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## Adaptation of sculptural designs to develop home furnishing products using digital printing

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### Abstract

The old structures and heritage of a place serve as a representation of its culture, which makes it unique to that location. Indian temples feature a wide variety of intricately carved sculptures on their walls, floors, ceilings and entrances. The *Sailodbhava* period, which lasted from the sixth to the seventh century AD, is when the architectural splendor of Odisha was first seen. The sculptural designs of the Parsurameswara temple served as the study's inspiration for the home furnishings product designs, which were created using printing technique. The sculptural designs of the temple were simulated using CorelDraw 2020 software. The designs were selected and were adapted on textiles through digital printing. The developed products were assessed under various parameters by the consumers and they were well accepted by all.

**Keywords:** Sculptural designs, culture, adaptation, printing, CAD, textiles

### 1. Introduction

The temples from the ancient times plays a significant role in lives of people. The origin of Indian Hindu temples can be traced back to the beginning of Indian civilization. Indian temples have a rich pool of sculptural designs which are carved on walls, floors, ceilings, doors of the temples. The land of Odisha witnesses its architectural beauty from the *Sailodbhava* period that dates back to 6<sup>th</sup>-7<sup>th</sup> century AD. Odisha is endowed with rich cultural heritage having various forms of art expressions included in beautifully carved sculptures intact within the mesmerizing temples. Temples are the most dominant form of architectural expression in Odisha and capital of Odisha, Bhubaneswar is also known as the temple city. The period between 6<sup>th</sup> to 9<sup>th</sup> centuries AD was considered the formative phase of temple building in Odisha and Parsurameswara temple is one of the representatives of such temples. It is one of the earliest temples in Odisha dated back to 7<sup>th</sup> century AD, located in Bhubaneswar. The temple is dedicated to Lord Shiva and has all the main features of pre-10<sup>th</sup> century *Kalinga* architecture that emphasizes vertical structures which are also prominent in other temples of the state. The adaptation of design allows for further improvements and revision to the original design, resulting in the design being considered a different and distinct design with slight changes from the original design. The term "adaptation of design" refers to the process of changing motifs, resizing and developing them so that they are easier to use, create and implement.

In today's fast changing world of fashion, designers and manufacturers are standing on a verge where something new and different is always awaited to suit the rapidly growing fashion market. In the field of textiles, digital textile printing is considered to be the next generation printing technology that consists of printing design directly on fabric. The diversification and adaptation of sculptural designs inspired from Parsurameswara temple using computer aided designing helps in creation of digital design pool including variety of simulated designs, design arrangements and different colour ways. Product design and development with adapted motifs will satisfy the quench of consumer's ever-increasing demand of unique and innovative traditional as well as cotemporary home furnishing products.

### 2. Materials and Methods

#### 2.1 Collection of the Sculptural Designs

Parsurameswara temple is one of the ancient temples of Bhubaneswar, Odisha that dates back to 7<sup>th</sup> century AD. The temple is situated in Old Town of Bhubaneswar city, near the famous Bindu Sagar pond. The sculptural designs were collected from Parsurameswara temple. The temple has carvings on the exterior walls of the shrine depicting various type of designs.

The designs were documented according to their nature, which included animal designs, floral designs, idol designs, human designs and stylized designs. Total ninety-four designs were captured during the visit.

## 2.2 Screening and Categorization of Designs

The designs were screened and analysed on the basis of clarity in carved sculptural designs and also care was taken that designs were not repeated. So, out of 94 sculptural designs, 60 designs were finalized. Thereafter, screened sixty designs were categorized according to their type's namely animal designs, floral designs, idols designs, human's designs and stylized designs. The categorized designs were evaluated and selected by the panel of thirty experts for transferring them on fabric.

The evaluation was carried out on the basis of overall appearance with the goal of selecting the top five designs from each category suitable for adaptation. The sculptural designs were evaluated using a five-point rating scale, with five being excellent and one being poor. Five designs from each category i.e., a total of twenty-five designs were chosen based on their highest weighted mean score.

## 2.3 Digitalization and Adaptation of Selected Motifs

Computer Aided Designing aids in modification/simulation of designs or motifs and hence, the designing software CorelDraw 2020 was used. The original designs were simplified/modified through the various tools of CorelDraw 2020. The designs were traced using Bezier and B-spline tools. To make the lines clearer and more delicate, shape and smooth tools of CorelDraw 2020 were utilized. Total selected twenty-five designs were simulated and adapted using CAD, according to their appropriateness for digital printing technique.

## 2.4 Selection of Digitalized Motifs

The twenty-five digitalized motifs were evaluated and selected on the basis of their suitability for digital printing. The WMS was calculated and the top five designs were selected on the basis of weighted mean score and rank.

## 2.5 Creation of Design Arrangements

The proper placement of designs on the space attracts the attention and accentuate the value of a design. The adapted motifs were also arranged in variety of ways according to planned home furnishing product.

After thoughtfully finalizing the home furnishing products (cushion cover set, wall panels and room divider) to be developed for the present study, the design arrangements were made accordingly using selected adapted designs for digital printing technique.

The design arrangements were created using single motif and motif combinations i.e., single motif designs, two motif designs and three motif designs. Design arrangements were done on the basis of compatibility of the motifs with each other and the aesthetic appeal of the combined motifs in totality. The arrangements were created with the help of Computer Aided Textile Designing i.e., CorelDraw 2020 and the developed design arrangements were evaluated by the same panel of experts as done in previous evaluations.

## 2.6 Preparation of Colour Ways

A total of three design arrangements were finalized for

creation of colour ways. The researcher created colour board using the theme "Traditional colours of Odisha" for preparing colour ways for each selected design. Six colour ways were prepared for each product (cushion cover set, wall panel and room divider).

The developed colour ways for home furnishing products through digital printing technique were again evaluated by the panel of experts. The selection was done on the basis of WMS on the preference given by the experts on 5-point rating scale.

## 2.7 Development of Home Furnishing Products

The top ranked colour ways for the home furnishing products (cushion cover sets, wall panels and room dividers) were selected for digital printing technique. The dimensions of the home furnishing products i.e., cushion cover sets, wall panel and room divider with selected design arrangements and finalized colour ways was decided.

**Table 1: Product specifications of developed home furnishing products**

Sl. No.	Product	Digital printing
1	Cushion cover set	16 x 16 inch
2	Wall panel	4 x 2 ft
3	Room divider	5 x 2.5 ft

## 2.8 Development of digital printed home furnishing products

The selected design arrangements with final colour ways for cushion cover set, wall panel and room divider were finalized for transferring and printing them through digital printing. Digital Printing is to be done by the printing expert.

## 2.9 Cost calculation

Cost of the individual products were calculated using different parameters like fabric used, printing cost, stitching cost. The stitching cost was included according to the products that were stitched i.e., cushion cover sets. For digital printing, printing cost was according to the sizes of the fabric that was printed.

## 2.10 Assessing Consumer Acceptability for Developed Home Furnishing Products

The consumer attitude and purchase decision towards any developed or designed textile product is important for its market acceptability. The consumer tends to play a vital role in making a way for the products in the market and understanding their preferences is most important. The developed home furnishing products i.e., cushion cover set, wall panel and room divider were assessed on the five-point rating scale ranging from poor to excellent.


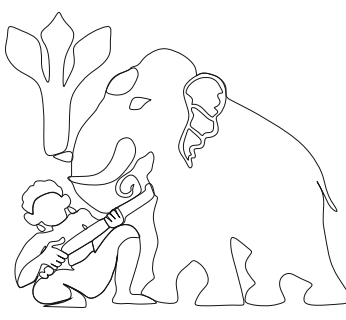



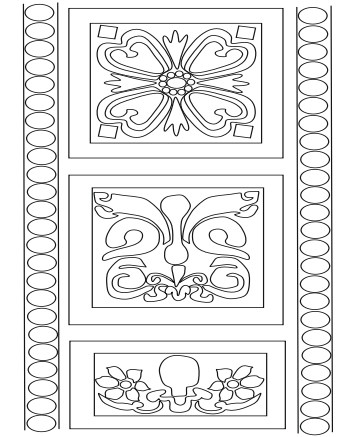




## 3. Results

### 3.1 Adaptation of Selected Sculptural Designs

The selected twenty-five designs i.e., five from each category were simulated and adapted according to their appropriateness for application through digital printing technique on the fabric.

### 3.2 Evaluation of Adapted Designs

The adapted designs were assessed and scored by the experts. The top five designs were selected for design arrangement on the basis of weighted mean score.

S. No.	Original sculptural designs	Adapted designs
1		
2		
3		
4		
5		

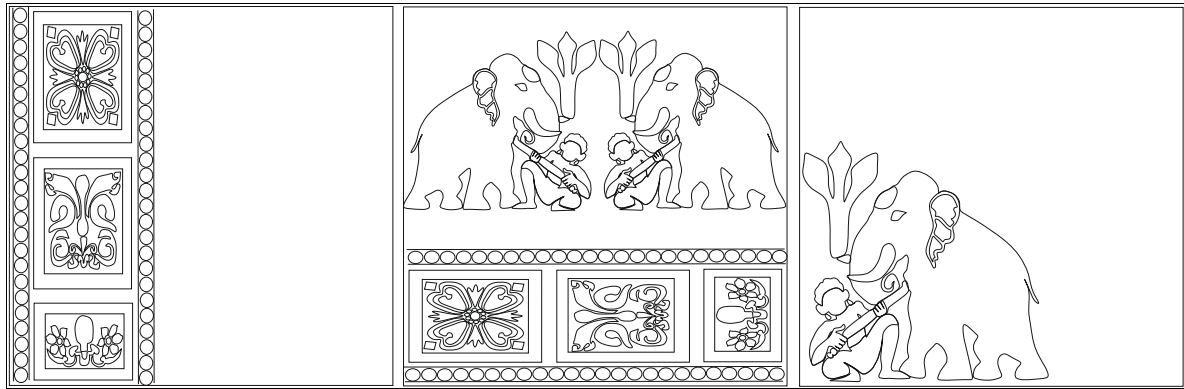
**Plate 1:** Selected designs for design arrangement

**3.3 Preparation of Design Arrangements of the Selected Designs and their Evaluation**

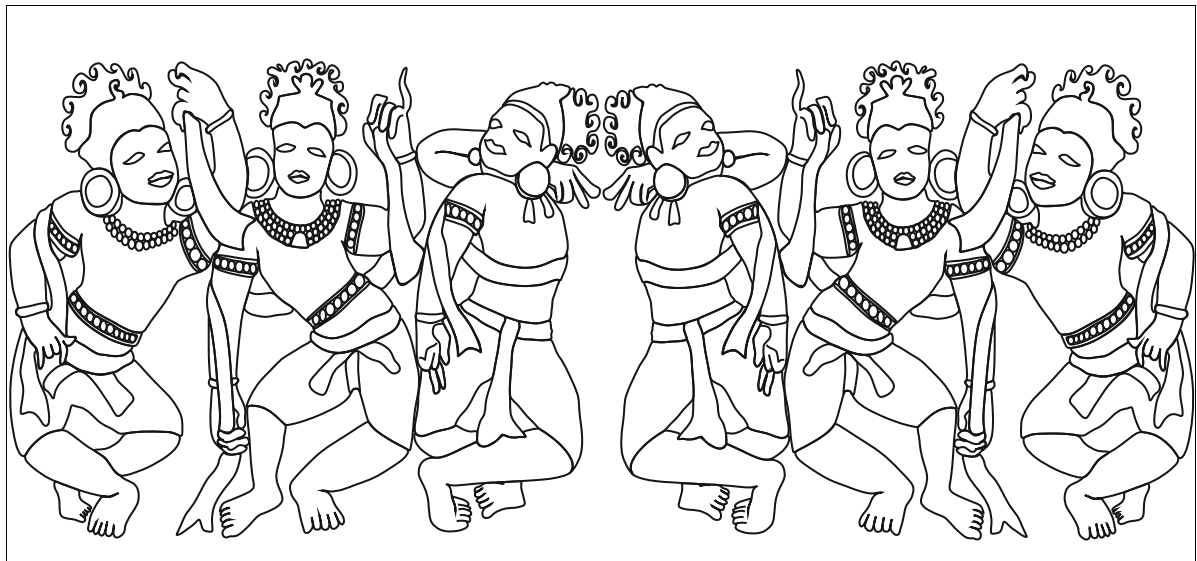
Design arrangements were done by placements of the selected motifs on the desired dimensions of the products on the

CorelDraw 2020 software and it was achieved through rotating, duplicating, increasing or decreasing the size of the motifs using cursor and tools like Ctrl + D for duplicating, selecting mirror tool from the transform tool, etc.

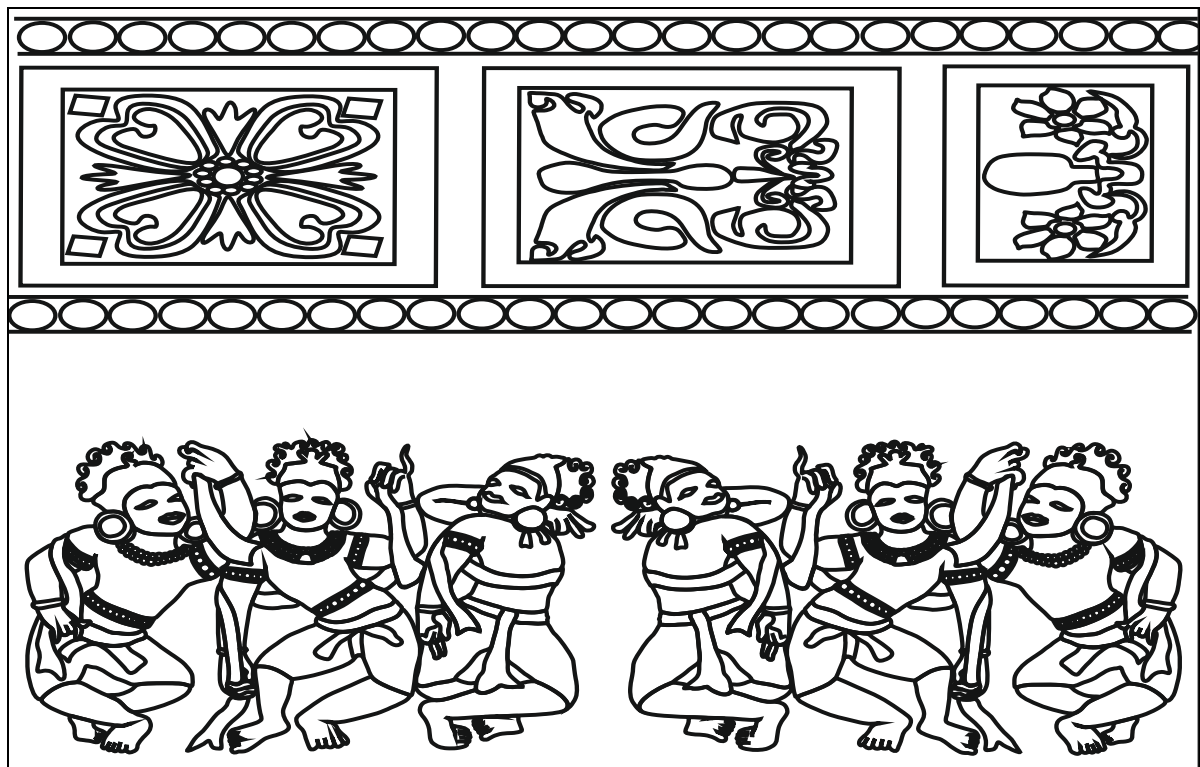


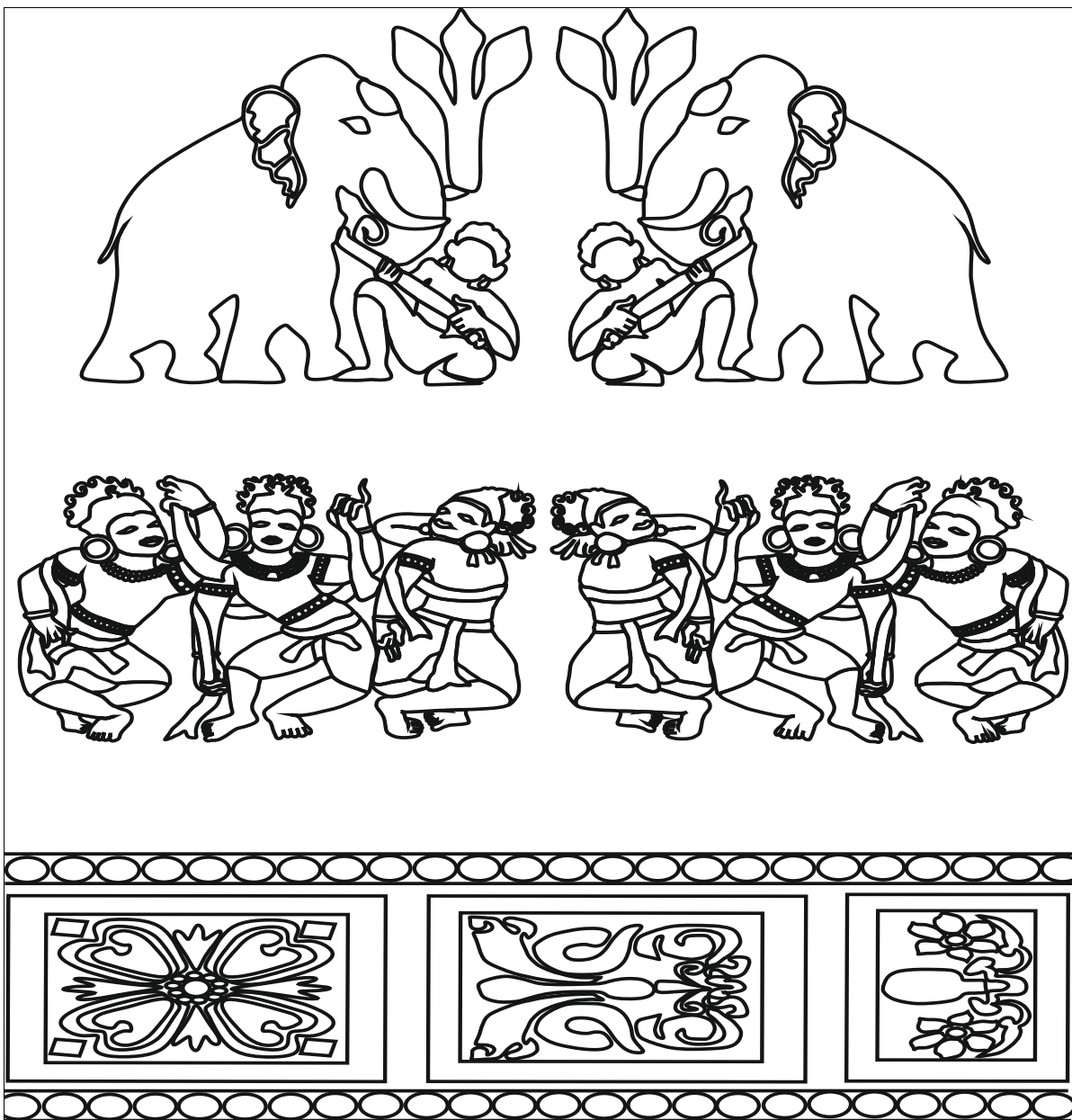


Cushion cover set



Wall panel





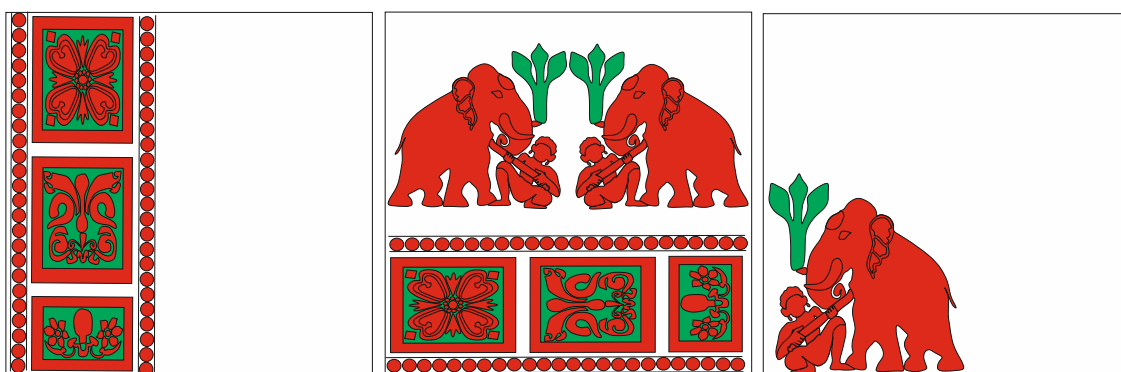
Room divider

Plate 2: Selected design arrangements for digital printing technique

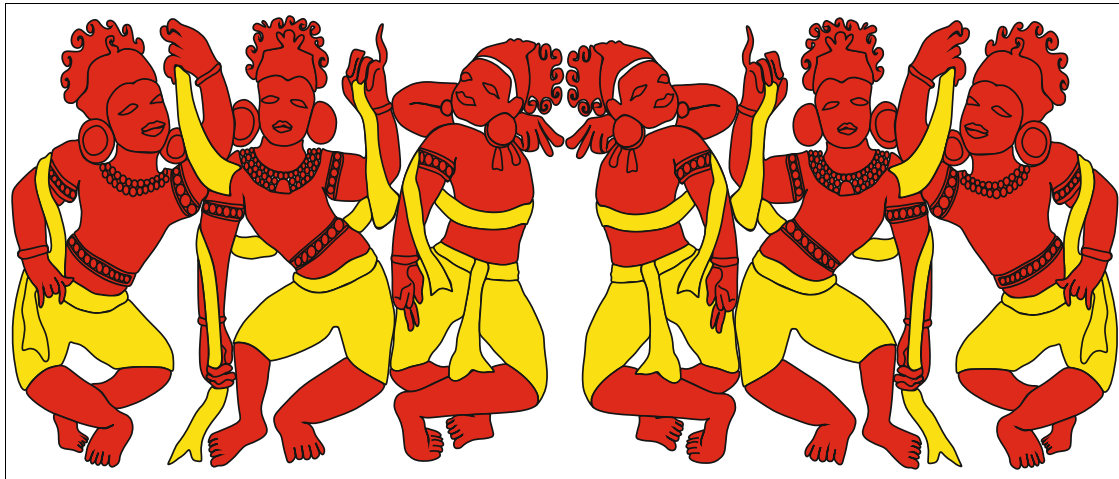
**3.4 Creation of Colour Ways on Selected Design Arrangements and their Evaluation**

The selected design arrangements were made into various colour ways. For digital printing the design colour combinations included yellow, red, blue and green colour but

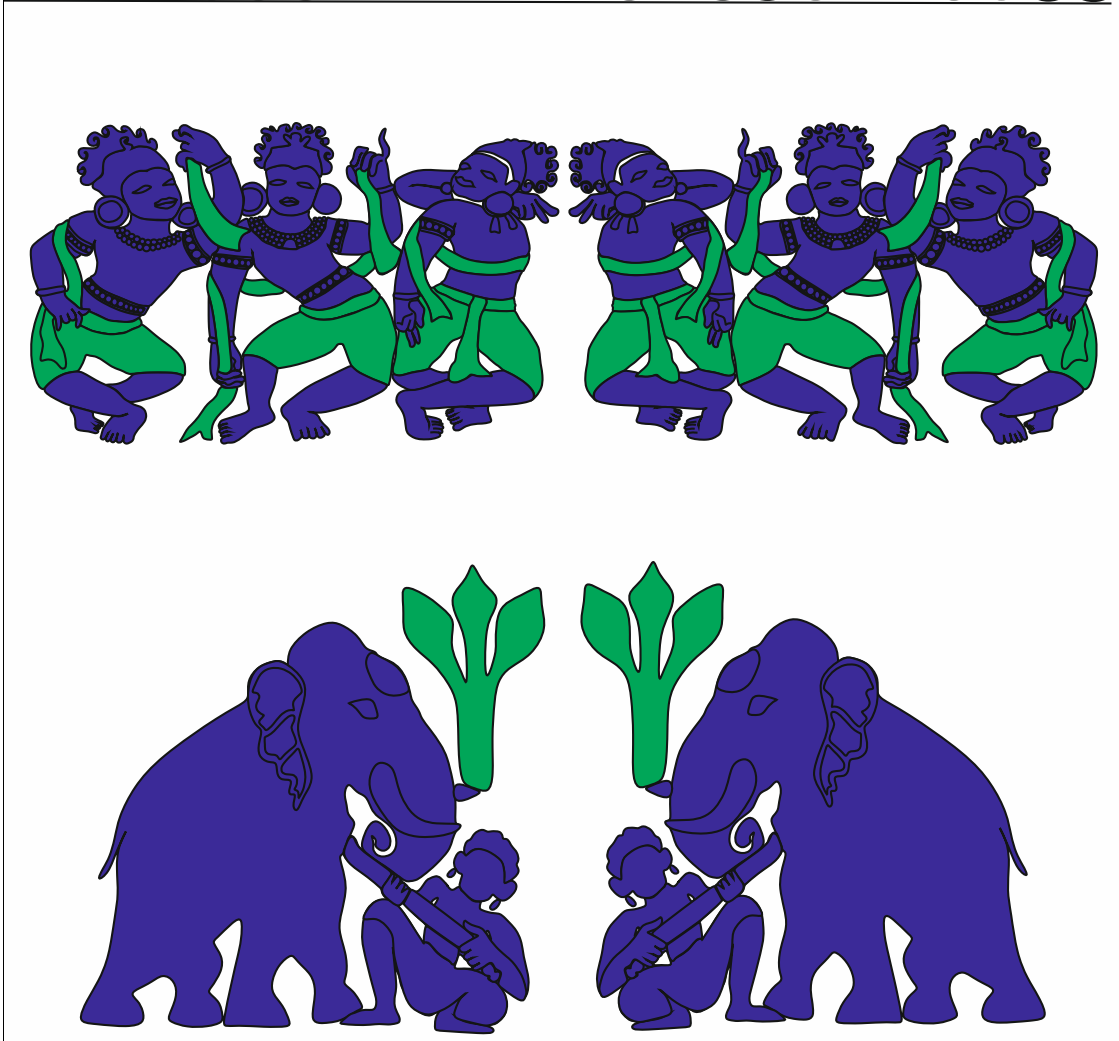
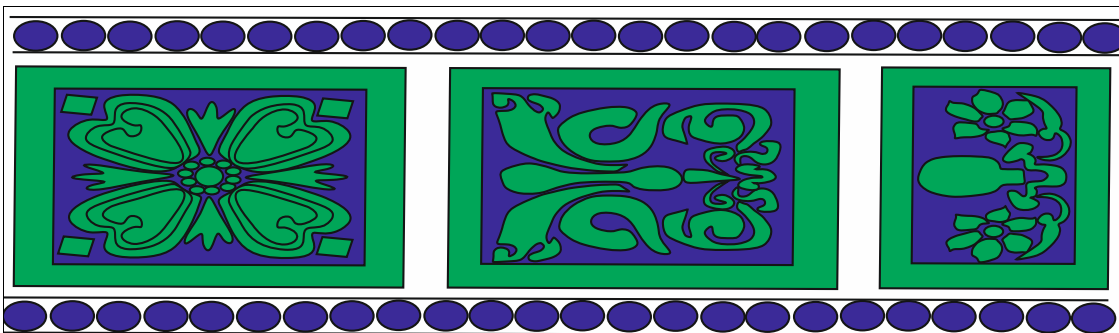
the background colour of the home furnishing products i.e., cushion cover set, wall panel and room divider were kept chalk and white shade. The colour ways having highest WMS was selected for the final product development.

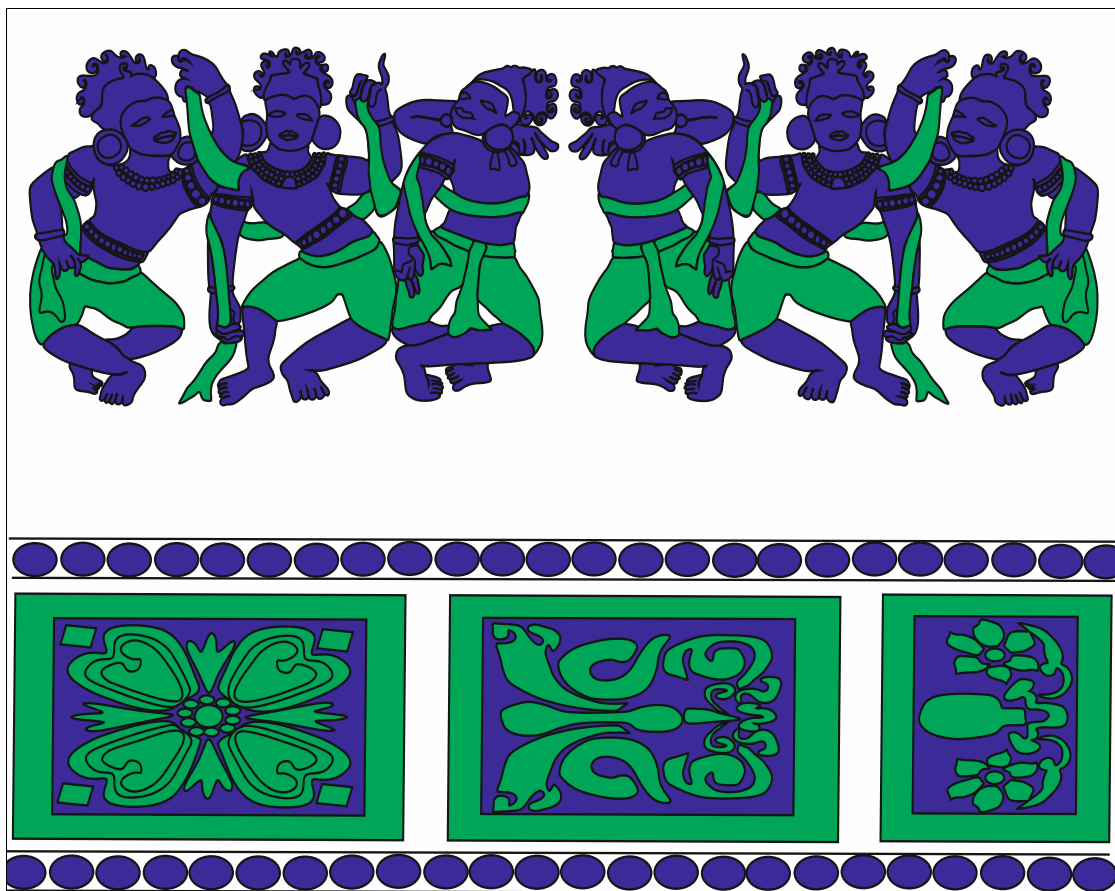


Cushion cover set



Wall panel





**Room divider**

**Plate 3:** Selected colour ways for digital printed products

**3.5 Development of digital printed products**

The selected design arrangements with final colour ways for cushion cover set, wall panel and room divider were finalized for transferring and printing them through digital printing.

The printed cushion cover sets, wall panels and room dividers were stitched/finished according to the selected dimensions for home furnishing products. The cost of the individual products was calculated by considering various charges.



**Cushion cover set**





Wall panel







**Room divider**

**Plate 4:** Digital printed home furnishing products

**3.6 Cost Calculation of Developed Home Furnishing Products**

In the present study, the cost for the developed home

furnishing products was calculated by considering parameters like fabric cost, printing cost, stitching cost, labour cost along with 10% of profit.

**Table 2:** Cost calculation of digital printed home furnishing products

Products	Fabric used (in meters)	Printing cost including fabric cost (in Rs)	Stitching cost (in Rs)	Total cost (Rs)	Selling Price +10% profit (in Rs)
Cushion cover set	1	900	150	1050	1155
Wall panel	1.5	480	-	480	528
Room divider	2	750	-	750	825

The price of the products varies due to the dimensions of the fabric printed. The highest percent for the price of the products was contributed by the digital printing cost.

From the data in the Table 3, it was found that the neatness and clarity of design in the developed cushion cover set by digital printing technique was highly accepted criterion with WMS of 4.27.

**3.7 Assessment of Consumer Preferences and Acceptability of Developed Home Furnishing Products**

The developed products were accessed on various parameters like newness in the design, appropriateness of colour, suitability of design colour with background colour, neatness and clarity of design, suitability of the design, suitability of cost etc.

**Table 4:** Consumer preferences for wall panels developed through digital printing technique n= 100

**Table 3:** Consumer preferences for cushion cover set developed through digital printing technique n= 100

Sl. No.	Parameters	Average ± S. D. Digital printing
1	Suitability of design	4.18 ±0.89
2	Appropriateness of colour	4.22 ±0.85
3	Neatness and clarity of design	4.27 ±0.80
4	Suitability of design colour with background colour	4.22 ±0.79
5	Placement of designs	4.09 ±0.95
6	Appropriateness of design according to the product developed	4.16 ±0.89
7	Suitability of cost	3.95 ±0.95
8	Newness in the design	4.07 ±0.90
9	Overall appearance of the product	4.23 ±0.80
	Average	4.15

Sl. No.	Parameters	Average ± S. D. Digital printing
1	Suitability of design	4.29 ±0.80
2	Appropriateness of colour	4.22 ±0.88
3	Neatness and clarity of design	4.32 ±0.87
4	Suitability of design colour with background colour	4.17 ±0.89
5	Placement of designs	4.32 ±0.83
6	Appropriateness of design according to the product developed	4.21 ±0.88
7	Suitability of cost	4.23 ±0.86
8	Newness in the design	4.19 ±0.86
9	Overall appearance of the product	4.33 ±0.78
	Average	4.25

Data in the Table 4, states that the overall appearance of the product in digital printing technique with 4.33 WMS was highly accepted criterion by the respondents.

**Table 5:** Consumer preferences for room dividers developed through digital printing technique n= 100

Sl. No.	Parameters	Average ± S. D.
		Digital printing
1	Suitability of design	4.37 ±0.76
2	Appropriateness of colour	4.26 ±0.70
3	Neatness and clarity of design	4.36 ±0.78
4	Suitability of design colour with background colour	4.3 ±0.73
5	Placement of designs	4.36 ±0.79
6	Appropriateness of design according to the product developed	4.36 ±0.73
7	Suitability of cost	4.39 ±0.70
8	Newness in the design	4.36 ±0.73
9	Overall appearance of the product	4.47 ±0.73
Average		4.35

In digital printed room divider overall appearance of the product was most preferred criteria for acceptability with WMS 4.47. The consumer least preferred parameter was appropriateness of colour for digital printed room divider that had a WMS of 4.26.

**Consumer opinion regarding digital printing technique**

Consumer’s opinions under different statements were evaluated. Number of respondents were 100.

**Table 6:** Consumer opinion regarding digital printing technique n= 100

Statements	Percentage				
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
More complex and intricate designs can be done by digital printing	52	37	11	-	-
Digital printing technique is low cost and time saving	55	36	8	1	-
Digital printing has high resolution, flexibility and fine patterns can be created	54	32	9	5	-
I would prefer to buy digital printed products because of easy care and durability	25	32	34	9	-
Traditional designs through modern technique looks unique/ innovative	41	45	11	3	-
Digital printed textile product caters to the present trend	38	39	18	5	-
I would suggest others to buy digital printed home furnishing articles with traditional designs	35	33	28	4	-

Table 6 explains the consumer opinion regarding digital printed home furnishing products. Fifty two percent respondents strongly agreed that more complex and intricate designs can be done by digital printing whereas 55% strongly agreed to digital printing technique was low cost and time saving. Fifty four percent strongly agreed that digital printing had high resolution, flexibility and fine patterns can be created and 34% were neutral to prefer buying digital printed products because of easy care and durability. Forty five percent agreed that traditional designs through modern technique looked unique/ innovative whereas 39% agreed that digital printed textile product caters to the present trend. Thirty five percent strongly agreed that they would suggest others to buy digital printed home furnishing articles with traditional designs.

**4. Conclusion**

According to the findings, developed home furnishing products with adapted designs from the Parsurameswara temple were well embraced and accepted by the consumers. Digital printed home furnishing products have large accessibility to the consumers because of their fast, easy and low-cost production as well as durability and diversity. Thus, it may also be suggested that traditional designs may be commercialized using digital printing technique that can cater to a large segment of population.

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