Climate Impact Rating Label

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Abstract — **Environmental Impact labelling on products is an informative way to aware consumers about how the products that they use in their day to day life impact the environment. This information becomes important to compare different products not just on the basis of costs and other relevant factors but also upon how it impacts the environment. This project aims to create a system which will give consumers the ability to know the environmental impact of a product at the point of purchase by scanning the product barcode or by searching for the product. The information about the product's environmental impact is visible to the consumer in the form of a graphical label which displays a rating out of five about the product's environmental impact. It also displays ratings of certain parameters taken into account like material used, impact in use, recycle, etc. Manufacturers provide the environmental information about their products which is posted to a central database. The end product is basically a centralized system enabling manufacturers to post data about their product's environmental impact and consumers to compare and choose products with better environmental rating. Such a centralized system sharing environmental data is the first step towards an environmentally sustainable economy.**

Keywords - Environmental labelling , Energy , Ratings , Climate , Sustainable Development.

I. INTRODUCTION

The earth is finite. Its ability to absorb wastes and destructive effluent is finite. Its ability to provide food and energy is finite. Its ability to provide for growing numbers of people is finite. And we are fast approaching many of the earth's limits. Current economic practices which damage the environment, in both developed and underdeveloped nations cannot be continued without the risk that vital global systems will be damaged beyond repair.

We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. A great change in our stewardship of the earth and the life on it is required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated.

– World Scientists 1992 [1]

Earth provides us with an environment to live in. But in the recent past, we, the humans have exploited the environment for our own benefit. Our environment is deteriorating and we are the one to be held responsible for it. Thus, there is a need to improve the environment and we present a system which may ameliorate the present conditions.

Many studies and surveys suggested that consumers do care about the environment & are alarmed by this issue. But the consumers lack the knowledge of informed decision-making. They are unaware of the fact that how much are the so-called "environment-friendly products" really environment-friendly. This gap is due to the absence of a proper labelling on each & every product so that the consumers can improve their purchasing decisions. Furthermore, to encourage more consumers to buy environment-friendly products, we can provide some economic incentives. To incorporate these ideas, we, through this report, propose a system where users have access to a more comprehensive yet informative label & can improve their purchasing decisions.

Here, we first examine the previous systems which have some flaws which increases the necessity of creating a new more consumer-centric solution.

The EU energy labelling system is rigorous but lacks direct involvement from consumers. It becomes important to propose a simple system which helps consumers to not only identify the environmental impact of a product but also help them in comparing the rating of different products on the go. Unfortunately another system called the BEE star rating system focuses only on Electrical consumption and not environmental impact, moreover its domain is restricted only till electrical appliances ,thus leaving out all other categories of products.

In the heart of the paper, we present a Climate Impact labelling system(CIRL) - a comparative based label prototype, similar to that of Environmental Life-Cycle Rating Label(ELCRL)[2] which can be used to educate consumers about environmental implications of the products they may purchase.

Lastly, we describe the future scope of the project and the later stages of development which should be carried out in order to implement a full functional system at commercial level.

II. PROBLEM DEFINITION

The project aims to create a system to facilitate consumers to make better decisions at the point of purchase which will promote products having minimal or zero impact on the environment.

The project focuses on achieving energy sustainability by identifying technology-based solutions to address one or more of the targets in UN Sustainable Development Goals which includes -

1. Ensure universal access to affordable, reliable and modern energy services
2. Responsible consumption and production.
3. Improvement in energy efficiency.
4. Expand infrastructure and upgrade technology for supplying modern and sustainable energy services.

The vision we have is to promote a comprehensive Climate Impact Rating (CIRL) labelling system, which enables consumers, at the point of sale, to determine the overall impact on the climate of the product so that they may improve their purchasing decisions in the favor of the environment. Also, this system will encourage manufacturers to create more eco-friendly products.

III. LITERATURE SURVEY

The major area of research dealt with the identification of a label which is user friendly and conveys relevant information in a concise and precise manner. There are various environmental labels used in the market, the most recent and widely used being the European Union Energy Rating Label[6]. The Indicating impact paper[2] discusses various types of label and proposes a new label which is both user friendly and easy to understand. Various energy labels are currently used in the world. These labels can be broadly divided into Endorsement label, Information-only label and Comparative labels[2].

1. Ecomark (Endorsement label)

The ecomark label, operated by the government of India for environmental friendly products works as a seal of approval of the product as a green product. The ecomark label was started in 1991 but the concept never picked up. In the paper by A P Singh, N S Raman and U P Waghe[8], the main reasons being that people are not aware of the concept and attempts were never made to understand the importance of the concept[8]. On top of that, such labels do not provide any transparency about what calculations are undertaken to reach the conclusion. Few of the manufacturer's claim that their product is energy efficient even though it is not. Such 'self-claims' misdirect the consumers and creates a mistrust in the system. In India, ISO has identified three major environmental labelling Type I: Environmental labelling (i.e. "eco labels"), Type II: "Self declaration claims" and Type III: "Environmental declaration like report cards / information labels"[2].

2. BEE Star Rating (Information Label)

The BEE star rating which is printed on electronic appliances gives out of 5 star rating about the electrical consumption of the appliance. In this rating system, the appliance with the lowest energy consumption is given the most stars and those with the highest energy consumption are given the least number of stars[9]. This label became very popular in India and served its purpose to provide information about energy efficiency of electrical appliances. As discussed in [9], this energy label has single handedly influenced our consuming habits. This paper also discusses the various testing and relevancy methods accounted for by the BEE star rating. However this rating system does not take into account the overall climatic impact of the product from cradle to grave but rather focuses on one of the factors of climatic impact. Also, the domain is limited to electrical appliances but there are other products which have more environmental impact than electrical appliances.

3. European Union Label

One of the most rigorous climatic impact labels is provided by the European Union Commission. In June 2003, the European Union adopted a Communication on Integrated Product Policy to reduce the environmental impact of products and services throughout their life cycle[6]. The EIPRO report gives a well defined approach of calculating the climatic impact of the products and services throughout their life cycles[6]. One of the ways of calculating environmental products is LCA as defined in [7], Life cycle assessment is a "cradle-to-grave" approach for assessing industrial systems. "Cradle-to-grave" begins with the gathering of raw materials from the earth to create the product and ends at the point when all materials are returned to the earth. The EU label describes another approach - CEDA EU-25, which is a top-down approach, which takes into consideration input - output tables produced by statistical agencies.

Though these labels are very useful and provide an overall description of analyzing a product but lack the involvement from consumers. We have made an effort to bring consumers involvement in this system so that they can consciously make an effort to buy better products and take initiative in sustainable development. The idea of creating an app for displaying climatic impact of a product comes from the call for code energy sustainability initiative organised by IBM.

IV. METHODOLOGY

The implementation includes two major pieces -
1. App for the consumer
2. Central Database and the API

1. App for the consumer

The application is built using React Native which is an open-source mobile application framework used to create applications that are platform independent. We have used Expo which is another framework that provides a set of tools & services built around React Native.

Here, we go through the complete application & explain briefly about some of the important modules used.

A. Onboarding swiper

One of the key aspects of building a software system is proper communication between the software and the users. To make sure that the users don't just download our application & never use it just because of the fact that they are unable to understand what our application does in the first glance, we need to make them understand effortlessly. Onboarding swiper solves this problem as it provides screens that give a gist of what lies inside our application with some visuals.

B. Authentication module

We have used firebase in our application for managing the authentication process and
store the user's information in the firestore database provided by the firebase. Firebase is a platform that provides a backend service to the application. Along with the normal authentication, it also provides google & facebook authentication. We have used the google authentication feature to provide ease to the users.

C. Barcode scanner

Expo provides many tools & services to a React Native application. One such tool is a barcode scanner. The expo barcode scanner provides a React component which displays a viewfinder for the device's camera that scans the barcode appearing in that range. The object returns the type of barcode scanned and the data i.e. the barcode number which helps in navigating to the label screen in our application.

2. Central Database and the API

The Central Database is stored in the form of documents in the collections of a MongoDB Atlas cluster. MongoDB is a no-sql, non relational, document oriented database program which uses JSON like documents with optional schemas. MongoDB Atlas is the cloud form of the MongoDB program.

The CIRL API is a REST based application programming interface which helps to contact the database and returns the relevant data in the form of JSON on GET request and populates the database with relevant information on POST request.

Express.js acts as the server framework with node.js being the runtime environment. Mongoose acts as the middleware between mongodb and node, mapping Javascript objects and their representation as Mongodb documents.

Any requests on the API endpoints trigger the server - side script to generate relevant results in the database and respond to the client with relevant information.

V. CONCEPTUAL ARCHITECTURE

The proposed system is the first software based implementation of the current system. The extant system lacks a user interface which might be helpful for any consumer who are apprehensive about the deteriorating condition of the environment. Here, the relevance of our system comes into picture as we come up with the idea of a centralized system which enables consumers to choose eco-friendly products & their purchasing decisions will promote manufacturers to produce more environment-friendly products.
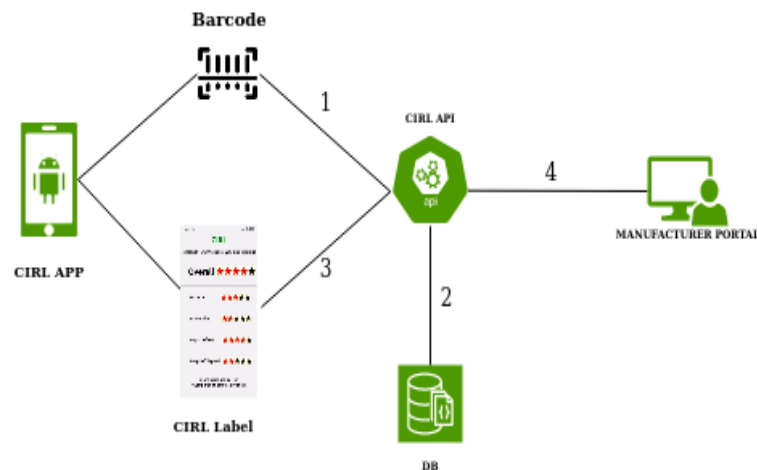

Fig. 1. Conceptual Diagram of CIRL system

The architecture can be explained in 4 steps as follows-

1. User scans a product barcode with an app, which then calls the Climate Impact Rating API, passing in the barcode ID.

2. The Climate Impact Rating API retrieves the ratings data that matches that barcode ID.

3. Manufacturers can upload product and ratings data via the Climate Impact Rating API (via a reserved portal).

4. In the future, a Climate Impact Analyzer will run in the background to produce summary data, enabling broader ratings queries to be satisfied by the API.
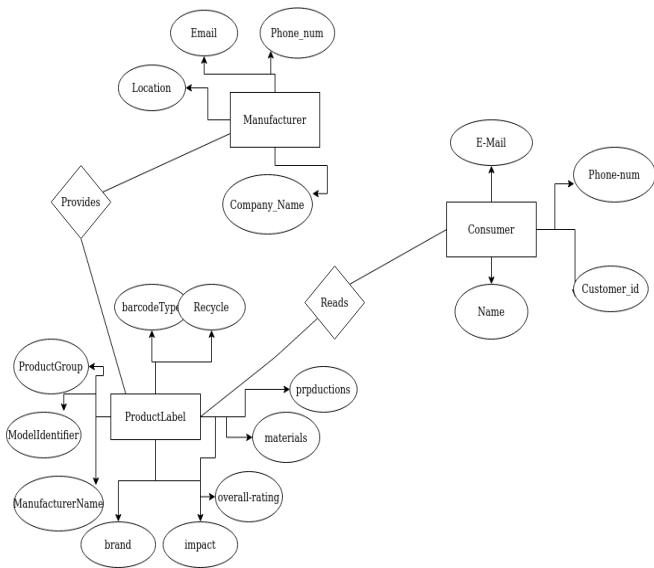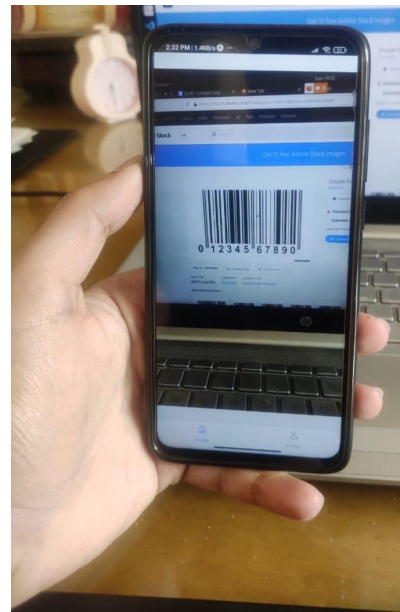
Fig. 2. ER DIAGRAM

Fig. 3. SCANNING BARCODE

VI. IMPLEMENTATION SETUP

On starting the app the user has the option to check the tutorial in order to understand the app's functionality. The user then creates a profile on which Users information will be recorded by our app to create a unique profile. After creating the profile, the user will be redirected to the barcode scanning page. After scanning a product barcode ,the system sends an (Application Programming Interface) API request. The API retrieves the ratings data that matches the barcode ID for and redirects to the Label screen where the Climate Impact Rating Label (CIRL) will appear.

VII. RESULTS AND ANALYSIS

While purchasing a product, the application serves as a helping hand for the customers to make efficient decisions. They won't be completely unaware of the impact made by their purchase.
After the product barcode scanning is done, the climate impact rating label of the corresponding product is shown as mentioned in the implementation setup which includes the rating calculated on the of scale A to G, along with the values of essential factors which contribute in obtaining that particular rating.Also the scale for these factors can be viewed by the customer for better understanding.
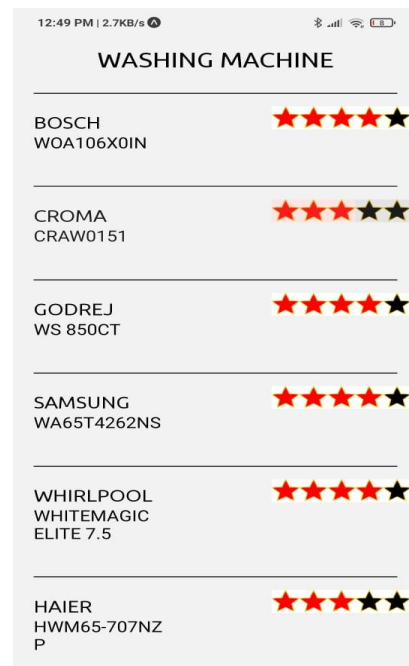

Fig. 4. LIST OF PRODUCTS

PRODUCT: WASHING MACHINE
BRAND: BOSCH
MODEL: WOA106X0IN

Overall ★★★★★

Materials ★★★★★

Production ★★★★★

Impact of Use ★★★★★

Recycle/Disposal ★★★★★

More stars are better.
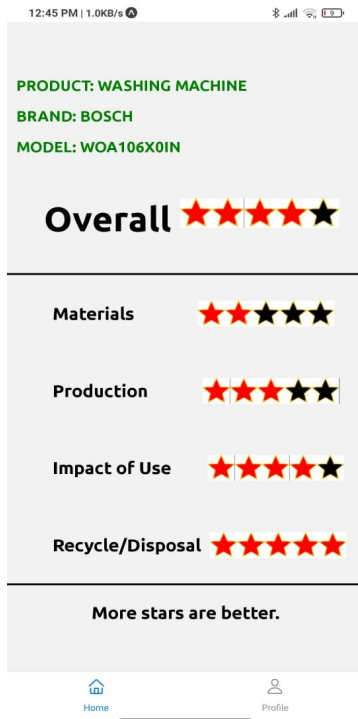
🏠 Home   👤 Profile

.   Fig. 5. LABEL SCREEN

On similar bases, every appliance will have its own various factors which will be mentioned and explained by the label along with the rating.

VIII. CONCLUSION

Sustainable development has become a need now and we must innovate new methods using technology. Our proposed system is an initiative for promoting such practices and can actually change the consumer-seller relationship and make this world a better place to live in the long run.Many consumers, given appropriate information with incentives in an easy to use form, will include environmental considerations in their purchasing decisions. Unfortunately, European label is an information-based label which lacks simplicity for a layman to use on day-to-day basis and The BEE star rating focuses only on Electrical consumption and not environmental impact.We have presented a prototype for a product dependent Climate impact rating label (CIRL).The product delivered by us is a prototype that facilitates point-of-sale decision making inspired from the positive aspects of both EU label and BEE star label with a software implementation which was missing up until now. With the completion of this project, we have attempted to contribute towards a better future in terms of an improved environment where the consumer's choice while purchasing a product can greatly impact the environment in a positive way.

IX. FUTURE SCOPE

Some aspects of the project are left for future study due to lack of resources in the present system. One of the important aspects missing in the current system is the absence of a central database which will provide energy rating for varying products.

European Union has the energy label product database but the database is yet to be released for the researchers to extract statistical data for in-depth analysis[13]. Furthermore, after the database is released, developers will be able to export the data using Application Programming Interface. Also, the project can be further extrapolated by comparing different outlets based on the quality of environment-friendly products offered by them.

In the present system, the data given by the manufacturer of a product is verified manually by an auditor. So, there is a need for an automation algorithm to verify the data which will save a lot of time & cost which will increase the efficiency of the current system.

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