Women's Shield

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The women's majesty is always respectable but presently the cruelty of humans and the jeopardy on women are not leading us towards hell only but also degrading our sublimity. A lot of women were sexually and mentally harassed while some are beaten to death and many of the cases are even not registered in the papers. Generally, when the wrong behavior happening to the woman, at that time she alone fought with them, no one comes to save her life because no one saw her and if she went to the police, she has no proof. So, for the safety of the women, we think to design such a device so that the woman could get help from the police department and her family too. The device contains e-components like GSM, GPS, ESP32 camera module, battery, etc. The whole design will be coded in the IC ATmega328p. Later on, the design will be printed on the PCB. The device will be in a very small design in the form of "Borla" a Rajasthani traditional wear. Because of the device, we will make a direct touch with the lady and along with the live tracking of that woman. It will also help us in tracking delinquents to put them behind the bars with adequate proofs. With the help of GSM, GPS the nearest police department and her family members will get the location of the woman via mobile message and the police will lead the rest. It will give a complete shield to the woman just with a single touch. In this paper, we tried to reduce the cost of women's shields with help of value analysis and optimization.

Keywords: ESP, GPS, 3D-Modelling, GPS, Buck-Buck Convertor, Value Analysis, Cost Reduction, Optimization Techniques

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1 Introduction

This research was conducted in rural areas of Rajasthan which is the implementing area of our gadget. In order to minimize its cost all components cost, making and distribution should be allocated optimally. To minimize the size and cost of this device it is necessary to do the planning in the components cost, making and distribution so that the size and cost is very optimal. The aim of this study is to analyze the prospect of size and cost reduction through value analysis technique. Value engineering is the process of finding and using acceptable material and process substitutes that will optimize both the cost and the performance of a structure. Manufacturing process of conventional Women's Shield is regarding to its basic functions. This study focuses on the design alteration of the Women's Shield by changing materials used for manufacturing of it. This study presents the functional and cost analysis of Women's Shield and ideas are proposed to reduce the cost of manufacturing per product. Through newly proposed analyzed to apply the value analysis technique in order to reduce cost [5]. Value analysis is the study of existing process to reduce the cost incurred on the manufacturing of a product through process reengineering or design alteration without reducing the performance of the product ideas; cost saving per Shield is expected to be reduced [3]. Value engineering is the process of finding and using acceptable material and process substitutes that will optimize both the cost and the performance of a structure. At the Engineering design, when our project is on a tight budget and an even tighter construction schedule, we are skilled at applying Value Engineering and Optimization principles, to obtain the following results:

How the whole design space can be used using creative and analytical tools to optimize spaces what types of materials can equally perform substituting acceptable construction materials that add value the design model and ease of designing a structure that is optimized for fast and easy construction. The benefit of value engineering and optimization goes beyond a budgetary or time factor benefit. The stakeholders receive a value for the money and time invested because the structure is built for functional efficiency. We work on it to gather the key criteria needed for the project, and then we set about asking the questions that lead to acceptable alternatives – every step of the design process. All value-based decisions concerning the building's design layout, construction materials, and installation of components are verified and validated to be the right choice. The Engineering Design to apply the strategies of value engineering and optimization save our time and money. The manufacturing process at Women's Shield roughly includes printing and programming of circuit on PCB, etching the plate, cleaning and disposal of the circuit board and finally fixation of the components with the strings to hold it. A survey is conducted to gather the data about current costing of the Shield to explore the areas where improvement is possible along with the functional analysis of the various parts and processes to study their importance in the process. In the technical terminology of the value engineering, this phase is known as orientation phase. In order to reduce the cost incurred on the manufacturing of the Women's Shield,

the detailed study of current costing is undertaken to identify the possible areas of improvement. The overall study showed that the small design aspects are capable of producing significant impact on the cost of manufacturing and are need to be carefully studied. The ideas presented in this manuscript propose slight change in the design of the product through changing the shape and material used during manufacturing of the Shield. The potential of the ideas is also explored in this text through expected reduction in the cost of manufacturing. Further, the existing and newly proposed costs are compared to estimate the cost saving per piece. The process of cost reduction through value analysis is explained step by step through this manuscript [6].

2 Method

There are certain steps involve in it

(a) Orientation Step

In this phase, functional analysis of e-components and processes is carried out to differentiate them into basic and secondary functions [1]. The segregation is done based on the individual function and their functional contribution to assembly. Basic function is what a product or process must do to work or sell and the customer is willing to pay for, followed by secondary functions that support that basic function. Secondary functions can be modified or eliminated to reduce product cost. The Shield is mainly divided into following components:

- Microcontroller
- Camera
- GSM
- GPS
- PCB
- Battery

The functional analysis is also presented in Table 1 based on their contribution to the assembly [4]. The numbers indicated in the functional evaluation table indicate:

- Major Performance = 3
- Medium Performance = 2
- Minor Performance = 1
-

(b) Information Phase

In the information phase, the detailed information regarding the costing of the Shield gathered from the survey of the production line. The Shield manufacturing consists of overall 5 stages. As a unit, the current manufacturing cost of the Shield per piece is 3505/-. Camera and 3D- modeling of Shield are the two expensive elements in the manufacturing of a borla which share 44.5% of the total cost of a borla. The primary

focus is kept on these two elements for the cost reduction [2]. The detailed costing of the parts and processes is presented in the following table.

Table 1. Functional Analysis of Parts and Processes

S.No.	Component Description	Performance level	Functional Definition		Part		Assembly	
			Verb	Noun	Basic	Secondary	Basic	Secondary
A	Microcontroller	3	Programming	Processor	✓		✓	
			Storing constant and variable	Memory	✓			
			input/output (I/O) peripherals	Interface with a given job	✓			
B	Camera	2	CAPTURE	IMAGE	✓			
C	GSM	2	SEND	MESSAGE	✓			
D	GPS	2	FIND	LOCATION	✓			
E	PCB	3	CIRCUIT	designing	✓			
F	Battery	2	POWER	supply	✓			
G	3D-Modelling	1	Improve	Appearance	✓			
			Provide	Strength				
H	Shinning paint	1	Enhance	beauty		✓		
I	Buck-Buck converter	1	Voltage manager	manage	✓			

Table. 2 Detailed Costing of Parts and Processes

S.No.	Component Description	Quantity	COST IN Rs.
1	Microcontroller	1	200
2	Camera	1	560
3	GSM	1	350
4	GPS	1	645
5	PCB	1	300
6	Battery	1	50
7	Buck-buck converter	1	150
8	3D-Modelling	1	950
9	Shinning paint	1	300
	Total		3505/-

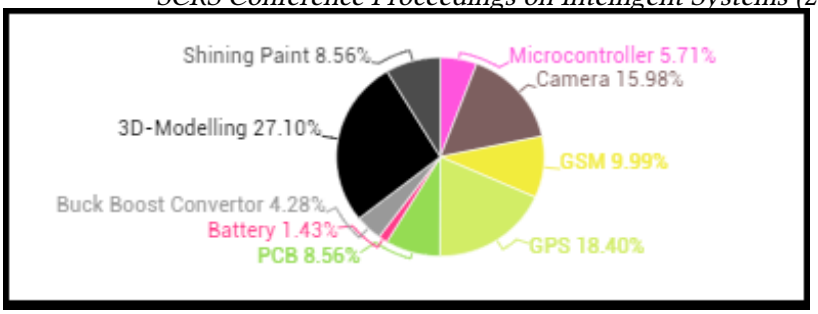

Fig. 1. Components vs. Cost graph

Table. 3 Comparisons of Functional Weightage and Cost

Key word	Component	Function	Weight	Cost (in %)
A	Microcontroller	Programming Processor	9	5.7
B	Camera	Capture Image	2	15.97
C	GSM	Send Message	2	9.98
D	GPS	Find Location	2	18.40
E	PCB	Circuit designing	3	8.56
F	Battery	Power Supply	2	1.42
G	Buck -Buck converter	Voltage manager	2	4.27
H	3D-modelling of Shield	Provide Strength	2	28.53
I	Shinning paint	Enhance Appearance	1	8.55

(c) Creative Phase

This phase is concerned with, "What are the other options which could satisfy the same functions" of the handle assembly. Many ideas are generated and discussed in the brain storming session. Following ideas were generated during this phase.

1. Change in the design (round shape): Instead of using the hexagonal shaped CAMERA, the round shaped design can be incorporated to reduce the manufacturing time and thereby, manufacturing cost.
2. 3D printer is used for making model to save the cost.

3. Golden Polish is used for giving beautiful look.

After discussing on the ideas put forth, the function cost worth analysis is performed on the product to estimate the effectiveness of the newly proposed ideas.

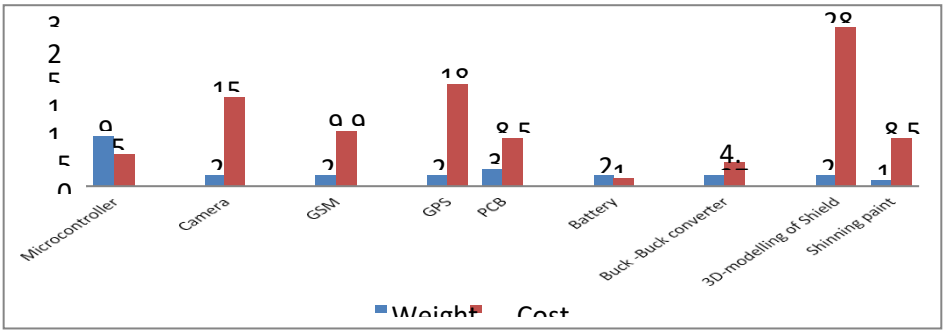

Fig. 2 Comparison between Functional Weightage and Cost

Table. 4 Function Cost worth Analysis

Function		Existing cost	Worth tentative alternative	Estimated Cost	Value Gap	Ranking
Verb	Noun					
Programming	Processor	200	None	200	0	
CAPTURE	IMAGE	560	ESP32	450	110	III
SEND	MESSAGE	350	None	350	0	
FIND	LOCATION	645	None	645	0	
Designing	Circuit	300	None	300	0	
Supply	Power	50	None	50	0	
voltage	manager	150	None	150	0	
Provide	Strength	950	Technology 3D	500	450	I
Enhance	Appearance/beauty	300	Golden polish	150	150	II
Total		3505		2795	710	

3 Result

In the evaluation phase, the costing of the new ideas is done considering one piece of model but if the monthly demand is more than one piece than cost of borla will be less in amount. The percentage saving and total per order is also calculated.

- Saving per product = 710/-
- % saving per product = 20.25 %
- Monthly demand = 1,000
- Actual monthly overall cost = 35,05,000/-
- New monthly overall cost = 27,95,000/-
- Total monthly saving = 7,10,000/-

Table. 5 Comparison of Existing and Estimated Cost

Part Name	Existing Cost	Estimated Cost	Gap
Microcontroller	200	200	0
Camera	560	450	110
GSM	350	350	0
GPS	645	645	0
PCB	300	300	0
Battery	50	50	0
Buck Buck Converter	150	150	0
3D-modelling of Shield	950	500	450
Shinning paint	300	150	150

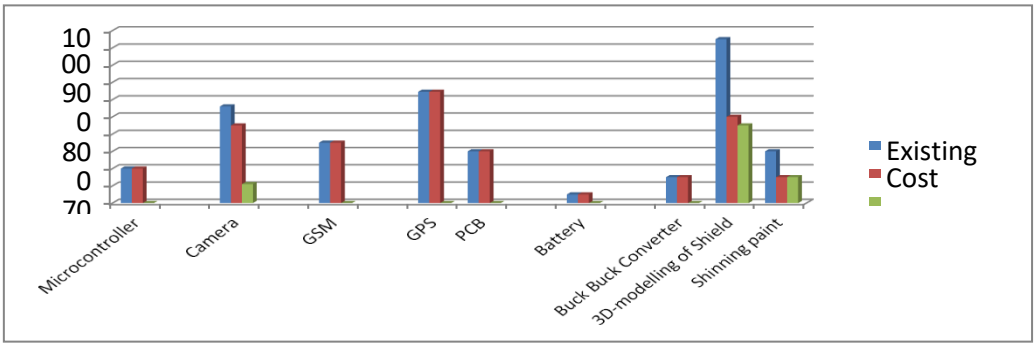

Fig. 3 Comparison of Existing and Estimated costs

4 Discussion

With the proposed design changes, it is expected to reduce the cost for the manufacturing of the one piece of Borla by 38.76%.It is a huge reduction in the cost.

The saving expected per order is Rs. 1000/- which will be utilized for the additional manufacturing of nearly 633 extra Borla. The new design will also give the product more aesthetic look which will be more appealing to the customers. New ideas are also expected to achieve more customer satisfaction along with the performance improvement and cost reduction.

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