INNOVATIVE STUDY OF WASTE MANAGEMENT - EBINS APP

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Abstract

As of late because of the innovative turn of events and fast development of the economy of India a market has grown for PCs, consumer electronic items and home machines. This developing business sector brings about an expansion in how much neighborhood customer items on the lookout and a lot of electronic items need to be disposed of after several years of use which ultimately cause a new environmental challenge. In India , the e-waste is reused, separated for parts or discarded totally. The present casual act of reusing isn't done securely and it turns into a threat to human wellbeing and the general climate. Not only the people of India are not yet concerned about the hazards of e-waste but also there is lack of awareness in the government and private organizations.

So we will likely gather e-waste from clients and afterward offer it to the approved Recycler, the Normal wellsprings of e-waste include televisions, air conditioners, computers, mobile phones, equipment, fridges, and electric fans. Such things contain valuable metals like gold, silver, copper, iron, and a few other weighty metals.

Introduction

India still doesn't have a reliable system in place for safely disposing of electrical waste (e-waste). India generates almost 1,000,000 metric tonnes of this e-waste annually, according to a recent study by the Indian University of Engineering and Technology. The survey also found that only 3% of the total generated waste is being sent for recycling. India uses approximately 1,014,961 tonnes of electronic products. Only 20 to 30 percent of this amount is recycled, and the remaining 80 to 90 percent is discarded as outmoded or dumped in the open, endangering human health and the environment.

The most popular form of disposal is to burn it in a pit outside under the open sky, however doing so releases hazardous compounds into the environment that are harmful to human health.
We are coming up with a method to stop this by collecting user-generated electronic garbage through mobile apps and websites so that it does not end up in the hands of unlicensed buyers who do not know how to recycle the devices safely and sell them to the authorized vendor. The Recycle Bin app will be created with the intention of increasing revenue in the E-Waste collection sector.

To prevent this, Mobile Apps and websites are being used to collect e-waste from users and then sell it to the authorized Recycler. The most common disposal method is burning it in a pit under the open sky, but this releases toxic substances into the ecosystem.

The seedling process starts with selecting the product, selecting the brand, inputting the initial business price, and uploading a photo or video tile of the product within 5 MB. The buyer must register to our websites or apps with their trade license to view our categories of product, Brands, Inventory, and send a Purchase request to our operation team.
After confirming the purchase, the buyer can directly contract with us without using the apps or websites. The delivery man will pick up the product within 24 hours.

Literature review

A waste bin full up level system was created using an Arduino microcontroller, a tilt sensor for orientation, a level sensor, a real clock time module, and a web server for receiving data from the sensor node in a study by **Muyunda and Ibrahim et al.,[1]**The design temperature, fire outbreak, and theft, however, were not taken into account.

Tripathi et al., [2] hinted that one of the difficulties with using trash cans in public areas is that they must be frequently checked to prevent overflow. Routine refuse disposal checks are ineffective because the trash can frequently fills up before it is full. In our country, it is common to see overflowing trash cans with trash spilling out of them. This is where a lot of disease-causing organisms and insects proliferated. Inadequate urban waste collection may result in a number of issues that have an impact on the ecosystem, countries, and citizens. Waste management has recently gained significant attention in urban areas. Consequently, the use of clever trash cans in our country can reduce, if not completely eliminate, this challenge.

Gaddam et al[3] .'s study of an IOT-based smart trash management solution. The level of waste in the trash can is measured using an ultrasonic sensor, and a raspberry pi is also employed for additional processing of knowledge. The Raspberry Pi's Wi-Fi module is used to upload sensor data to the cloud. Also, the bin and location are displayed in the app via google maps whenever the garbage volume reaches a certain threshold. Also, using GPS, the truck driver's current location and the shortest route are shown. However, the system's functionality is constrained by the power supply.

An Automated Waste Segregator was implemented by **Kesthara et al., [4].** developed an automated waste segregator. The suggested system divides waste into three groups: dry waste, wet waste, and metal waste. This aids in collection plan optimisation. There is a rejection and acceptance rate system built into the different categories. Additionally, sensors are built in to track the condition of the trash can, and when it reaches capacity, instant signals are sent to the waste management authority instructing them to empty the can. An Arduino microprocessor platform controls the GSM module, Servo Motor, Ultrasonic Sensor, and Humidity Sensor in this system. However, the 24th International Conference on Science and Sustainable Development is using ultrasonic technology to quantify the amount of trash in the trash can. (ICSSD 2020) Publishing IOP Earth and Environmental Science IOP Conf. Series.

A smart trash can that separates trash into biodegradable and non-biodegradable materials was created by **Singh et al., [5].** The sensor identifies and separates the waste whenever a human approaches the trash can with waste in front of it (biodegradable or non-bio-degradable). When the trash can is full, a message will be sent to the person in charge instructing them to empty the trash can. The inappropriate disposal of garbage contributes to the spread of many diseases. Wet and dry garbage were automatically separated using a low-cost smart waste system, which was then dispatched for additional processing.

Sreejith et al. [6] have proposed a robot smart garbage container. The suggested solution includes waste level monitoring. When the bin is full, it automatically moves to the designated collection area for disposal of waste before being returned to its starting position by a two-axis robot. A petrol sensor has also been included to the system to identify odours and buzz the area's occupants into action. Also, when rain is detected, a rain sensor is employed to detect it and automatically close the bin's lid. The microcontroller is additionally interfaced with an infrared sensor to track the waste level. Using the Wi-Fi module, the complete system is monitored on the website.

Raaju et al. [7] created a smart waste collecting system using ZigBee and IOT, incorporating solar-powered modules and sensors. When placed in a cloud, it not only reads and collects data but also transmits a significant amount of data via a network for use in monitoring garbage collection systems. This paper presents an IOT based smart waste collection bins which were interfaced with a microcontroller incorporating an IR wireless system paired with a system indicating the state of the waste bin, using a mobile web browser with HTML page by Wi-Fi This paper address a smart means of treating garbage via IOT protocol for transmission of waste bin status. If the bin is full, the waste management authority will send a message outlining the status of the bin and the need for a replacement. This system uses proximity sensors to identify objects in front of the bin and ultrasonic sensors to indicate the level of rubbish. Moreover, an LCD has been added to display the bin's current state. Nevertheless, this study did not take waste segregation into account.

Two IR sensors placed at the base of the robot looking forward enable **Rajathi et al[8]** .'s suggested robotic dustbin to move along a lined path. It has an obstacle sensor built into the side that detects dark objects and emits a buzzer to indicate a temporary halt in the deposit of trash. A waste level detection ultrasonic sensor is also installed at the bin's rim. By using a Wi-Fi module, the state of the trash can is updated on the website,

showing whether it is full or empty. An Arduino integrated development environment loaded onto a microcontroller is used to programme the robotic bin.

Mamun,M et al.,[9] Collection E-waste through mobile apps: According to their plan, they would collect consumer e-waste utilizing online platforms including mobile apps and websites before selling it to a licensed e-waste recycler. Their collecting procedure is economical,since it uses less raw materials, less energy, and used materials. Due to the fact that this concept is entirely new to the waste management industry in many places they have an advantage over other E-waste Recyclers in the market. Eco-friendliness is another benefit. Under the company name Recycle Bin, our company will conduct business as a private limited company.

People consume a lot of electronic products each year. Of this amount, only 20 to 30 percent is recycled and rest is dumped as obsolete or disposed of in open places, which is hazardous to health and environment. So they are going to take this opportunity and convert these environmental challenges into business models.

A system that uses an RLC metal detector circuit to identify and filter metallic waste from non-metallic trash has been created by **Saranya et al., [10]**. The actual bin is divided into two sections. The classification is based on the fact that the coil's inductance rises whenever an object is positioned close to the coil. The plate tilts into one side of the partitioned bin and the object is categorized as metal if the inductance change exceeds a threshold. An Arduino and Wi-Fi are used to build this suggested system, and a 9v battery powers both devices.

Smart waste bin system deals with a systematic review of existing literature, identifying and characterizing active research activities on smart waste bins that will allow effective waste management which has been created by **Noiki,A et al.,[11] .** Pattern of production and consumption has resulted in the generation of huge amounts of waste that must be properly disposed of, treated and managed to ensure a sustainable environment and a decent living for the increased population. The current waste management practices are not effective and efficient enough to handle the rise in waste level. The traditional approach has led to this challenge. There is a great need for deployment of this Smart technology on a large scale in the developing nations of the world for a sustainable, healthy and clean environment. However, the cost of applying such solutions is still relatively high.

Research Methodology

Indians consume around 1014961 tones of electronic products each year. Of this amount, only 20 to 30 percent is recycled and rest is dumped as obsolete or disposed of in open places, which is hazardous to health and environment. So we are going to take this opportunity and convert these environmental challenges into a business model. Our business plan is to collect e-waste from consumers through E-commerce Platforms such as using (Mobile Apps and websites) and then sell it to the authorized E-waste Recycler. Since our collection process requires used materials, less energy, less raw materials, it is a cost effective process. For this reason we have advantages over other E-waste Recyclers in the market since the idea is completely new in the India waste management market. Another advantage is that it is eco-friendly. Our business will operate as a private limited company under the business name Every bin.

Goals and objective:

The objective of Recycle Bin Management is to expand and improve its primary e-waste collection company while also creating a cutting-edge recycling solutions application.

● **Specific:** Our specific objectives include creating and maintaining a successful waste collection business, educating the public about environmental pollution, and promoting sustainable communities among rural residents.

● **Measurable** : Delivering sound and economically viable solutions for waste management and the recycling of consumers' electronic items will help us reach our objective, which is measurably.

● **Assignable**: In order to gather e-waste and increase public and individual awareness of environmental issues, we will assign our aim by utilizing cutting-edge Al-based mobile apps.

● **Realistic**: Our app programme will lessen environmental pollution.

● **Time-based**: In this period of pollution and global warming, our purpose is very much environmental protection. Our goal is to help the unemployed find work, which is important given the state of the global economy today.

App Process

● By using our mobile application users can easily sell their used electronic products to us at a competitive fair market price.
● To sell any used electronic products first customer has to create a profile by using their email id into our mobile apps.
● Once a customer creates his/her profile into our apps or website he/she will face several options such as Products,Brand, Usage time, Initial Buying Price, Description of Current condition, Attached a Photo or Video File.

- The seedling process starts with selecting the product whether you want to sell your mobile, TV, Fridge etc.
- The second option is selecting the brand like what is the name of your product brand such as Samsungs, Nokia, and Apple etc.
- In the third option you have to input your initial buying price of the products into our apps. After that a description of the current condition of the product is to be written within 150 words.
- Final option is to upload a Photo or video tile of the product within 5 MB.
- Once a user complete all the steps and click on the next button immediately a sell request will be sent to our operation team and after judging all the options that the user input to our system an Al based automation price will be shown in the Apps which the users will receive if he/she wishes to sell their product to at the automation price.
- After seeing the price, if the customer wishes to sell he/she will have to click on the confirmation and then automation sms will be sent to the user's mobile number.
- After that our delivery man will pick up the product from the users within 24 hours.
- In terms of a buyer point of view who wishes to buy e-waste from us, the desired company must register to our websites or apps with their trade license. After that they can see our categories of product, Brands, Inventory.
- Once a buyer chooses all the options and based on his demand he can send a Purchase request to our operation team by using our app or websites.

Analysis Result and Discussion:

According to the survey conducted, we can conclude that most of the people, especially the students in Bangalore are aware of the hazardous effects of e-waste not being collected and managed in a proper way and are already contributing to this in multiple ways.

As per the findings we see that the majority doesn't have a strong positive opinion towards usage of second hand gadgets. The main reason being outdated, low quality hazardous products being sold in the market. Only a minor segment of the population purchase second hand gadgets due to their low prices as compared to the first hand market. As per the research we see that the majority of the population are familiar with the fact regarding India's outdated electronics market when compared with developed nations like the US, UK, etc.,. India usually imports it's electronics from China, and it's a well known fact that China finds India to be its suitable dumping ground for cheap electronics. Therefore, the majority of the electronics that gain hype and popularity in the Indian market at the moment are mostly outdated in the foreign competitor's market. This adds on to the burden for India's technological growth and development and creates an adverse effect on the economy of the country.

Artificial Intelligence (AI) is gaining a lot of popularity in all fields of work and supports in global development. Using AI and other upcoming technologies, proper waste management is becoming an organized sector. Waste management along with the help of technology can be one efficient solution for a sustainable tomorrow. Applying AI to the e-waste crisis could save electronics manufacturers a fortune and end e-waste pollution. Technology has the ability to compress and analyze large sets of data and instructions that can help monitor and interpret the data regarding the different e-wastes, their costs, and usage. People agree on adapting new technologies which will help in safe disposal of e-waste.

AI and the upcoming technology help in proper waste management.

As per the results we see that the majority is in favor of the statement that, "AI and the upcoming technology help in proper waste management." AI is changing the very way in which waste is collected, segregated and transported. AI combined with robotics makes the process of dealing with electronic hazards a simpler and quicker process by simplifying the complex tasks that are otherwise required to be performed manually by laborers. Upcoming technology not only provides ease to the waste management party, but also ensures simplicity for the party disposing off the said waste in a proper manner. Such development in technology coupling with AI will reduce the dumping grounds thereby reducing hazardous substances lying around untreated in the vicinity.

According to the responses received, it is evident that people are willing to adopt and learn the usage of new technology for safe e-waste disposal. AI and upgradation in technology is at a rise and soon India much like the other developed nations will be highly dependent on technology for numerous activities. One such being Waste management. E-bins which are AI automated e-waste collection bins operated through an application in the users mobile phone etc., is a comparatively new technical development unlike other existing mechanisms. Using this application will require diligent dedication of the party willing to avail this method, but once it gains public acceptance and popularity it'll be certain to make a huge impact on the economy of the country by ensuring a cleaner and safer tomorrow encouraging rightful disposal of electronic waste.

Nowadays, individuals like us, who really want to help in the reduction of e-waste, do the same, by selling the electronic items. But unfortunately, these individuals end up selling the e-wastes to unauthorized buyers, who do not have knowledge about e-waste management. Therefore, our app uses all the data given by the seller, who want to help in the reduction of e-waste, checks the further uses of the mentioned device and recycles it in a proper way, or sell it to genuine buyers who can recycle the e-waste in a proper manner without giving a lot of damage to the ecosphere or our health.

On careful analysis we find that more than 50% of the responses lean towards agreeing to recycling their old batteries. Recycling old batteries helps to recover the non - renewable materials in them. Materials such as iron, zinc nickel commonly found in batteries are non - renewable but are infinitely recyclable. Proper recycling of old batteries maintains the availability of these materials and therefore also makes a positive impact on the country's economy and must be considered on a serious note.

As per the results we observe that most of the people do believe in refurbishing their electronic goods to increase their lifespan and enhance their performance. Repairing and refurbishing electronics are often the cheaper solution instead of buying a new one because of an existing defect. Refurbishing not only increases the mere duration of the product but improves and enhances it's functioning in various aspects making it no less than a brand new purchase.

We see that a wide majority of our respondents are aware of the hazardous elements present in e-waste and the treatment they require before being disposed of. The most commonly used day to day equipment such as LCD Desktop monitors, LCD Televisions contain elements like mercury, lead, arsenic etc, which are very hazardous in nature and prove to be toxic if dumped carelessly in a dumping ground without prior treatment. Therefore to ensure a safe environment for all life forms it is necessary that electronics be treated with methods as specified by the governing law.

On thorough analysis of the results we notice that a major chunk of the population live in a locality without e-bins. E-bins are widely gaining popularity and support in foreign countries. But India is yet to catch up to it in this aspect. E-bins are automated smart e-waste collection bins made by coupling AI with up and coming technology. These make the collection and treatment process of e-waste hassle free with the presence of apps

to guide one through the process and also safer in the aspect that no hazardous element would go untreated. Setting up these in localities would prove to be of much help towards both, the parties disposing the e-waste and the party in charge of waste management.

As per the analysis, we see that the majority of the respondents have a positive reaction towards a future in the world with the presence of e-bins. Having e-bins will not just make the process of e-waste disposal easier but will drastically improve the country's overall economic situation. They will help in efficient collection, segregation and management of e-waste by focusing on the intricacies of the substance thereby providing treatment as per the nature of the equipment. Products with high concentration of hazardous elements like nickel, arsenic, lead etc, can be given special treatment before disposing them off to avoid toxicity from spreading through these items. They are already being readily adapted to certain foreign nations such as Singapore. E-bins will provide us with a hazard free environment to reside in and promote towards a sustainable development for the future.

As per the survey conducted we find that about 60-70% of the population are interested to gain in-depth knowledge about the E-bins app through the training camp. This app will ensure proper collection of e-waste, their specified treatment methods and even selling them to authorized recyclers which will further help the e-waste management sector to earn a higher revenue. The training camp will provide clearer, in depth information and instructions regarding the programme thereby keeping the interested customers updated with the up and coming developments in the e-waste management application while providing them the ease of using the above stated app.

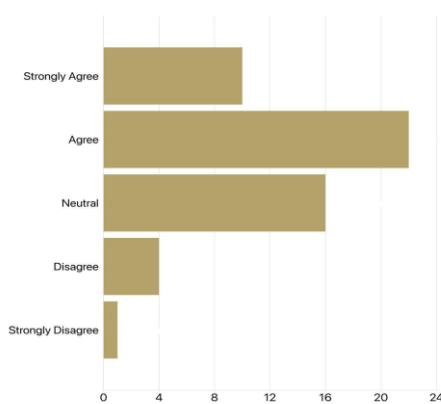Following are some of the responses we received after conducting a survey on Smart E-Bins
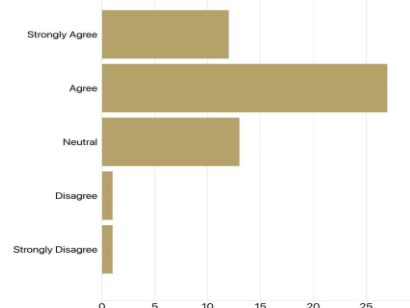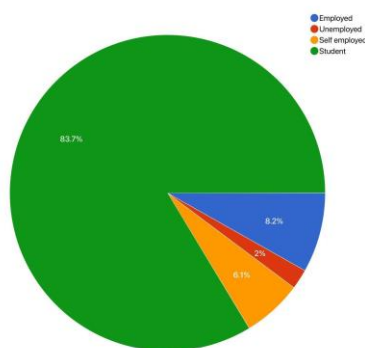
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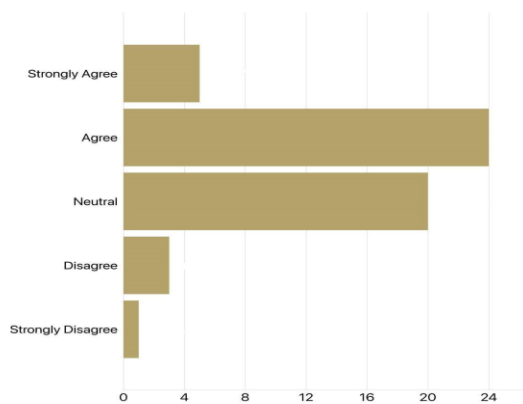
Recycling Old Batteries

AI Help In Proper Waste Management
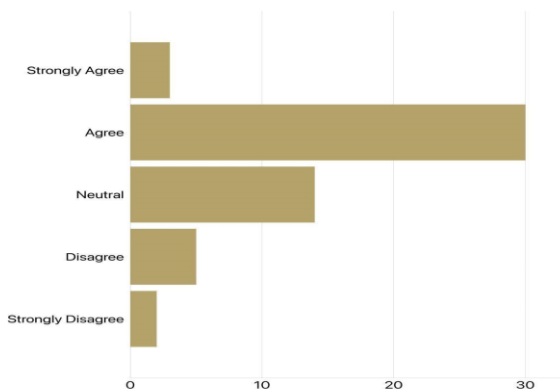
Getting all the information and nearest dumping zone through an app is the next new step

**You refurbish or repair electronic items
to increase their life span**

Sampling technique
Random sampling technique

Sample size - 100+

Target - Youth as they are the ones who use the apps very frequently

Conclusion

While the problem of e-waste and the current waste management practices were widely discussed, there was an urgent need to conduct in-depth studies in Bangalore. Our application will help the general public from the danger of e-waste. We will likely make mindfulness among the clients of electronic goods about the terrible impacts of e-waste with the goal that they can know about the risk and motivate them to offer their used items to us while we achieve our vision . In the event that we keep on succeeding we will present a waste-collector vending machine all through Bangalore city.

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