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Electric Kettle

Abstract

The main aim for this report is to focus upon the process of using an electric kettle and further redesign the form keeping in mind the problems faced by the users. An electric kettle by Prestige was studied and tinkered with to understand the basic working. Surveys were conducted on a sample of 41 participants. For deeper understanding Task analysis and User journey was observed on individual users and mapped. In order to conceptualize ideas, vessels used in the kitchen were studied and the key elements were considered for further development.

Introduction

Many households in India are comfortably using the gas stove for all purpose heating. But a transition can be seen as people are shifting towards the use of electrical alternatives.

The Question arises on the need of electric kettle in our kitchen. It is seen as a safer way to warm milk, make tea and coffee. Many a times the electric kettle due to its portability is used by students staying in hostels or travellers for ready to eat meals that can be prepared by boiling or adding boiled water.

An electric kettle was tinkered with to understand the working mechanism. It involved understanding the front end, back end and the core mechanism of the product. Surveys on the usage of electric kettle was conducted that required the participants to give their feedback on their experience while using a kettle. Task analysis was done and observed for further understanding the drawbacks in the current design of the kettle.

A problem encountered by the user group was that of cleaning the kettle. Many a times food particles used to get stuck to the inner container. A few more issues observed were with the power cable and the handle.

Referring to the studies and analysis, different concepts were generated so as to solve the problems and overcome the drawbacks of the kettle. Ideations were done keeping in mind the current scenario. Different parts like the handle, the power base, the container, the lid was redesigned.

Objective

The study objectives of this report are:

Understanding the behavior of the user, and the drawbacks in the current scenario of using an electric kettle.

Analyzing the problems faced by the user while using an electric kettle.

Redesigning an electric kettle keeping in mind the current problems and the demands.

Need Statement

Redesign an electric kettle for use by the students and that ensures a wide range of cooking.

Background Study and Research

Basic mechanism: The electric kettle has a heating element and a thermostat. The high resistive coil is responsible for the heating provided to the electric kettle. When current is provided the electric energy is converted into heating energy that is transferred to the container. The thermostat is responsible for the energy cut off, from the kettle. It controls the heating element.

Tinkering Kettle: To understand the basic anatomy of an electric kettle (as shown in figure 1), a product by Prestige (Prestige PKGSS, 1.7L, 1500W, Stainless Steel) was tinkered and the structure and mechanism was observed and studied.



Figure 1 components from the tinkered kettle

User Study

Next a questionnaire was released and a survey was conducted with a total of 41 respondents of varying groups including students, homemakers, working professionals and senior citizens, majority of them being students.

The demographics of the sample space is shown in figure 2 (age distribution) and figure 3 (gender distribution) and the findings from the responses is shown in table 1.



Figure 2 Age Distribution

Figure 3 Gender Distribution

Table1 Survey Analysis (findings from the survey)

Demographic	General Usage	Functioning issues	Observational Analysis
Students [< 25 years]	-Making noodles, -Boiling milk, water, etc.	-Cleaning -Supplying power -Inserting inputs -Handling the cord	Food gets stuck in the mating edges and the spout filter
Working Women [<35 years]	To make tea coffee, noodles, porridge	-Supplying power, -Inserting the inputs	-Shorter Cord resulting in accidents -Narrow mouth of the container
Homemaker [<35 years]	-Boiling water -Making food while travelling	Supplying power	No temperature control resulting in spillage
Professional Men [<45 years]	-Boil water, make tea and coffee usually in the office	Cleaning	Opaque walls disable visibility
Elderly [>46 years]	Boils water	Cleaning	The lid gets loose and often hurts the hand

Some of the key insights from the survey were as follows: -

- 1. 70% of the users faced problem while cleaning the kettle.
- 2. 34% of the users claimed/faced compatibility issues with lid and handle.
- 3. 40% of the users found it tedious to pour and serve food from the kettle.





Figure 4 User Study



Figure 5 User Journey experience mapping

Task Analysis: A user study was conducted to observe the user behavior for the task of boiling water in an electric kettle. The interaction and the observations were recorded in the table. The study was conducted on four different types of users, a homemaker who was aware of the usage of the kettle, a service man who has used the kettle quite often, a student who use the kettle for cooking and a grown-up child who could just follow the instructions given.

The users were given a packed box that they had to unbox and boil water. The task initiated with the user unboxing the product and it concluded with pouring out the boiling water. The observations were recorded and feedback was taken. The task satisfaction did not vary for a lefthanded and a right-handed person. But it did for the age groups. Overall placing the container on the power supplying base was comparatively difficult than the other steps involved. The pouring of water was also difficult for male and the child but not for the female as she is quite used to doing this task. After the surveys and analysis some of the points about the drawbacks in the design of the electric kettle, the problems faced due to them and the reason behind them were noticed. Some of the problems associated with different part of the kettle are given in the table.



Figure 6 Journey map

Focusing on the problems encountered while using the electric kettle the answer might lie in the use of the kettle.

For example: An electric kettle is meant to be used to boil water but people often boil milk, make coffee or tea or at times even make noodles, oats, rice, pasta, boil eggs etc. as a result they encounter problems. Some other problems faced are handling the lid with ease, balancing the container on the power base and supplying power. The probable reasons could vary with the variant uses.

Parts of the kettle	Problem Associated		
Long narrow container	Not easy to cook as it often stuck at the bottom		
Lid	The hinged lid gets loose after few uses and keeps on falling on the		
	hand		
	The detached lid often has a rubber around its bottom that gets		
	stretched and loses up after a while		
spout filter	the spout filter is attached with the container and so the food gets		
	stuck in it while taking it out		

Table 2 Scope of improvements

Wobbly power base	at times maintaining the balance of the power base while the	
	container is not attached to it is difficult	

Building the Persona: User Persona is the next step in research, basically refers to the building of a fictional character that represents the target audience. Here the persona of a student was taken with various other information relevant for the research as shown in the fig 7.

Areas of improvement: After the above research the major areas of improvement in the electric kettle are listed below,

- The shape and form of the container
- The wobbly base of the detachable electric kettle
- The detachable lid
- Spout filter
- Handle



Figure 7 User Persona

Concept Generation

The process of concept generation involved a lot of observation. Objects from day to day lives were perceived and how they could affect the design change in the kettle. This phase included the evolution from rough sketches to the final form. Various iterations were done keeping in mind the drawbacks and the problems that were taken from the research study. Various forms were iterated, revised and evaluated by keeping them in the scenario.



Figure 8 Concept Map

Design Development: Focusing upon different components of the kettle and their redesigning, different concepts for the developed form were generated. The journey of the evolution is showed in the fig 9. This was the first rough idea where the focus was on making the container compact and portable. The container was ideated to have a form that could fold up, reducing the space occupied with it.

Some of the major flaws encountered were the lack of proper material for the task, moreover it lacked in the physical stability of the product. The above image refers to the initial ideation combining the features of a traditional and an electric kettle. It was observed that the handle provided could be held both ways that is from the top as well as from the side.

The reason for not going further with any of these was the fact of lid opening that hindered the use of such extended handle.



Figure 9 Design Evolution



Figure 10 Concept 1



Figure11 Concept 2

The above image refers to the initial ideation combining the features of a traditional and an electric kettle. It was observed that the handle provided could be held both ways that is from the top as well as from the side.

The reason for not going further with any of these was the fact of lid opening that hindered the use of such extended handle.



Figure 12 Concept 3

The next concept ideas that were thought after acknowledging the drawbacks of the last ideations. These comparatively resolved the problem of the lid, as they were now made movable. The problem for these designs was that there was no steadiness in the grip of the handle and its ability to hold the weight of the electric kettle while the container is filled.



Figure 13 Final Concept

These can be considered as the final step to the generation of the final design. These resolved the issue of stability of the lid and also an additional lock system was added giving them the capability to hold the weight of the kettle.

Final concept

The final prototype is a CAD Model that has stated all the developments in the design discussed above. The different advancements can be seen in the overall prototype. There are developments in the design of the handle, the lid, power base, the form of the container and even the spout filter.



Figure 14 Rendered images of final concept

Structure and Components of the kettle are listed below

- The kettle is given a spherical form keeping in mind, better cooking.
- The lid is provided with a spout filter to resolve the problem of food getting stuck in the filter.
- The lid comes with a rotatable handle that locks with the handle attached with the container. This is done for better handling of the product, as a fact that upper lift is easier to carry and side lift is easy to pour.
- The power button is provided on the handle itself.
- The bottom of the kettle has an intrusion as it is a part of the power supplying component. It is provided on the side and not at the bottom for an easy view while handling the kettle.
- The power base provided has an enclosing structure that ensures better support to the base of the kettle.



Figure15 Labelled Image

Different features added to the concept:-

• Spout filter is provided on the lid for preventing the food to get stuck.

Figure 16 Spot Filter

• Rotatable handle along with the lid and container for better hold.





Figure 18 Current Element

• Curved surface of the power base to provide stability.



Figure 19: Power Base



Figure 20: CAD Model



Figure 21: Final Thermocol Model

Conclusion

The process of redesigning the kettle required a lot sensitive thinking towards the scope of improvement of the product. The final prototype presented has been designed after studying and going through all the research and the analysis of the various methods of analysing the use of the product in actual scenario. The different components are designed keeping in mind the difficulties that the user was facing while using the product. The report consists of all the research, analysis, and other aspects that were taken into consideration for the development of the product.

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