries of Europe and the USA. These institutional pressures of the clients seem to have sensitised them to the environmental damage due to improper management of e-waste in the developing countries. This is demonstrated here through their attention to e-waste management practice (under waste management) among the IT service providers while examining and auditing their environmental management system. The IT service providers who do business with such clients interpret this importance for environmental management in their clients and develop systems to respond as elicited by the proactive approach to e-waste management among very large IT organisations.

The service providers see good environmental management as adding value to their service. The extension of brand and reputation to include environmentally-responsible action, the corporate culture that acknowledges and responds to environmental responsibility and environmental actions becoming integral of their CSR activities, all signal to their clients about their good environmental practices. Especially in the current case where the regulatory requirement for e-waste management is absent for these IT service providers, proactive management of e-waste sends a strong signal to their clients. This value addition provided by environmental management cannot be ignored as the clients still hold the power over their service providers. The role and power of clients in determining e-waste management among the bulk consumers is also confirmed by the reactive and indifference approach to e-waste management when the client demand for environmental management was weak or absent as demonstrated in the case of large and SME IT organisations.

Analysing the findings of this result using the GPN framework not only informs us about the determining role of institutional pressures for environmental responsibility in the developed countries in bringing environmental responses from the suppliers in developing countries but also the need for the regional government to acknowledge such pressures and facilitate the required transformation. The depletion of natural resources and their ever-increasing demand means that environmental concerns cannot be peripheral to economic development and must be acknowledged by the regional government, which should also play a proactive role in developing environmental good practices in the region.

In the present research it can be noticed that in order to promote IT growth in various states of the country, IT service providers have been given environmental regulatory exemption (5.2). Even the new e-waste regulation that has been implemented exempts SME IT service providers from the bulk consumer responsibility although they constitute over 70% of the IT service sector in the country. By doing so although it may appear to be benefiting these organisations, in the long run it may affect their growth as environmental management is increasingly seen as 'value adding' for their business by their clients. Following Porter and Linde (1996), who have emphasised the role of regulation in triggering innovation and bringing early mover advantage, the regulatory instruments should recognise the importance of environmental value addition for these businesses and develop policy instruments acknowledging and supporting this. Institutional support in the form of awareness creation and facility for these organisations to enable responding to these demands must be developed in parallel. In the case of failure for the regional institutions to recognise the value addition environmental management brings the threat of these operations moving to other regions where this is offered cannot be ruled out, as power asymmetry still exists making the clients more powerful than their suppliers.

8.3 Summary

This chapter discussed the role of various determinants and enablers in the adoption of e-waste management among the various stakeholders. When the indirect financial benefits and socio-ethical drivers were strong the organisations adopted a proactive level of e-waste management (very large IT). When the direct financial considerations were strong and the socio-ethical drivers and indirect financial benefits were weak the organisations adopted a reactive level of e-waste management (large IT). When the direct financial consideration was the only strong determinant the organisations adopted an indifferent attitude to e-waste management (SME IT). The adoption of e-waste management practice is driven by institutional pressure that is predominantly shaped by the clients from developed countries.

Application of institutional theory using the GPN framework has helped to explain, the behaviour seen in the Indian IT service sector (which is the focus of this research) with respect to the their management of e-waste. The institutional pressures of the clients from North for responsible environmental behaviour has translated into normative pressure for these IT service providers. E-waste management practice adopted by these organisations was a response to this. Although the production network framework has focused on economic development, it does provide an opportunity to understand and explore environmental preservation, especially when the regulatory drivers and awareness level in the Southern countries with regards to environment is low. This role of GPN in providing an opportunity to study the impact of global production on the physical environment has also been acknowledged (Coe et al., 2008; Bolwig et al., 2010).

Following this discussion on factors and forces shaping the factors in the bulk consumer response to e-waste management, the next chapter will draw the conclusions of this research. It will draw attention to the challenges in management of e-waste in the stakeholders and suggest recommendations that would enable the participation of bulk consumers that could improve e-waste management practice in the country.

9 CONCLUSIONS

This research has looked at the challenge of e-waste management in an important stakeholder group – bulk consumers- that have not received much attention so far. In doing so, it has created knowledge in a vital area that is important to tackle this global challenge. In this last and concluding chapter attention is drawn to the challenges for participation in e-waste management in the stakeholders and recommendations to enrol bulk consumer participation for e-waste management in India, and in doing so it answers Objective 5 and 6. This chapter begins with a summary of the research findings (9.1) by matching them with the research objectives (1.5). It moves on to present the contribution to knowledge made by this research (9.2), before reflecting on the limitations of methodology used (9.3). The chapter also presents a note on scope for future research (9.4) and briefly presents the learning from this research that could be useful in other developing country contexts (9.5).

9.1 Summary

The aim of the current research was:

> ***To analyse the e-waste material flow and factors driving management of e-waste in the IT service sector in India, in particular the bulk consumer response to e-waste and suggest recommendations for their participation in its management.***

To attain this overall aim six objectives were formulated. This section will discuss how each of these objectives was achieved in the research

9.1.1 Objective 1 - Develop a conceptual model of factors influencing e-waste practices among IT bulk consumers

E-waste management is a new global challenge with not much research that has focused on bulk consumer participation. So, it was important to develop a conceptual model that would provide a framework for the research and help in gaining an understanding on bulk consumer response. In order to attain the first objective of developing the conceptual model of factors driving the organisational response of IT bulk consumers to the issue of e-waste, which is an environmental challenge, the existing literature on e-waste and that on organisational environmental strategy and management was reviewed (Chapters 2 and 3). This review of literature not only pointed to some of the existing e-waste material flow in the country but also the various theoretical lenses used to explore organisational environmental response and helped in identifying the various factors (external and internal) that determined the response of organisations to their environmental impacts. These factors identified were used in construction of the preliminary conceptual model. The conceptual model developed based on research literature was tested during the pilot fieldwork (which was part of objective two) and amended based on the analysis of this pilot data (4.7). The amended model recognized two levels in organisational e-waste management viz. the ***factors*** that determined the organisational e-waste management strategy and ***enablers*** that facilitated in the implementation of the organisational e-waste management. This amended model guided data collection at the time of main fieldwork.

9.1.2 Objective 2 - Evaluate the practices prevalent in e-waste management in the Indian IT service sector

The literature review apart from enabling in the development of preliminary conceptual model also threw light on existing e-waste management practices in the country and international e-waste context. After the development of the preliminary conceptual model, it was important to investigate further, the current status of e-waste management in India (beyond that known from existing literature) and also the management practices for e-waste in India's IT service sector that was the chosen case of bulk consumers- which was the second objective. Therefore, a pilot study was conducted to understand the prevalent e-waste management practice in India and to test the conceptual model for its ability to capture the context (Chapters 4 and 5). The pilot study brought to light the status of e-waste management in India, which was recognised as an important challenge due to the large quantity of e-waste generated (estimated as 800,000t per year by MoEF) that was mostly handled by the informal recycling sector. This challenge had drawn the attention of the regulators, industry associations, international organisations, and NGOs, which were working together to develop a separate e-waste regulation to tackle the problem. Interviews undertaken during the pilot study (4.7) pointed to the pyramidal structure of India's IT service sector (5.1) and the need to recognize this at the time of data collection, which was acknowledged. Analysis of pilot data also revealed the opportunity that existed to study the applicability of the amended conceptual model on other stakeholders like producers and recyclers. Thus, accomplishing objective two not only helped in amending the preliminary conceptual model to capture field data adequately it also helped in identifying the various stakeholders that needed to be included to obtain the overall aim. Attaining objective one and two formed the first phase of this research.

9.1.3 Objective 3 – Identify the path of e-waste among the stakeholders to understand the material flow

The amended conceptual model was used as a framework for data collection - the second stage of the research. This research was conducted taking a qualitative multiple case study approach and the data collection included semi-structured interviews with responsible organisational members from the organisations in the IT service sector, direct observations and document analysis. In order to improve the rigour in research, simplified Structure Laying Technique (SLT) and data and methodological triangulation was done (4.6). Due to recognition of the pyramidal structure of Indian IT sector and the need to factor this during data collection, in all 20 organisations of different size from IT industry formed the cases of bulk consumers in this research. These included the very large (5), large (5) and SME (10) IT organisations that helped gain a complete picture of the sector with respect to e-waste management adopted (4.4). The interaction with other stakeholders (to authenticate the information gathered from bulk consumers), mainly the producers and formal recyclers, also provided an opportunity to explore the applicability of the conceptual model on them and understand the dynamics of their relationship with bulk consumers.

The analysis of data pointed the material flow of e-waste arising from the bulk consumers and their interaction with other stakeholders namely the producers, secondary users, and recyclers (Chapter 6). It was revealed that the material flow from bulk consumers to producers is very minimal despite the voluntary take-back offered by producers. The e-waste material from bulk consumers reached either the formal or informal recyclers depending on their organisational size (Figure 6.9). Three distinct levels of e-waste management could be noticed among the bulk consumers in the IT service sector, which ranged from indifference (SME IT) through reactive (large IT) to proactive (very large IT) levels. It was revealed that refurbishment and part reuse was not very popular and only encouraged by large and SME IT organisations. It was also noted that while the producers of IT equipment had a proactive approach to e-waste management, the formal recyclers were more reactive in their approach to managing e-waste.

9.1.4 Objective 4 - Analyse the factors determining the current practices for e-waste management

This objective was also attained through the second and third stage of research. The data about the factors determining e-waste management based on the amended conceptual model was collected during the second stage of research (empirical phase). This was then analysed using literature from the first stage and further with new literature, which formed the third stage of research. The analysis of data revealed that the factors driving organisational responses for e-waste management manifested to varying strengths and levels among the organisations in the bulk consumer group, the producers and formal recyclers (Chapter 7). Application of the conceptual model to all the stakeholder groups revealed that there were similarities in the manifestation of factors among the very large IT organisations and IT producers. Similarities were also noted among the large IT organisations and formal recyclers.

The influence of these factors on the level of e-waste management expressed by the organisations (8.1) revealed that financial and socio-ethical factors both played an important role in the organisational response to e-waste management. Although value for e-waste at the time of disposal was recognised by all the groups, the very large IT organisations and IT producers adopted a proactive approach, as both socio-ethical drivers - such as corporate culture and leadership and CSR – and indirect financial benefits were strong.

The large IT organisations and the formal recyclers valued the direct financial benefits from e-waste management more than the indirect ones, and also the socio-ethical drivers - such as corporate culture and leadership and CSR - in these organisations were weak, which together brought a reactive level of e-waste management. In the case of SME IT organisations it was the direct financial benefit from e-waste management that was most important to them, as the indirect financial benefits were not recognised (absent) in this group, which also had weak socio-ethical drivers thus making them take an indifference approach to organisational e-waste management. Exploring the driving forces for these factors that determined the response of bulk consumers in IT service sector pointed to the institutional pressure that was coming from their clients in the global North due to their participation in GPN (8.2). This client pressure for environmental management, which also translated to e-waste management, was influencing other organisational factors like recognition of peer practice, corporate leadership and culture, brand image among others and shaping the response of these organisations to the challenge of e-waste. Thus, despite the absence of regional institutional pressures for e-waste management, due to the nature of their business, some types of organisations of the IT service sector were responding to the challenge of e-waste.

9.1.5 Objective 5 – Analyse the challenges for participation in e-waste management for the stakeholders

Attaining the four objectives above has revealed the state of e-waste management among the various stakeholders like the bulk consumers in the IT service sector, IT producers and formal recyclers in India and the factors that were driving and enabling them. This fifth objective presents the challenges to participation of these stakeholders in the existing context, based on the observations and analysis of data collected.

Value expectation at the time of e-waste disposal

All the stakeholders (producers, consumers and recyclers) looked for value; a value that should be reflected in the disposal transaction of e-waste, despite the differences in the respective organisational level for e-waste management. This expectation of value from e-waste directs the material flow and alters the dynamics of e-waste management in India. Among the producers it was noted that although at the time of this research they did not have regulatory obligation to manage EOL waste (and so no direct financial implications) this would soon change with the implementation of e-waste regulation in India (May 2012) where the onus of establishing, financing and operating systems that enable environmentally safe handling of e-waste is shouldered by the producers (5.5). The producers believed in EOL waste having an innate value that would offset any negative values and so did not want to offer recycling fees to the formal recyclers (like those offered in developed countries) who were processing the EOL waste on their behalf (6.5.5).

Furthermore, in developed countries, where EPR-based e-waste management has been implemented, the producers partly transferred this financial burden to consumers by charging advanced recycling fees (ARF). Such ARF mechanisms to manage EOL waste were neither preferred by producers in India, due to competition from unbranded products (6.5.3), nor would work, due to value expectation for EOL waste by the consumers which would mean ARF could only function as a deposit refund scheme and not be used for offsetting e-waste recycling cost. Similar observation on preference of deposit refund scheme over ARF was also noted by Dwivedy and Mittal (2013), albeit in the case of household consumers. This is contrary to the view expressed by Wath et al. (2010), who recommend ARF. This difference, with the view expressed by Wath et al (*ibid.*), could be attributed to the fact that their study was not an empirical one as against the work of Dwivedy and Mittal (2003) and this research where the information has been gathered from the stakeholders directly.

Although it was seen that in the very large IT organisations the direct financial benefits associated with e-waste management only had a weak influence (8.1.1) on their proactive approach to its management, only one of the five very large IT organisations investigated in this research gave its e-waste for free to the formal recycler. The rest either tendered or negotiated a price for it with the recyclers, despite the monetary value of e-waste being small (6.2.4). This was one of the reasons for these organisations not opting for the free voluntary take-back offered by the producers. This value expectation also existed among the large and SME IT organisations whose practices were influenced strongly by direct financial benefits associated with e-waste management (6.3.4, 6.4.4, 8.1.2, 8.1.3). Due to higher value offered for e-waste when they went into refurbishing or reuse markets these groups of organisations did not restrict such practices and so the material flowed into the informal sector which has environmentally damaging practices.

This value expectation for e-waste among the bulk consumers and recognition of innate value in e-waste by producers was also shaping the behaviour of the formal recyclers for whom the direct financial benefits were shown to influence their reactive approach to e-waste management (8.1.2). Unlike in developed countries where the formal recyclers received financial support from the producers through PROs to offset any negative recycling value of EOL waste, the formal recyclers in India did not receive any such support. In fact they paid for the material from the bulk consumers by decreasing their profit margin. As a result, they only sought profitable sources and adopted recycling operations limited to dismantling and separation rather than resource recovery (7.6). For the formal recyclers the major source of material was the IT bulk consumer mostly from the very large IT organisations who did not bargain much with them for value of e-waste, and so they focused on this group over other groups.

Thus, it can be seen that this value expectation for e-waste was present among all the stakeholders, although it was perceived differently among them. This recognition of innate value in e-waste stems from the opportunity for income generation it provides to the large unskilled pool of labour in the informal sector that is presently engaged in its recycling (Sinha-Khetriwala, 2004). The finding of this research point out that e-waste is viewed as a resource by each of the stakeholders engaged in its management. However, both the current system and the intended system in India do not openly acknowledge this. In developing a system for e-waste management that meaningfully engages all the stakeholders, it is important to recognise and acknowledge this value proposition in e-waste, which has been neglected despite its acknowledgement by previous researchers (Manomaivibool, 2009; Wath et al., 2010).

Patchy awareness

Awareness about the issues of e-waste and the need to manage them safely has been recognised to be low and has been identified as one of the challenges for e-waste management in India (Sinha-Khetriwal et al 2005; Chatterjee and Kumar 2009). The findings of this research reaffirm this. Levels of awareness varied among the different stakeholders concerning the environmental impacts from improper management of e-waste, and also the changing regulatory demand for e-waste management. Awareness was identified to be an enabler in implementation of organisational e-waste management strategy (7.3, 7.5), and it was recognised to play a dual role in e-waste management. It not only helped in recognition for the need to manage e-waste generated in the organisation, but awareness among the employees also helped in proper implementation of an organisation's e-waste management plan.

When the level of awareness was high, the organisations adopted a proactive approach to managing their e-waste as in the case of very large IT and producer organisations (6.2.6, 6.5.5). A further indicator of the role of awareness in changing the existing practices for e-waste management for better was the change demonstrated by the large IT organisations that have begun to use the services of formal recyclers to dispose of their e-waste (6.3.4, 7.3). Also, the lack of awareness about the need to manage e-waste, availability and access to formal recyclers to handle this waste, along with lack of awareness about the changing regulatory requirements were all facilitating the SME IT organisations to use the services of informal sector for disposal of this waste (7.3).

There is scope for improvement of awareness even in the stakeholders that showed a proactive level of e-waste management as reflected in their current practice (preference for recycling) that did not recognise the importance and environmental benefits of reuse and refurbishment of electronic equipment where practicable (8.2). In the case of the very large IT organisations this restriction was due to their apprehension about data security. The producers did not encourage such practices, due to fear of unwanted competition for new products despite their having refurbishing options and sale in developed countries. In general it could be seen that the level of awareness varied and there is a need to improve this to develop robust systems for e-waste management.

Lack of formal collection mechanism

Although nearly 800,000t of e-waste is generated in the country most of the recycling happens in the informal sector (5.4) which makes it challenging to manage (Sinha-Kethriwal 2005; GTZ-MAIT 2007; MoEF 2010). This is reflected clearly in the findings of this research, where it has been seen that availability of formal recyclers and associated collection mechanism has played an enabling role in the implementation of e-waste management practices.

Availability and access to collection was not a challenge for the very large IT organisations or producers who were presently the target material source of the formal cyclers (6.7). This availability and access was limited for the large IT organisations which had to seek the formal recyclers and stock the e-waste for collection by any formal recycler who offered the best value and easy collection (6.3.7, 6.7). In the case of SME IT organisations that operated from small facilities both in commercial and residential areas, the availability and access to collection mechanisms was lacking and this had also played a role in their lack of awareness about the existence of a formal recycling sector (6.4.4). The formal recyclers in turn did not recognise the large base of SME IT sector- as a viable source of material for their process – and had left them from being tapped through an appropriate collection mechanism. The lack of formal collection mechanism has also facilitated the secondary users of electronic equipment from schools and other institutes to use the service offered by the informal sector for disposing e-waste (6.3.6).

Presently access to formal recycling is limited to those stakeholders who have been approached by the formal recyclers (very large IT and producers) or who have approached them (large IT). In these cases, the formal recyclers provide collection. When there was lack of access to formal recyclers, the collection was undertaken by the informal sector as seen in the case of SME IT organisations. It is important to both offer a formal collection system and also to keep it simple. For the generators of e-waste, it is usually the operational waste that has to be removed from the facility. Complicated collection mechanisms would fail, as reflected here by the failure of free take back offered by the producers due to their elaborate cumbersome procedures (6.2.5, 6.7). Thus, it is important to recognise the deterrents in formal collection and access to recyclers to bulk consumers that alters the flow of material from them and poses challenges for their participation in e-waste management.

Regulatory shortcomings

Regulation has an important role in e-waste management (Widmer, 2005). Compliance and enforcement has been acknowledged as one of the biggest challenges for e-waste management (Ongondo et al., 2011). Lack of regulation and its impact on e-waste management in India has also been acknowledged (Toxic links, 2003; Sinha-Khetriwal et al., 2005; Chatterjee and Kumar 2009). This is also clearly demonstrated in the findings of this research. Due to the absence of regulatory demand there was neither any formal requirement for the bulk consumers to manage e-waste generated by them nor any requirement on the producers to manage EOL waste.

The need for regulation emphasised in previous research for changing and improving e-waste management practices has been demonstrated in the findings here, where the anticipation of the new regulation has brought a change to the practices for e-waste management among the various stakeholders in the bulk consumers (7.2, 7.4, 7.6). It is not only having regulation, but also its effectiveness in terms of enforcement and monitoring that is important for effective e-waste management. This is also demonstrated in this research where, due to the weak monitoring in the regulatory system, the possibility of material reaching the informal sector could not be ruled out (6.6.3). All the stakeholders have acknowledged the weakness of monitoring systems.

The regulatory shortcoming is further exemplified here by the inadequacies in the new e-waste regulation. Although the new regulation that was implemented in 2012 defines the role of bulk consumers, it exempts the SME sector from the responsibilities of bulk consumers (5.5). SMEs form around 80% of all ICT companies in India and contribute in total around 30% of output (Upadhyay, 2007[47]). On that basis, it is likely that they contribute around 30% of ICT bulk consumer e-waste, yet they are exempt from the new e-waste legislation. This regulatory exemption then means they are unlikely to change their approach and currently they are the major source of material to the informal sector.

Also, the new regulation does not provide details of penalties for regulatory non-compliance. Given the current limited approach to monitoring this would only weaken the impact of the new regulation. The laxness in the new regulation is also exhibited by the lack of any collection and recycling targets for the producers. The research findings indicated that the producers had been hesitant in sharing information on the quantity of e-waste collected through their voluntary take-back system (6.5.3). The lack of targets for collection and recycling would make implementation of this rule weak, as it has been based on a producer-based EPR principle. In the absence of targets, monitoring of producers compliance to EPR will also be difficult.

The participation of the IT service sector in GPN (Global Production Network) has made environmental management a 'value-adding' service (8.2). Thus, there is a need for the regulatory system to acknowledge the growing demand for better environmental management globally and its role in enabling the organisations to attain this through associated institutional pressure.

The fifth objective has pointed to four important challenges - value expectation for waste, low awareness, lack of formal collection facilities and regulatory shortcomings - that affect the participation of not only the bulk consumers, but also other stakeholders like producers and formal recyclers in the management of e-waste.

9.1.6 Objective 6- Recommend strategic actions that would enable the participation of bulk consumers from the IT service sector and enhance the management of e-waste based on analysis of current practice and opportunities available in the system

This research explored the e-waste material flow originating from bulk consumers using the case of the IT service sector. It also explored the factors that brought this response in this group. In tracing and evaluating the material flows, various system components were revealed that were shaping this material flow. Currently e-waste management in India is fragmented and even the new regulation of 2012 has remained more focused on producers and recyclers. The new regulation has evolved without paying attention to the current practices that provide opportunities to overcome the challenges. This last objective presents the recommendations that would enable participation of bulk consumers and enhance the management of e-waste

[47] Defining SME as <500 employees. Although in the present research SMEs are defined as organisations with <1000 employees, eight of the ten SMEs surveyed fall into the <500 staff category.

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management based on examination of current practice and opportunities available in the system.

Incentivising collection

There is value in e-waste and this must flow properly through the system. This research has revealed that consumers have come to expect a payment – even if a small one – in exchange for their end-of-life equipment. Yet India's new e-waste regulation does not recognise this difference and limits itself to the definition and role of consumers and bulk consumers as shown below:

- " 'Bulk consumers' means bulk users of electrical and electronic equipment such as Central Government or State Government Departments, public sector undertakings, banks, educational institutions, multinational organisations, international agencies and private companies that are registered under the Factories Act, 1948 and Companies Act, 1956;
- 'Consumer' means any person using electrical or electronic equipment excluding the bulk consumers
- Consumers or Bulk consumers of electrical and electronic equipment listed in Schedule 1 shall ensure that e-waste are channelized to distributor or authorized collection centre(s) or refurbisher or registered dismantler(s) or recycler(s) or is returned to the pick-up or take back services provided by the producers and
- Bulk consumers shall maintain record of e-waste generated by them in Form 2, and make such records available for scrutiny by the State Pollution Control Board or Pollution Control Committee." – E-waste management and handling rules (2011).

It ignores this value recognition among the consumers and bulk consumers and expects them to partake in the collection systems offered by producers. This value recognition is also not acknowledged in the producer's current voluntary take-back, which is free. This has resulted in its weak uptake among the bulk consumers. It is also because of this value-seeking tendency among the bulk consumers that the formal recyclers only approach those who have lower expectations of this value, like the very large IT organisations.

In these conditions it is important to acknowledge the value in e-waste and ***offer incentives to bulk consumers to enrol their participation.*** The next question then would be who offers this value to consumers? In an EPR based e-waste management system, the financial responsibility of developing and managing the system lies with the producers. This then implies that the producers should offer this value if the EPR based rule is to work and the regulators should also pay attention to how this value is created and transferred in the system. Although this would mean increased financial liability on the producers (as producers do not want to go with ARF and transfer some financial liability to consumers as in developed countries – 9.1.5), it would however encourage them to actively participate in closing the material loop and develop systems that would enable them to fulfil their EPR requirement as envisaged in the new regulation. Delegation of legal, financial and collection responsibility on producers so as to manage e-waste effectively in developing countries like China has also been recommended (Lin et al., 2001; Jinhui Li et al., 2013). Lin et al (2001) recommended establishment of a fund generated by pre-determined surcharge levied on the producer for each unit sold. The producers can then be given the option to transfer some of these to the consumers as value in exchange of e-waste. Jinhui Li et al (2013) proposed a full EPR where, the producers are not only responsible for the take-back process in their own country, but are also responsible for the product when it is exported, thereby (in theory) providing mechanism to improve the performance of the informal sector and also recovery rate of metals in destination countries. Thus, the expected role of producers in creating this value so as to enable proper management of e-waste does not appear inappropriate given that past researchers have recommended thorough and serious engagement of producers in managing this waste.

Also, it has been shown in this research that the level of interaction between the bulk consumers and producers is limited (6.7). So there is a need for an intermediary to transfer this value, and formal recyclers can step in to fulfil this role. The formal recyclers, who take up the collection of e-waste along with treating it, should be offered some financial support from the producers to offset negative recycling cost like the one offered in developed countries through PROs (6.7). The formal recyclers would then be able to use this to get access to more material from the bulk consumers by transferring some of this to the consumers. It would be especially helpful in accessing e-waste generated by the large number of SME IT organisations spread far and wide that are presently using the scrap collector's network. Currently the scrap collectors hand over the material to the informal recyclers as they offer more value (6.6.5). The material could be channelized to formal recyclers if appropriate value is paid for the material. So an incentive system that offers financial value would help in channelizing this material. Also, if this value proposition in e-waste is recognised it would enable upgrading of practices among the formal recyclers for resource recovery. The resource recovery process in formal recycling sectors needs high investment and constant flow of material, which is not possible in the current system due to loss of material to the informal sector that offers higher value and so the formal recyclers have remained confined to only dismantling and segregation processes.

Enhancing awareness

Awareness of the issue is the necessary first step to recognise the problem and develop ways to manage it. As reflected in this research, the very large IT organisations with higher awareness of issues of e-waste managed it well compared to the SME IT organisations that lacked this awareness. The onus of creating awareness under the new rule is left with the producers. The producers are required to inform the consumers not only about the hazardous substances in their products, but also educate them about the hazards of improper handling along with providing them with information on authorised collection centres. This entire task left solely with the producers would not be effective in the existing context where the interaction between producers and consumers is limited (6.7).

Apart from producers other channels to create awareness should also be harnessed. The exploration of practice in this research has revealed that many such channels are available to take the issue of e-waste management to IT bulk consumers. These include industry associations like NASSCOM, MAIT and CII, state IT departments, STPI, MSME board (Micro Small and Medium Enterprise Board), etc. These organisations have closer contact with the bulk consumers in many ways through membership in the case of industry associations, registration in the case of STPI and MSME board, and regulation in the case of state IT department.

The findings here indicate that industry associations have been proactive in raising environmental awareness and so they can be actively engaged. The STPI and MSME could be very useful sources for taking awareness on the issue of e-waste especially to the SME IT organisations that are registered with them. In doing so, they would not only help in reaching out to a wider network, but would also gain recognition as organisations that are environmentally sensitive and proactive. This is particularly important in the current global production network system where environmental values are gaining importance and where there is need for local institutional systems in developing countries to help organisations respond to this by being proactive rather than ignoring or avoiding it. The role of such institutions in creating awareness should also be acknowledged in regulation.

Facilitating collection

As mentioned earlier, lack of a collection mechanism is a serious challenge in e-waste management. The collection of e-waste from very large IT organisations, and to some extent from large IT organisations, is less challenging compared to the SME IT organisations as the formal recyclers directly collected the material from the former. The new regulation puts the onus of collection on the producers. However, in the current context where the level of interaction between the producers and bulk consumers is limited the producers should explore other sources and engage them actively to fulfil the producers' EPR mandate of collection and treatment of e-waste.

Formal recyclers and informal network could act as proxies for producers and engaged in collection if a value system is established as discussed earlier. A robust collection mechanism should be developed to enrol the participation of challenging bulk consumers namely the SME IT organisations. It was shown here that the SME IT organisations either returned their products to the dealers at the product's end of life in return for a concession during the purchase of new product, or sold it to informal sector (6.4.5). These dealers usually collected the EOL and disposed it to scrap dealers, which are part of the informal sector. It may be hard for the producers to target the individual SME bulk consumers, but they can definitely educate the dealers and provide them with facilities and information for return of these materials to formal recyclers, who would properly manage these materials on their behalf. Since in the relationship between dealers and producers, the latter are more powerful, they could positively engage the dealers in this collection. Also the producers could engage with STPI[48] and other private parks registered with it to organise collection. However, STPI currently does not acknowledge the issue of e-waste arising from operations in its facilities and so in order to engage such institutions, e-waste management should be acknowledged and recognised by STPI; this point to the lacunae in regulation, which has failed to recognise other institutional support mechanisms that could be leveraged.

Regulatory support

Building awareness and a collection mechanism would help in addressing the problem only if the regulatory monitoring is strict with high penalties for non-compliance. The penalties and monitoring are weak in the current system as revealed by the flow of material from formal recyclers to the informal sector (6.6.3). To overcome the shortcomings of the HWMHR to e-waste management, the new e-waste rule has been implemented in the country based on the principle of EPR as in developed countries. The new rule therefore looks like a transplantation of rules developed in the global North without paying due attention to the context. In the developed countries, where these EPR-based rules were developed and implemented (at least a decade ago), there were no systems for managing the growing e-waste and so these EPR-based regulations helped in the development of a system for managing them. However, the contextual reality of e-waste management in India is very different, as practice for e-waste management has already occurred before the implementation of this new regulation as shown by the different practices among the bulk consumers, producers, formal and informal recyclers to manage e-waste. The new regulation does not recognise this prevalent practice, as revealed by its failure to recognise the perceived value for e-waste in the system.

Although the new regulation has been based on EU WEEE (interviewee from industry association, MAIT), unlike the European rule it has not set collection and recycling targets for producers, which further weakens the implementation and monitoring of an EPR-based regulation. Also, it has exempted the SME sector from the bulk consumer responsibility for e-waste whose large base of organisations has been recognised as source of material for informal sector. So, rather than providing mechanisms to enrol this group, exemption of this group would only further divert the material away from proper e-waste management system. Finally lack of penalties for non-compliance is also obvious in the new e-waste rule, which would only make it weaker.

In order to fully implement EPR and monitor it closely, it is important **to have collection targets** in the new rule. Such importance of collection target on producers for effective EPR has also been emphasised by Li et al (2012) in their research on EPR and e-waste management in China. **All bulk consumers should be mandated to participate** and to facilitate the

[48] Although STPI scheme has come to a closure, the institutional set up is still operative as alternate schemes are being worked out

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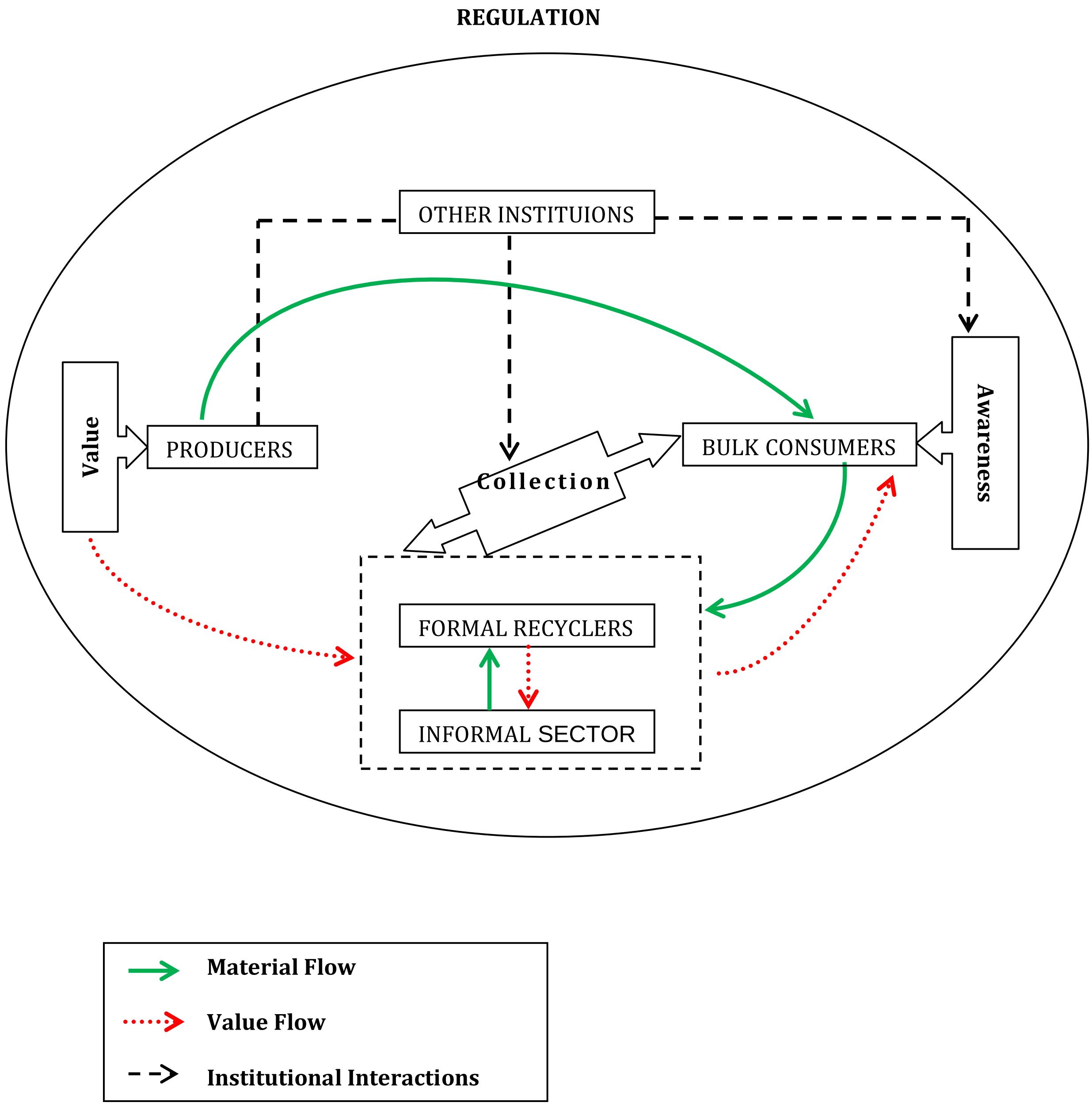
participation of SME organisations it is also important to **recognise the role of other institutions** like industry association, state IT departments, STPI, MSME boards etc., that could not only help in taking awareness to these organisations but can also mandate their participation through leveraging the forces through their institutions. **Penalties for non-compliance must be explicit** and high so that the stakeholders are forced to acknowledge and fulfil their responsibilities. The regulation also should ensure that appropriate systems are developed by producers to enable value transfer to consumers so that consumers use the collection systems developed by the producers. Table 9.1 summarises the required system changes along with the roles of different stakeholders.

Table 9.1 System changes and roles of stakeholders

System changes	Initiating Stakeholders	Complementary Stakeholder	Targeted Stakeholders
Incentivising collection	Producers	Formal recyclers and informal network of recyclers	Bulk consumers
Enhancing awareness	Producers, Regulators	Other institutions	Bulk consumers
Facilitating collection	Producers	Dealers, other institutions, formal and informal network of recyclers	Bulk consumers
Regulatory support	Regulators		Producers, Bulk consumers, other institutions, and recyclers

The above discussions have pointed to challenges in participation for e-waste management and ways to overcome this. With respect to the behaviour of bulk consumer participation, contrary to the popular belief that bulk consumers are easier to be engaged in a system developed to manage e-waste when regulations are in place compared to household consumers, the results here indicate otherwise. Figure 9.1 projects the material flow envisaged if the challenges recognised above are acknowledged.

Figure 9.1 Envisaged e-waste material flow after addressing the challenges



Regulation is overarching and the regulatory shortcomings should be addressed. It should embrace all stakeholders, including the SME sector, and also recognise the role of other institutions like STPI, MSME board, etc. It should also recognise that value expectation plays a decisive role in material flow and therefore should ensure that systems are created recognising this. When economic value is offered by the producers (although it increases their financial liability) the e-waste material can be diverted to proper and safe recycling system. Producers can transfer this value to consumers through formal recyclers who act as proxies and help in fulfilling the EPR obligation of producers. When economic value is recognised and created the material reaching the informal sector could also be passed on to the formal recyclers. The red dotted arrows in Figure 9.1 represent this value transfer.

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Recognition of other institutions by the regulations would increase the avenues of awareness creation among the bulk consumers. These institutions could work separately or with the producers to take this awareness to the bulk consumers and that would impact on and improve bulk consumer participation. In a similar vein the producers could also interact with these institutions and work together to organise collection, which would benefit the recyclers with sources of material as well as helping the bulk consumers with facilities for disposal. The black dashed arrows represent these institutional interactions that could enhance awareness and enable collection. Thus when value is recognised by producers and passed on, when awareness of the issue among consumers is improved through enrolment of other institutions and collection systems are developed for the e-waste generated by the bulk consumers, it would be directed to proper waste treatment operations as envisaged here. The electronic equipment bought by the consumers from the producers, after its useful life would reach proper waste treatment channel and is represented by the green arrows in the Figure 9.1.

Acknowledging these challenges, and ensuring systems to address them, would not only integrate the scrap collectors in the informal sector into the folds of the new system, but would also ensure the participation of all the stakeholders to achieve an e-waste management system that would be good for environment. The participation and practices of bulk consumers, improved through awareness and facility for disposal of e-waste to institutions practicing safe operations, would also enable closing of the material loop. The learning curve on e-waste management in developing countries has just begun and there is need to explore them from the specific context and practices in the country, rather than simply emulating the Western mechanism.

9.2 Contribution to Knowledge

This research was conducted at a point of time when although there was no specific regulation to address the challenges of e-waste, preparations were underway for implementation of a new e-waste regulation, as e-waste was recognised as a growing challenge in the country. Exploring the existing research on e-waste pointed to the dearth in research that looked at role of generators of e-waste in its management (1.3). Considering this, the research here chose to focus on bulk consumers from the IT service sector in India who generate nearly 30% of e-waste in the country (1.4). With its focus on IT bulk consumers the research set out to explore and evaluate the existing knowledge and practice for e-waste management in the country. The data gathered in this research informs about the prevalent practices that predates the implementation of new rule, thereby making it useful to know the impact of these existing practices on the regulation when implemented (9.1.5).

Previous research had looked at e-waste material flow in India (GTZ-MAIT, 2007; Manomaivibool, 2009; Wath et al., 2010, 2011). However, these evaluations of e-waste material flow were generic, and presented the overall material flow in the system by including both the formal and informal sector. Also, these research either used data from a particular city in the country (Delhi- GTZ-MAIT, 2007; Bangalore- Manomaivibool, 2009) or used secondary data and presented an analysis of the issue (Wath et al. 2010, 2011). Further, during the pilot field work it came to be noted that with the increased quantity of e-waste generated in the country, formal systems to manage them were also on the rise. This strengthened the idea to explore e-waste material flow existing in the formal system.

The e-waste material flow explored in this research focused on the formal sectors only, with emphasis on e-waste material arising from the bulk consumers of the IT service sector. The data for the research was collected from the IT service sector spread across the country. The focus on bulk consumers from IT service sector has helped in drawing attention to the generators of e-waste (who have not hitherto received specific attention) from the formal system. The prominence of formal recyclers in managing the e-waste (Figure 6.12), is contrarory to the popular belief that e-waste recycling in developing countries is retained in the informal sector. Although the competition and engagement of informal sector in e-waste management cannot be ignored, there is a growing presence of formal recyclers in the country.

Analysis of material flow also pointed to different levels of e-waste management among the organisations in different groups. While the very large IT organisations and IT producers exhibited a proactive approach to e-waste management, the large IT organisations and the formal recyclers took a minimal reactive approach to e-waste management. It was noted that the SME IT organisations ignored the challenge of e-waste and were indifferent to its management. The different levels of e-waste management indicate that management practices for e-waste already exists in the country. The existing research on e-waste have not observed or pointed to these different levels of e-waste management in organisational groups as they were generic and were conducted with an aim to present overall e-waste scenario in the country. The recognition of existence and understanding of these practices is essential to rope the participation of these groups in any new system developed to manage e-waste.

Examination of the levels of e-waste management among the organisations in different groups pointed to the presence of certain drivers and enablers that drove the approach to e-waste management in the organisations. Although the drivers for organisational environmental response identified in the conceptual model (Figure 3.3) came from past research that were mostly based on polluting industrial sector, many of them were applicable even in the case of service industry like IT that carried a green image. It was noted that the proactive approach to e-waste management was driven by indirect financial drivers like regulation, peers, clients/NGOs, brand image and socio-ethical drivers like corprate culture and leadership and CSR. The direct financial benefit of e-waste management was only weak in this proactive approach. The reactive approach to e-waste management was driven by regulations and direct financial benefits of e-waste management. The indifferent approach to e-waste management was taken by those organisations that only viewed and valued the direct financial benefits associated with e-waste management. The drivers further point to the effect of participation in the global production network, which has made organisational environmental response important for businesses in

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the present competitive global environment as identified by Christmann and Taylor (2001). This is an indicator for policy makers in developing countries, that environmental issues cannot be ignored or left on the periphery, if economic growth of the country is envisaged. Apart from this awareness, EMS and availabilty and access to formal recyclers enabled the organisations to implement their e-waste management practice.

The identification of flow of e-waste material and analysis of practice here has also helped in drawing attention to the challenges in the existing practices which include value expectation from e-waste at the time of disposal, patchy awareness, lack of formal collection mechanism and regulatory shortcoming. Need for formal collection mechanism in developing countries (Lin et al., 2001; Manomaivibool, 2009; Li at al., 2012) and role of awareness in e-waste management (Sinha-Khetriwal et al., 2005; Chatterjee and Kumar 2009) have been identified in the past research. Previous research has also acknowledged value expectation by the consumers at the time of disposal of e-waste in developing countries (Lin et al., 2001; Wath et al 2010, 2011). However, the consumers referred to in these researches are the household consumers. Bulk consumers from institutions have been regarded as a group that could easily be roped in an e-waste management system when developed (Manomaivibool, 2009). But the findings here show that value expectation from e-waste is not just limited to household consumers but also extends to bulk consumers in developing countries. Although the need for regulation to manage this e-waste (Sinha-Khetriwal et al., 2005; Chatterjee and Kumar 2009) has been emphasised, the findings here point to the need for effective regulation with proper mechanism for monitoring, targets and wider applicability to include the generators of e-waste. The recommendations (9.1.6) made in this research are based on the analysis of existing practice (before the implementation of new rule) and point at ways for better e-waste management, which have gone amiss in the new rule. It points to the limitations in the new rule, which include - lack of collection target, need to mandate all types of bulk consumers, recognition and role of other institutions to improve awareness and provide support for collection and lack of explicit penalties for non-compliance. These limitations need to be addressed if the new rule should effectively manage e-waste.

9.3 Methodological Reflection

The topic of this research was novel in many senses in that it chose to study a **new environmental challenge** – e-waste; in a **developing country** context – India where the existing research on e-waste focused on need for regulatory changes and environmental damages due to informal recycling sector; chose a stakeholder group that had not gained much research attention – **bulk consumers** and finally even among the bulk consumers it chose a group that carried a ‘clean green image’ in the country – **IT service sector**. This novelty made it very challenging to draw the conceptual model required for data collection. But this challenge was anticipated and it was overcome by combining the elements of deductive and inductive research.

To begin with since e-waste was recognised as an environmental challenge and since bulk consumers came from organisations, literature on organisational environmental management and strategy was reviewed along with existing literature on e-waste and waste management to develop the conceptual model. Testing of this conceptual model during the pilot phase helped in amendments to the model by incorporating the field realities before data collection. The data collection and analysis not only revealed the e-waste material flow and the factors driving organisational response to e-waste management but also helped in revealing forces driving these factors. Thus, although the amended conceptual model did not point beyond the factors driving and enabling implementation (Figure 4.3) the data analysis revealed the forces driving the factors for organisational response to e-waste management (Figure 8.2). A retroductive approach moving between deduction and induction alternately has been useful in this context where the research topic is unexplored and new.

The enquiry of this research was to analyse the mechanism of e-waste management in the bulk consumers. Despite the criticisms of multiple cases for compromise on depth of analysis (4.4) the chosen qualitative approach based on multiple cases provided an opportunity to understand and explore the existing system for e-waste management among the bulk consumers more thoroughly and helped in gaining a complete picture of the sector as a whole. The quality of material generated was rich and so it helped in also understanding the factors determining the response of producers and formal recyclers. It is acknowledged that statistical conclusions that are favoured for decision-making purposes in policy matters could not be drawn from this approach. However, that was not the aim of this research. Here the aim was to gain an understanding of practices and drivers for e-waste management in a stakeholder group that was not researched, so as to provide an understanding that would enable in policy matters. The research strategy and approach used thus helped in generating authentic and first hand information on the current practices that has not been acknowledged even in the new e-waste regulation in the country.

9.4 Scope for Future Research

Past research have emphasised the need for regulations in developing countries to manage e-waste and have proposed EPR based approach (Widmer et al, 2005; Sinha-Ketriwala et al., 2005). This research was conducted at the time when regulatory interventions for e-waste management were being formulated based on EPR policy. Also, at the time of this research changes were being made with regards to certain IT policies in the country like closure of STPI scheme. It cannot be ignored that these policy changes would influence the behaviour of the system and stakeholders, which must be acknowledged when considering the findings and applicability of the research in the future. However, this also provides the opportunity to study how these system changes would alter the behaviour of stakeholders (especially bulk consumers) and what transformation it would bring to e-waste management practice in the country. This would also help in assessing the usefulness of EPR based approach in a developing country context.

This research has explored the e-waste material flow in the formal system and has identified three distinct approaches to e-waste management viz. proactive, reactive and indifferent exhibited by the organisations in the formal sector. Such levels of e-waste management have not been identified in past research as discussed (9.2). It would be useful for the future research on e-waste management practices in the country to study these levels in more detail and identify if such levels are also exhibited by other stakeholders. Such an understanding would help in assessing the level of e-waste management in the country better.

This study by identifying the factors determining e-waste material flow originating from bulk consumers in a particular private sector (IT service sector) has brought another aspect of e-waste management under examination as this aspect has not been looked at in the past research on e-waste (1.3). The findings here from this research could be applicable to other private service sectors like banks and other financial institutions, but caution must be placed on application of learning from here to bulk consumers in public limited organisations. The determinants and the response in public and government institutions would be different from private sector. So the findings here are more generalizable for bulk consumers from the private sector. Future research could look at the material flow and factors influencing the behaviour of bulk consumers in the public sector so as to gain a complete picture about the bulk consumer response and add to the existing knowledge of e-waste material flow in the country.

Although previous research (Manomaivibool, 2009; Wath et al., 2010) have pointed to various systems (ARF, tax credits etc.) that could be leveraged for e-waste management in the country, the value expectation for e-waste and its influence on e-waste material flow that has been identified in this research has not gained sufficient research attention so far. Future research on e-waste in a developing country context should explore this. The value for e-waste was revealed to be less for the very large IT organisations who are generators of large quantities of e-waste. These organisations were environmentally proactive and were actively engaged in reducing their carbon footprints and were looking at corporate sustainability more holistically. This may be true for large organisations. So, an incentive system for the participation of bulk consumers that goes beyond financial considerations (like carbon credit), could be explored that would help in closing the material loop.

9.5 Lessons Beyond India

This research focused on bulk consumer response to the challenge of e-waste in India. The findings have revealed that e-waste is viewed to have an innate value among the stakeholders in India. Prevalence of such value in e-waste in other developing countries is possible where e-waste is viewed as a resource that provides livelihood opportunities. Also this research has shown that e-waste management in India not only exists in the much debated and explored informal sector, but is also prevalent in formal sector like bulk consumers and producers. Formal recyclers have also come into operation and are receiving material from the aforesaid formal sector stakeholders. So, practice for e-waste management has already evolved before the implementation of new regulation. Such practices need to be recognised in developing countries while developing regulations for e-waste management and should not be a transplantation of Western e-waste rules as demonstrated in the case of Indian e-waste regulation.

The level of e-waste management practice demonstrated by the bulk consumers, the factors shaping e-waste management and enabling its implementation could also be applied to other private sector settings in other countries, although it would need to be tested. The lessons in e-waste management obtained here have demonstrated that when waste has an innate value the dynamics of waste management is altered. This lesson could be useful while looking at management of similar waste.

Another learning outcome from this research is that participation in the global production network has not only brought about regional economic development but has also brought recognition of the importance of environmental management. The regional institutions (particularly the national government) in developing regions should acknowledge this changing global requirement that has begun to emphasise good environmental management practices and need to provide an encouraging environment for the organisations to respond to this if regional economic developments are to continue.

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APPENDIX 1 - Interview Guide

A.1. Questions for IT Sector Bulk Consumers

Current practices in the organisation

- What are equipments that are considered as e-waste in your office? (Prompts- duration of use; approximate quantity generated; storage period and place)
- What do you do with used electronic equipments? (Observe the path/ step-by-step approach chosen; Prompts- which are the various groups within the organisation that are involved; is it inventoried? ; how is it coordinated)
- Could you tell a little more about receivers of your e-waste ((Prompt- How they identify them; what are the requirements they look in them; data security measures; any support in identification from external agencies like peers, regulators)
- Do you check on the recyclers about the status of the e-waste you give to them? (prompt- any documents that are needed to be supplied, any inspection)
- Is there an e-waste policy? (Prompt – Is e-waste management part of EMS/OHAS/CSR; a copy of policy/ a glance at it)
- How long have you been following the above practice?

Factors determining/influencing the current practices

- What according to you were the reasons for having an e-waste management system in place? (Prompt – Reasons; Finance, regulation, sector/peer pressure, client requirement, brand image any other)
- Is there any requirement from your clients to have certain sustainable practices in place like this? (prompt- competitive advantage, contract requirement, enhanced brand image)
- To what extent you would say that financial costs and benefits shaped the current practice of e-waste management in your organisation (warehousing cost, waste disposal cost etc.)
- Was there any early mover advantage within the sector for having an e-waste management system in place? (Prompt- how and why? who according to you were the first to have the system in place? What could be the reasons?)
- Is there an EMS in place? (Prompt – what are the environmental practices covered here, EMS policy statement, Who is responsible, participation from employees, motivations, years in existences)
- Is environment a thrust area in the organisational CSR activities (observe – the kind of activities undertaken; is e-waste management being considered under this? prompt

motivations, how long, people involved, observe for any link with core business practices)

- What are the environmental regulations that your organisation has to comply with? (Prompt: kind of monitoring, effect of non-compliance)
- Could you tell something about the general practices on e-waste management adopted in the sector and the reasons for the same?

E-waste Value chain

- Do you use the services of service providers? What kind of services they offer? (ask: for some contact for this group)
- Who are the suppliers of electronic equipment (manufacturer/service providers, assemblers)
- Do you keep a track of the used equipment that has reached other places through donation? (How, why?)
- Who is preferred partner to take the e-waste recycler/ manufacturer? Why? (Prompt- what factors influence this decision)
- What is the financial and other requirement you need to carry out the e-waste disposal (material and monetary path)
- Do you face any difficulties in carrying out the e-waste disposal? What are they? (prompt- for any support or system requirement)
- What is the kind and level of interaction you have with the producers? (Prompt- Do they ask on product quality improvement? Do they discuss about material take-back?)
- Are you aware of the e-waste policy that is being formulated? Do you think that would affect or alter the current practice you have in place?

A.2. Questions for Producers

Current practices in the organisation

- What do you do with the e-waste generated during manufacture? (Prompts- approximate lifespan of equipments; approximate quantity generated; storage period and measures taken)
- To whom do you handover the e-waste? (Prompt- How they identify them; what are the requirements they look in them; any support in identification from external agencies like peers, regulators)
- Do you take responsibility of end-of-life equipment generated currently? (Prompt- What do you do, how (buy-back or other options), why? What happens to the collected EOL equipment by them)
- Is there an e-waste policy? (Prompt – Is e-waste management part of EMS/OHAS/CSR; a copy of policy/ a glance at it)
- How long have you been having the system in place?

Factors determining/influencing the current practices

- What according to you were the reasons for having an e-waste management system in place? (Prompt – Reasons; Finance, regulation, sector/peer pressure, global requirement, brand image any other)
- Do you think the global emphasis on e-waste management has influenced in anyway your current practices? (prompt- competitive advantage, brand image, parental company policy)
- To what extent you would say that financial costs and benefits shaped the current practice of e-waste management in your organisation (warehousing cost, waste disposal cost etc.)
- Was there any early mover advantage within the sector for having an e-waste management system in place? (Prompt- who according to you were the first to have the system in place? Why?)
- Is there an EMS in place? (Prompt – what are the environmental practices covered here, EMS policy statement, Who is responsible, participation from employees, motivations, years in existences)
- Is environment a thrust area in the organisational CSR activities (observe – the kind of activities undertaken; is e-waste management being considered under this? prompt motivations, how long, people involved, observe for any link with core business practices)
- What are the environmental regulations that your organisation has to comply with? (Prompt: kind of monitoring, effect of non-compliance)

- Could you tell something about the general practices on e-waste management adopted in the sector and the reasons for the same?

E-waste Value chain

- Who are the major customers (IT companies, service providers, others)
- When you take the responsibility of EOL equipments is it easier to get it back from bulk users (prompt- what they offer to get it from bulk users, what is shaping the decisions of bulk users), why?
- Do you keep a track of the used equipment that has reached other places through donation? (How, why?)
- Do you check on the recyclers about the status of the e-waste you give to them? (Prompt- any documents that are needed to be supplied, any inspection). Why?
- Is there any refurbishing activity undertaken (Prompts- in-house; authorised; kind of support given to refurbishers; markets for the products, closed loop material manufacture). Why?
- What is the financial and other requirement you need to carry out the e-waste disposal (material and monetary path)
- Do you face any difficulties in carrying out the e-waste disposal? What are they? (prompt- for any support or system requirement)
- Do you seek any input from users for design/product improvement? Whom? Why? And how?
- Do you offer any kind of assistance to the recyclers (training on product design for dismantling, buying back any material from them for production, or refurbishment).Why and how?
- Are you aware of the e-waste policy that is being formulated? Do you think that would affect or alter the current practice you have in place?

A.3. Questions for Formal Recyclers

Current practices among the Recyclers

- What is your source of material? (observe for different groups like IT companies, service providers, manufacturers and others like e-waste importers, informal sector Prompt – do they approach you; how do you reach them)
- Could you tell about your collection and handling practices (Prompt- What do you do, how, cost associated, logistics, documents/paperwork, any requirement from clients to follow certain procedure)

Factors determining/influencing the current practices

- How long have you been in the business of recycling and why? (Prompt – Reasons; Finance, market, anticipation of regulation, any other)
- Do you have EMS in place? (Prompt – reasons, difficulties and advantages of having it, a copy of policy/ a glance at it)
- What are the environmental regulations that your organisation has to comply with? (Prompt: kind of monitoring, effect of non-compliance, support you receive from government/regulators)
- Are there any requirements specified by your clients while giving you their e-waste? (Prompts- what are they, are there any competitive factors, how do they monitor it and why do you think they ask for them?)
- Could you tell something about the general practices on e-waste management adopted in the sector and the reasons for the same?
- Is there CSR in your organisation and what does it include?

E-waste Value chain

- What is the market for the different outputs of recycling? (Prompt- who are the different downstream vendors, how they identify them; Do they look for any special process to be undertaken by recyclers for any product, in case of export to other countries, what are the procedures that they have to follow, get some contacts of them)
- Is there any refurbishing activity undertaken (Prompts- in-house; association with secondary market for parts, with manufacturers refurbishing system)
- Could you tell something about the cost associated with recycling (material and monetary path)
- What are the challenges you face in the business? (prompt- competition from informal sector, acquiring material, markets for your products, regulations)

- Do you receive any kind of assistance from manufacturers for dismantling?(Prompt- training on product design for dismantling, giving back certain parts for reuse, or refurbishment to manufacturers, why do you think they are doing it?)
- Are you aware of the e-waste policy that is being formulated? Do you think that would affect or alter the current practice you have in place? (Prompt- do you think manufacturers will become your competitors by starting their in-house recycling to close the material loop)

A.4. Questions for Regulators and Others

Current practices among different stakeholders

- What are the environmental regulations that govern e-waste management currently in the country? (prompt- monitoring mechanism in place by the regulators, non-compliance effects)
- What is your opinion about the current practices in e-waste management (prompt- role of manufacturers, bulk users like IT companies, recyclers (formal/informal)

Factors determining/influencing the current practices

- What influences the e-waste management in IT companies (prompt – regulations, CSR, EMS, peer pressure, financial, global clients, and brand image; how it is in SME IT companies?)
- What influences the e-waste management in Manufacturers (prompt – regulations, CSR, EMS, peer pressure, financial, global parent organisation/global pressure, and brand image; Is there difference among national and MNC manufacturers)
- What are the factors that are bringing the formal recyclers into the business despite stiff competition for raw material and strong informal sector?

E-waste Value chain

- What is the support you offer to the different stakeholders for e-waste management?
- What do you think is the level of awareness about the e-waste policy that is being discussed among the IT companies, manufacturers, recyclers?
- Do you think it will bring about a change in the current practices (prompt- liabilities of different group, preparedness and systems in place among them)

APPENDIX 2 - Participant Information Sheet

MANCHESTER
1824

The University of Manchester

Title of Research-
E-waste management in the IT/ITES service industries

You are being invited to take part in a research study as part of a student project.
The aim of the research if to identify the methods of e-waste management currently practised in IT sector, the motivations for these and the hurdles they face to implement it. This study is being conducted as part of the postgraduate research programme, leading to a PhD degree, at the University of Manchester, UK.
Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the research?
The principal investigator is myself, Logakanthi Subramanian. I am being supervised and guided by Dr. Carys Jones, Senior Lecturer Planning and Dr. Richard Heeks, Chair, Development Informatics Institute of Development Planning and Management (IDPM) at the University of Manchester.

Title of the Research
E-waste management in the IT/ITES service industries

What is the aim of the research?
The aim of the research if to identify the methods of e-waste management currently practised in IT sector, the motivations for these and the hurdles they face to implement it and develop an appropriate framework for the management of e-waste.

Why have I been chosen?
Your position in the industry will provide me with an understanding of the nuances that exist in the sectors and the various factors that affect the management of e-waste. Your continued association with my current research will aid in providing valuable insights from the sectoral perspective. It will also aid in further refining the model formed to answer the research questions.

What would I be asked to do if I took part?
As a participant for my empirical field work, you will be required to be part of the semi-structured interviews. The interviews would be recorded electronically, to aid transcription at a later stage. I may also be taking some written notes to supplement the recoded data. You will be required to answer the questions, which I shall be asking you during the meeting.

What happens to the data collected?
The data collected through the meetings, interviews and other documents provided by you will be used purely for academic purposes and will not be made commercial use of. It will be used to answer the research questions.

How is confidentiality maintained?
Confidentiality of the data/information you provide will be ensured. The data, if marked confidential, will be used appropriately and will not be shared with other sources. However, the analysis based on the data may be used for further academic purposes, and shared with other researchers. In addition, your anonymity will be ensured if you so wish. The data will be stored for a maximum of 10 years, in conformation with the policy of data storage of the University of Manchester. It will not be stored either on my personal computer or the server of the University, which is absolutely secure. The data will not be seen by anyone other than the principal investigator (myself) and my supervisor. The records of the interviews will be in my personal possession and will not be shared with any other source, nor will be stored in any location which is not my own.

What happens if I do not want to take part or if I change my mind?
It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time without giving a reason and without detriment to yourself

Will I be paid for participating in the research?
No, there will be no remuneration for participation in the interactions/interviews.

What is the duration of the research?
I will need to seek you time for at least two sessions of one hour each, at times convenient to you. I may, also have to clarify some details if needed during the time of data analyse, which can be provided by your kind self.

Where will the research be conducted?
The research will be conducted in your office space, during office hours.

Will the outcomes of the research be published?
The anticipated publication of the research study and findings are the thesis report and possibly research journals and writings in the newspapers.

Criminal Records Check (if applicable)
N/A

Contact for further information
Contact details will be provided when I move to India where this study will be conducted.

What if something goes wrong?

If you wish to make a formal complaint about the conduct of the research please contact the Head of the Research Office, Christie Building, University of Manchester, Oxford Road, Manchester, M13 9PL.

APPENDIX 3 - List of Participated Organisations

List of IT Service Organisations

S.No.	About the Organisation	Organisation strength and location	Nature of business
VL1	It was started in 1968 to provide computer services to their own group of companies. Today it is an IT services, business solutions and outsourcing organisation that caters to global businesses. It is part of one of India's largest industrial conglomerates and most respected brands. It has been rated as number one IT company in India and is headquartered in Mumbai.	It has over 2,14,000 of the world's best-trained IT consultants in 42 countries	It offers a consulting-led integrated portfolio of IT and IT-enabled services delivered through its unique Global Network Delivery Model. Their clients range from banking, financial services and Insurance sector to telecom, to retail and distribution to manufacturing, life science, energy, media and others.
VL2	It is an IT consulting company started in 1981 and is today the third largest IT Company in the country with its headquarters in Bangalore, India.	Together with its global subsidiaries it employs 1,41,822 employees as of 2011 and has 64 offices and 65 development centres across the world	It offers business and technology consulting, application services, systems integration, product engineering, custom software development, maintenance, re-engineering, independent testing and validation services, IT infrastructure services and business process outsourcing to financial, manufacturing, retail, telecom and other sectors

VL3	It was established in 1945 as a vegetable oil manufacturer but diversified into IT business in late 70s and produced the first personal computer in 1985. However, by 1990s it took its hardware expertise into the services arena and is today second largest IT Service Company in India.	It employs 1,20,000 employees in 21 locations across the world	The Company operates in three segments: IT Services, IT Products, Consumer Care and Lighting. It provides outsourced research and development, infrastructure outsourcing, business process outsourcing (BPO) and business consulting services. It offers services to clients in segments such as banking & capital markets, insurance, travel & hospitality, hi-tech manufacturing, telecom and healthcare.
VL4	It is a brand identity of a big group founded in 1987. It is a part of a group which is one of the top 10 industrial firms based in India. In June 2009, the company unveiled its new brand identity after its takeover by the latter Group's IT arm. It is headquartered in Hyderabad, India.	It has offices in 32 countries and employs 42,092 people	The Company offers consulting and information technology (IT) services spanning various sectors like Banking and Financial services and Insurance, Aerospace and Defence, Energy and Utilities, Life Sciences & Healthcare, Manufacturing, Chemicals & Automotive, Public Services & Education, Retail, Telecom, Infrastructure, Media and Entertainment and others
VL5	It is a unit of U.S.-based company started in 1994 with operations based in India. After two year during which time it acquired 24% stake in another Indian IT service company it became an independent organisation with its headquarter in Teaneck, New Jersey, USA	It employs 1,30,000 employees globally. It has delivery centres in the UK, Europe, India, China, Philippines, Canada, Argentina, and Mexico	It currently provides a wide range of business, technology and consulting services including business process outsourcing (BPO) and has significant practices in Banking and Financial services, Communications, Consumer Goods, Energy & Utilities, Health care, Information, Media & Entertainment, Insurance, Life Sciences, Manufacturing, Retail, Technology, Transportation & Logistics and Travel and Hospitality
L1	It's an Indian company founded in 1993 with major focus on banking solutions	It employs over 10,000 people and operates from multiple location within the country and globally	It offers banking and insurance services. It is an outsourcing partner for 10 of the top 15 global banks and 6 of the 10 top global insurance companies.

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L2	It is a captive BPO of an international bank and was founded in 2000 and operates from Chennai in India.	Employs over 10,000 people in India and operates from one city	It offers ITeS and BPO services to its banking group across the globe.
L3	It is merger of two companies now. The older of the two was founded in 1978 in India. It is headquartered in Bangalore, India.	It has an employee strength of over 15,000 with multiple global delivery centres spread across 11 cities worldwide and 22 international offices	Its service offerings include application development and maintenance, enterprise application solutions, business and technology consulting, product engineering services, infrastructure management services, customer interaction services & business process outsourcing, quality assurance and engineering services
L4	It was established in 2001, as a third party service provider. The company has its headquarters in New York.	It employs close to 5000 employees in India and has four operational centres located at Mumbai and Chennai	The services offered include Customer care, Document Management, Tele-Marketing, Insurance Claim Processing and Revenue Cycle Management, Finance & Accounting in areas of Health care, Finance, Banking, Insurance, Consumer Goods and Real Estate
L5	It was founded in 1991 and has its headquarters in Chennai, India and provides integrated IT services to small, medium and large enterprises	It employs over 4,000 employees and has over 30 offices across the country offering services and operates from 7 countries	It offers services in Engineering and R&D, Outsourced Product Development (OPD), IT Infrastructure Management (RIMS), Enterprise Applications for Banking, Telecom and Manufacturing

SM1	It is an eight year old software company that sells software products to domestic and international clients. Its main office is based in Chennai, India	It employs over 200 people and operates from single location.	Software services
SM2	It is over 20 years old and all its clients are from US insurance sector and is headquartered in Chennai, India.	It employs close to 100 people and operates from single location	Software development for insurance sector
SM3	It is over two years old and services domestic clients	It employs 25 people operates from single location	Provide sustainability benefit services to companies in banking, IT and BPO services
SM4	Over seven years old with providing service to clients from USA and Europe	It employs over 300 people and operates from three locations in India	Provide service in real estate space
SM5	It began operations in the 90s and specialises in IT infrastructure and is headquartered in Chennai, India	Over 500 employees and operates from six cities in India	IT infrastructure and development of built space for IT
SM6	It is over five years old and services US clients. It is head quartered in Hyderabad, India	It employs about 25 employees and operates from single location	It provides Off-shore development and ITeS services
SM7	It was founded in 2005 and has head office in Chennai, India. It only offers service to overseas clients from USA, Europe and Middle east.	It employs over 100 people and mainly operates from one location in India, although it has two overseas offices.	It provides outsource management for accounting, legal and other business services

SM8	It was founded in 2001 to offer service to its own financial group but has extended this to overseas clients and has over 50 global clients from Asia, Australia, UK and US. It is headquartered in Chennai, India.	It employs close to 1000 employees and operates from one location in India.	It is a BPO mainly offering banking and insurance services.
SM9	It was founded in 2000 and offers service to both domestic and internal clients.	It employs about 80 employees and operates from a single location in India	It is an IT service company offering application development and maintenance to media and mobile companies.
SM10	It is over 10 years old and services both domestic and international clients.	It employs about 700 employees and mainly operates from Chennai, although it has small offices in Bangalore and Mumbai.	It provides software testing service

VL – Very Large IT organisation

L – Large IT organisation

SM – Small and Medium IT organisation

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List of IT Producer Organisations

S. No.	Type of Organisation	Nature of operation
P1	Domestic Manufacturer	IT Equipment manufacturer mainly focused on commercial sector
P2	International Manufacturer	IT Equipment manufacturer that services both household and commercial sector
P3	International Manufacturer	IT Equipment manufacturer that services both household and commercial sector

P – Producer

List of Formal Recyclers

S. No.	Type of Organisation	Nature of operation
RC1	Domestic	Handles only IT equipment. Has collection across the country but operates from one location. Only involved in dismantling and segregation no resource recovery
RC2	Domestic	Handles only IT equipment. Has offices in five locations and collects across the country but operates from two locations. Only involved in dismantling and segregation no resource recovery
RC3	International	Handles only IT equipment. Operates from SEZ in one location, while has collection across the country. Involved in dismantling and segregation no resource recovery also has a separate refurbishing unit.
RC4	International	Handles only IT equipment. Has collection across the country and operates from one location in the country and is currently developing resource recovery operations
RC5	Domestic	Handles only IT equipment and collects and operates from one location. Involved mainly in dismantling and segregation.

RC – Recycler

List of Other Organisations

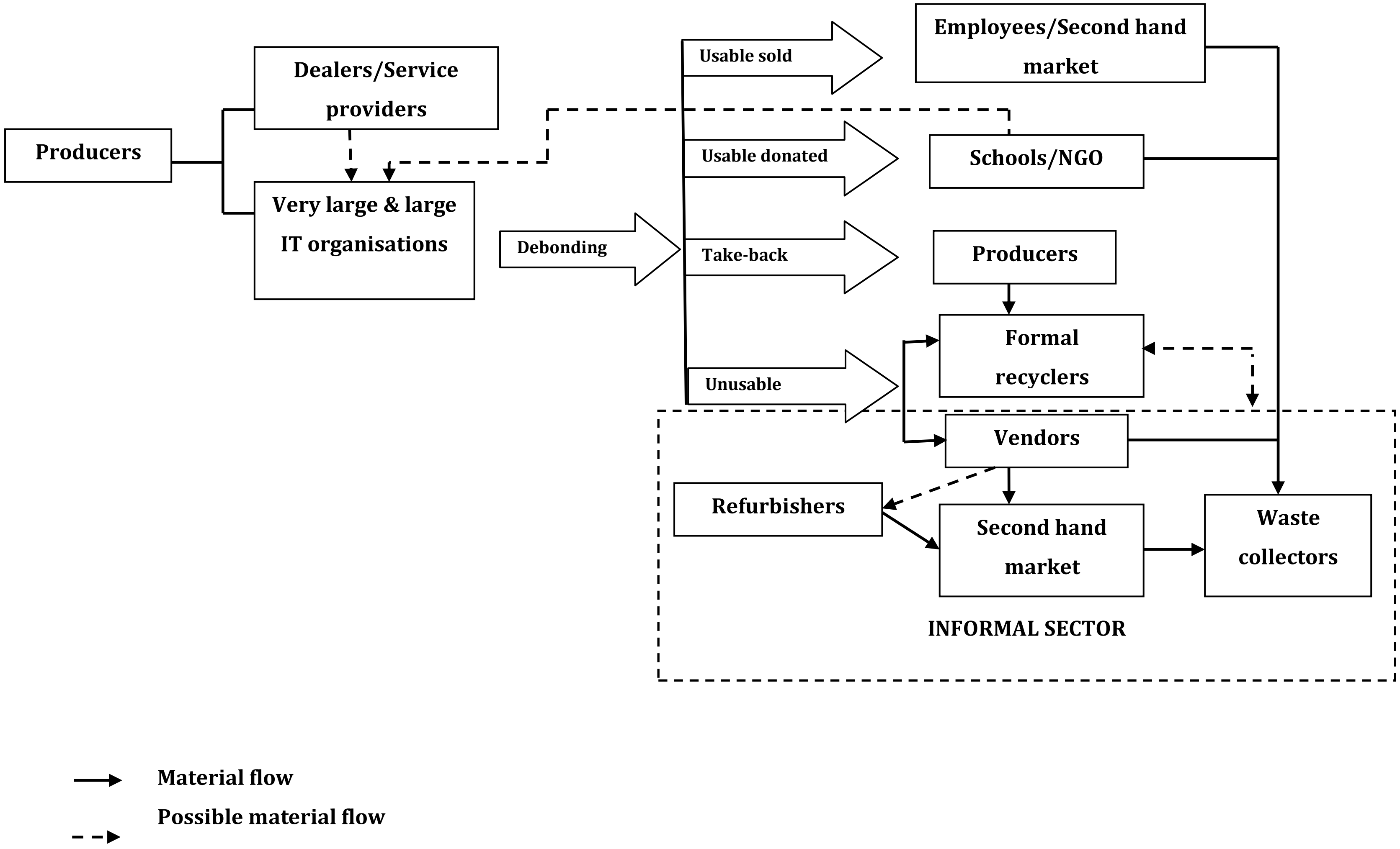
S. No.	Type of Organisation	Nature of work
German international cooperation (GIZ)	International	Provider of international co-operation services for sustainable development
MAIT	National	Industrial Association of IT hardware organisations in India
NASSCOM	National	Industrial Association of IT software organisations in India
Greenpeace	International NGO	Environmental activist organisation
Toxic links	National NGO	Environmental NGO, working to bring toxics related information into the public domain in India
Sahas	National NGO	Environmental NGO working on urban solid waste issue
Centre for Sustainability	National NGO	Organisation working on sustainability issue in India
ELCOT	State government agency	Organisation involved in procurement and maintenance of IT equipment in the state
TNPCB	State government	Environmental regulator in the state
APPCB	State government	Environmental regulator in the state
Orient computers Pvt. Ltd	National	Dealer
Star computers Pvt. Ltd	National	Dealer
Apsar system	National	Refurbisher and service of IT equipment
Ramakrishna Mission students' home	Service	School
Sahayam	Service	Training centre and orphanage
Dr. Joseph	University	Professor
Others		Waste collectors (2)

APPENDIX 4 - Dates of interview

S.No	Organisation	Date
1	Very Large (VL) 1	6.4.2011; 23.5.2011; 31.5.2011
2	VL2	12.10.2010; 15.4.2011
3	VL3	12.4.2011; 19.7.2011
4	VL4	13.7.2011
5	VL5	13.10.2010; 31.3.2011; 9.6.2011; 23.6.2011
6	Large (L) 1	17.6.2011
7	L2	17.6.2011
8	L3	29.7.2011
9	L4	16.6.2011
10	L5	14.6.2011
11	Small and Medium (SM) 1	10.6.2011
12	SM2	22.6.2011
13	SM3	2.6.2011
14	SM4	10.6.2011
15	SM5	8.6.2011
16	SM6	1.8.2011
17	SM7	6.7.2011
18	SM8	6.7.2011
19	SM9	10.6.2011
20	SM10	13.6.2011
21	Producer (P) 1	12.4.2011
22	P2	13.10.2010; 13.4.2011
23	P3	30.5.2011; 18.8.2011
24	Recycler (RC) 1	14.10.2010; 15.4.2011
25	RC2	20.5.2011; 22.5.2011
26	RC3	21.5.2011
27	RC4	12.5.2011
28	RC5	26.4.2011
29	Regulator (R) 1	5.11.2010; 6.6.2011; 17.8.2011
30	R2	11.7.2011
31	MAIT	18.10.2010; 30.3.2011
32	NASSCOM	19.10.2010; 5.4.2011
33	GTZ	18.10.2010; 30.5.2011; 17.8.2011
34	ELCOT	27.10.2010; 30.3.2011
35	Toxic Links	20.10.2010; 17.8.2011
36	Green Peace	12.10.2010
37	Sahas	14.4.2011
38	Centre for Sustainability	15.4.2011
39	Waste collector	21.6.2011
40	Refurbisher	5.8.2011
41	Office scrap dealer	7.5.2011
42	School 1	8.8.2011
43	School 2	17.8.2011
44	Academician	9.11.2010; 18.7.2011

APPENDIX 5 - Figures Used for Simplified Structure Laying Technique

Likely E-Waste Path among Very Large and Large IT Organisations



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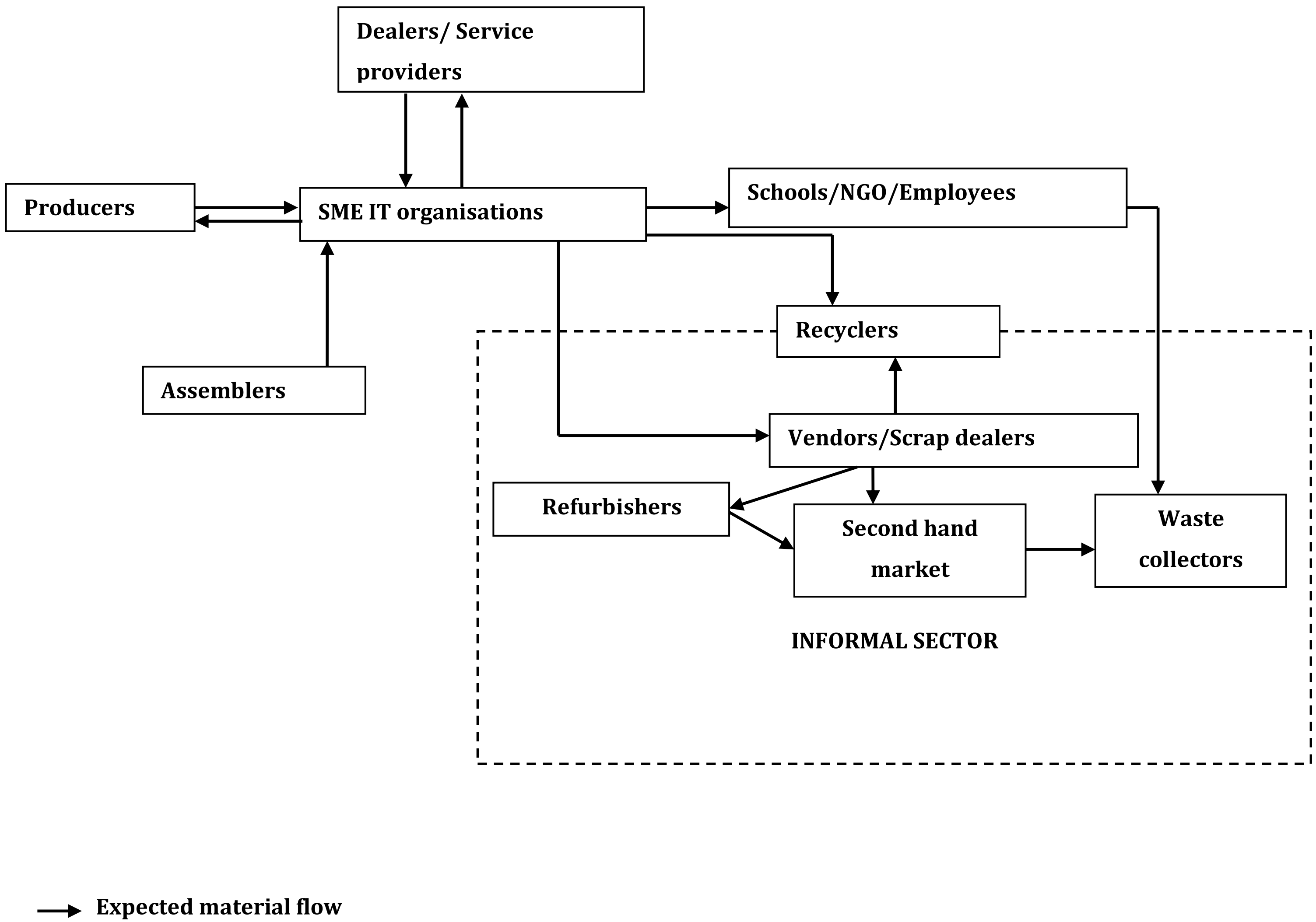
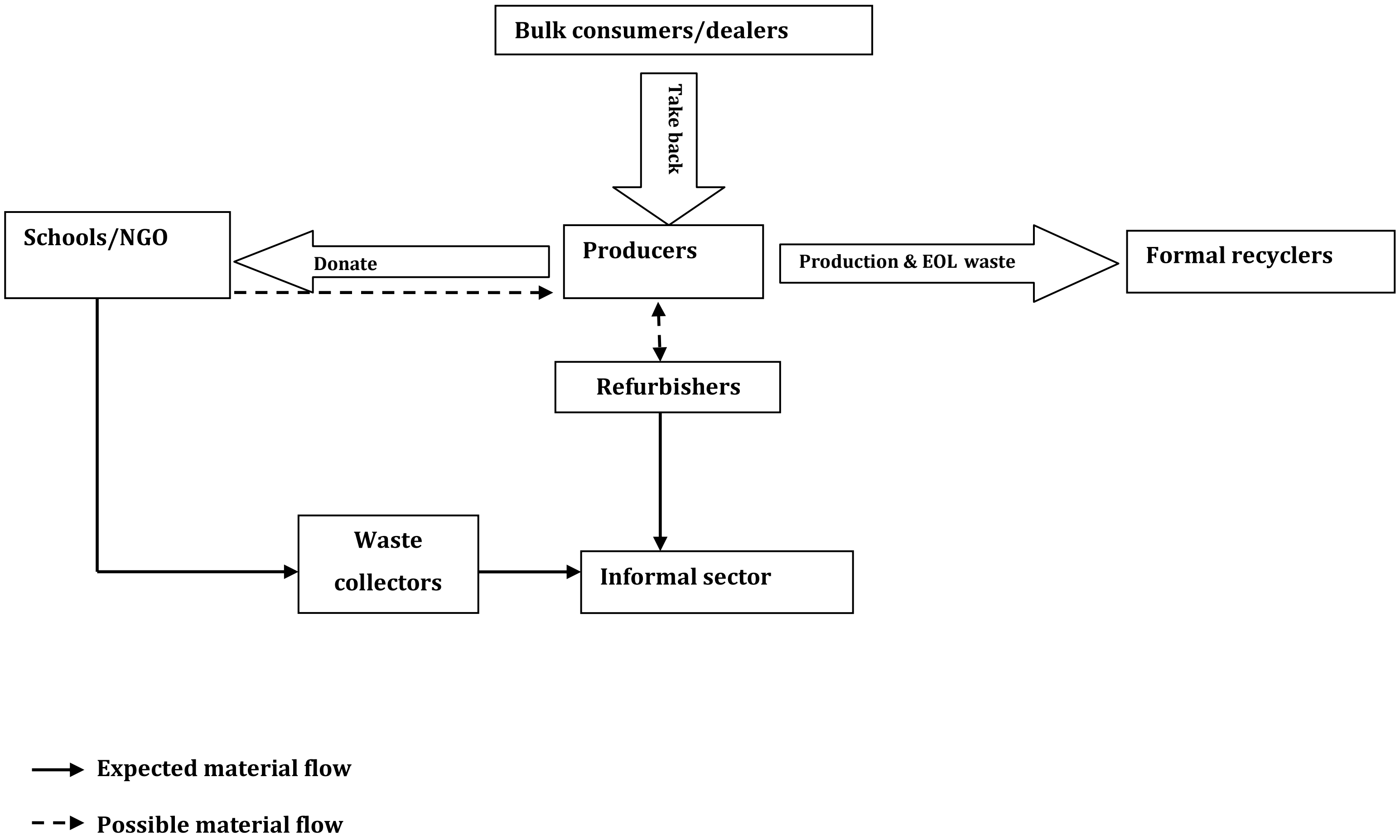
Likely E-Waste Path among SME IT Organisations



Likely E-Waste Path among IT Producer Organisations



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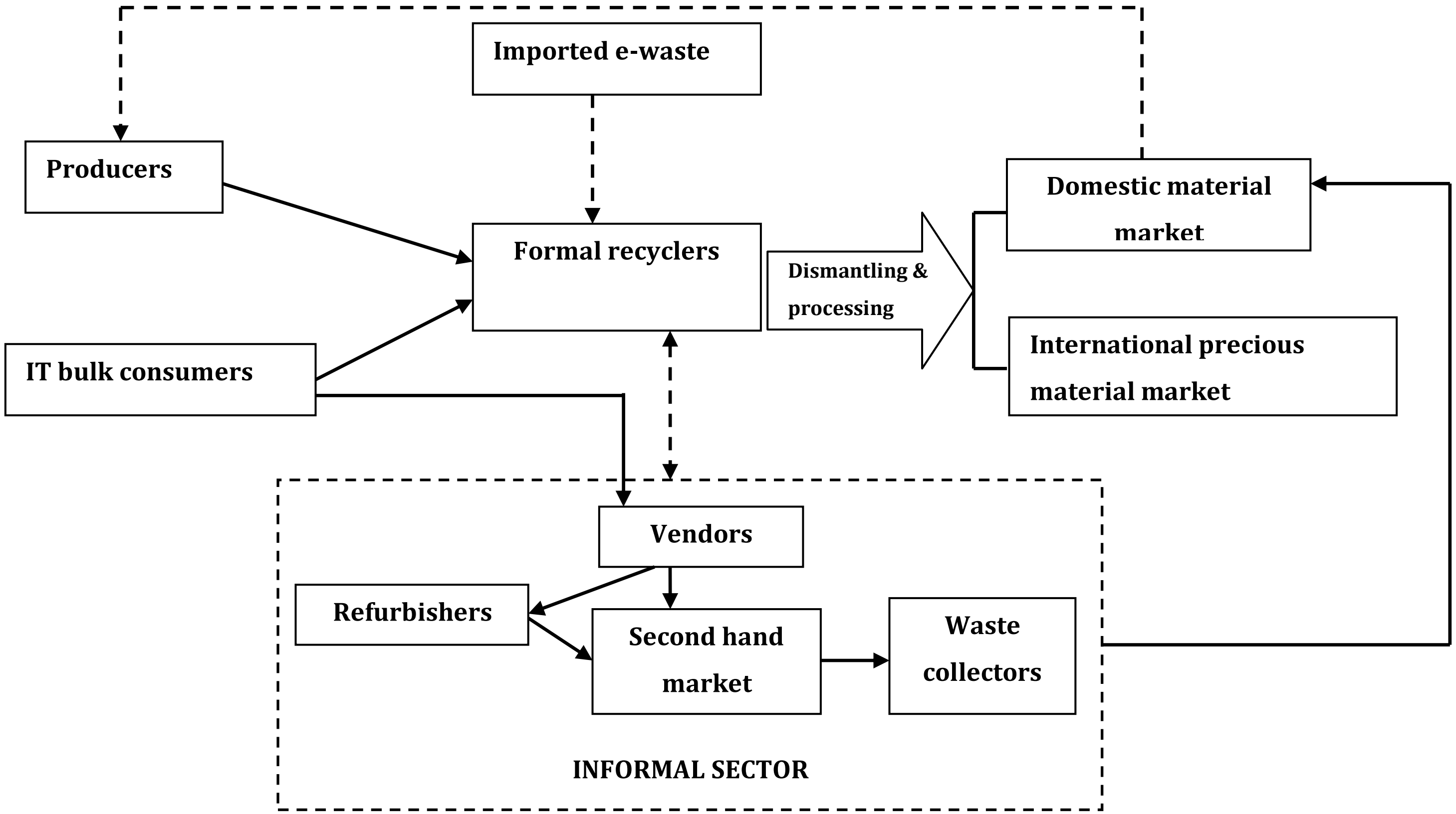
Likely E-Waste Path among Formal Recyclers



Material flow

Possible material flow

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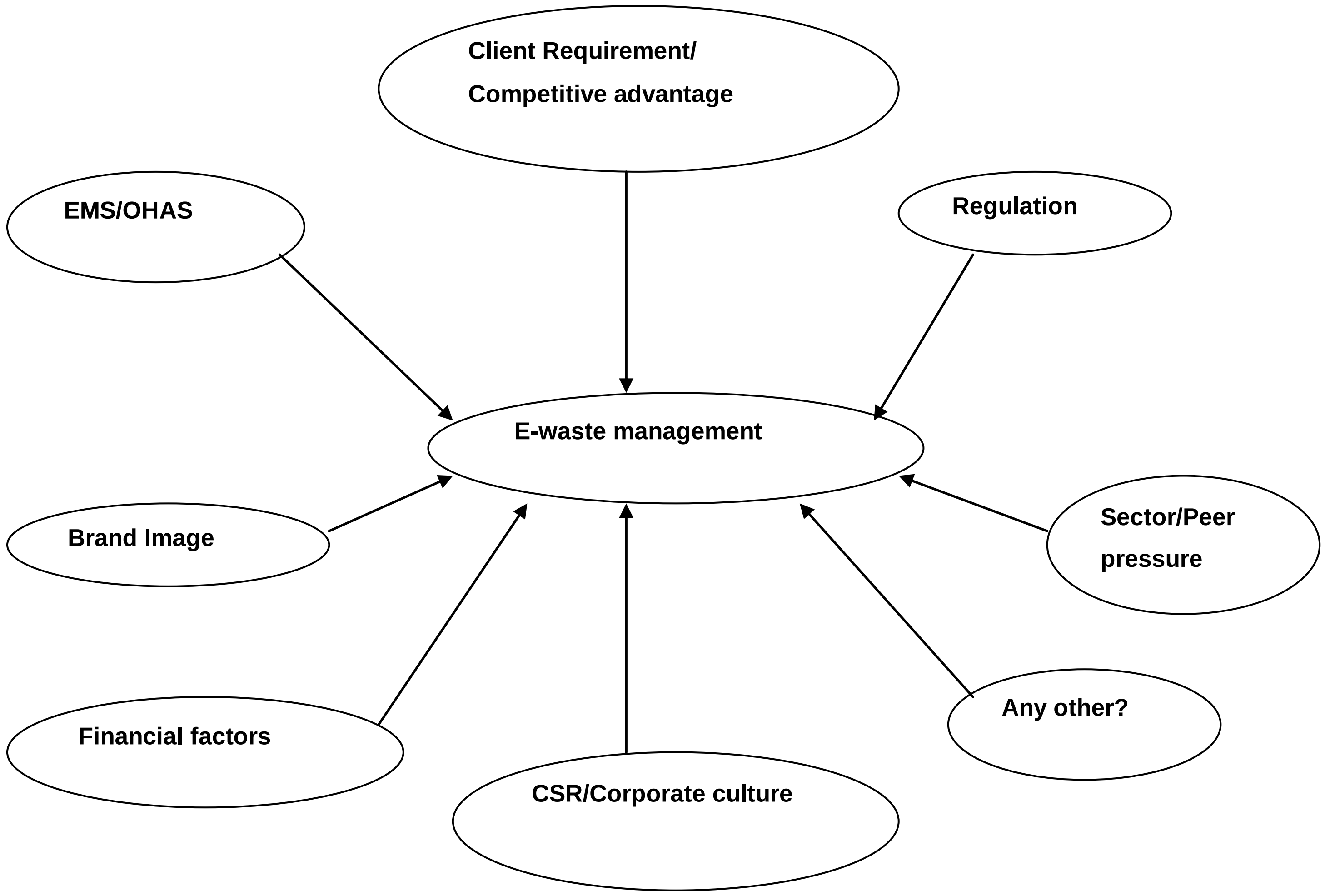
Factors Influencing E-Waste Management



APPENDIX 6 - Code Tag

Code	Theme
AEWP	Awareness on E-waste policy
AOBTE	Attitude of business to environment
AOC	Age of company
AOP	Age of Practice
AWCPS	Awareness on current practice in the sector
CHEWM	Challenges to e-waste management
CR	Client requirement
DEFEW	Definition of e-waste
DFEWB	Drivers for e-waste business
DFEWM	Driving force for e-waste management
DON	Donation
DSVOR	Downstream vendors of recyclers
EMSOHAS	EMS/OHAS Certification
EREGR	Environmental Regulatory Requirement
EWMPIY	E-waste management practice in years
EWP	E-waste policy
EWPR	E-waste processing
EXEW	Example of e-waste
FIEWMBI	Factors influencing e-waste management -brand image
FIEWMCC	Factors influencing e-waste management-corporate culture
FIEWMCR	Factors influencing e-waste management-client requirement
FIEWMCSR	Factors influencing e-waste management -CSR
FIEWMEA	Factors influencing e-waste management -employees awareness and demand
FIEWMEMS	Factors influencing e-waste management -EMS
FIEWMF	Factors influencing e-waste management -Finance
FIEWMPP	Factors influencing e-waste management -Peer pressure and sharing
FIEWMREG	Factors influencing e-waste management -Regulation
FIFI	Formal informal interaction
GITBM	General IT business model
GRNACT	Green activity

IEWMITS	Importance of e-waste management in IT sector
IEWR	Identification of e-waste recyclers
IEX	Forum for information exchange
IRECEW	Identification of receivers of e-waste
ITPIEC	IT Policy influence on environmental compliance
LLE	Life cycle of leased equipment
LOF	Location of facility (STPI/Non-STPI)
MEW	Manufacturing e-waste
MREOL	Mechanism and Responsibility for EOL equipment
NOE	Number of employees
OEP	Organisation Equipment policy
OGI	Other green initiatives
OGIEWD	Organisational groups involved in e-waste disposal
ORE	Operation of renting equipment
PAS	Products and services
PCFS	Part cannibalisation for service
PEPR	Preparedness for EPR based rule
PFEWD	Procedure for e-waste disposal
PP	Peer Practice
PPIR	Preferred partner in recycling
QEW	Quantity of e-waste
RECEW	Receivers of e-waste
RECOGAP	Recognition among peers
RECUACHB	Recyclers understanding and challenges to business
REFRBSH	Refurbishment
REGS	Regulatory support
RoHSC	RoHS compliant
RTBEOL	Reasons for take back of EOL
RUREC	Reuse and recovery of material
SCRD	Scrap dealer
SOM	Source of material
STFEW	Storage time for e-waste
TEWD	Tracking of e-waste donated
TMCTGI	Top management commitment to green initiative
TOC	Type of clients

USP	Using external service providers
VCIMR	Interaction between manufacturer and recyclers
VCMMFR	Monetary and material flow to recyclers
VCPFB	Product feed back to manufacturers
VCPPM	E-waste value chain- procurement practice with manufacturers
VCRC	Regulatory checks by authorities
VCRS	Regulatory support
VCSAR	Service agreements with recycler
VCTBM	Take/buy-back with manufactures