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Online Exchange Portal Solution For E-Waste Management

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Abstract: With the emerging technology, e-waste management and disposal had become a big issue and it is easily conclusive that India had become a one of the biggest e-waste generators. Through being one of the biggest e-waste generators, India is lagging behind the e-waste collection target.

In India the big worry related to e-waste management is that 95 percent of e-waste is being handled by the informal sectors. And this had become the cause for various dangerous diseases and even can led to the death of the workers dealing with the e-waste.

In the view of this situation, we had tried to propose a portal system which not only channelize the e-waste to the correct destination but also reduce pollution, along with reduction of hazardous contamination. And the most important thing in this approach is to involve the informal sectors in a hygienic manner.

Key Words: e-waste, management, portal, system, online.

I. INTRODUCTION

According to the CPCB report on E-waste Management in India, 2020, states that India had generated 1,014,961 tonnes to e-waste in 2019-20 which is a 32 percent rise from previous fiscal year. The report also stated that at around 50.75 percentage of waste is actually collected with respect to the targeted value in 2018-19. In India, 95 percent of e-waste is being handled by the informal sectors, which are the main cause for various dangerous diseases and even can led to the death of the workers dealing with the e-waste.

We have proposed a portal system, which will channelize the e-waste generated from the user of the electronic product to the manufacturers or the recyclers. This approach had taken into consideration of the employment or involvement of the informal workers but in a hygienic manner.

II. DISCURSION

Till now we had understood few important facts regarding e-waste management are:

- Till today, Informal sectors are the main actors that actually did the work, although having various drawbacks.
- We are far away from the government e-waste collection & disposal target.
- There is a huge requirement of formal sectors to take major serious step to assist the informal sectors to meet the target fixed by government to collect & dispose e-waste.

Keeping the above-mentioned fact in mind we have proposed a system that defines the flow of e-waste from electrical and electronic equipment's consumers to recyclers/manufacturers. This system also involves the informal sectors but in a proper predefined formal way to avoid the environmental hazards and reach the governmental e-waste collection target.

1.1 OVERVIEW

In this project, we have proposed a system which consist of four major entity which would be centrally controlled by the portal admin. The four major actors under the portal admin's supervision are Sellers, Collectors, Warehouses, Buyers.

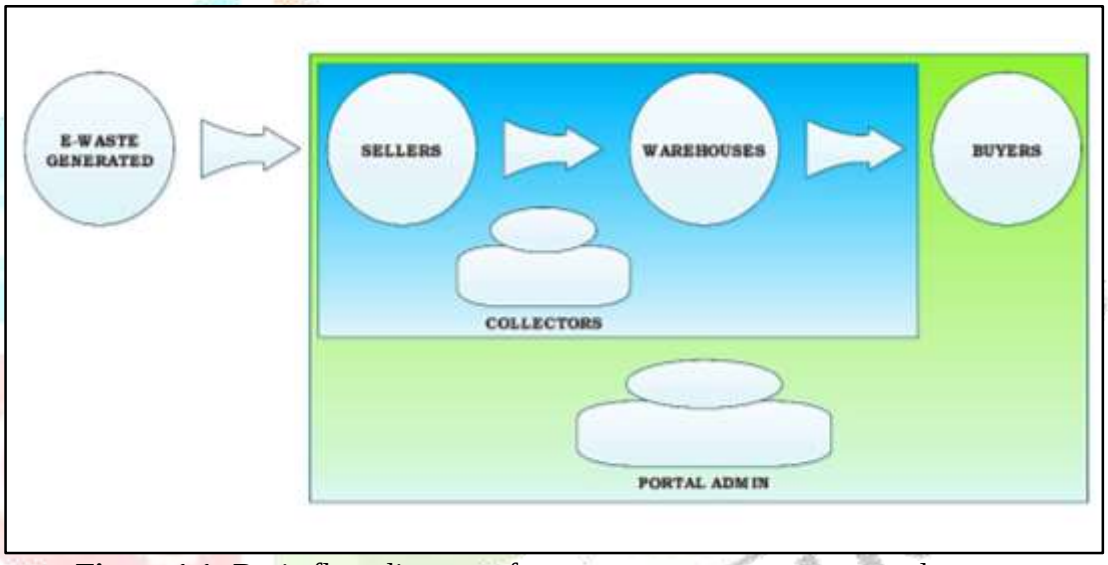

Figure 1.1: Basic flow diagram of our e-waste management portal system.

As shown in figure 1.1, it can be easily interpreted that the flow of e-waste will start from the consumer of E&E products, which led to e-waste generation at the end of the life of the E&E products. Then it is brought by the sellers (can be a scrap dealer or an electronics shop) and inform the portal admin through the collector. And on receiving the delivery order from the portal admin as demanded by the buyer, through the collector, the demanded e-waste is delivered to warehouse and get accumulated to finally get dispatched to the buyer. But before taking the delivery, the warehouse by the instructions of the portal admin through collector, checks the list of items received with the list of demanded items and in specified condition.

The pictorial representation of our proposed system is being shown below in figure 1.2.

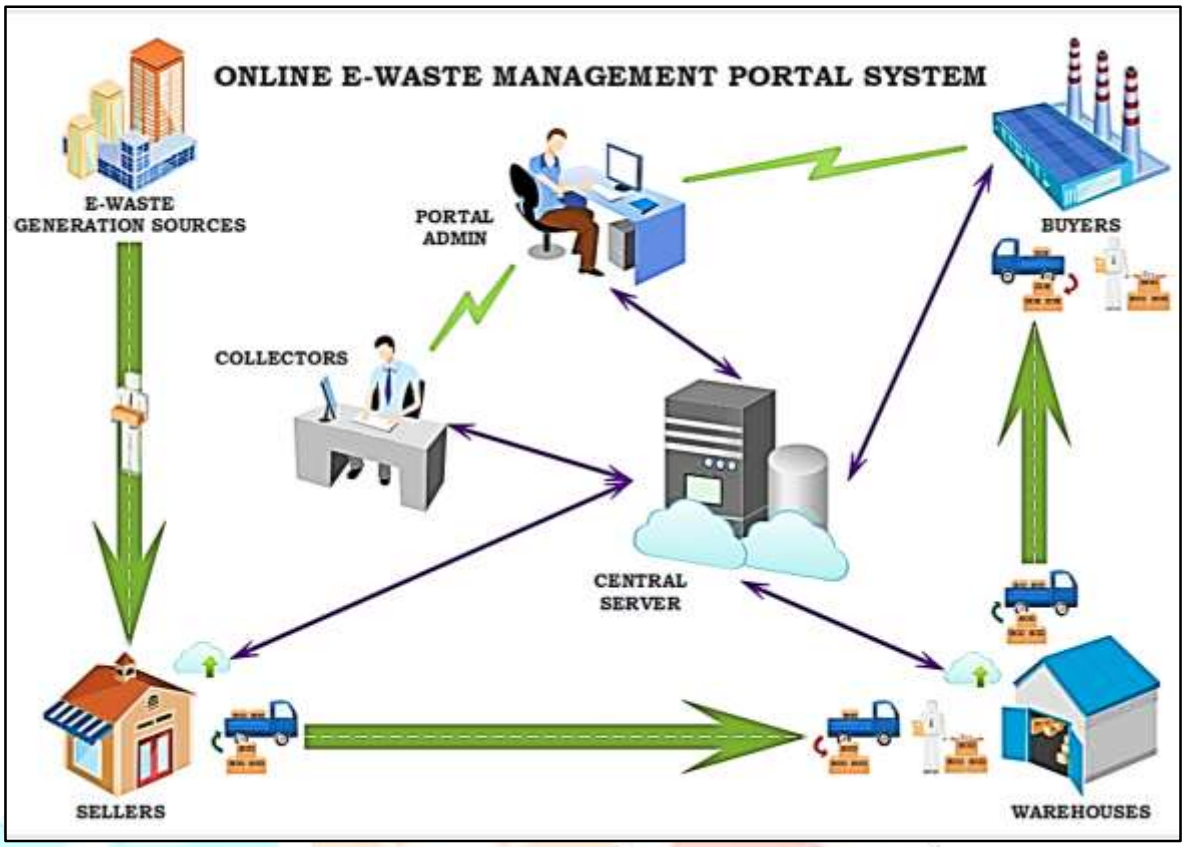

Figure 1.2: Pictorial representation of our e-waste management portal system.

As already discussed above we can relate the same using the figure 1.2. the cycle starts from the top left-hand side where it is showing that e-waste is generated after the end of life of various E&E products used by the consumers (that can be a singular individual or an organization). Then the e-waste is either carried by the consumer himself to the seller or can be carried by the waste collectors (i.e., *kabadiwalas* or *raddiwalas*) to the sellers which then is directed in our proposed online e-waste management system. And we can see in figure 1.2 a central server is been connected to all the entity in the system to track the real-time stock update and order confirmation as well as passing of delivery orders from one entity to other.

Now let us understand the detailed process flow as shown below:

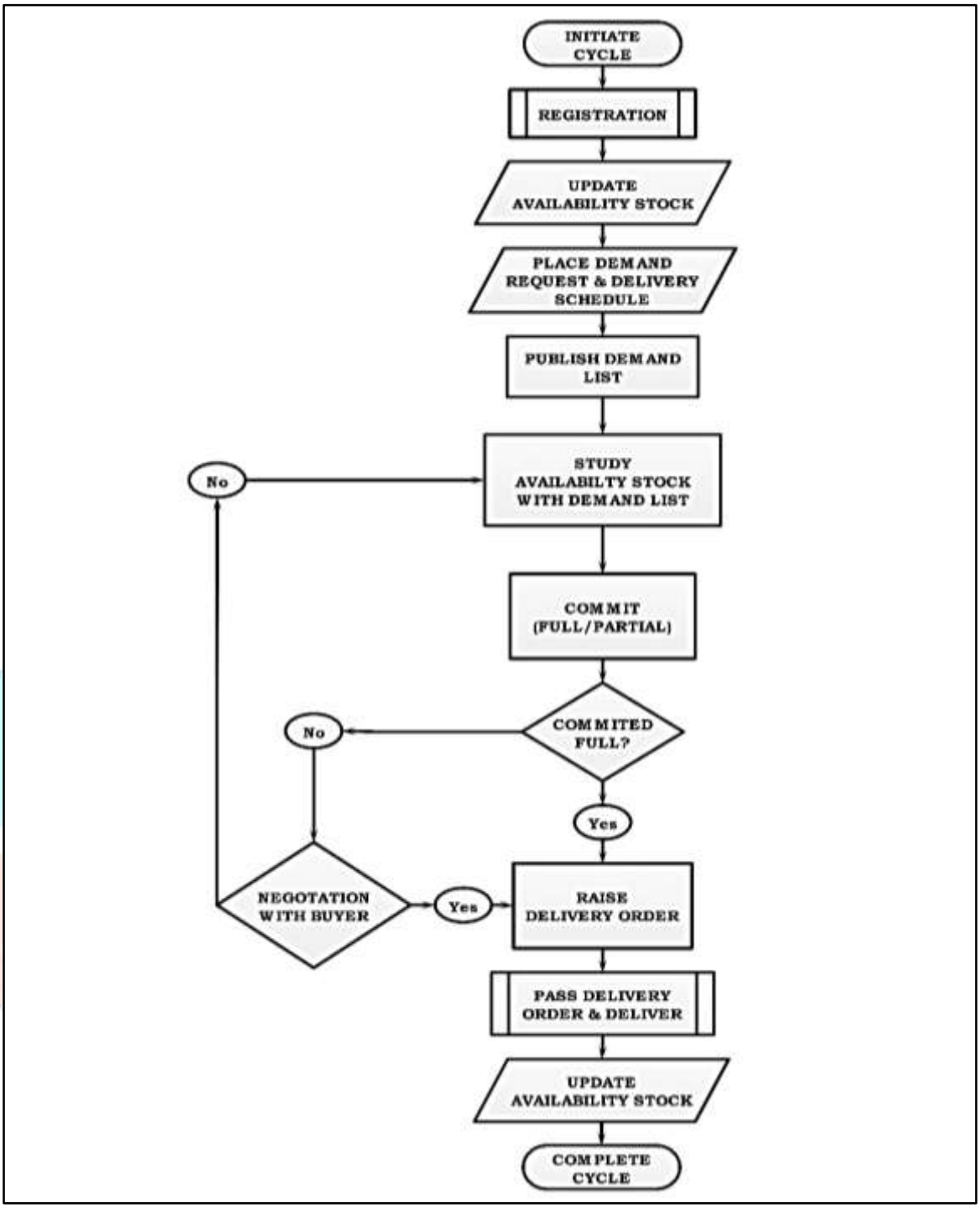

Figure 1.3: Main Work flow diagram of our e-waste management portal system.

As shown in figure 1.3, the work flow starts with registration process of all actors in two phases. First phase consists of registration of collectors and buyers and second phase consists of sellers and warehouses through respective registered collectors.

1.1.1 REGISTRATION

Registration is a sub-process as show in the main work flow diagram as shown in figure 1.3. The detailed registration process can be understood using the figure 1.4 showing the work flow diagram for registration process.

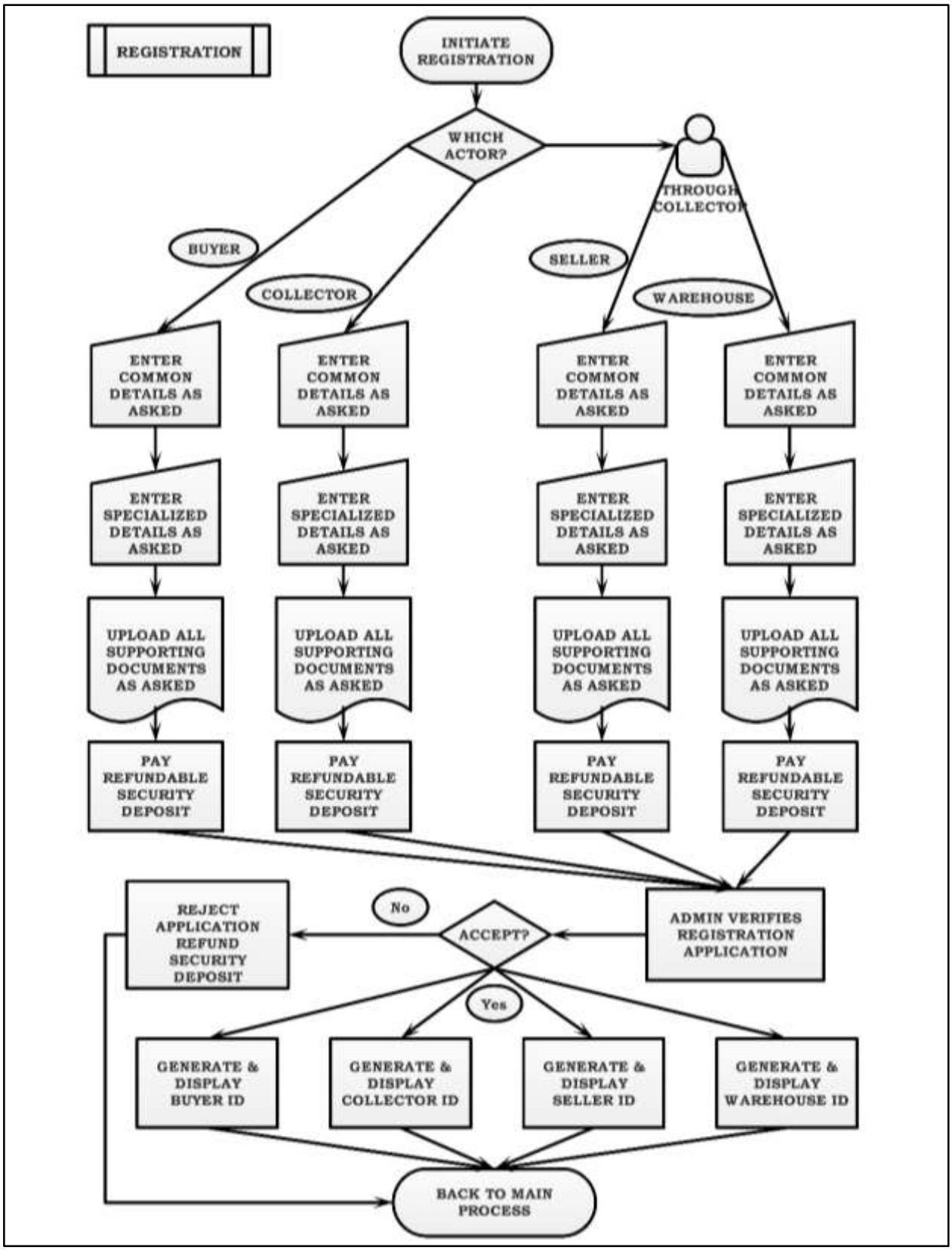

Figure 1.4: Work flow diagram of the registration process.

The collectors and sellers need to fill a registration application to get registered as an actor under the said portal system. While for sellers and warehouses need to contact the registered collector through the details shared (location wise) in the website and send the required details through mail to the respective collector. And then after verifying their credential, the respective collector fills the registration application on their behalf based on the data mailed by the sellers and warehouses. The registration of sellers and warehouses can

only be done through the respective collector's homepage after login. Rest all the procedures are same for all.

Firstly, they had to decide, which actors are they and fill the registration application accordingly. Secondly, they had to fill some common details as show in table I shown below. These common details are compulsory for all actors and incomplete application can led to rejection at any stages of the registration process.

Table I: List of common details required in registration application.

Sl. No.	Common Details
1	Company/Shop's Name
2	Address
3	Contact No.
4	Email ID
5	PAN Number
6	GST Number
7	Electricity Bill Consumer No. / Consumer Id.
8	Bank Details (Account Holder Name, Account number, IFSC Code)
9	Authorized Contact Person (Name, Address, Contact No.)
10	Date of Incorporation
11	Turnover of Last 3 years
12	Profit after Tax of last 3 years
13	Experience (relative to scrap dealing) in the current business (in Years)
14	Status of Company (Prop. / Pvt Ltd. / Ltd.)
15	Details of Proprietor / Partners / Directors

After filling the common details, few specialized details of respective actors need to be filled as listed in table II below. These details are different for different actors and each applicant need to fill only those details asked for those respective actors.

Table II: List of specialized details required in registration application.

Sl. No.	Specialized Details
1	Type of Business (Scrap Dealer/Electronic Shop) (For Sellers Only)
2	Godown Space Type (Rented / Leased / Owned) (For Warehouse Only)
3	Godown Area (In square feet) (For Warehouse Only)
4	Godown Address (For Warehouse Only)
5	Workshop / Delivery Address (For Buyers Only)
6	Total Value of Scrap Purchased / Sold in last two years (For Sellers & Warehouse Only)
7	Total Quantity of Scrap Purchased / Sold in last two years (For Sellers & Warehouse Only)

After filling the specialized details (if any), the next step is to upload the supporting documents as listed in table III below.

Table III: List of documents needed to be uploaded for registration application.

SL. NO.	Upload Documents
1	PAN (Self-Declaration on Company Letterhead)
2	GST (Self-Declaration on Company Letterhead)
3	Last 3 month's electric bills of the registered address
4	Financial Statement of Last 3 Years (includes P/L, Cash Flow statement, B/L Sheet)
5	Experience Proof (4 Scrap Purchase Invoice, among them one must be 2 years old and one recent)
6	Godown Space Type Proof (Sales/Rent/Lease Agreement and last 3 month's electric bills of the Godown)
7	Self-Declaration on company Letterhead Any Criminal /Financial /Economic /Tax Case pending in any Court of Law. Blacklisting by any Company. If yes-give details. Regarding Compliance of all Legal /Safety Rules /Regulation related to Handling /Transportation /Storage of the Press Shop Scrap.
8	Other Related Documents (If Any)

After filling and submitting all details and documents, a link will be sent to the applicant's mobile no. & email ID. On clicking the link, the applicant accepts all terms and conditions and pay the refundable security deposit and submit the application for acceptance, and finally a request Id will be generated and the same will be send to the respective contact no and a copy will be sent to the respective collector in case of sellers and warehouses applicants only.

Now, the portal admin will verify the credentials and either accept or reject the application based on specific eligibility criteria mentioned in the website and if accepted a respective seller/warehouse/collector/buyer ID and password will be created and will be informed through the registered mobile number / email ID and in case of sellers and warehouses a copy of registration ID will be sent to collector. And once the respective registration ID is created each actor can login to the portal and be a part of the portal and do their actions accordingly.

1.1.2 AVAILABILITY UPDATE & DEMAND REQUEST

Now, if we again see at figure 1.3, the next step that comes after registration is to update the e-waste availability stock by the respective sellers and warehouses in the portal in accordance to the coding as shown in table IV and table V.

Table IV: List of e-waste categories with codes.

SL. No.	E-Waste Categories	Code
1	Temperature exchange equipment	A
2	Screens and monitors	B
3	Lamps	C
4	Large equipment	D
5	Small equipment	E
6	Small IT and Telecommunication equipment	F

Table V: List of e-waste conditions with codes.

SL. No.	E-Waste Condition	Code
1	Fully functional	Q1
2	Functional, but with some drawbacks	Q2
3	No longer functional but repairable	Q3
4	Not functional and not repairable	Q4

This availability of stocks of the sellers and warehouses under respective collector will be visible directly to the respective collector and portal admin. On the other hand, buyers placed demand request in accordance to the coding as shown in table IV and table V along with demand schedule to the portal admin. After receiving the demand request, the portal admin publish the demand list (i.e., current demand evaluated using the demand schedule) for the collectors.

1.1.3 COMMITMENT, NEGOTIATION & RAISE ORDER

As soon as the demand list is published by portal admin, the collectors study the availability stocks of the sellers and warehouses under the respective collectors, with the demand list. And if the collector finds that they could be able to supply the full or partial portion of the demand then the collector commits either full or partial portion to the portal admin. Portal admin books the portion in the website and inform the buyer about the commitment. If the commitment is for partial portion, the portal admin negotiates with the buyer and if the buyer agrees, then the buyer raise the delivery order, otherwise the portal admin cancels the booking and inform the particular collector, and wait for other collectors who can commit the full portion. And if the collector commits the full portion, then, on informing the buyer by the portal admin, the buyer raises the delivery order without any negotiation.

After the receipt of the delivery order from the buyer, the portal admin pass the information and delivery order to the collector and ask to initiate the delivery process.

1.1.4 DELIVERY AND COMPLETION

After receiving the delivery order, it is the duty of the collector (who had been given the delivery order by the portal admin) to pass the information and the delivery order to preselected sellers and warehouse, and instruct them to safely deliver the demanded e-waste order as mentioned in the demand list, in its demanded condition to the respective buyer.

In this delivery system, the warehouse will play a vital role in matching the receivable items from various sellers with the demand list including the condition as demanded by the buyer. And if the warehouse finds any mismatch, then it is the duty of the warehouse to not to accept the stock and return the stock to the respective seller. And parallelly inform the collector and the portal admin as copy. And if the seller accepts the fault and resend the correct items as demanded by the buyer within a specified time decided by the collector, then it is accepted by the warehouse. On receipt of the stock from sellers, the warehouse raises a receipt flag. But if the seller fails to do within the specified time, then the seller's registration will be cancelled and the security deposit will be forfeited. And if the seller wants to reregister then the seller had to pay the security deposit again and a penalty fee too as a fine.

Similarly, the buyer matches the receivable items from warehouse with the demand list including the condition as demanded. And if the buyer finds any mismatch, then the buyer can reject the stock and return the stock to the warehouse. And parallelly inform the portal admin. And if the warehouse accepts the fault and resend the correct items as demanded by the buyer within a specified time decided by the portal admin, then it is accepted by the buyer. But if the warehouse fails to do within the specified time, then the warehouse's registration will be cancelled and the security deposit will be forfeited. And if the warehouse wants to reregister then the seller had to pay the security deposit again and a penalty fee too as a fine.

After the receipt of the stock by the buyer as demanded, the buyer raise a receipt flag, and the portal admin completes the cycle and payment procedures starts. And consecutively the availability stocks are updated.

1.2 FUND FLOW PROPOSAL

As soon as the buyer receives the demanded delivery, the buyer needs to pay the total amount to the portal admin (including payment of all actors involved in the process). And sequentially the amount is distributed among other actors in sequential manner as shown in figure 1.5.

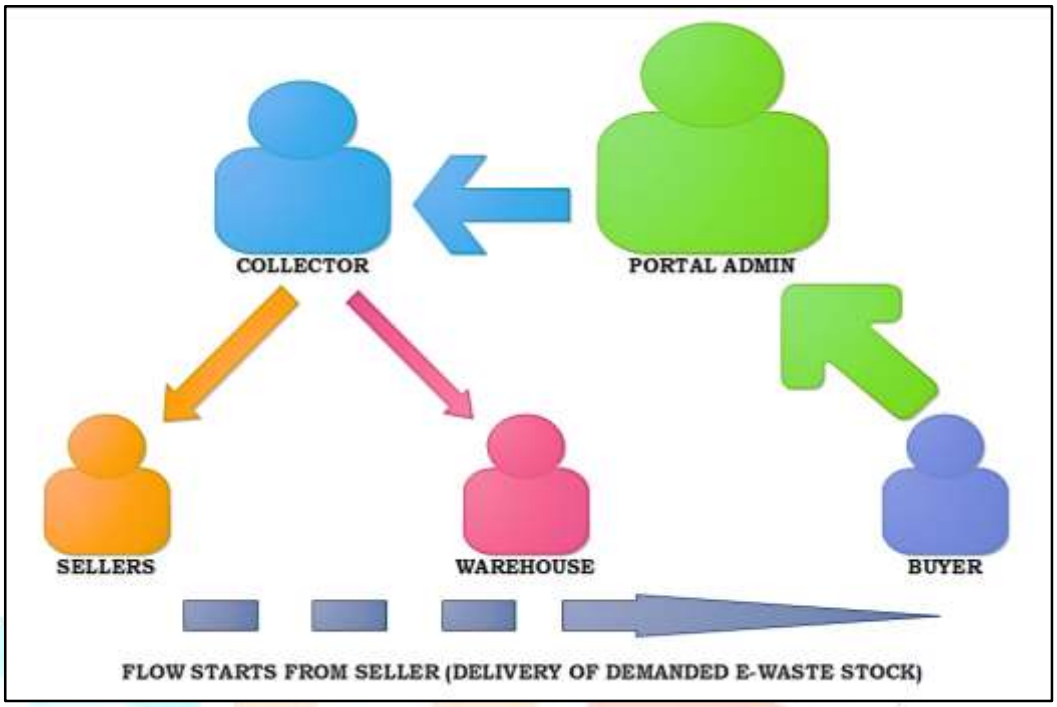

Figure 1.5: Stock and fund flow diagram of the e-waste management portal.

As already said, on receipt of delivery, the buyer pays the full amount including the payments of all actors to the portal admin.

Now after deducting the portal admin's payment, the portal admin transfers the collector's payment in respective collector's bank account and instruct the respective collector to initiate the warehouse's payment (including the payment of the warehouse's and delivery cost borne by warehouse to deliver the stock to buyer) and finally distribute the sellers' payment (including the price of e-waste and the payment of the sellers' and delivery cost borne by seller to deliver the stock to warehouse) and initiate the payment. This transfer of fund will be done directly through fund transfer from portal admin's bank account to the respective sellers' and warehouses' registered bank account. The job of respective collector is only to initiate the payment of the respective sellers and warehouses using their unique registration IDs, using the dedicated page in the portal after logging in.

And regarding the payment to the actual source (i.e., individual, office, etc.) of e-waste generation is to be borne by the sellers and needed to be instantly paid as soon as the seller receives the e-waste. And seller can decide the price of e-waste and can negotiate with the source on the price of e-waste to increase the seller's earning.
One more thing to be noted is that the buyer while raising the delivery order need to pay some advance payment to the portal admin and by any reason if the buyer refuse to accept the delivery due to his personal reason, then the security deposit of buyer and the advance payment will be forfeited to compensate the sellers and warehouse, here the collector and the portal admin will not be compensated for this particular declined order.

The advance payment to be made by the buyer for each order will be negotiated by the portal admin each time based on the buyer's profile, annual demand and previous transactions.
This fund flow system is just a proposal and should be consulted with financial consultant to build the system a sustainable one.

III. CONCLUSION

In today's world, we cannot think our life without the electrical and electronic equipments. And hence with the end of life of the equipments it becomes e-waste. And day by day the electronic waste piles are growing at a faster rate. And this growth creates an adverse impact on environment.

From one perspective it is clear that e-waste is one of the main factors for environmental disaster. But on the other side, e-wastes are a rich source of valuable resources that can be recovered profitably. And this second perspective is being used by the untrained workers of the informal sectors at an extensive rate, and this led the workers to get exposed to health hazards. And along with the health hazards this improper handling of e-waste is detrimental to the environment and mankind.

Hence, there is a huge requirement of a system which not only treat the e-waste in a proper way but also include the informal sectors and form a link between the formal and informal sectors to fulfill the e-waste collection targets of government. And our online e-waste management portal solution proposal can be a star in the darkness. Our proposal directly connects the sellers (i.e., scrap dealers, electronic shops) with the buyers (i.e., recyclers, manufacturers) and help them to sell off and get adequate quantity of e-waste in preferred condition respectively. And as our proposal saves the reusable components for refurbishing, this reduces the e-waste and helps to earn profit from selling refurbished components apart from profit earned from precious metals through the traditional ways.

But beside our proposal few recommendations are there:

- Governmental support to this proposal can bring an enormous success to overcome the e-waste pile problems and the environment will be less affected by the e-waste.
- Laws relating to e-waste must be made strong enough with certain penalties.
- NGOs and government must do awareness campaigns at various places and aware peoples about the problems faced by environment due to the growing e-waste piles and make them understand not to mix the e-waste with common household waste.

Finally, to conclude, we can say that this proposal will not only give a way for proper e-waste disposal but also will create employment to lot of people.

IV. FUTURE SCOPE

Our proposed system needs vigorous research and development before application of the system as it is based on the secondary data and human perception. Moreover, there is a scope to design the system in order to connect the sellers mentioned in this proposed system with the consumers who are the actual owners of the electronic equipments. That is to design a system which allows the consumer to inform the nearby sellers to collect the e-waste at the door step and channelize the e-waste in the proposed model. Moreover, vigorous research can lead to design a system which can determine the price of the e-waste based on its type, company, condition, etc. at various stages of the proposed e-waste management system.

Few things that can be worked up with, in future:

- Government can make policies to insist the manufacturers of electronic goods, to spent a percentage of CSR solely for this purpose.
- Introduction of some tax deduction policy by government to e-waste dealers, who are part of this system can attract more dealers to join this initiative.
- And last but not the least, NGOs along with government can organize award function along with training and awareness programs of how to handle and dispose e-waste dedicated for the e-waste handlers and recyclers can motive them.

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