

**ENTREPRENEURSHIP**

**FINAL ASSIGNMENT**

**BUSINESS: E-WASTE RECYCLE**

**COMPANY NAME: E-DRIVERS**

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## "Today's Electronic Gadgets, Tomorrow's Electronic Waste...!!!"

### 1. Introduction

#### 1.1 Is E-waste clearly defined?

The term "**e-waste**" is loosely applied to consumer and business electronic equipment that is near or at the end of its useful life. There is no clear definition for e-waste; for instance, whether or not items like microwave ovens and other similar "appliances" should be grouped into the category has not been established.

Electronic waste or e-waste describes discarded electrical or electronic devices. Used electronics which are destined for reuse, resale, salvage, recycling, or disposal are also considered e-waste. Informal processing of e-waste in developing countries can lead to adverse human health effects and environmental pollution.

Electronic scrap components, such as CPUs, contain potentially harmful components such as lead, cadmium, beryllium, or brominated flame retardants. Recycling and disposal of e-waste may involve significant risk to health of workers and communities in developed countries and great care must be taken to avoid unsafe exposure in recycling operations and leaking of materials such as heavy metals from landfills and incineration ashes.

E-waste is a popular, informal name for electronic products nearing the end of their "useful life." Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Many of these products can be reused, refurbished, or recycled.

#### 1.2 Is E-waste considered hazardous?

Certain components of some electronic products contain materials that render them hazardous, depending on their condition and density. For instance, California law currently views non-functioning CRTs (cathode ray tubes) from televisions and monitors as hazardous.

#### 1.3 E-waste Worldwide

Rapid changes in technology, changes in media (tapes, software, MP3), falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. Technical solutions are available, but in most cases, a legal framework, a collection, logistics, and other services need to be implemented before a technical solution can be applied.

Being able to simply replace the part of the phone that is broken will reduce e-waste. An estimated 50 million tons of E-waste are produced each year. The USA discards 30 million computers each year and 100 million phones are disposed of in Europe each year. The Environmental Protection Agency estimates that only 15–20% of e-waste is recycled, the rest of these electronics go directly into landfills and incinerators.

In 2006, the United Nations estimated the amount of worldwide electronic waste discarded each year to be 50 million metric tons. According to a report by UNEP titled, "Recycling – from E-Waste to Resources," the amount of e-waste being produced – including mobile phones and computers – could rise by as much as 500 percent over the next decade in some countries, such as India. The

United States is the world leader in producing electronic waste, tossing away about 3 million tons each year. China already produces about 2.3 million tons (2010 estimate) domestically, second only to the United States. And, despite having banned e-waste imports, China remains a major e-waste dumping ground for developed countries.

Society today revolves around technology and by the constant need for the newest and most high-tech products we are contributing to mass amount of e-waste. Since the invention of the iPhone, cell phones have become the top source of e-waste products because they are not made to last more than two years. Electrical waste contains hazardous but also valuable and scarce materials. Up to 60 elements can be found in complex electronics. As of 2013, Apple has sold over 796 million idevices (iPod, iPhone, iPad). Cell phone companies make cell phones that are not made to last so that the consumer will purchase new phones. Companies give these products such short life spans because they know that the consumer will want a new product and will buy it if they make it. In the United States, an estimated 70% of heavy metals in landfills comes from discarded electronics.

### 1.3 Classification of E-waste:

- **White Goods:** Heavy consumer durables such as air conditioner, refrigerators, stoves, iron etc. which used to be painted only in white enamel finish. Despite their availability in varied colours now, they are called as White Goods.
- **Brown Goods:** Light electronic consumer durables such as TVs, radios, digital media players etc. are called as Brown goods.
- **Grey Goods:** Light as well as heavy electronic consumer durables such as mobiles, tablets, computers, laptops, printers etc. are called as grey goods.

### 1.4 E-Waste a big question?

#### Problems:

- ❖ **Rapid Technology:** World is full of innovations, everyday new technology is introducing in each and every field. Example: Television has been developed from big box size to scale size.
- ❖ **Purchased Increase:** As soon as new product launched, there is huge demand for it, which increases the purchase ratio.
- ❖ **Unused store in House:** New product comes homes; old ones are dumped in the corner of the house.
- ❖ **Improper Dismantling:** As the user is not familiar to dismantling the old product, he throws it away; or sell it to someone who just scrap it.
- ❖ **Unorganised technique:** The person who purchases the product doesn't have the sufficient knowledge to dismantle it or recycled it.
- ❖ **Public health and environmental risk:** This above reasons has bad impact on human health and environment. It is also a reason for global warming.

**Disposal Problem:**

- Landfill: E-waste without any measure is dumped in the earth, this disposal allows heavy metals to leach into ground metals.
- Incineration: Burning the e-waste without proper precautions makes hazardous material airborne.
- Acid bath: Its dangerous and contaminants soil and water.
- Export: Developed countries dump their e-waste into developing countries like India, China, Indonesia, and many more.

## 2. The Proposed Business Plan

**E-drivers** is a solution to overcome e-waste. The proposed business plan is to collect the e-waste, from various resources and segregate it and properly dismantle the device; and use its raw materials.

**Mission:** To propagate and serve the cause of environment protection through technology and efficient management of resources.

**Vision:** To be a Benchmark solution provider in the field of environment protection. Benchmark of recycling is to recycle E-waste to about 90% and 1% hazardous material which cannot be further recycled or reused goes for scientific and secure landfill to adjacent treatment and disposal.

**Objectives:**

- High quality customer service and satisfaction.
- Lean, simple and effective process.
- Employee welfare and development.

**Location:** Bangalore, India.

The market size of e-waste in India is of 3.8 million tonnes and expected to touch 20 million tonnes by 2020. Total number of computers user in India are 80 million and mobile users are 600 million. India is 5<sup>th</sup> largest producer of E-waste in world. More than 50 thousand tonnes per year is imported to India from developed countries like USA, Europe and many more. Bangalore is known as 'Silicon Valley of India,' it produces almost 1 thousand tonnes of e-waste per year (Raw materials: 1000 tons of Plastic, 300 tons of lead, 350 tons of copper and so on.) As technology is developing, labour is available at low cost, less amount of investment, good connectivity in others major cities & parts of world, considering all this factors we plan to setup are business in Bangalore City, Karnataka, India.

### **Legislation and Regulations:**

To open any business, we need to know few legislation and regulations, government norms of that local vicinity and government. Also know norms related to specific business its specific pros-cons specify by the respective committee. For E-waste, we need to follow the strict regulations as it is more hazardous to human society and environment.

For E-drivers, we need to strictly follow rules and amendment of mentioned as follow.

- ❖ The hazardous Waste (Management and Handling) rules, 1998 as amended on 2008.
- ❖ Bangalore Municipal E-waste managing and handling rules for non-toxic content.
- ❖ Karnataka State and Central Government of India E-waste managing and handling rules.
- ❖ The Environment Protection Act-Batteries (M & H) 2008.
- ❖ The Environment Protection Agency (EPA)
  1. Central Pollution Control Board (CPCB).
  2. Ministry of Environment and Forest.

## **2.1 What should I do with my electronic discards?**

The mantra of " Reduce, Reuse, Recycle " applies here.

- Reduce your generation of e-waste through smart procurement and good maintenance.
- Reuse still functioning electronic equipment by donating or selling it to someone who can still use it.
- Recycle those products that cannot be repaired. To find an organization that will manage your electronics for recycling, search the directory.

## **3. Operation**

### **3.1 Composition in Consideration**

For our company we are aiming to get plastic, ferromagnetic materials (iron and steel) , non ferromagnetic material like copper, circuit board and aluminium in Scrap form which will be a useful raw material to the various industries. The other parts like batteries and glass doesn't come under our scope of recycling. In e-waste, mainly we are focusing on laptops, mobiles, and desktops which are being replaced by new ones by 5 years or less according to the Microsoft's reports. The replacement of mobile phones are more often than computers which are influenced by the competitive business market between Technology Giants like Samsung, Apple, HTC and many more.

### 3.2 Working Procedure

The Flow chart presented below, explains the step by step collection and segregation of the e-waste materials.

#### a) Source of Collection

We have considered three major source of collection of the e-wastes. According to our research, in India Municipality and Scrap local Markets are the major source of cheap e-waste, where as timely replacement of technology in institutions such as offices, hospitals, schools and universities has also made them a viable option for seasonal source of e-wastes.



**Municipality**

**Local Market**



**Institutions**

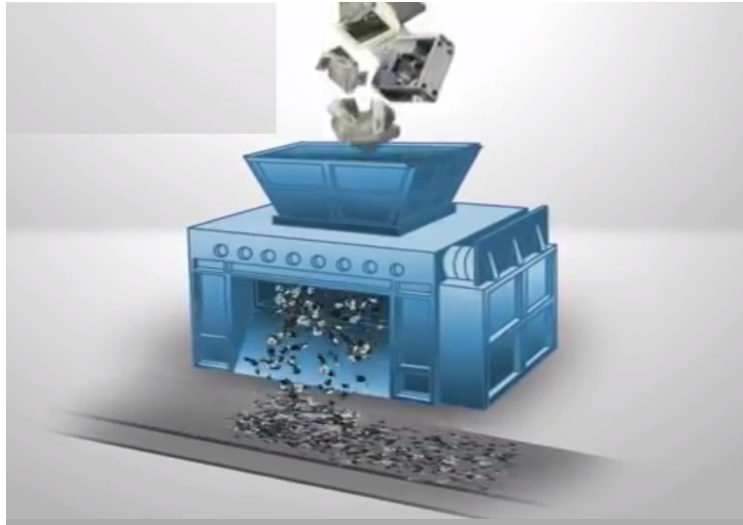
#### b) Material Segregation

The e-wastes that we collect will be then properly segregated to usable and non usable parts. The non-usable parts consists of batteries, screens and glasses which will be re- sold to the respective recycling companies in India. The usable parts which consist of metals and plastics will be processed following the segregation process.

**c) Segregation of Ferro Magnetic Materials**

**i) Grinder**

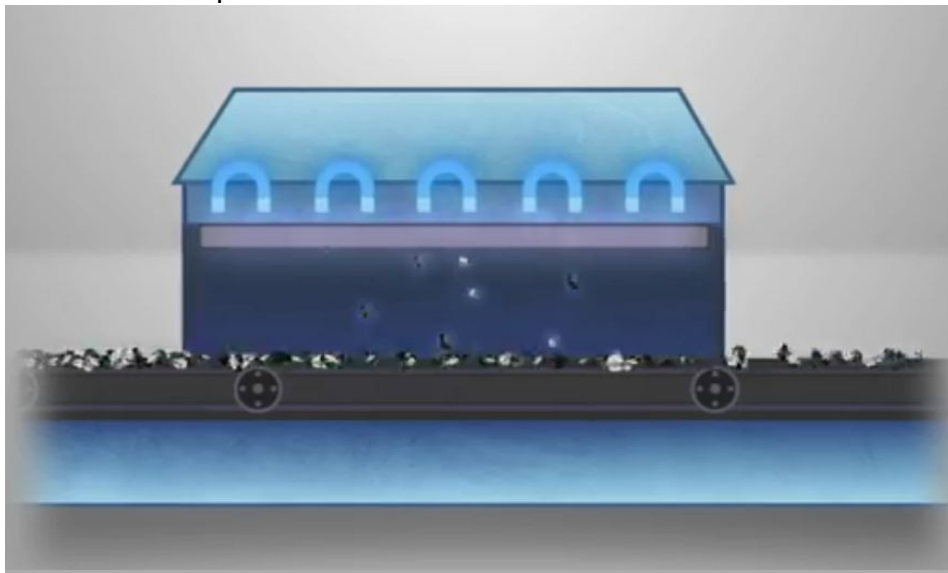
The usable materials will be fed into the grinder which will grind the e-waste in to the scrap particles ranging from 5 to 40 mm of size, depending on the material type.



**Grinder**

**ii) Magnetic Separator**

The ground material then passes through the magnetic separator carried by the conveyor belt. Then by the help of highly powerful magnet the iron and steel from the mixture are separated.



**Magnetic Separator**

**iii) Segregation of Non-Ferro Magnetic Materials**

The mixture of scrap which are free from the Ferro magnetic scrap will proceed through the eddy current separator. Due to the minute scrap size of the circuit board which consist of copper and other non ferromagnetic material, passes



through the evenly spaced wire mesh on the way to eddy current and then collected to a separate container.

**iv) Eddy Current Separator**

The remaining mixture will pass through the eddy current where aluminium which is a non-ferro magnetic material will be charged and will be directed to different trajectory path, separating aluminium and plastic scrap in two different containers.

In the final product, from our process we will be able to obtain aluminium, plastic, iron and steel, copper and circuit board scrap that will be sold to the respective consumer factories as a raw materials.

## 4. Market analysis

### 4.1 Demographic

Advantage: You need readily available for you that who, where and how you want to market your product.

Disadvantage: It makes an organization vulnerable to competitors and the competitors may try to use the same market technique and potentially take away the customer.

### 4.2 Market growth

Increase demand for particular product over the time.

The market growth can be slow if consumer do not adopt a high demand or rapid.

The market growth can be fast when consumers find the product or service useful for the price level.

The cost of product is very important for market growth because in many reason the customer search for cheap products.

New technology or special technology might only be marketable to small set of consumers.

Market growth can effect in the volume of product that company decide to sell it.

### 4.3 Market size

- Market potential
- Estimation
- Take the number of customer
- calculate the potential

### 4.4 Market trends

Market trends is an aspect of technology analysis that tries to predict the future based on past data.

Trends idea that what happen in the past and what will happen in the future.

Market trends show your opportunities to grow the business and it can significant change to your market. Knowing what market trends affect your market also allows you to take advantage of positive changes.

It means that the company can estimate based on the previous month data that customer adopt high demand or less demand after that with this information can increase or decrease product for next month.

## 4.5 Target market

Target market is a study that you do for knowing about potential customers.

First you should find out who your potential customers are. Our potential Customers for central and western state of India and second you should know that what type of product, service and features your potential customers interested in buying. Our customers buy Iron, Aluminium, copper, plastic and circuit board.

## 4.6 Competition

- Determine who the competitors are
- Determine who the customers are
- Determine the key strength

### Major Competitors

- i. Cerebra, Bangalore
- ii. E-parisaraa Pvt Ltd. Bangalore.
- iii. E-incarnation Recycling Pvt Ltd. Mumbai
- iv. Attero, Lucknow

## 5. Market strategy

### 5.1 Management

Key Ideas: Each business is unique and that there can be no formula for achieving competitive advantage firms should adopt a flexible planning and review process that aims to cope with strategic surprises and rapidly developing threats; management's focus is on how to deliver superior customer value.

- ✓ Lower cost
- ✓ Reduce risk
- ✓ Improve customer satisfaction
- ✓ Enhance process consistency
- ✓ Improve quality

### Pastel analysis

- ✓ Technology forces
- ✓ Economical forces
- ✓ Competitive forces
- ✓ Political forces
- ✓ Legal and regulatory forces
- ✓ Social and cultural forces

## 5.2 Plan

The business plan describes who the customers are and how you will get word to them about the goods and services you offer.

- ✓ Target market
- ✓ Product
- ✓ Pricing
- ✓ Competitors
- ✓ Market strength
- ✓ Budget

In this part for planning is very important to know about your customers and the product you want to sell. The product should prepare in high quality that customers are interested in buying it and the price should be logical because when customers find that the product useful for the price level decide to buy it. You should know who the competitors are in the local market. The initial budget play major rule in the company.

## 5.3 Advertisement

Advertising helps to keep the consumers informed about whatever new products or services are available in the market at their disposal. It helps to spread awareness about products or services that are of some use to consumer and potential buyers. The main aim of advertising, many believe is to sell.

- ✓ Social media
- ✓ Search engine optimization
- ✓ Hoarding
- ✓ Scrub market

### Social media

- ✓ YouTube
- ✓ Twitter
- ✓ Linked
- ✓ Facebook
- ✓ Instagram
- ✓ dig

### Digital marketing

- ✓ Social media
- ✓ Email marketing
- ✓ Web site design
- ✓ Search engine optimization
- ✓ Blog

### **Search engine optimization**

- ✓ Web site analysis
- ✓ Social media
- ✓ Article submission
- ✓ Competitors analysis
- ✓ Keyword research
- ✓ Quality link

## **5.4 Pricing**

Price is the value that is put to a product or service and is the result of a complex set of calculations, research and understanding and risk taking ability. A pricing strategy takes into account segments, ability to pay, market conditions, competitor actions, trade margins and input costs, amongst others. You should decrease the price as you can and the quality should not reduce.

## **5.5 Customer**

Leading companies do. They continually create better reasons for their customers to identify with the company and its products and services. Building great customer relationships is a long-term game. It goes against many common practices, such as tracking the short-term return on customer acquisition investments. In this part you should work on customer satisfaction and quality of the Product should be good.

- ✓ Product
- ✓ Distribution
- ✓ Promotion
- ✓ Price

## **5.6 Research**

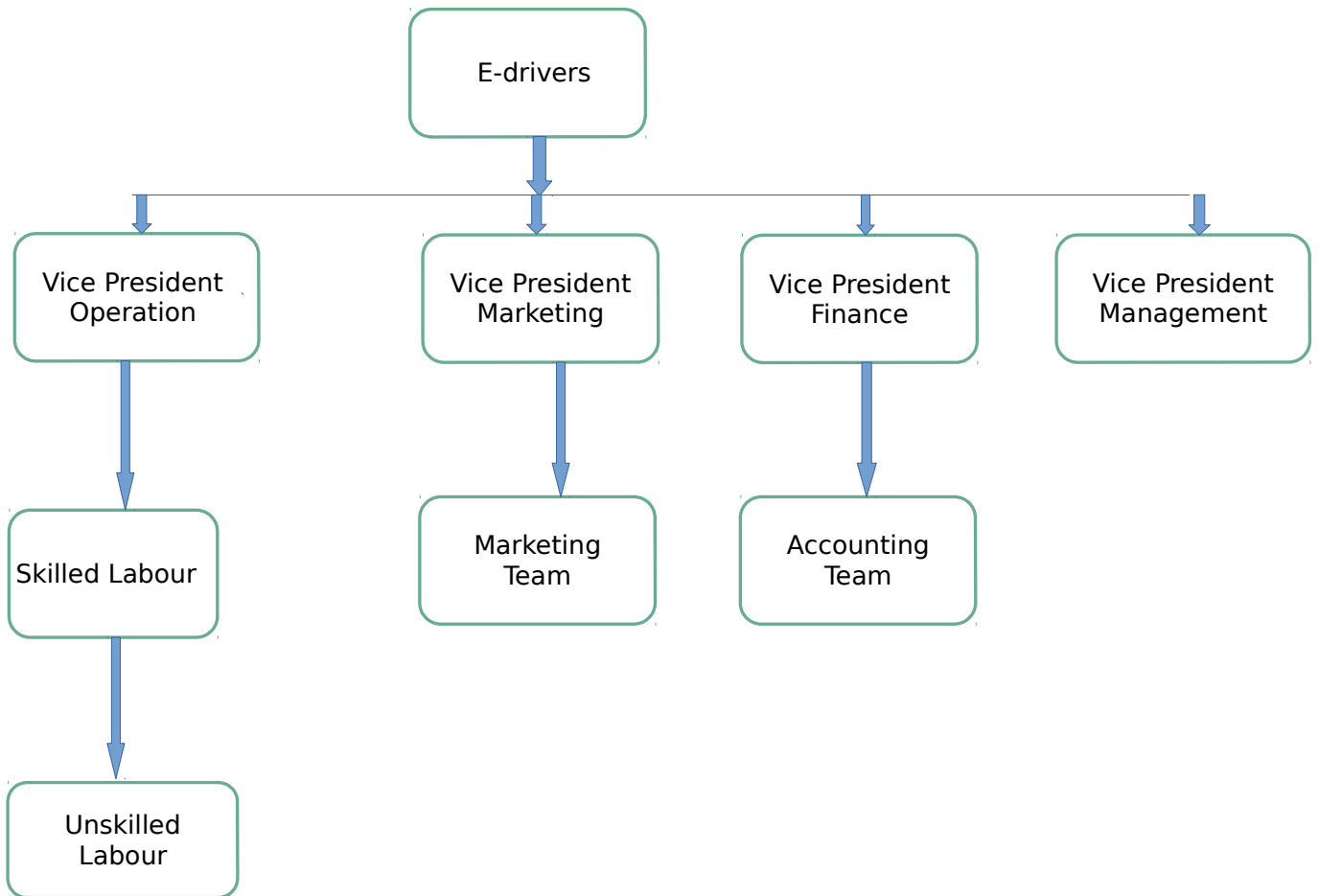
Strength: Existing player in the market and market reconstructing based on real life.

Weakness: Failure to find customer in the market, limit capacity.

Opportunities: Value money on essential component in current market scenario.

Threats: competition for existing player in similar technology.

## 6. Human resource



## 7. Financial Calculations

### 7.1 Exchange Rate

Since India was used as the place where business was setup, many financial calculations were done in Indian Rupees (INR - ₹). Below table has been used to convert INR (₹) to Euros (€), Dollars (\$) (USD) or Pounds (£).

76.21	INR	=	1	EUR
65.06	INR	=	1	Dollar
86.11	INR	=	1	Pound

### 7.2 Revenue from Material

To calculate the value of material that can be extracted from computers and mobiles, the following data has been used.

	Materials	Wt in grams	Percentage		Price Per tonne of Computers
Battery	Li ion	493	19.70		
Memory Cover	Aluminium(BR)	21	0.84		3044.81
PCMCIA Reader	PM, low grade	31	1.24		518.62
Hard Drive	Aluminium(BR)	108	4.32		15659.01
Circuit Board	PM, med grade	12	0.48		62.00
Drive Carrier	Steel	29	1.16		161.72
Cooling Fan	Motor	36	1.44		2896.33
Heat Sink	Al+Cu	64	2.56		9279.41
Memory Battery	Li ion	3	0.12		0.00
Cpu Chip	PM, Hi grade	6	0.24		100.38
Memmory Module	PM, Hi grade	9	0.36		150.57
Modem	PM, med grade	4	0.16		66.92
Hinges	Zinc (Br)	41	1.64		1605.24
Wifi Card	PM, med grade	6	0.24		100.38
DVD	Breakage	228	9.11		31.28
Main Circuit board	PM, med grade	270	10.79		4517.02
Bottom Cover	Magnesium (Br)	282	11.27		7404.29
Light Carrier	Aluminium(BR)	10	0.40		1449.91
Antenna with Cable	PM, low grade	22	0.88		368.05
Display Back	Magnesium (Br)	240	9.59		6301.53
Control Cable	PM, low grade	14	0.56		234.22
LCD Display	PM, low grade	573	22.90		9586.13
		2502	Fraction of Laptop Recycled	0.89	

		Total Revenue per tonne Laptop from Main Constituent	
	Average Weight		63537.81
	2.8		

The total weight of the computer is considered to be of 2.8 kg.

Price per tonne of Computer Processed is calculated by the below formula:

$$1000 \times \text{Fraction of Computer Recycled} \times \text{Material Percentage of Weight of Computer} \\ \times \text{Pure Metal price / kg} \times \text{Percent of Price Considered}$$

Since Printed Circuit Board (PCB) contains a large chunk of Materials, mostly metal, it is given special attention. The following data was used for computer PCB

Material	Percentage in a PCB	Pure Material Price (INR/kg)	Percent of price considered	Weight of PCB per tonne of Laptop (kg)	Price Per tonne of Computers
Copper	14.6	450.54	50	107.91	3549.22
Plastic (separate)	0	52.048	90		0.00
Tin	6.62	1363.007	40		3894.87
Bromium	5.07		40		0.00
Carbon	18.1		40		0.00
Silicon	24.7	1561.44	40		16647.87
Al2O3	9.35	1014.936	40		4096.25
Iron	4.79	19.518	80		80.71
Nickel	1.65		40		0.00
Lead	2.96	36.1662	40		46.21
Silver	0.045	35783	60		1042.60
Gold	0.0205	2672664.8	40		23650.20
Palladium	0.022	2086474.2	40		19814.00
Zinc		219.2522	50		
Lithium					
Magnesium		147.0356	50		
				Total Revenue per tonne Laptop PCB	72821.93

When added for the revenue of total of Materials that can be extracted for each computer, the total was found to be ₹ 136359.74



Calculations similar to that of computers have been done for mobiles as well. They are as shown below.

	Materials	Wt in grams	Percentage		Price Per tonne of Mobiles
Metal Hardware	Steel	3	2.13		332.22
Ear phone Jack, external	PM, low grade	1	0.71		332.22
Earphone	PM, low grade	1	0.71		332.22
Battery	Li ion	25	17.73		0.00
Back	PM, low grade	22	15.60		7308.87
Display, tochsreen	PM, low grade	33	23.40		10963.30
Carrier	Stainless Steel	32	22.70		3543.69
PCB	PM, med grade	16	11.35		5315.54
Internal Cable	Cu	2	1.42		3195.32
Antenna and Loud Speaker	PM, low grade	3	2.13		996.66
Vibrator Motor	Steel	1	0.71		110.74
Main Circuit board	PM, low grade	1	0.71		332.22
Main Camera	PM, low grade	1	0.71		332.22
	Total	141	100		
			Fraction of Mobile	1	
				Total Revenue per tonne Mobile from Main Constituent	33095.23

To calculate the Price per Tonne of mobiles processed, the following formula was used.

$$1000 \times \text{Fraction of Mobile Recycled} \times \text{Material Percentage of Weight of Mobile} \times \text{Pure Metal price / kg} \times \text{Percent of Price Considered}$$

For PCB calculations of Mobiles the following data was generated.

Material	Precentage in a PCB	Pure Material Price (INR/kg)	Percent of price considered	Weight of PCB per tonne of Mobiles (kg)	Price Per tonne of Mobiles
Copper	14.6	450.54	50	113.48	3732.13
Tin	6.62	1363.007	40		4095.59
Bromium	5.07		40		0.00
Carbon	18.1		40		0.00
Silicon	24.7	1561.44	40		17505.85
Al2O3	9.35	1014.936	40		4307.36
Iron	4.79	19.518	80		84.87
Nickel	1.65		40		0.00
Lead	2.96	27.3252	40		36.71
Silver	0.045	35783	40		730.89
Gold	0.0205	2672664.8	40		24869.05
Palladium	0.022	2086474.2	40		20835.15
				Total Revenue per tonne Mobile PCB	76197.60

To calculate the revenue per tonne of mobile from PCB, the following formula was used.

$$\text{Weight of PCB per tonne of Mobiles (kg)} \times \text{Percentage in a PCB} \\ \times \text{Pure Metal price /kg} \times \text{Percent of Price Considered}$$

Total revenue that could be generated per tonne of mobiles processed was found to be ₹109292.84

### 7.3 Projections of Scrapped Devices

The next step was to calculate how much raw material, in this case old computers and mobiles could actually be found from the market.

To do this, Operating System usage data from wiki-media was used.

Any device has a shelf life. After that time, it has been assumed that the device will be disposed off by the user almost for free or at a minimal price.

The following shelf lives was considered.

Device	Shelf Life before Recycle (Years)	Number of Recycle per LCM
Mobile	4	5
Computer	10	2
Least Common Multiple (LCM)	20	

The Number of Recycle per LCM actually represents the number of times the user will change their device over the LCM period.

The following table represents the data from wiki-media

Usage Statistics by OS (Wikimedia)	Percentage	Use per 100 Devices		Weight of Recycled device in LCM years per 100 devices
Android	23	42	Mobiles	29.61
iOS	19			
Mac OS	5.4	44.18	Desktops/Laptops	247.408
Windows	38.78			

Weight of Recycled device in LCM years per 100 devices is calculated by the following formula

1. For Mobile devices:

$$\text{Percentage of Mobile use} \times \text{Shelf life of Mobiles (years)} \times \text{Unit Weight of Mobile}$$

2. For Computers:

$$\text{Percentage of Computer use} \times \text{Shelf life of Desktop/ Laptop (years)} \times \text{Unit Weight of Computer}$$

At the end we are able to calculate the following data:

Ratio of Recycled by Weight	0.120
Mobile Revenue per tonne of mix	11682.13
Computer Revenue per tonne of mix	107209.20
Total Revenue per tonne of mix	118891.33

Where, Ratio of Recycled Weight is calculated by:  $\frac{\text{Weight of Recycled Mobiles}}{\text{Weight of Recycled Computers}}$

Mobile Revenue per tonne of mix is calculated by:

$$\frac{\text{Ratio of Recycled by Weight}}{1 + \text{Ratio of Recycled by Weight}} \times \text{Total Revenue per tonne of Mobile}$$

Computer Revenue per tonne of mix is calculated by:

$$\frac{1 - \text{Ratio of Recycled by Weight}}{1 + \text{Ratio of Recycled by Weight}} \times \text{Total Revenue per tonne of Computer}$$

## 7.4 Labour Costs

For Labour Costs, the following data was used:

Labour Costs	Per Month (INR)	Per Day (INR)	Per Month (EUR)	Per Day (EUR)
Unskilled	7720	513	101.30	6.73
Semi - skilled	7772	565	101.98	7.41
Skilled	7930	622	104.05	8.16
Highly Skilled	8229	623	107.98	8.17

Devices/per person/hour/unskilled labour	30
Devices/per person/day	180
Kg of Devices/per person/day	398.97
Kg of Devices/per person/month	9974

6 hour working shift was considered per Labourer

25 days were considered as the number of working days per month

To calculate the Kg of Devices/per person/day , the following formula was used

$$\begin{aligned}
 & \text{Devices per person, per day} \times \frac{\text{Ratio of Recycled Weight}}{1 + \text{Ratio of Recycled Weight}} \times \frac{\text{Weight of Mobile, Grams}}{1000} \\
 & + \text{Devices per person, per day} \times \frac{1 - \text{Ratio of Recycled Weight}}{1 + \text{Ratio of Recycled Weight}} \times \text{Average Weight of Computer, kg}
 \end{aligned}$$

	Number of Labourers	Costs
Unskilled	3	23160
Semi-Skilled	0.1003	779.21
Skilled	0	0
Highly Skilled	4	32916

Here, number of semi-skilled labourer is calculated by  $\frac{1}{\text{Kg of Devices/per person/month}}$

The idea is that as long as the value is less than the value of semi-skilled labourer is less than one, the cost is distributed among the Unskilled Labourers. When the value reaches one or more, an Unskilled Labourer is now a Skilled Labourer and a new Unskilled Labourer is added.

## 7.5 Equipment Costs

The Equipment costs are considered as follows:

Equipment	USD	INR
Crusher	3000	195180
Magnetic Separator	500	32530
Eddy Current Separator	500	32530
Belts per foot	7500	504215
Total	11500	764455
Insurance Cost		7644.55
Total cost per month for 5 yrs	191.67	12740.92

## 7.6 Commercial Costs

The Commercial Space Cost are considered as follows

	Per Month (INR)	Per Month (EUR)
Factory Space in Bangalore near BHEL, Karnataka, India 7000 ft <sup>2</sup>	110000.00	1443.38
Factory Space Considered 2000	31428.57	364.98

A 2000 sq ft (~186 m<sup>2</sup>) area has been considered for commercial space.

## 7.7 Transportation Costs

For Transportation Cost the Following Data has been considered

	Cost per ton per km (INR)	Cost per ton per km (EUR)
Truck (22 feet, 21 tons, 12 wheel)	2.9	0.04
21 tons, 10 kms	9135	119.87
1 ton , 10kms	435	5.71

For calculation purposes, price has been considered on per tonne basis for 10 km range which is justifiable within city limits.

## 7.8 Energy Costs

For Energy Costs, the following data has been considered

Electricity per unit (kWh) ₹	7.4
	Power kW
Capacity for Crusher	22
Capacity for Magnetic Separator	0.37
Capacity for Eddy Separator	1
Capacity for Belt	20
Energy Cost per hour ₹	320.938
Number of tonnes per hour ₹	2
Energy Cost per ton ₹	160.469

## 7.9 Final Values

At the End, the following values are collected together.

Revenue per tonne	118891.33
Rent per month	31428.57
Equip per month ₹	12740.916667
Labour (depended) ₹	779.20770917
Lab (Independent) ₹	56076
Energy Cost per month ₹	160.469
Transport Cost per month ₹	435
Raw Material cost per tonne ₹	30000
Insurance Cost ₹	637.05
Government Legalization (per month ₹)	416.67
Miscellaneous and Advertisement Costs ₹	1666.67
Cash Reserve for 5 years (per month) ₹	14666.67
Amount of Processed Material (tons)	1.1765288476
Minimum Number of Computers to be Processed	330
Minimum Number of Mobiles to be Processed	892

Amount of Processed Material to be processed in tons to reach Break Even is calculated by:

$$\frac{\text{Rent} + \text{Labour (Independent)} + \text{Eqmmt Cost} + \text{Insurnce Cost} + \text{Govt Regulation} + \text{Misc Cost} + \text{Cash Reserve}}{\text{Revenue per Tonne} - \text{Labour (Dependent)} - \text{Energy Cost} - \text{Transport Cost} - \text{Raw Material Cost}}$$

Minimum Number of Computers to be Processed is calculated by:

$$\frac{(1 - \text{Ratio of Mobile : Laptop Revenue by Weight}) \times \text{Amount of Processed Material} \times 1000}{(1 + \text{Ratio of Mobile : Laptop Revenue by Weight}) \times \text{Average Weight of Unit Laptop/ Desktop (kg)}}$$

Minimum Number of Mobiles to be Processed is calculated by:

$$\frac{\text{Ratio of Mobile : Laptop Revenue by Weight} \times \text{Amount of Processed Material} \times 1000}{(1 + \text{Ratio of Mobile : Laptop Revenue by Weight}) \times \text{Average Weight of Unit Mobile (kg)}}$$

## 7.10 Monthly and Yearly Projections

The following values are on Monthly and Yearly Basis.

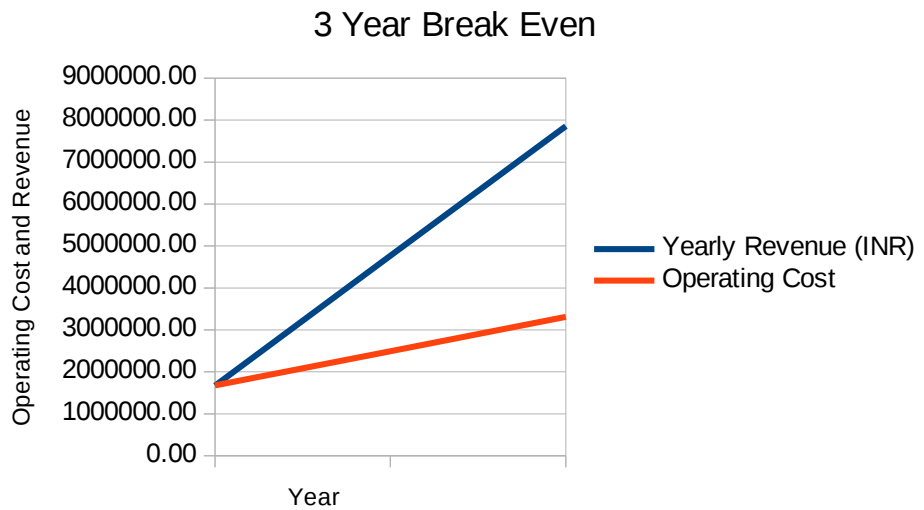
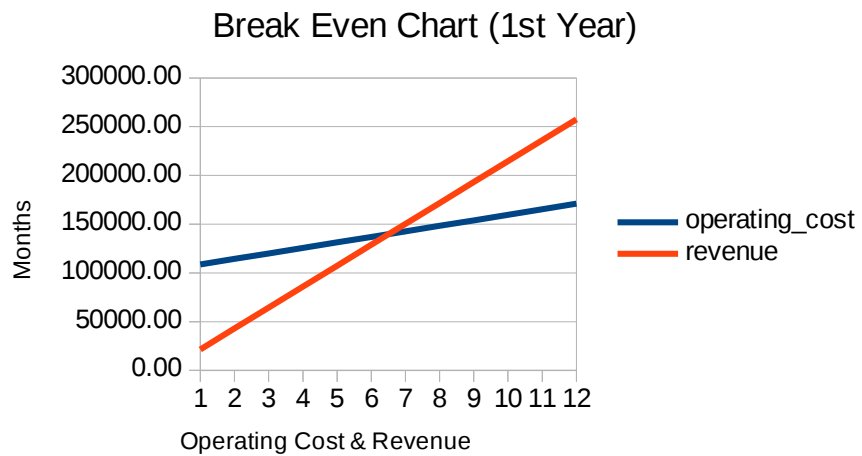
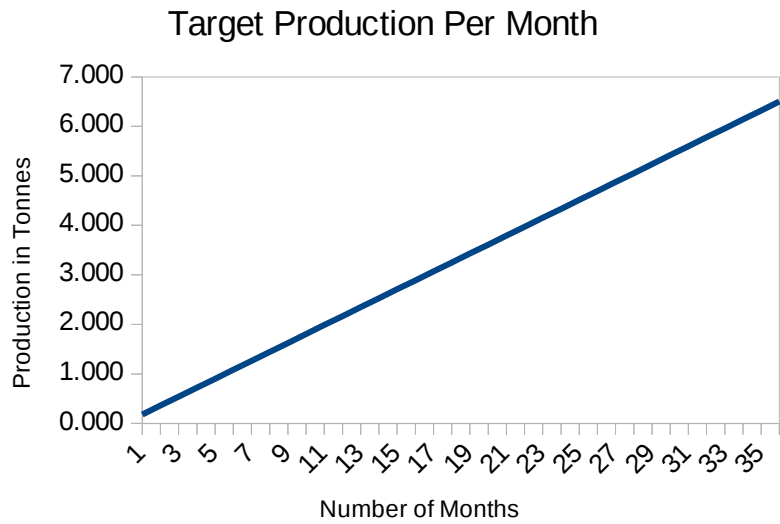
Year	Month	Target of Processed Material (tonnes)	Total Yearly Processed Material (Tonnes)	Operating Cost	Operating Cost	Revenue (INR)	Yearly Revenue (INR)	Yearly Revenue (EUR)	Profit	Yearly Profit Before Tax (INR)	Total Yearly Profit Before Tax (EUR)
1	1	0.181	14.08	108630.74	1677450.44	21466.49	1674386.23	21970.69	-87164.25	-3064.21	-40.21
	2	0.361		114295.61		42932.98			-71362.63		
	3	0.542		119960.48		64399.47			-55561.01		
	4	0.722		125625.36		85865.96			-39759.40		
	5	0.903		131290.23		107332.45			-23957.78		
	6	1.083		136955.10		128798.94			-8156.16		
	7	1.264		142619.97		150265.43			7645.46		
	8	1.444		148284.84		171731.92			23447.08		
	9	1.625		153949.72		193198.41			39248.69		
	10	1.806		159614.59		214664.90			55050.31		
	11	1.986		165279.46		236131.39			70851.93		
	12	2.167		170944.33		257597.88			86653.55		
2	1	2.347	40.08	176609.21	2493192.03	279064.37	4765560.81	62531.96	102455.17	2272368.78	29817.2
	2	2.528		182274.08		300530.86			118256.78		
	3	2.708		187938.95		321997.35			134058.40		
	4	2.889		193603.82		343463.84			149860.02		
	5	3.069		199268.69		364930.33			165661.64		
	6	3.250		204933.57		386396.82			181463.26		
	7	3.431		210598.44		407863.31			197264.87		
	8	3.611		216263.31		429329.80			213066.49		
	9	3.792		221928.18		450796.29			228868.11		
	10	3.972		227593.06		472262.78			244669.73		
	11	4.153		233257.93		493729.27			260471.35		
	12	4.333		238922.80		515195.76			276272.96		
3	1	4.514	66.08	244587.67	3308933.63	536662.25	7856735.39	103093.23	292074.58	4547801.77	59674.61
	2	4.694		250252.54		558128.74			307876.20		
	3	4.875		255917.42		579595.23			323677.82		
	4	5.056		261582.29		601061.72			339479.44		
	5	5.236		267247.16		622528.21			355281.05		
	6	5.417		272912.03		643994.70			371082.67		
	7	5.597		278576.90		665461.19			386884.29		
	8	5.778		284241.78		686927.68			402685.91		
	9	5.958		289906.65		708394.17			418487.53		
	10	6.139		295571.52		729860.66			434289.14		
	11	6.319		301236.39		751327.15			450090.76		
	12	6.500		306901.27		772793.65			465892.38		

The Initial Investment was calculated to be the following:

	INR	EUR
Cash Reserve (5 year)	880000	11547.04
Initial Investment	1050416.23	13783.18
Government Legalization(for 10 years)	50000.00	656.08
Miscellaneous and Advertisement Costs	20000	262.43
<b>Total</b>	<b>2000416.23</b>	<b>26248.74</b>



## 7.11 Projection Charts



## 8. Conclusion

It is our view that a business based on Recycling of E-waste, specially computers and mobiles can be a viable one. Analysis of Market, Technology and Finances, support the view. An initial investment of approximately ₹ 2,000,000 or € 26,000 should be enough for a viable start-up based in India.