On the Pathway of Waste to Wealth, Issues, Challenges and Role of a Start-up in E-Waste Management – A Case Study of Mahalaxmi E Recyclers

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Electronic devices play an important role in everyone's life which turn into obsolete due to lifestyle changes, or replacement and turn to e-waste. E-waste with diverse composition pose challenges in management which is major cause of concern for environmental sustainability. Productive usage of E-waste has played a considerable role in reducing the stress on natural resources through ventures turning "Waste to Wealth. nnovations in Green Entrepreneurship and E-waste Policies would be of help. E-waste management start-ups like Mahalaxmi E Recycler have played an important role which authors in this paper have attempted to understand and depict the role using field visit.

Keywords: E-waste, Mahalaxmi E recycler, Pune, Sustainability

1. Introduction

With the exponential increase in the production/usage of electronics like laptops, smartphones etc., the frequency of older models being discarded to acquire recent versions is a growing trend. E-Waste, comprising disposed electronics/electrical items, including Laptops, Smartphones, Tablets, Computers, Monitors, Servers, Printers, Television units, Refrigerators, Air conditioners, Washing Machines, Computer Monitors etc., has been regularly building up to end in widespread pollution. A massive quantity of e-trash is dumped inappropriately each day and that is one of the everyday worries of environmentalists. Major cause for generation of E-waste:

1. Information & communications technology devices are becoming more affordable
2. Many people own multiple devices
3. Users change their devices more often to keep up with technological changes

The concept of 3 R's-Reduce, reuse and recycle, can applied as the essential functions of doing away with waste and defending our surroundings. All leftovers are not harmless when left to waste. This is especially true for Electronic Waste. Containing a plethora of precious material and finite resources, the reduce-reuse-recycle strategy is constantly being overlooked because of lenient policies governing the disposal of electronic and electric waste. The distinct lack of public awareness and limited avenues for organized, safe e-waste disposal are the two primary issues plaguing countries across the world today. Green activists in India and internationally have rolled up their sleeves to chase their assignment of making cognizance about the want to recycle used merchandise. In recent years, there has been a strong push from private sector to create a positive impact in this industry. A few start-ups have come forward to allay their worries with their innovative ideas to create something new, exquisite and useful out of junk. Although many start-ups now days are offering the option of e-waste recycling, there are few companies that have already set a new standard in this untouched sector. One such example is of Mahalaxmi E Recyclers.

The availability of natural resources is a big question for the future, even when we take the example of electrical and electronic equipment (EEE) products for which natural resources are required in abundance. That's why recycling of these resources assumes importance. The formal recyclers and the recycling centres need to show momentum at this point of time. One can imagine a plethora of direct and indirect benefits such as cleaner and greener environment, better health, enhanced productivity, reduced price, fewer mining activities, etc. from the implementation of formal recycling and hence the formal recyclers should be encouraged to take an active role in e-waste management, especially in developing countries.

Pune Waste Management Scenario

Pune is governed by PMC (Pune Municipal Corporation) and the region includes Pune city, Pimpri Chinchwad, the cantonment areas around Pune and the IT belt in Hinjewadi which nearly generates around 10,000 MT per annum. Pune Municipal Corporation (PMC) and Pimpri-Chinchwad Municipal Corporation (PCMC) together, work with a co-operative called Solid Waste Collection and Handling SevaSahakari Sanstha Maryadit (SWaCH), for solid waste management since 2008. Most areas in Pune had been blanketed through the door-to-door waste collectors who work hard to preserve the town clean and functioning. Pune was chosen among the first cities in India for Smart City Development. As per the Government

Resolution no smartci-pune-2016/PR94/UD-23 dated 14/03/16, the "Pune Smart City Development Corporation Limited (PSCDCL)" was formed on 23rd March 2016 as a Special Purpose Vehicle (SPV) under Smart City Mission for implementation of Smart City Projects in Pune. Pune's smart city proposal with a point of accomplishing zero waste status by 2019 with an orderly operational scheme which incorporates the board and includes management of e-waste. Currently in Pune, e-waste processing is majorly managed by informal sector and there is a dire need of intervention from local governing bodies and participation from various stakeholders to bring about change to formalize the sector.

Pune City populaces have been actively working to segregate dry and wet waste but E-waste disposal procedures are still not clear with the residents. They have not been made aware of the risks and dangers of improper e-waste disposal when disposed with dry waste

The Pune Municipal Corporation (PMC) has undertaken a number of steps to tackle the situation -

- Formation of a Core Committee to properly plan out E-Waste Management Plan for the City
- Conducting studies through their field staff to understand how scrap shops in the informal economy deal with E waste
- Tie-ups with authorized E-Waste dealers and collaborating with them to reduce E-Waste impact
- Designing printed and distributed Information Education Communication (IEC) material to the general public to spread awareness
- Organizing various workshops for awareness of citizens, students and waste generators
- Organizing E-waste collection drives, 'V collect' in various localities of Pune City
- Formation of a PMC authorised E-waste collection centre at Kothrud for the people who want to personally hand-over their E-Waste

E-waste management participation by various stakeholders in Pune is the key focus of the following paper and hence the project investigators decided to study the e-waste collection start-ups in Pune region with reference to formal sector as the main stakeholders.

According to the e-waste management rules 2016, of the government in India, a manufacturer is responsible to collect e - waste generated during the manufacture of any electrical and electronic equipment and channelizes it for recycling or disposal and channelize it to government authorized recyclers. In the Indian context, the onus falls on the recyclers for sound waste management with informal recyclers dominating the market. Formal players' count was a mere 178 units as of Dec 2016, with Maharashtra having the maximum count of 32. One of the biggest amongst the authorized sector is Trishyiraya Recycling India Private Limited, Chennai, who collect and process E-Waste from across South India. With yearly collection and segregation of over 2000 tonnes, the organization is working towards the goal of sustainable E-Waste Management. Pune City is the 2nd biggest IT Hub of India. As a city with population of over 50 lakhs, it has a strong need for a proper system to collect and process all the E-waste that it continuously generates. Following a strong push from local population, Pune Municipal Corporation instituted various local policies to incentivize local recycling resource centers. Following on similar lines to Trishyiraya Pvt. Ltd. is Mahalaxmi E Recyclers, a Government of India authorized, E-waste collection and processing organization, is 1 amongst 178 Authorized organizations that cater to the entire population of the country, is registered in Pune and has been actively supporting in channelling the e-waste formal recycling centre. The Project investigators visited the collection and processing site of Mahalaxmi E Recyclers and conducted the requisite interviews. The details of recycling centre, its operations and role in e-waste management have been discussed in the coming sections.

The company was founded in Aug 2013 and it provides a wide variety of e-waste management services to the community. The proprietor and Managing Director, Mr. Manoj Mehta, a vibrant gentleman with over 15 years of IT industry experience has been the force behind the foundation of the company, working tirelessly to bring about change. The inspiration to start the business was the market and social need and from the thought of treating waste as wealth. The resource center in Kolhapur and Pune has been functional in providing collection, dismantling and outsourcing for refining and recycling to countries in Europe and Japan. With 0% disposal to landfills and random throw outs, they ensure optimum utilization of e-waste in the most environment friendly way.

2. Objectives of the Study

The objectives of the study in this paper have been as follows:
1. To understand and depict the role of an e-waste recycler with focus on study of the working model
2. To understand the challenges, barriers and limitations the start-ups in the E-waste management sector in India face

3. Research Methodology

The primary source of data collected was a field visit to Mahalaxmi E Recyclers to gain relevant and meaningful information on the process and working of formal E-waste recycler in Pune city.

4. Results & Findings

Mahalaxmi E Recyclers as an organization has performed tremendous work in the past few years in local collaborations, awareness generation, lead creation and growth. The organization has multiple tie-ups with local and domestic agencies that aid in its collection and processing operations. The main goal of the Recycler, since its inception has been to –
1. Spread awareness amongst the general population about the problems and effects of unsafe disposal of E-Waste
2. To give back to society by actively working on creating a solution to reduce the levels of toxic substances generated

3. To actively reduce the impact of E-Waste generation and disposal on the environment
4. Improve recovery of Raw Materials through inclusive business model

At local scale, with continuous network building and strong emphasis on proper disposal has net the organization various government and private sector contracts for E-waste collection and disposal. With plans for expansion and growth in the near future, the organization is geared up to face the challenges of the future.

The processes and the activities carried out by Mahalaxmi E Recyclers is detailed below for managing e-waste in the Pune region.
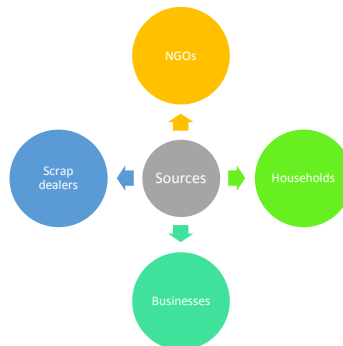
Collection of E-Waste

Figure 2.1 *Sources of E-Waste Collected (Mahalaxmi E Recycler)*

The above chart shows the various sources of procurement for Mahalaxmi e-recyclers, such as scrap dealers, households, business organisations and NGOs. E-waste is also sourced from different locations in India and not constrained to Pune region for economic benefits and business sustenance. The company handles all IT equipment, peripherals, telecom products, mobile, Air Conditioners, fridge, washing machine, Tube Lights, CFL, Lead Bulbs etc.

The most convenient channel of collecting the e-waste is from scrap dealers and NGOs. They have tie-up with multiple scrap dealers who transport the e-waste in closed vehicle, two to three times daily. It also has agreements with NGO such as Janadhar and Janwani, which act as a collection source from housing societies. SWaCH, a waste collection agency, collects solid waste and the segregated e-waste collected reaches Mahalaxmi E-Recyclers. Being an authorized recycler, it also has multiple government tie-ups for E-waste collection and disposal. It also participates in local e-waste collection drives, sends quotations on demand to the business organisation along with participating in the tender process of government organisations for procuring e-waste.

Mahalaxmi E Recyclers Pune City Operations -
E-waste collected gets segregated at their Pune resource center. Goods that come in go through significant testing procedure to check whether they have been disposed of at working conditions. If the goods are repairable, they get repaired and refurbished. Rest of the non-working e-waste goes through manual dismantling by the experienced workers working at site. Workers working at the resource center have traditional experience in the informal sector of e-waste handling and hence have better skills and productive. There are four full time and four part time workers and contractual labour gets hired as and when required. The collected e-waste goes though manually dismantling at the resource center followed by segregation and separation of the metals. Personal protective equipment (PPEs) such as masks, gloves, googles, etc. are used by the workers to ensure protection from any occupational hazards event during the work. However, proper dismantling of e-waste does not release any hazardous fumes but improper disposal or damage to e-waste could release hazardous fumes that damage the environment.

The sanctioned collection capacity of Mahalaxmi e-recyclers Pvt. Ltd. is 1000 Metric Tons per year. The collection of e-waste at the facility has seen an unprecedented growth, for example, e-waste collected in the fiscal year 2017-18 amounted to 200 metric tons, growing to over 800 metric tons in fiscal year 2018-19.

With a daily in-take of 3-4 metric tonnes of E-waste per day, the recycler is working tirelessly to segregate the material collected and processed safely and securely in its collection centre. Most of the equipment collected at the facility consists of chargers, CFL, Monitors and CRTs. It receives 300-400 kg of chargers and Compact Florescent Lamp (CFL) every day. The e-waste gets stored at Pune location situated in Ambegaon site, where it gets basic treatment such as segregation and dismantling. The e-waste collected after segregation gets stored neatly in the storage room by stacking it up category wise. The metal scrap get separated and stored before sending it for recycling to the metal recyclers.

The in-house testing is done properly, like checking plug and power, to segregate the material into working and non-working categories. After proper separation, the material is categorized into refurbished or directly for dismantling. E-waste, especially PCBs consist of a lot of expensive resources like precious metals which are can be extracted, like silver, gold but the process has been outsourced for now because for now, owing to capital investments and funding, which is required for such kind of setup for the company. From their own statistics, out nearly of 100% E-waste material collected, nearly 60% can

be refurbished and reused while from the other 40% material,50% is Plastics and polymers, 30% is Metal Scrap and the remaining 15-20% is PCB which is specially segregated and sent to Europe for further processing.
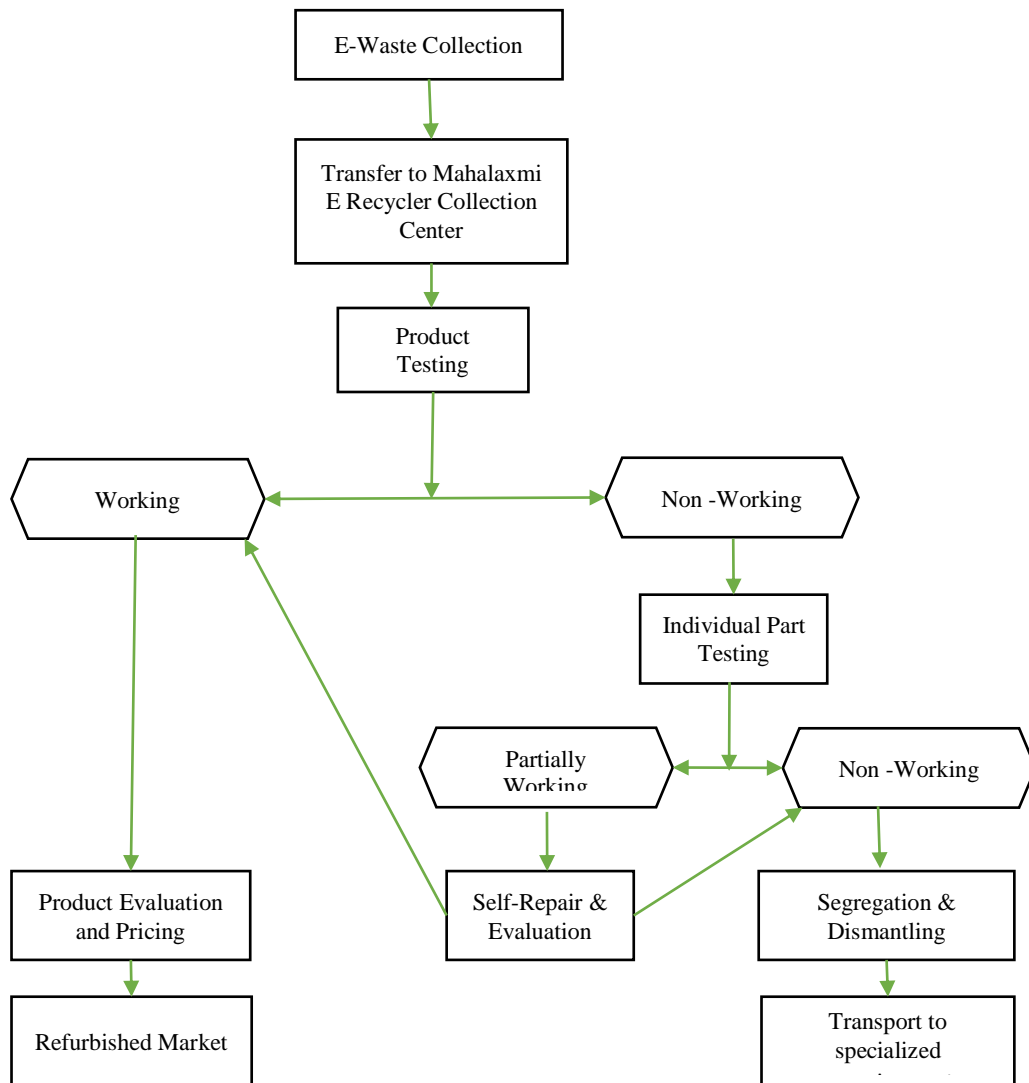

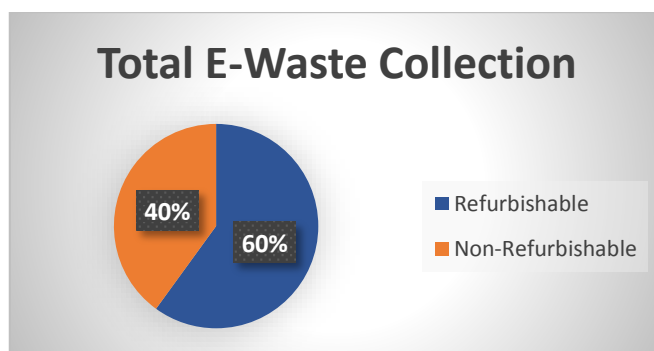**Figure 2.2** *E-Waste Collection and Processing Process*

Figure 2.3 *Total E-Waste Collection Breakdown*

The entire segregation process takes about 10-15 days, with major processing complete with-in the time frame. The e-waste can be stored for a maximum of 180 days at the resource center as per the E-waste Management Rules, 2016. Complete recycling facility is not available anywhere in India. Mahalaxmi has partnered with reputed international metal extractions companies like Umicore Belgium, where PCB get treated. Assignment of IE code for the materials is done before the goods get exported through shipping. Large quantities of processed e-waste is shipped out at a go to ensure cost cutting and profit for all the parties involved in the process. The remnants of the e-waste, usually plastic is dismantled and sent to Chennai for the post-processing and re-use by the process of pyrolysis.
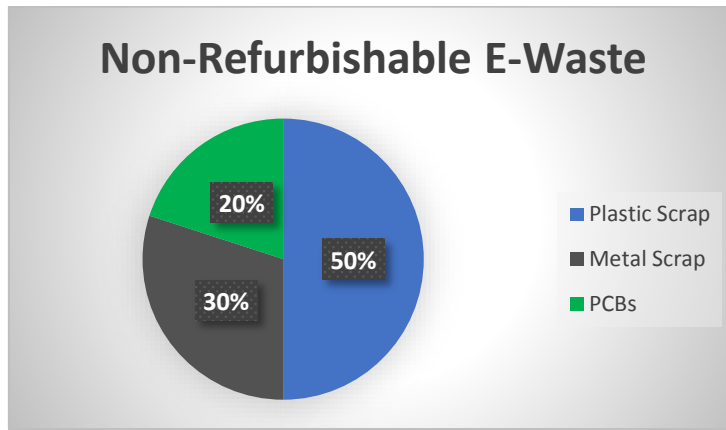
Figure 2.4 *Non-Refurbishable E-Waste Breakdown*

While there were major challenges in the earlier years for the company but the statistics shows that after creating huge awareness drives in collaboration with various government and non-government local sources, coupled with overall expansion, Mahalaxmi E Recycler is doing well and has increased its business 8 times in the year 2018-2019.

E-Waste Collection – Yearly Figures

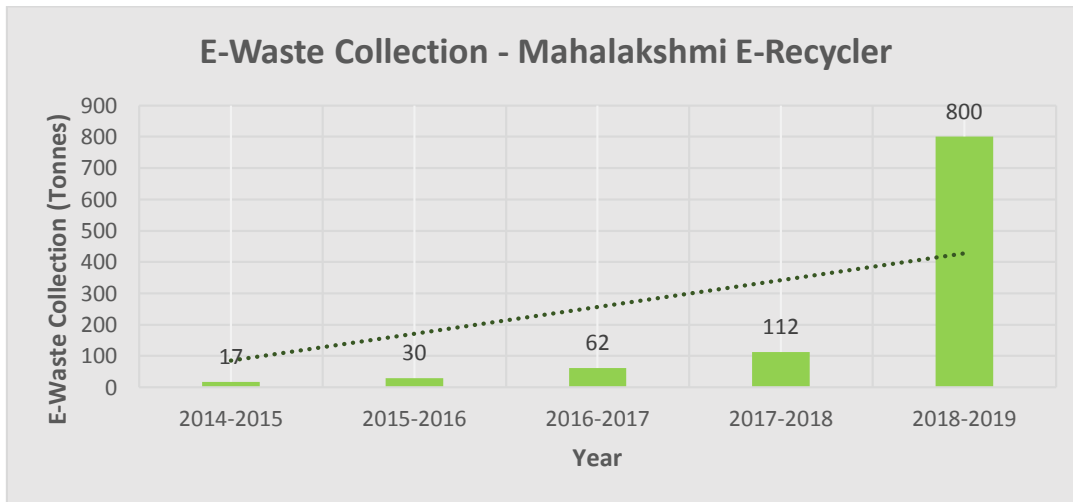| 2015-2016	30 tons
2016-2017	62 tons
2017-2018	112 tons
2018-2019	800 tons

Figure 2.5 *Year on Year Collection Growth*

Mahalaxmi E Recyclers have seen phenomenal growth in the past few years. With an overall collection of over 800 tonnes of E-Waste in the past year, the growth experienced by Mahalaxmi E Recyclers is a testament to their hard work in bringing about positive difference and innovation to society. The large growth in the past years is attributed to increase in awareness amongst the local population and a strong support from local government in the form of collection drives and awareness out-reach programs.

Measuring e-waste is an important step towards addressing the e-waste challenge. Statistics help to evaluate developments over time, set and assess targets, and identify best practices of policies. Better e-waste data will help to minimize its generation, prevent illegal dumping and emissions, promote recycling, and create jobs in the reuse, refurbishment, and recycling sectors.

While the company's customer base has been expanded and spread to states of Goa, Kerala, Assam, Rajasthan and Uttarakhand. The major customers have been Symbiosis International University, Bharat Sanchar Nigam Limited, Rayat Shikshana Sanshta, Shivaji University, Bharat Electronics Limited, Rajaram College, Kirloskar Group and many more. They have also branched out in collection of Medical electronic waste, because of more awareness and response from local clinics, multi-speciality hospitals and District Magistrates. Even with the success achieved by the organization and the great work

performed by them, there are a few challenges that they need to overcome in the near future to become a beacon of change for this generation.

Problems and Barriers Faced by E-Waste Start-ups
After an enlightening conversation with the Managing Director of Mahalaxmi E Recycler, he expressed his observations and experience about the current E-waste management scenario in India and has rated the e-waste recycling situation and means of process in India as 1 on a scale of 5. Lack of awareness, lack of proper government incentives for formal recyclers, lack of a proper payment system to government organization in exchange of e-waste goods, lack of consumer disposal behaviour, an active informal collection network coupled with high difficulty in technological developments in setting up of formal recyclers have been the major barriers for the growth of formal recycling industry in India.

The drivers for formal recycling sector growth, which would enable shift of informal sector towards the mainstream would be setting up of e-waste recycling and processing units in industrial area, tax incentives to e-waste collectors, dismantlers and recyclers by the government, encouraging legal import of e-waste to turn India into a recycling hub, enable accountability of products by the manufacturers in supply chain and push for research and development to recover silver and gold using low cost materials and cost effective, environment friendly methods.

Lack of awareness, lack of strict enforcement of rules and regulations by Government, strong presence of informal sector, low incentives and huge capital investment requirements to set up proper facilities to process E-waste properly in India have hampered growth of start-ups such as Mahalaxmi E Recycler.

Mahalaxmi E Recyclersis a great example on how to overcome some of the barriers faced by E-Waste start-ups. It has partnered with Kolhapur Institute of Technology (KIT) for a pilot study with an objective for efficient recovery of gold using low cost materials, is working tirelessly to keep itself updated with the latest techniques and methodology to dispose of E-waste.

Advantages to the Society
Since its commencement, Mahalaxmi E Recyclers have worked hard to change the local landscape to bring about awareness and change about E-waste and its proper management. With expansion year on year, it has also provided employment opportunities and created a huge impact on the environment by means of proper E-waste management. Any organization in the following field have an ethical responsibility to create a progressive setting for the current and future generation, to create something impactful, that would enhance society as a whole. Mahalaxmi E Recyclers are executing the same by undertaking such operations to do their bit for the society.

| To promote E-waste awareness | Generate employment | To create a circular economy-getting Forex. |
| To prevent illegal dumping of emissions | To reduce the impact of E-waste on ecology | To promote Recycling |

Figure 2.6 *Mahalaxmi E Recyclers Contribution to Society*

5. Conclusions

There is no unique or ideal model for e-waste management in developing countries, every model a little different as characterized by its own specific environmental, social, technological, economic and cultural conditions. Within India, owning to the strong presence of an informal market for E-waste collection and disposal, coupled with general lack of awareness or access amongst the local population of proper disposal techniques, lack of government incentives and support at grass-root level, there is only so much a start-up can achieve in limited amount of time. As awareness grows, so does a push for better techniques for disposal and more interest and capital is generated towards formal E-waste management market, of which Mahalaxmi E Recyclers, Pune is a key part of. Within the Indian market, there is a clear need to have proper information system in place through standardized mechanisms by the Government of India, to ensure proper channels of distribution and collections are created to ensure optimal functioning of current systems and to enable a good incentive process to ensure growth of current industry.

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