

ADAPTATION OF MADHUBANI MOTIFS FOR SCREEN PRINTING AND HAND EMBROIDERY ON STOLES

By

**POOJA RANI
[2016HS21M]**

*Thesis submitted to Chaudhary Charan Singh Haryana
Agricultural University in Partial Fulfillment of the
Requirements for the Degree of*

**MASTER OF SCIENCE
IN
TEXTILE AND APPAREL DESIGNING**

**DEPARTMENT OF TEXTILE AND APPAREL DESIGNING
I.C. COLLEGE OF HOME SCIENCE
CCS HARYANA AGRICULTURAL UNIVERSITY
HISAR - 125004**

2019

CERTIFICATE-I

This is to certify that this thesis entitled, '**Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles**' submitted for the degree of **Master of Science**, in the subject of '**Textile and Apparel Designing**' to CCS Haryana Agricultural University, is a bonafide research work carried out by **Pooja Rani**, Adm. No. **2016HS21M**, under my supervision and that no part of this dissertation has been submitted for any other degree.

The assistance and help received during the course of investigation have been fully acknowledged.

Dr. Saroj Yadav
Major Advisor
Assistant Professor
Department of Textile and Apparel Designing,
I.C. College of Home Science,
CCS Haryana Agricultural University,
Hisar-125004, India

CERTIFICATE-II

This is to certify that this thesis entitled, '**Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles**' submitted by **Pooja Rani**, Adm. No. **2016HS21M**, to the CCS Haryana Agricultural University in partial fulfillment of the requirements for the degree of **Master of Science**, in the subject of '**Textile and Apparel Designing**' has been approved by the Student's Advisory Committee after an oral examination on the same.

MAJOR ADVISOR

EXTERNAL EXAMINER

HEAD OF THE DEPARTMENT

DEAN, POSTGRADUATE STUDIES

**CERTIFICATE –III
FORMAT FOR P. G. THESIS**

It is certified that the thesis submitted by **Ms. Pooja Rani**, Adm. No. **2016HS21M**, M.Sc. student of the Department of Textile and Apparel Designing has been checked and found as per specification of the format circulated by the Dean PGS, vide his Memo No. PGS/A-1/09/6926-90 dated 26.08.2009.

MAJOR ADVISOR

HEAD OF THE DEPARTMENT

ACKNOWLEDGEMENTS

Though only my name appears on the cover of this thesis, a great many people have contributed to its production. I bow my head before Almighty. It is only with the grace of Almighty, that I am able to carve this milestone in my academic journey.

My deepest gratitude is to my esteemed Major Advisor, Dr. Saroj Yadav, Assistant Professor, Department of Textile and Apparel Designing, I.C. college of Home Science, who went out of the way to act as catalyst for preparation of this manuscript. It was her kind cooperation, constructive and pertinent suggestions and friendly behavior which acted as motivation during the entire work, I have been amazingly fortunate to have an advisor who gave me the freedom to explore on myself and at the same time the guidance to recover when my steps faltered. Her patience and support helped me overcome many problems and finish this study.

Too tiny is the gratitude and too great is the gift of knowledge, competent advice, constant encouragement and round the clock help extended to me by my co-advisor Dr. Neelam M. Rose, Professor and Head, Department of Textile and Apparel Designing.

I wish to convey my heart-felt appreciation for ever-willing help extended to me by members of my advisory committee, Dr. Beena Yadav, Professor and Head, Department of Extension Education and Communication Management, Dr. Sushil Ahalawat, Asstt. Scientist, Department of Chemistry and Dr. Shanti Balda, Professor, Department of Human Development and Family Studies.

I am highly grateful to Dr. Bimla Dhandra Dean, I. C. College of Home Science, Dr. Saroj S. Jeet Singh, Emeritus Professor, Dr. Vivek Singh, Dr. Nisha Arya and Mrs. Rakhi Dalal for their continuous encouragement, guidance and help.

I am greatly obliged to all the teaching and non-teaching staff members of Department of Textile and Apparel Designing for their timely help and encouragement.

Words fail me in expressing the debt of gratitude to My Parents, for silent wishes and blessing received from them to bring me to this level. Words are inadequate to convey the depth of my gratitude to my brother Sachin. With unbound affection I spread special fragrance of thanks to my respectable seniors Sunita Nehra, Vandana Bhandari, Pooja, Sunita Khatkar and my friends Basanti Sharma, Monika for sharing their experiences, guidance, caring and helping behavior during the course of study. My sincere thanks to all the respondents of this investigation who provided data for this study, they deserve special thanks and appreciation for their cooperation and devoting their valuable time.

I have no words to express, about the experience and opportunities CCS Haryana Agricultural University has provided me in these years. I was blessed with a lot of friends and the moments I spent here are the most memorable moments in my life.

Last but not the least I also wish to endorse my sincere thanks to all those who directly or indirectly helped me during my thesis work,

Place: Hisar

(Pooja Rani)

Dated: July, 2019

CONTENTS

CHAPTER	TITLE	PAGE NO.
I	INTRODUCTION	1-4
II	REVIEW OF LITERATURE	5-14
III	MATERIALS AND METHODS	15-20
IV	RESULTS	21-47
V	DISCUSSION	48-54
VI	SUMMARY AND CONCLUSIONS	55-58
	BIBLIOGRAPHY	i-iv
	ANNEXURES	I-VIII
	DESIGN CATALOGUE	1-29

LIST OF TABLES

TABLE NO.	DESCRIPTION	PAGE NO.
1	Preferences of experts for floral and foliage motifs	24
2	Preferences of experts for geometrical motifs	25
3	Preferences of experts for animal and bird motifs	27
4	Preferences of experts for religious motifs	29
5	Preferences of experts for developed designs for stoles	32
6	Preferences of experts for created design placements for stoles	34
7	Preferences of experts for type of fabric for stoles	36
8	Preferences of experts for base colour for stoles	37
9	Dry rubbing fastness grades of screen printed samples	38
10	Preferences of experts for colourways for screen printing and hand embroidery on stoles	39
11	Preferences of experts for selection of finishing/embellishment material for developed stoles	42
12	Cost of screen printed and hand embroidered stoles	43
13	Assessment of developed stoles on different parameters	43
14	Opinion of consumers regarding screen printed and hand embroidered stoles	45
15	Opinion of consumers regarding the cost of screen printed and hand embroidered stoles	47

LIST OF PLATES

PLATE NO.	DESCRIPTION	PAGE NO.
1	Screened Madhubani motifs	22-23
2	Selected floral and foliage motifs	25
3	Selected geometrical motifs	26
4	Selected animal and bird motifs	28
5	Selected religious motifs	30
6	Developed designs	31
7	Selected designs for placement on stoles	33
8	Selected design placements for stoles	35
9	Selected colourways for screen printing and hand embroidery on stoles	41
10	Stole I	
11	Stole II	
12	Stole III	
13	Stole IV	
14	Stole V	

LIST OF FIGURES

Figure No.	DESCRIPTION	Page No.
1	Preferences of experts for fabric for stoles	36
2	Preferences for colourways for screen printing and hand embroidery on stoles	40
3	Assessment of developed stoles on different parameters	44
4	Acceptability scores for developed stoles	46

Textile designing has been an ancient art and perhaps the most ancient craft of India. Variety of good designed fabrics which are more appealing and marketable may have been influenced by the initial designing process. Textile designing is one of the most demanding and emerging field as it is full of scope and creativity but many individuals become quite lost when confronted with the task of finding inspiration. An inspiration can come from any stimulus that starts the creative process. Sources of inspiration are literally everywhere, but more importantly; it is the designer's artistic sensibility and interpretive style that brings creative design into being virtually live. Any object or things we see in our daily routine are possible design sources. These may include nature, temples, famous monuments, furniture, various kinds of toys, folk arts and crafts such as wall paintings, floor paintings, sculptures, carvings etc. They can also be created through adaptation of a specific design base and by fusion of different arts. The execution of a good design needs the consideration of certain essential factors such as the motif, arrangement of motifs and style of rendering combined with the use of colour. The rich motifs and designs of the various arts and crafts can be readily adapted into contemporary forms to make them suitable for textile products. These sources of inspiration play a powerful role in the beginning of the design process and in research and strategic collection planning. They also play an essential role in the communication of design ideas, both among designer and between designers and managers and buyers (Sharma *et al.*, 2014).

India is a territory of diversity, extending from Himalaya in North to Kanyakumari in South, from Gujarat in West to Arunachal Pradesh in East. Each state of India has its uniqueness in terms of residing communities and their cultural aspects like costumes, traditions, rituals, attitudes, beliefs, language, arts and crafts. Cultural and traditional diversity make India multicultural nation where culture and people are very closely related with each other. The arts and crafts reflect rich heritage of India through beautiful designs inspired from monuments, architecture, religion, nature, etc. Indian arts and crafts had attracted not only the people of India since ancient times but also have a huge global demand in present time. These are human creations, activities, and expressions which attract the attention of an individual and have an aesthetic impact on his mind. Arts and crafts define the cultural layers of a particular place and community. Every corner of India reflects definite specialties and uniqueness, showing the character of the area and its people (Bhandari, 2017).

In India paintings can be referred to as the mirror of India's fascinating history from the ancient times. These offer a beautiful record of centuries, by reflecting religious beliefs, political event and social customs and an aesthetic continuum that extends from early civilization to present day. Painting may be defined as the practice of applying paint, pigment colour or other mediums to a surface (Chouhan, 2016). Indian paintings were evolved for the religious purposes but with passage of time these became a fusion of various cultures and traditions. Indian folk paintings have a special place in the Indian paintings and have become a center of attraction at the national as well as the international level amongst art lovers. These are symbolic expressions of village artists, related with mythological scenes of Ramayana, Mahabharata, Bhagwad Gita, etc. These also depict the day to day life of village, natural objects, etc. These are very vibrant and done on different media like paper, cloth, leaves, mud walls, etc. The folk paintings of different parts in India thus reflect rich cultural heritage of specific regions and are inspired from the local customs and traditions. In India, there is great variety of folk and tribal paintings such as Patachitra paintings from Odisha, Phad and Pichhvai Paintings of Rajasthan, Kalamkari of Andhra Pradesh, Warli Paintings of Maharashtra, Nirmal Paintings of Andhra Pradesh, Aipan of Uttarakhand, Pithoro paintings of Gujarat, Gond and Mandana Paintings of Madhya Pradesh, Kalighat paintings of Calcutta, Madhubani paintings from Bihar and many more forms (Sharma and Paul, 2015).

Madhubani paintings are one of the best-known examples of Indian folk paintings. The literal translation of Madhubani is 'Forest of Honey' (Madhu-honey, Bans-forest or woods). Being basically religious in nature and mainly done by women predominantly in the prayer rooms at home these paintings portray all the aspects of human development and cultural beliefs. Madhubani painting is done with fingers, twigs, brushes, nib- pens and match sticks, using natural dyes and pigments and is characterized by eye catching motifs and patterns. Madhubani painting has remained confined in a compact geographical area and the skills, the content and the styles that have been passed through centuries, have largely remained the same (Chacko and Garg, 2010; Gupta and Gangwar, 2016).

Printing and embroidery are the most preferred techniques used for the fabric enrichment to make it more attractive and fascinating. Printing is the process of transferring design through rollers, screen, block and so on onto a textile material with print paste and it includes roller printing, screen printing, block printing, heat transfer printing, polychromatic, electronic printing, etc. Screen printing is a most versatile method of fabric decoration that enhances the appeal of the particular product to a great extent. It requires the use of simple equipment that is preparation of screen and a tool known as squeeze which spreads the paste so that design can be transferred to the fabric in a proper distributed manner. Attractive

designs with well-defined boundaries made by the artistic arrangement of a motif in one or more colours can be developed. The number of screens to be used depends upon the number of colours which are used in the design. Hand embroidery is a means of creative expression of nature; patience and perseverance in making beautiful articles, expressed through the art of embroidery. It is a media of decorating fabric and other materials with needle and thread. Screen printing with the combination of hand embroidery has an advantage to express one's creativity or ideas to develop something unique to cater to the needs of consumers who are always in search of new and innovative designs (Ashitey, 2013).

The Indian arts and crafts can play an important role in fashion world. As now a days fashion trends are fragile and consumer's constantly demand innovative designs and change over existing fashion trends. Fashion designers and garment manufacturers persistently face the challenges of providing new and innovative designs to suit the rapidly growing fashion consciousness in the market. It is important to keep innovative but at the same time taking inspiration from the rich treasure of our traditional textiles and crafts will help to keep them alive, relevant and marketable (Vaishnav, 2015).

Fashion is distinctive and often a constant trend in the style. It is the prevailing style in newest creations of textile designers adopted by a group at particular time period. It depicts a particular style, trend, talent and personality of the individual. It is always considered the important part of our life as it guides us towards maximizing our assets and minimizing our flaws. Today's society is much aware about importance of style and fashion. Fashion in new era does not focus only on traditional costumes but has also switched to the western dresses or fusion of Indian and western dresses. Along with these dresses people are using various accessories such as scarves, stoles, gloves, jewellery, etc. In recent times stoles are very much popular and in trend. A stole is a woman's shawl which is narrower than a shawl. Stoles can either be wrapped or carried around the shoulders, arms or neck. It completely alters the overall look of dress with its fascinating appearance (Sharma, 2017).

Now-a-days, stoles are accessible in wide range of fabrics, colours, textures, quality and prices for casual and formal wear. It has become popular among the women of all age groups and has almost been considered an integral part of their dressing. Since, the primary interest of women of all ages is what is new and different in clothes, every year fashions are created that are different enough from fashion of previous year to satisfy the needs of consumers. Thus, the fashion designers are always in search of new ideas and the inspiration. Madhubani painting can serve as a source of inspiration for the fashion designers to create new and interesting designs.

Application of Madhubani painting motifs on stoles through different surface enrichment techniques such as printing and embroidery or their combinations can provide an imaginative and fresh collection to the people who want to adopt their tradition with minute modernization. This will help in the preservation of painting tradition on one hand and on the other will broaden the design bases for textile products, so application of traditional motifs of Madhubani can be a creative approach. The ornamentation of textiles by combination of printing and embroidery in an appealing manner can prove to be very effective for improving the marketability of the designed products. Thus keeping in view the development of new and innovative designs from Madhubani motifs and their application on stoles through combination of screen printing and hand embroidery the present study was carried out with following objectives:

- To create designs for stoles using Madhubani painting motifs
- To develop silk stoles through combination of screen printing and hand embroidery
- To assess the acceptability of developed stoles

The literature of the related researches conducted provides a suitable background for the study undertaken with a view to associate their relevance with objectives of the study. A brief description of researches of relevance to present study has been arranged in this chapter under the following sub-headings:

- 2.1 Historical information and present status of Madhubani
- 2.2 Role of Folk Art in Design Inspiration and Product Diversification
- 2.3 Creation and Development of Designs using CAD

2.1 Historical Information and Present Status of Madhubani

Each nation has its own indigenous culture, heritage and tradition and also has its own way of expression. Heritage of Madhubani art goes back to last 2,500 years. Madhubani paintings are said to date back to the time of Ramayana. These paintings are accomplished by generations of skilled artists from Bihar which depict all aspects of tribal life. In other words, it is the representative of folk art in visual form (**Gupta and Gangwar, 2016**). Madhubani paintings, also known as Mithila art or *Bhitti Chitra*, have been in practice in areas around Bihar and Nepal. Mithila or Madhubani paintings are done using fingers and twigs as well as matchsticks and pen nibs in the modern day (**Das, 2013**). Natural dyes are used for the Madhubani paintings, for example, charcoal and soot for black, turmeric extract for yellow, red from sandalwood, blue from indigo and so on. These paintings are characterized by figures that have prominently outlined, bulging fish-like eyes and pointed nose. The main themes of these paintings include natural elements like fish, parrot, elephant, turtle, sun, moon, bamboo tree and lotus etc. Geometric patterns can also be seen in these paintings that often symbolize love, valour, devotion, fertility and prosperity. For example, fish symbolize fertility, procreation and good luck, peacocks are connected with romance/love & religion and serpents are the godly protectors. This ancient art form has also been known to depict scenes of wedding and religious rituals and different cultural events such as festivals; mythology like Ramayana. Madhubani painting can be classified into many categories like floor painting, wall painting or mural painting, canvas painting and so on. It expresses day-to-day experiences, feelings and thought. The symbols, used by painters, have their specific meanings (**Thakur, 1982 and Thakur, 2017**). The tradition of Madhubani painting of Bihar has continued unbroken, this ethnic art tradition is practiced till date in various villages of Bihar like Jitwaripur, Ranti, Rasidpur, Simri, Bacchi, Rajangarh, etc. by different community

artist i.e. *Bramhana*, *Kayastha* and Scheduled caste. It is not only limited to the artists of the villages of Madhubani but also connoisseur of art lovers beyond the country (**Das, 2013**).

Madhubani art memorialize every event and festival like wedding, *Kali Puja*, *Durga Puja*, *Holi*, and many more. Conventionally, this art was done to beautify and add colors to homes and ambiance but with changing times, it is now even done on clothing, papier-mâché products, wall panels, paper stands, magazine holders, jewellery boxes, book marks etc. Themes vary from contemporary issues, mythological panels to geometric patterns. Madhubani painting is traditionally made using solid natural shades for *bharni* and tones for delineating delicate fine lines via a method called *kachni* where colours are seldom used (**Jha, 2015**). Earlier known as the women's art, today the creative world is seeing a gender shift where men are seen adding their artistic touch to this traditional art form. Folk art is always practiced by a group within the periphery of a society. But the geographical and cultural factors of Mithila did not collaborate for creative activities. Consequently the people of Mithila developed an entirely different form of art catering to their needs and taste which presented the primitive impetuous and conventional survivals in a distinctive manner (**Agarwal, 2015**).

The traditional art of Madhubani painting has remained confined to a compact geographical area and the skills have been passed on to generation of artists through centuries, the content and the style have mainly remained the same. These paintings have been accorded the coveted GI (Geographical Indication) status. It is still practiced and kept alive in the institutions spread across Mithila region. *Kalakriti* in Darbhanga, *Vaidehi* in Madhubani, *Benipatti* in Madhubani district and Gram Vikas Parishad in Ratni are some of the major centers of Madhubani painting which has kept this ancient art form alive. Madhubani got recognition when Sita Devi, a painter received the state award in 1969 and Jagdamba Devi was given a Padma Shri in 1975. The government also awarded Sita Devi the National Award that year (**Ghosh, 2013**).

Mahasundari Devi, Dulari, and Mahalaxmi, women from three generations have made extensive efforts to keep the art form alive by educating other women in their village and teaching them how to make Mithila painting a means of earning livelihood and take the legacy forward. Works of these three women have been commissioned by the Government of India and also found a place in the Mithila museum of Japan. These women are empowering other women through painting and creating awareness on issues like education and eve-teasing. They are encouraging their students to paint on different topics of social relevance like folk tales they might have heard during their childhood to the status of women in the society today (**Jain, 2011**).

Madhubani paintings, today, not only add to the family income of the artist, but also contribute toward empowering the women folk pursuing this craft. In addition, they bring name of their area on the world map by taking this art to various countries and earning foreign

exchange for our country. Its production and marketing is regulated by Regional Craft Guides run by the state Government of Bihar and the Government of India. Continuing market demand of articles adorned with this art, throughout the world is a tribute to the resource fullness of the women of Mithila, who have successfully transferred their technique of 'Bhiti Chitra' or 'wall paintings' to the medium of paper and fabric (Khanna, 2018).

Today, Madhubani art grabs interest of art lovers from different countries like USA, Australia, UK and Russia. In present time, fashion designers are going back to the rich heritage of this art and reviving it by designing *dupatta*, *saree*, scarf and Indo-western dresses. At numerous fashion weeks, designers have showcased a color-filled collection of Madhubani designs in traditional and contemporary apparel. Due to their style and technique they gained immense fame and recognition in the world. But nowadays Madhubani art has become a globalised art form and received international and national attention (Anonymous, 2019a).

2.2 Role of Folk Art in Design Inspiration and Product Diversification

Sangma and Rani, 2012 defined that it is possible to develop new and interesting designs from the existing folk art to meet the excessive demands of contemporary designs in the fashion industry and also to increase the variety of designs in the field of textiles. Various crafts can be explored for development of new designs in order to broaden the base of textile designs, to preserve the traditional art form to diversify the designs in different forms and prevent them from going into extinction since these folk arts and crafts symbolizes the culture and traditions of various types of people residing in different regions.

Ashitey, 2013 focused on exploring techniques of transferring designs using natural objects such as leaves, pieces of paper, saw dust, local sponge and threads etc. Other techniques such as printing object directly on fabric and developing screen manually were explored. The study revealed that developing printing designs directly from leaves, weeds, twigs, traditional sponge and thread among others provided a collection of unique designs with aesthetic values. This will enable textile students; teachers and designers acquire new and interesting techniques in creating textile designs.

Pant and Gahlot, 2013 prepared that ready to use borders using screen printing. The selected fifteen *Aipan* motifs were used to developed designs for designers borders and a total of eight combinations each of two motifs were made. For each combination of motifs, five border arrangements were made. In this way forty designs were prepared for borders. The five best designs were selected on the basis of their weighted mean score for preparation of borders. The borders were printed in red- violet and yellow-green colour combination using screen printing. Surface enrichment of borders was done with embroidery, beads, stones and laces. The consumers acceptability of prepared borders was accessed on three design parameters i.e. embroidery, embellishment and overall appearance. The results of the study showed that all the prepared borders were liked by the consumers on all the design parameters

and most of the respondents stated that they would definitely purchase these borders if available in the market.

Rajvanshi and Srivastava, 2013 found that Phad paintings currently do not find much usage on textiles/ fashion apparel, except as a few decorative painted wall panels, greeting cards, etc. To preserve the reminiscent beauty of Phad paintings, this art needs to be popularized by adapting its motifs/designs on textiles. The adapting folk art and their traditional motifs on apparel are gaining commercial popularity in domestic and overseas markets. Phad painting can be displayed for interior decoration of residence.

Sharma, 2015 emphasized that India is marked by its rich traditional heritage of tribal/folk arts and Culture. Since the days of remote past, the diversified art and cultural forms generated by the tribal and rural people of India have continued to evince their creative magnificence. The folk paintings have rich heritage, give aesthetical feelings and remind us about the native life through their colorful line drawings. Without folk paintings, there is no identity of culture in human life as well as occasions will also be incomplete. Further commercialization of these tribal paintings creates a new source of non-agricultural income as these have achieved eminence in the national and international art market. Due to the growing demands of the crafts internationally, different organizations encourage the artists to produce their traditional paintings on handmade paper for commercial sale.

Srivastava and Vaishnav, 2015 undertook an investigation for adaptation of *Warli* folk art motifs with computer aided designing for contemporary uses. A total of sixty designs were developed, 20 each for the three selected categories of furnishing items *i.e.* dining table cover, sofa set cover and *diwan* cover for product development. CorelDRAW software was used to create customized graphic of selected furnishing articles. The adapted motifs were also simulated on scaled graphics of furnishing articles in different placements.

Boruah and Kalita, 2016 discussed that the traditional designs were found suitable for printing the eri silk fabric with screen printing, which enriched the surface of the fabric as well as added beauty to the fabric. Considering its geometrical properties, it can be inferred that the eri printed fabric can be utilized for producing the different diversified products. In respect of design evaluation brilliancy of colour, clarity of design and sharpness of design outline were also found acceptable. Moreover, it can also be commercialized and emphasized on exposing the products in the domestic as well as international markets which can play a significant role in improving rural economy.

Kavita, 2016 adapted canvas embroidery motifs for fabric painting on *kurti*. Eight *kurti i.e.* four embroidered and four fabric painted were developed as per selected designs, their placements and colour ways. Developed *kurti* were assessed by thirty consumers for their acceptability level on various parameters. Created designs and fabric painting technique were highly acceptable parameters while design placements, colour ways and embroidery technique were acceptable parameters of all the designs by consumers. Cost of all the

developed *kurti* was rated appropriate and comparatively more number of consumers rated the cost of fabric painted *kurti* as appropriate. Experts had high opinion regarding application of canvas embroidery motifs through fabric painting as they strongly opined that fabric painting was time saving and cost effective surface embellishment technique as per market trend.

Renu, 2016 worked on adaptation of *Kasuti* embroidery motifs for hand painted textile articles. A total of six articles, three fabric painted jackets and three fabric painted file folders were developed as per the selected designs, their placements and colour ways. Developed articles were assessed by sixty consumers for their acceptability on various parameters. Created designs and fabric painting technique were found highly acceptable parameters while design placements, colourways and embroidery technique were acceptable parameters of all the designs by consumers. Cost of all the developed articles was considered appropriate but comparatively more number of consumers rated the cost of fabric painted articles as appropriate. Experts had high opinion regarding adaptation of *Kasuti* embroidery motifs for fabric painting as they strongly opined that fabric painting was time saving and cost effective surface embellishment technique as per market trend.

Sharma, 2016 prepared fusion designs by CAD using Madhubani and Warli painting designs. Various apparel and handicraft items were prepared through digital printing with application of developed designs. The results indicated that the prepared products were highly appreciated and well accepted on the basis of overall appearance and cost effectiveness. Digital printing technique facilitates the faster production with high accuracy in short duration hence, commercialization and economic gain is more as compared to conventional methods of printing. Further, the advanced digital printing technique produces vibrant and even coloration on textiles with no release of effluents. Hence, reduces the load on environment and its degradation.

Sushila, 2016 adapted *Chikankari* embroidery motifs for fabric painting on *kurti*. Selected fifteen *chikankari* motifs were converted into forty eight designs. Selected designs were worked in fabric painting on *kurti* in selected placements and colour ways. The developed *kurti* were assessed by consumers on different parameters i.e. suitability and appropriateness of designs, technique, placement of designs and colour schemes. The prepared articles were highly appreciated by the respondents.

Yadav and Gaba, 2016 investigated a study on screen printing with natural dyes. Value added screen printed file folders and table mats were prepared and market potential of developed products was assessed. Designs were collected from secondary sources and five designs were selected according to the product and printing technique. The printed products were further embellished with hand embroidery, machine embroidery and fabric painting. Results of the study showed that the design placement, printing and surface enrichment techniques used for developed products were highly appreciated by the respondents. Cost of the developed products was assessed as appropriate by all the respondents.

Babel and Chouhan, 2017a developed shawls through hand painting inspired from traditional motifs of Madhubani painting. Selected fifteen motifs of Madhubani painting were used for development of designs. Developed designs were placed on shawls in ten different ways and selected five placements were used for screen printing on shawls. The prepared shawls were got evaluated from thirty market personnel. All the respondents highly appreciated the developed shawls and found them unique in terms of selection, placement and colour combination of designs. Acceptability range of all the shawls ranged between 77 to 83.33 percent. Cost of all the shawls was between Rs. 685 to 730 and marketability results revealed that developed shawls can be sold through handicraft units.

Babel and Chouhan, 2017b affirmed that *Kalamkari* painting is a beautiful art form of Andhra Pradesh. The study was carried out for documentation of *Kalamkari* paintings and develops value added shoes through hand painting using *Kalamkari* art. The effort was targeted towards finding the possibility of applying *Kalamkari* designs on shoes through hand painting. Thirty motifs were developed as per their suitability for shoes. Developed design sheets were evaluated by clothing and textile experts for selection of fifteen appropriate designs. Finally ten pairs of shoes were prepared using ten most suitable designs and all the prepared shoes were highly appreciated by the respondents.

Devi et al., 2017 reported that motifs play an important role in designing. Each motif, like the fabric itself has an origin, evaluation and variety in shape and presentation. In designing, a weaver, embroiderer, dyer or printer creates dreams of beauty using motifs familiar through culture, religion, environment and history on textiles. Development in any field is essential and continuing process so in the field of textile designing.

Sharma and Gandotra, 2017 undertook a study to develop screen printed silk stoles using blue pottery motifs. Six stoles were developed taking inspiration from these motifs. The concept of designing screen printed silk stoles using blue pottery motifs was found useful for designing different garments and accessories. This study would also be helpful for the fashion designers to create something innovative by taking the similar ideas on the preferences of the respondents. The cost effectiveness of the prepared stoles was studied from 20 respondents. Majority of the respondents considered the quoted price for stole1, stole 2 and stole 6 as adequate while 35.00 percent respondents found the quoted price of stole 3 as higher than what the price should have been. The cost of production is expected to be lower on being mass produced.

Gayathri and Sunitha, 2018 opined that Madhubani painting as its name itself indicates *forest of honey*, has its own place for its replication of flora and fauna. In order to revive the tradition in minds of youngsters an attempt was made by selecting the common motifs like birds, fish, sun and borders from Madhubani style which were then developed into designs by arranging in proper fashion. The inspired traditional Madhubani motifs were beautifully hand painted on fabrics for skirts. The selected Madhubani designs, colours and

constructed fashion garments were liked by the adolescent girls. The selected Madhubani designs were liked by the adolescent girls. The colours preferred and constructed garments were well appreciated by the adolescent girls.

Ankita et al., 2018 explained that folk culture of Mithila especially paintings has rich heritage and has achieved eminence in the international art market. One must consider or agree that in the absence of folk painting there is no identity of culture in human life as well as occasion will be incomplete. If anyone wants to know the nation, first she has to know the roots. Folk paintings give aesthetical feelings and remind us about the native life through their colorful line drawings. The repetition of same kind of line confers a harmonious unification of elements. In order to create a new source of non-agricultural income, different organization encourages the artist to produce their traditional paintings on handmade paper for commercial sale.

Patil, 2018 conducted a study on 'Madhubani: A traditional art form from walls to apparels'. Seventy five students were trained in Madhubani painting. The trainees successfully prepared samples of Madhubani painting with fabric colors on unbleached cotton fabric. Traditional motifs like two headed peacock, single headed peacock, fish, lotus etc. were selected. The prepared samples were got analyzed by the experts of Textile Science & Apparel Design Department and renowned fashion designers of Nashik. It was concluded that the selected samples can be used for value addition on apparels. Considering the suggestions given by the experts Crop top, *Palazzo*, *Kurti* and Sari Blouse were prepared. The prepared articles were evaluated on the basis of overall aesthetic appeal, placement of motifs, cost effectiveness and market acceptability of products. It was concluded that Palazzo and crop top were found to be highly appealing to 70 percent respondents for design, color combination, placement of design and traditional look of apparel in contemporary form. Sari blouse was found to be appealing to 68 percent respondents. Respondents opined that palazzo and crop top were aesthetically appealing at a glance because of use of motifs, layout and color combination.

Sharma and Bains, 2018a adapted traditional Madhubani motifs to develop contemporary designs for *kurti*. The selected five designs were applied on kurti through hand painting using pigment dyes. Colour fastness of painted samples was tested to washing, rubbing, perspiration and sunlight. The results indicated that pigment dye black and red showed excellent (5) grades for wash fastness and perspiration. Good (4) rubbing fastness grades and very good (6) light fastness grades were obtained by red and black pigment dyes.

Sharma and Bains, 2018b stated that Madhubani painting is a Hindu style of painting. In literature motifs have been categorized into various categories including mythological themes, abstract motifs, village scenes and Hindu deities, natural objects, geometrical motifs, animal and bird motifs, human motifs etc. These paintings have depicted an assembly of symbolic images, such as images of lotus plant, the bamboo grove, fishes, birds and snakes in union, represented fertility and proliferation of life. Traditionally Mithila

paintings were done only by the women of the house and dalit women only in the occasions of marriages. The obscure Mithila art contrived of hundreds and thousands of fine details; depicting human figures with proportionately big eyes and noses, telling the story of rituals ceremonies, customs and everyday life in the ancient Mithila region of Bihar.

Singh, 2018 emphasized that folk paintings are pictorial expressions of village painters which are marked by the subject chosen from the epics like Ramayan and Mahabharat. Madhubani art of the Bihar state has been undergoing transition where its application in original composition has been declined owing to social and economic changes now a days. The reason for using traditional motifs in textile is to keep our designs or motifs alive. The effort was targeted towards finding the possibility of applying Madhubani design on garments utilizing the button and hand painting. Three Madhubani designs were selected through internet, books and magazine for designing of garments (*Saree, Kurti and Ponchu*). The developed garments were visually evaluated on the basis of color combination, purchasing preference, placement of design, cost and overall appearance. Amongst all garments *saree* was most liked by the respondents.

Pooja et al., 2019 conducted a study to explore the possibility of adaptation of *Kathiawar* embroidery motifs for fabric painting. Twelve motifs suitable for fabric painting on jacket were selected by experts. The selected motifs were scanned to convert them from print version to digital format, edited with the help of CorelDRAW software and sixty innovative designs were prepared. Consumers had high opinion about all the designs of developed jackets as they strongly agreed with all the opinion statements regarding suitability of created designs for product and technique, size and shape of created designs, design placements, colour schemes and overall appearance of the developed jacket with average scores ranging between 2.36 to 2.59.

2.3 Creation and Development of Designs using CAD

Bhargav and Goel, 2014 developed thirty five designs for carpets using CorelDRAW 12 software. It was found that the newly created designs were contemporary and simple to weave. Samples of three best selected designs were got prepared from weavers. These designs were visually evaluated by the thirty respondents. Design no. 34, 33 and 9 were adjudged as 1st, 2nd and 3rd best designs among all the carpet designs.

Dormor, 2014 stated that CAD software is used to enhance the productivity of the designer, to make the quality of design better, to improve communications through documentation and to create a database for manufacturing. Basically, output of CAD is like electronic files for printing, machining, or doing manufacturing operations. CAD is Computer Aided Design, which is mainly used in designing units, to input weave structure, drafting plan and lifting plan through weave CAD software.

Vaishnav, 2015 created designs for diwan sets, dining table cover sets and sofa set covers using motifs of Warli folk art of Maharashtra. Products were developed using selected designs through screen printing and got evaluated from ten experts, ten consumers and ten stake holders. The developed articles were highly appreciated by the respondents and found to have good marketability. A customized software comprising of basic design library, colourways, placements and developed products was developed using Flash along with other suitable softwares. The developed software was found helpful for artisans in applying the designs to different articles.

Pandey *et al.*, 2016 determined the role of advanced CAD/CAM technologies in modern manufacturing industries. The recent advancement in technology of product designing and manufacturing has progressively inflicted impacts upon smart CAD/CAM technologies, demanding for research in this area and growth of CAD/CAM based manufacturing in modern industries. The creation of a CAD /CAM integrated provides a direct link between the design and manufacturing processes; the goal of the system CAD /CAM not only mechanize certain phases of design and development, but also computerize the transition from design to manufacturing.

Jyoti and Grover, 2017 explained that with the introduction of computer aided designing software, the entire process of textile designing has revolutionized. In the present study CorelDRAW and Photoshop programmes were used to create designs for screen-printing of bed covers. Fifteen designs were developed, for bed covers by arranging scanned and prepared motifs in different variations. All the developed designs were subjected to visual evaluation for selection of five best designs by 15 entrepreneurs who were involved in printing business and 15 staff members from the College of Home Science and Women's Development, Allahabad.

Islam *et al.*, 2018 concluded that CAD is a technology for design and technical documentation, which replaces manual drafting with an automated process. CAD helps to construct, document, explore design ideas, visualize concepts and simulate how a design performs in the real world. CAD allows engineers to design variants with nominal physical models to achieve lower product development costs, better speed, better productivity, quality guarantee, and faster time-to-market.

Kala and Babel, 2018 highlighted that CorelDRAW is a vector graphics and editing software. It provides both options either drawing or editing of pictures with ease and accuracy. It is computer based software; all the work is done on the computer. There are numerous graphic tools in order to fit lines, shapes, text according to the shape or designs together and then color them. The CAD software is currently used in fashion designing. Some of the salient features of the software are that it can provide the designer with an extremely detailed drawing and drawing tools, simple to operate and easy to be accepted by the

designers. In Corel DRAW, an interactive and amazing shaping and illustration tools are available to achieve fast work, which are useful for tracing anything speedily.

Anonymous, 2019b accentuated that the CAD software has turned into a revolution for textile designing by changing the face of the textile industry forever. The introduction of CAD has done away with the time-consuming and cumbersome process of creating designs using paper and pencils. Every aspect of design can now be done with computer software; be it creation, presentation or production. It has also proved a flawless tool for the textile designers as shortens the design cycle, visualizes the design in 3D, creates texture map and virtually analyses of end products in terms of hues, texture and drape. CAD softwares also aid in calculating cost and quantity of materials. There has been no looking back after CAD for textile designing revolutionized the textile industry.

Indrie et al., 2019 emphasized that CAD/CAM technology plays a very important role in textile designing and manufacturing. CAD/CAM is an essential part of the design process, acting not only as a tool to create ideas, but also simplifying the textile designing process to meet the rapidly changing demands of consumers for fashionable designs. The creative process is about creating a drawing of a garment deriving versions of it, creating visualizations, developing, deriving and drawing up patterns, creating patterns, in order to enable the designer to visualize the design before committing to an actual fabric.

Khemani, 2019 affirmed that CAD software is being used on large scale by professionals for various applications. The most common application of CAD software is designing and drafting. The CAD software helps the designer in synthesizing, analyzing, visualizing the final product that is to be made and documenting the design. All these factors help in drastically improving the productivity of the designer that translates into fast designing, lower designing cost and shorter completion times. The CAD systems offer greater accuracy; the errors are reduced drastically in the designed product leading to better design. Eventually, better design helps carrying out manufacturing faster and reducing the wastages.

According to **Matheson, 2019** Computer-Aided-Designing system breaks down complex designs into easily modifiable shapes for custom manufacturing and 3-D printing. A system that applies a technique called ‘program synthesis’ to break down CAD models into their primitive shapes, such as spheres and cuboids. Program synthesis automatically constructs computer programs based on a set of instructions. Essentially, to build CAD models, designers assemble individual shapes into a final object; the researchers’ method does the reverse, disassembling the CAD models into individual shapes that can be edited.

Methodology outlines the scientific way of conducting any investigation so that the study leads to both reliable and accurate data. The chapter enumerates the detailed methodology adopted in conducting the present investigation on ‘Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles’. The research procedure followed has been distinctly expressed under the following headings:

- 3.1 Locale of the study
- 3.2 Collection and selection of Madhubani motifs
- 3.3 Development and selection of designs
- 3.4 Creation and selection of design placements
- 3.5 Selection of material for stoles
- 3.6 Preparation and selection of colourways
- 3.7 Development of products and their cost determination
- 3.8 Assessment of developed stoles for consumers’ acceptability
- 3.9 Preparation of design catalogue
- 3.10 Analysis of data and application of statistical tools

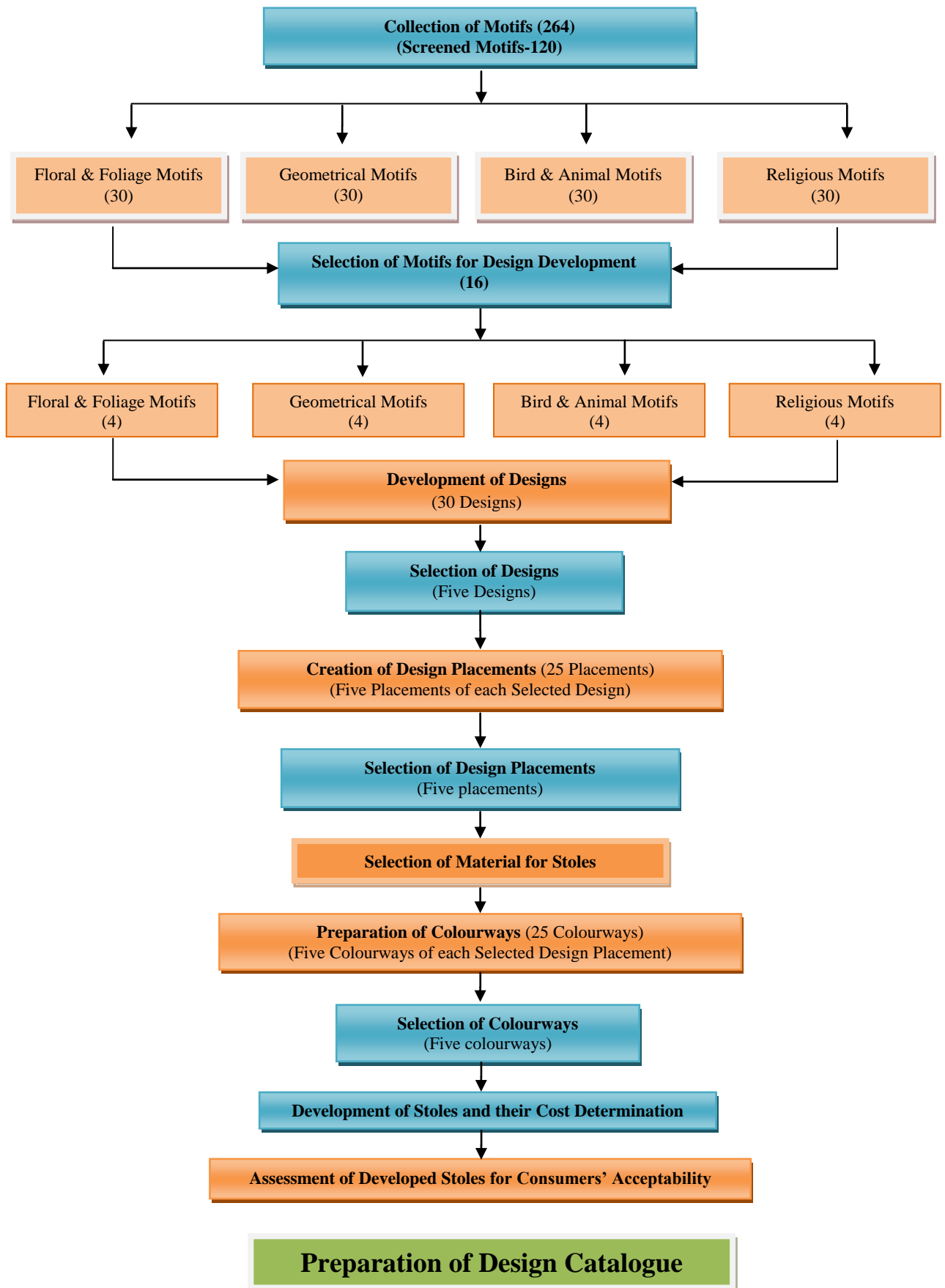
3.1 Locale of the Study

The present study was conducted in the Department of Textile and Apparel Designing, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar to adopt Madhubani motifs for development of stoles through screen printing and hand embroidery.

3.2 Collection and Selection of Madhubani Motifs

3.2.1. Collection of Madhubani motifs: For the present study the traditional motifs of Madhubani were collected from various secondary sources like books, journals, encyclopedia, magazines, websites etc. A total of two hundred sixty four motifs were collected and all the collected motifs were analyzed critically by the researcher and advisor on the basis of their suitability to develop designs for stoles through screen printing and hand embroidery technique of fabric embellishment. Out of collected 264 motifs, 120 motifs were screened and were classified as floral & foliage, geometrical, birds & animals and religious motifs.

RESEARCH DESIGN



3.2.2 Selection of motifs: The collected motifs of Madhubani sketched manually as well as scanned from literature were recreated and refined on computer using CorelDRAW X5 and Adobe Photoshop software to get the required intricacy and fineness. The collected 120 motifs were shown to a panel of thirty experts comprising of faculty members and PG students from I.C. College of Home Science, CCS Haryana Agricultural University, Hisar. In order to know the preferences of experts regarding collected motifs, preferential choice index was prepared (Annexure-I). Preferences were obtained on three point rating scale i.e. highly preferred, preferred and least preferred scoring 3, 2, and 1, respectively. Weighted Mean scores were calculated for all the motifs according to the preferences obtained. On the basis of weighted mean scores, ranks were assigned to the motifs. Total sixteen motifs i.e. four motifs from each category were selected to develop designs for stoles.

3.3 Development and Selection of Designs

3.3.1 Design development: The selected sixteen motifs i.e. four top ranked motifs from each category, were used for creation of innovative contemporary designs for stoles. The simulation of motifs was done with the help of CorelDRAW X5 using various software tools for enlargement/reduction of size, transformation, modification, rotation, editing until an aesthetically pleasing and required arrangement of motifs was obtained. A total of thirty designs were developed from the selected sixteen motifs using two to four motifs as per their compatibility and harmony.

3.3.2 Selection of designs: The developed designs were got assessed from the experts for selection of top preferred five designs from developed thirty designs to apply on stoles. To know the preferences of experts regarding created designs for screen printing and hand embroidery technique, preferential choice index was developed (Annexure-II). The created designs were shown to the experts and their preferences were sought on three point rating scale as highly preferred, preferred and least preferred scoring 3, 2, and 1, respectively. Individual score of each created design was calculated as weighted mean scores. These were assigned ranks according to their weighted mean scores. The top preferred five designs were selected for preparation of placement on stoles.

3.4 Creation and Selection of Design Placements

3.4.1. Placements of selected designs on stoles: The five selected designs were arranged in systematic manner on stoles to create design placements. Design layouts were created in the computer with the help of CorelDRAW X5 and the size of the each design was increased/decreased or rotated as per requirement of design layout. Five placements of each selected design were done in all the possible variations as per suitability of the design. Hence, a total of twenty five design placements were prepared.

3.4.2 Selection of design placements: The printout of prepared design placements were taken for evaluation by panel of experts. The preferences of experts were sought using the developed preferential choice index (Annexure-III). Weighted mean scores were calculated and on the basis of weighted mean scores obtained, ranks were assigned to each placement of the selected five design placements. The top ranked design placement of each design was selected for preparation of colourways.

3.5 Selection of Material for Stoles

3.5.1 Selection of fabric for Stole: Different samples of silk and art silk fabrics were collected from the local market of Hisar. The collected samples were visually analyzed and tested in the laboratory. Screen printing and hand embroidery was done on each collected fabric sample to assess its suitability to screen printing and hand embroidery. The prepared samples were shown to the panel of experts for selection of fabric. Preferential choice index (Annexure-IV (A)) was developed to obtain the preferences of experts on three point rating scale i.e. highly preferred, preferred and least preferred scoring 3, 2, and 1, respectively. Weighted mean scores were calculated and ranks were assigned according to weighted mean scores. Highly preferred fabric was selected for preparation of stoles using both the techniques i.e. screen printing as well as hand embroidery. To ensure the rubbing fastness of screen printing, the printed samples were further tested for rubbing fastness as per IS: 766-1988 test method.

3.5.2 Selection of base colour for stoles: A colour palate (Anonymous, 2017) was used for selection of base colour for stoles (Annexure-IV (B)). Preferences of experts were sought on three point rating scale as highly preferred, preferred and least preferred. Weighted mean scores of each colour was calculated to assigned rank and on the basis of ranks, one most preferred base colour of fabric was selected for stole.

3.6 Preparation and Selection of Colourways

3.6.1 Preparation of colourways: The preferred design placement of each selected design was simulated in five different colourways with the help of CorelDRAW X5 software. Five colour schemes i.e. analogous, complementary, monochromatic, tetrad and triad were used to create five colourways for each selected design. Hence, a total of twenty five colour ways, five each for selected five design placements were prepared. These colour schemes were selected as per their suitability for base colour of stole.

3.6.2 Selection of colourways: For selection of colourways for development of stoles, the developed colourways were subjected to visual evaluation by the experts and their preferences were sought on self-structured preferential choice index (Annexure-V). On the basis of preferences obtained, the weighted mean scores were calculated and ranks were assigned to the developed colourways. As per assigned ranks, one top ranked colourway of each preferred design placement was selected for screen printing and hand embroidery.

3.7 Development of Products and their Cost Determination

For development of stoles through screen printing and hand embroidery, selected fabric with preferred base colour was procured from the market of Hisar. The five stoles of 90x30 inches were developed through screen printing and hand embroidery using most preferred placement and colour way of selected five designs. Screen printing on stoles was got done from local market using commercially available pigment colours as per the selected colourways. Once the printing was done, the colour was fixed by steam ironing the stoles from wrong side after 72 hours. After screen printing hand embroidery was done on the stoles using different stitches, i.e. running stitch and back stitch as per suitability to the design. After screen printing and hand embroidery, edges of stoles were finished.

Cost is one of the important features of any developed article. Cost of each stole was calculated including the cost of raw material, printing, embroidery, finishing/embellishment.

3.8 Assessment of Developed Stoles for Consumers' Acceptability

All the developed five stoles were displayed in the Department of Textile and Apparel Designing, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar and got assessed from thirty consumers on the basis of different parameters viz. developed designs, placements of designs, techniques used i.e. screen printing and hand embroidery and overall appearance. The opinion of the consumers regarding developed stoles were also sought in relation to use and suitability of motifs, appropriateness of developed designs, placement of designs, colour combinations, quality of workmanship and acceptability of idea with the help of self-structured opinion scale (Annexure-VI). The opinions of consumers were assessed on three-point continuum scale as strongly agreed/most suitable, agreed/suitable and somewhat agreed/somewhat suitable scoring 3, 2 and 1, respectively.

Rating	Weightage
Very Appealing/Strongly Agree	3
Appealing/ Agree	2
Least Appealing/Somewhat Agree	1

For each feature the frequency of each rating was multiplied by the respective weightage to calculate the weighted mean score. The developed stoles were finally rated on the basis of weighted mean scores (WMS) as per following scale.

Weighted Mean Score	Rating
2.33 - 3.00	Very Appealing/Strongly Agree
1.66 - 2.33	Appealing/ Agree
1.00 - 1.66	Least Appealing/Somewhat Agree

The stole or statement with 2.33-3.00 WMS was considered as high opinion/most acceptable/most suitable, with 1.66-2.33 WMS as medium opinion/acceptable/suitable and stole or statement with 1.00- 1.66 WMS was assessed as low opinion/least

acceptable/ least suitable. Average weighted mean scores of each stole were also calculated.

Cost of each developed stole was estimated on the basis of actual cost of raw materials used and labour charges. The cost of consumed amount of raw material was calculated by unitary method according to the market rate. To calculate the labour charges, time utilized in making each stole of respective techniques was calculated. Labour charges were calculated on the basis of daily wages i.e. Rs. 380 for skilled worker, working for 8 hours, as per approved rate of Government of Haryana (Govt. of Haryana instructions No. 16/7/2015-1GSII dated 06.04.2015).

Assessment index was developed to know the opinion of consumers regarding cost of stole (Annexure-VI). Opinions were recorded and analyzed using percentages.

3.9 Preparation of Design Catalogue

A design catalogue was prepared using suitable textile designing software for documentation. Design catalogue included 120 collected Madhubani motifs categorized under floral & foliage, geometrical, bird & animals and religious motifs, developed thirty designs, created twenty five design placements- five for each selected five designs with various design layouts and developed twenty five colour ways- five for each selected five design placements.

3.10 Analysis of Data and Application of Statistical Tools

The collected data were coded, tabulated and analyzed using suitable statistical tools to draw the meaningful inferences.

Frequency: Frequency was calculated and used to calculate weighted mean scores

Percentage: Percentages were calculated for analysis of data regarding opinion of consumers about the cost of developed stoles.

Weighted Mean Score: To quantify the data regarding assessment of developed stoles on different parameters by consumers and their opinion regarding developed screen printed and hand embroidered stoles, weighted mean scores were calculated and ranks were allotted on that basis. Weighted mean score of each feature was worked out separately using following formula:

$$\text{Weighted Mean Score} = \frac{W_1 X_1 + W_2 X_2 + \dots + W_n X_n}{\text{Total number of respondents}}$$

Where,

W_1, W_2, \dots, W_n are weights, X_1, X_2, \dots, X_n are frequencies

Average Score: Average score were calculated to find out the preferences of consumers for assessment of developed stole on various parameters and opinion of the consumers regarding developed stoles.

$$\text{Average Score} = \frac{\text{Sum of all observations}}{\text{Total number of observations}}$$

The present study was conducted on ‘Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles’. The results of the present study derived through the prescribed methodology and standard tools in accordance with the objectives are furnished in this chapter. Keeping the stated objectives of present study in mind, suitable traditional Madhubani motifs were selected to develop designs for stoles and placements of selected designs as per experts’ preferences. Screen printed and hand embroidered stoles were prepared using preferred colourways of selected design placements and got evaluated to assess their acceptability among consumers. The results of the study have been described under following sub-sections for meaningful conclusions:






















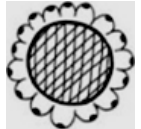







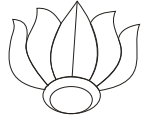

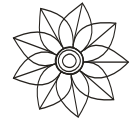




























- 4.1 Collection and selection of Madhubani motifs
- 4.2 Development and selection of designs
- 4.3 Creation and selection of design placements for stoles
- 4.4 Selection of material for stoles
- 4.5 Preparation and selection of colourways
- 4.6 Development of products and their cost determination
- 4.7 Assessment of developed stoles for consumers’ acceptability
- 4.8 Preparation of design catalogue

4.1 Collection and Selection of Madhubani Motifs

The Indian folk arts play an important role in creating new and diversified designs in the fashion world. The collected and selected motifs of Madhubani have been presented in this section.

4.1.1 Collection of motifs: India has always been known as the land that represents culture and traditional vitality through its varied art and craft. These crafts are not only used for decorating and religious purposes but they also accommodate day-to-day needs of the people. The folk arts have been a great source of inspiration and ideas for textile designers and play an important role in developing innovative designs. As an inspiration from Madhubani art, 264 traditional Madhubani motifs were collected from books, magazines and internet etc. The screened 120 motifs, considered suitable for stoles were broadly classified under four categories viz. floral & foliage, geometrical, birds & animals and religious motifs. The collected motifs are presented in Plate-1.

Screened Madhubani Motifs

Floral and Foliage Motifs					
 F1	 F2	 F3	 F4	 F5	 F6
 F7	 F8	 F9	 F10	 F11	 F12
 F13	 F14	 F15	 F16	 F17	 F18
 F19	 F20	 F21	 F22	 F23	 F24
 F25	 F26	 F27	 F28	 F29	 F30
Geometrical Motifs					
 G1	 G2	 G3	 G4	 G5	 G6
 G7	 G8	 G9	 G10	 G11	 G12
 G13	 G14	 G15	 G16	 G17	 G18
 G19	 G20	 G21	 G22	 G23	 G24
 G25	 G26	 G27	 G28	 G29	 G30








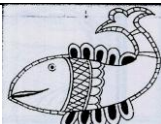
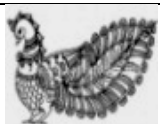
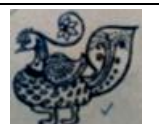









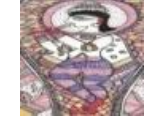


















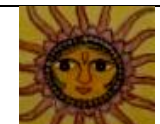
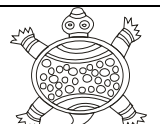
Animal and Bird Motifs					
 A1	 A2	 A3	 A4	 A5	 A6
 A7	 A8	 A9	 A10	 A11	 A12
 A13	 A14	 A15	 A16	 A17	 A18
 A19	 A20	 A21	 A22	 A23	 A24
 A25	 A26	 A27	 A28	 A29	 A30
Religious Motifs					
 R1	 R2	 R3	 R4	 R5	 R6
 R7	 R8	 R9	 R10	 R11	 R12
 R13	 R14	 R15	 R16	 R17	 R18
 R19	 R20	 R21	 R22	 R23	 R24
 R25	 R26	 R27	 R28	 R29	 R30

Plate-1

4.1.2 Selection of motifs: This sub-section presents preferences of experts for collected Madhubani motifs for design development. The collected motifs were got assessed from a panel of thirty experts and results obtained are presented from Table 1 to 4.

i) **Floral and foliage motifs:** The data regarding preferences of experts presented in Table 1 reveal that in floral & foliage motifs category, motif number 29 ranked I scoring highest weighted mean score (WMS 2.76), followed by motif number 30 (WMS 2.60) ranked II, motif number 11 (WMS 2.56) ranked III and motif number 8 (WMS 2.46) ranked IV.

Table 1: Preferences of experts for floral and foliage motifs

(n=30)

Motif No.	WMS	Rank	Motif No.	WMS	Rank
1	2.03	XV	16	1.66	XXVII
2	2.13	XII	17	2.10	XIII
3	1.83	XXIV	18	2.00	XVIII
4	2.23	X	19	2.03	XV
5	2.10	XIII	20	1.93	XXII
6	2.26	IX	21	1.60	XXVIII
7	1.60	XXVIII	22	2.30	VIII
8	2.46	IV	23	1.96	XX
9	2.40	VI	24	2.20	XI
10	2.36	VII	25	2.00	XVIII
11	2.56	III	26	2.43	V
12	1.76	XXV	27	1.70	XXVI
13	1.96	XX	28	2.02	XVII
14	1.86	XXIII	29	2.76	I
15	1.36	XXX	30	2.60	II

The preferences of experts for rest of the floral & foliage motifs in descending order were motif number 26 (WMS 2.43), 9 (WMS 2.40), 10 (WMS 2.36), 22 (WMS 2.30), 6 (WMS 2.26), 4 (WMS 2.23), 24 (WMS 2.20), 2 (WMS 2.13), 5 (WMS 2.10), 17 (WMS 2.10), 1 (WMS 2.03), 19 (WMS 2.03), 28 (WMS 2.02), 25 (WMS 2.00), 18 (WMS 2.00), 13 (WMS 1.96), 23 (WMS 1.96), 20 (WMS 1.93), 14 (WMS 1.86), 3 (WMS 1.83), 12 (WMS 1.76), 27 (WMS 1.70), 16 (WMS 1.66), 7 (WMS 1.60) and 21 (WMS 1.60). The motif number 15 was the least preferred floral & foliage motif ranked XXX with weighted mean score 1.36.

It is thus inferred that four top preferred floral & foliage motifs selected for the development of designs were motif number 29, 30, 11 and 8 (Plate- 2).

Selected Floral and Foliage Motifs

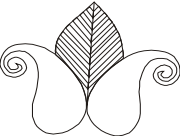

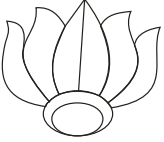
Motif No.	Motifs	WMS	Rank
8		2.46	IV
11		2.56	III
29		2.76	I
30		2.60	II

Plate-2

ii) **Geometrical motifs:** The data presented in Table 2 depicts that as per the preferences of experts, motif number 8 scored highest weighted mean score i.e. 2.80, ranked I in geometrical motifs category followed by motif number 26 (WMS 2.73) ranked II, motif number 2 (WMS 2.66) ranked III and motif number 15 (WMS 2.56) ranked IV.

Table 2: Preferences of experts for geometrical motifs

n=30)

Motif No.	WMS	Rank	Motif No.	WMS	Rank
1	2.53	V	16	2.46	VII
2	2.66	III	17	2.26	XIV
3	2.20	XVIII	18	2.23	XVI
4	1.86	XXIV	19	2.33	XII
5	1.85	XXV	20	1.93	XXIII
6	2.33	XII	21	2.26	XIV
7	2.40	IX	22	2.23	XVI
8	2.80	I	23	2.10	XXII
9	1.83	XXVII	24	2.11	XXI
10	2.20	XVIII	25	2.50	VI
11	2.43	VIII	26	2.73	II
12	1.84	XXVI	27	2.40	IX
13	2.36	XI	28	1.75	XXIX
14	1.80	XXVIII	29	1.70	XXX
15	2.56	IV	30	2.13	XX

The other geometrical motifs preferred in declining order were motif number 1(WMS 2.53), 25 (WMS 2.50), 16 (WMS 2.46), 11 (WMS 2.43), 7 (WMS 2.40), 27 (WMS 2.40), 13 (WMS 2.36), 6 (WMS 2.33), 19 (WMS 2.33), 17 (WMS 2.26), 21 (WMS 2.26), 18 (WMS 2.23), 22 (WMS 2.23), 10 (WMS 2.20), 3 (WMS 2.20), 30 (WMS 2.13), 24 (WMS 2.11), 23 (WMS 2.10), 20 (WMS 1.93), 4 (WMS 1.86), 5 (WMS 1.85), 12 (WMS 1.84), 9 (WMS 1.83), 14 (WMS 1.80) and 28 (WMS 1.75). The least preferred motif in geometrical category was motif number 29 with weighted mean score 1.70 and ranked XXX.

Hence, it is concluded that motif number 8, 26, 2 and 15 were the top preferred geometrical motifs selected for the development of designs for stoles (Plate-3).

Selected Geometrical Motifs

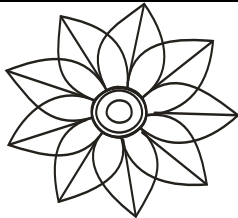
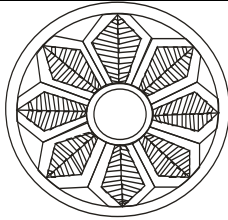
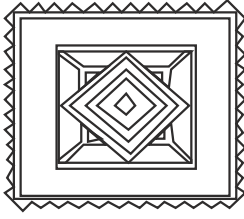
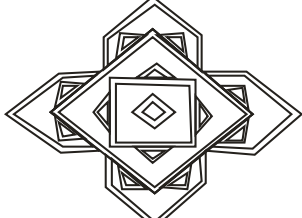
Motif No.	Motifs	WMS	Rank
2		2.66	III
8		2.80	I
15		2.56	IV
26		2.73	II

Plate-3

iii) **Animal and bird motifs:** The data regarding preferences of experts for animal & birds motifs category presented in Table 3 narrate that motif number 1 scored highest weighted mean score i.e. 2.80, ranked I followed by motif number 26 (WMS 2.66) ranked II, motif number 19 (WMS 2.60) ranked III and motif number 18 (WMS 2.56) ranked IV.

Table 3: Preferences of experts for animal and bird motifs**(n=30)**

Motif No.	WMS	Rank	Motif No.	WMS	Rank
1	2.80	I	16	2.05	XXIV
2	2.11	XXII	17	2.24	XIV
3	2.21	XV	18	2.56	IV
4	2.01	XXVI	19	2.60	III
5	2.27	XIII	20	2.15	XX
6	2.43	VII	21	1.40	XXX
7	2.40	VIII	22	2.53	V
8	2.08	XXIII	23	1.70	XXVIII
9	2.50	VI	24	2.34	X
10	2.37	IX	25	2.03	XXV
11	2.20	XVII	26	2.66	II
12	2.30	XII	27	2.31	XI
13	2.19	XVIII	28	2.17	XIX
14	2.21	XV	29	1.50	XXIX
15	2.13	XXI	30	1.90	XXVII

The declining order of preferences for rest of the motifs were motif number 22 (WMS 2.53), 9 (WMS 2.50), 6 (WMS 2.43), 7 (WMS 2.40), 10 (WMS 2.37), 24 (WMS 2.34), 27 (WMS 2.31), 12 (WMS 2.30), 5 (WMS 2.27), 17 (WMS 2.24), 14 (WMS 2.21), 3 (WMS 2.21), 11 (WMS 2.20), 13 (WMS 2.19), 28 (WMS 2.17), 20 (WMS 2.15), 15 (WMS 2.13), 2 (WMS 2.11), 8 (WMS 2.08), 16 (WMS 2.05), 25 (WMS 2.03), 4 (WMS 2.01), 30 (WMS 1.90), 23 (WMS 1.70) and 29 (WMS 1.50). Motif number 21 scoring weighted mean score 1.40 was ranked XXX.

It is thus deduced that motif number 1, 26, 19 and 18 were the four top preferred animal and bird motifs selected for the development of designs for stoles (Plate-4).

Selected Animal and Birds Motifs

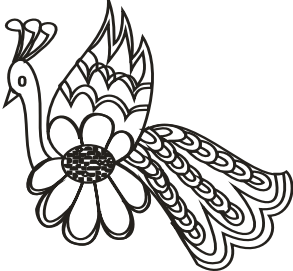
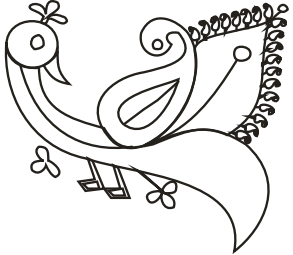
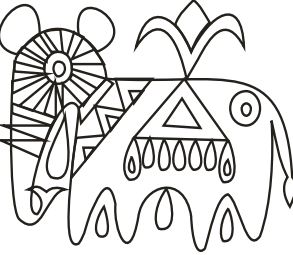

Motif No.	Motifs	WMS	Rank
1		2.80	I
18		2.56	IV
19		2.60	III
26		2.66	II

Plate-4

iv) Religious motifs: The data pertaining to preferences of experts for religious motifs incorporated in Table 4 highlighted that motif number 2 scored highest weighted mean score i.e. 2.76, ranked I followed by motif number 13 (WMS 2.65) ranked II, motif number 28 (WMS 2.60) ranked III and motif number 30 (WMS 2.57) ranked IV.

Table 4: Preferences of experts for religious motifs**(n=30)**

Motif No.	WMS	Rank	Motif No.	WMS	Rank
1	2.21	XVI	16	1.70	XXIX
2	2.76	I	17	2.10	XXI
3	2.16	XVIII	18	1.87	XXVII
4	2.06	XXIII	19	2.54	V
5	2.24	XV	20	1.65	XXX
6	2.27	XIV	21	1.90	XXVI
7	2.48	VIII	22	1.83	XXVIII
8	2.01	XXV	23	2.11	XX
9	2.46	IX	24	2.19	XVII
10	2.42	X	25	2.09	XXII
11	2.50	VII	26	2.52	VI
12	2.03	XXIV	27	2.13	XIX
13	2.65	II	28	2.60	III
14	2.35	XII	29	2.38	XI
15	2.31	XIII	30	2.57	IV

The preferences of experts for rest of the motifs in descending order were motif number 19 (WMS 2.54), 26 (WMS 2.52), 11 (WMS 2.50), 7 (WMS 2.48), 9 (WMS 2.46), 10 (WMS 2.42), 29 (WMS 2.38), 14 (WMS 2.35), 15 (WMS 2.31), 6 (WMS 2.27), 5 (WMS 2.24), 1 (WMS 2.21), 24 (WMS 2.19), 3 (WMS 2.16), 27 (WMS 2.13), 23 (WMS 2.11), 17 (WMS 2.10), 25 (WMS 2.09), 4 (WMS 2.06), 12 (WMS 2.03), 8 (WMS 2.01), 21 (WMS 1.90), 18 (WMS 1.87), 22 (WMS 1.83) and 16 (WMS 1.70). Motif number 20 with weighted mean score 1.65 was ranked XXX.

It is thus summarized that motif number 2, 13, 28 and 30 were the four top preferred religious motifs selected for the development of designs for stoles (Plate-5).

Selected Religious Motifs

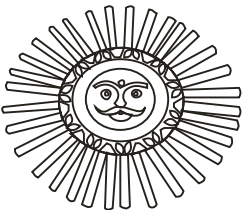


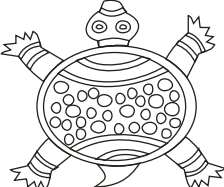
Motif No.	Motifs	WMS	Rank
2		2.76	I
13		2.65	II
28		2.60	III
30		2.57	IV

Plate-5

Thus it is concluded that total sixteen motifs i.e. four from each category of motifs were selected as per the preferences of experts for development of design. The motifs selected from floral & foliage category were motif number 29, 30, 11 and 8, from geometrical category motif number 8, 26, 2 and 15, from animal & bird category motif number 1, 26, 19 and 18 and from religious category motif number 2, 13, 28 and 30.

4.2 Development and Selection of Designs

This section includes development of designs for stoles using selected Madhubani motifs and selection of designs on the basis of preferences of experts.

4.2.1 Development of designs using selected motifs: To develop innovative designs for stoles, the selected sixteen Madhubani motifs were combined and arranged in systematic manner keeping their compatibility. Total Thirty designs were developed by all possible combinations of selected motifs of different categories using CorelDRAW X5 software. The developed designs are presented in Plate-6 (Enlarged design/ full scale designs are presented in Design catalogue at page number 12-17).

Developed Designs


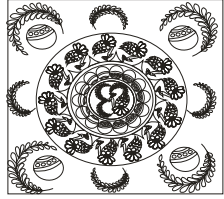

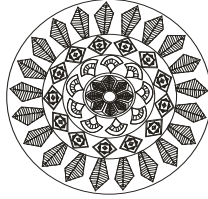
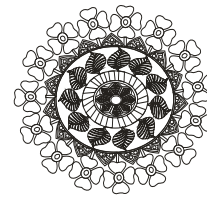
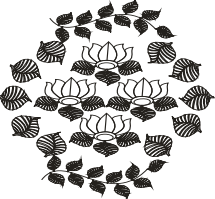
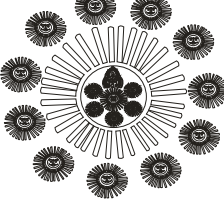
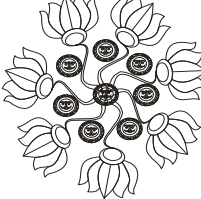
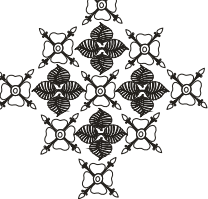


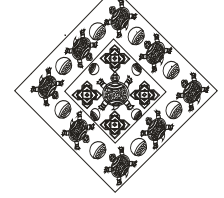

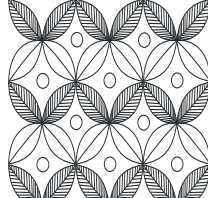


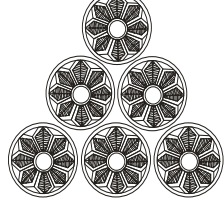
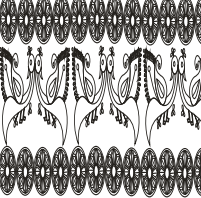

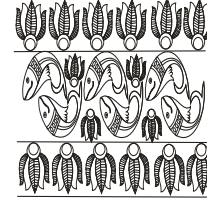

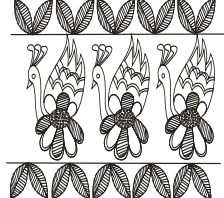
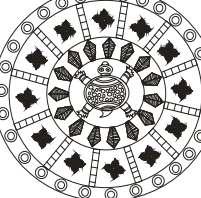
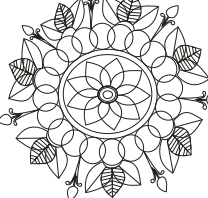
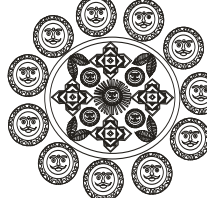
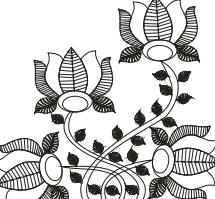
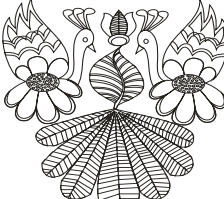
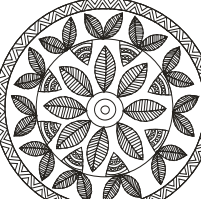
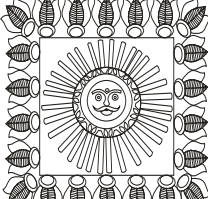

				
1(G2 R1,4)	2(B1, G1)	3(F2, G3, B 2)	4(G1,2)	5(F1,3, G1)
				
6(F1,2)	7(R1, 2)	8(F2, R1)	9(F1,3)	10(F1, R4, G3)
				
11(G3, R1, 2)	12(G2, B5)	13(F1, 2, R1)	14 (R1, G3)	15(A2, R1)
				
16(R1, 3)	17(G1, 3)	18(G1, B4)	19(F1,G3,A2)	20(F2, A2)
				
21(F3, A3, R1)	22(B1, R1)	23(F1,G1,R5)	24(F3, G3)	25(G2, R1)
				
26(F2, R1)	27(F1,2, B1)	28(G1,R1)	29(F2, G1)	30(F2, G2, B1)

Plate-6

4.2.2 Selection of designs: All the developed designs were subjected for visual evaluation by the experts and their preferences were obtained for selection of designs for development of stoles.

The data incorporated in the Table 5 regarding preferences of experts for designs developed for stoles elucidate that the most preferred design was design number 14 created by combining motifs number R1 and G3 scoring highest weighted mean score 2.69 and ranked I followed by design number 20 ranked II (WMS 2.65), which was created using motifs number F2 and A2, design number 29 was at rank III (WMS 2.60) and in this design motifs number F2 and G1 were used, design number 22 (WMS 2.44) ranked IV which was developed using motifs number B1 and R1 and design number 23 got rank V with weighted mean score 2.33 in which F1, G1 and R5 motifs were combined to create design.

Table 5: Preferences of experts for developed designs (n=30)

Design No.	WMS	Rank	Design No.	WMS	Rank
1	1.81	XXVIII	16	1.83	XXVII
2	1.90	XXIV	17	2.19	XIII
3	1.95	XXII	18	2.11	XVIII
4	2.14	XV	19	2.03	XXI
5	2.12	XVII	20	2.65	II
6	1.72	XXX	21	2.25	IX
7	2.23	XI	22	2.44	IV
8	2.18	XIV	23	2.33	V
9	2.29	VII	24	1.81	XXVIII
10	2.23	XI	25	1.87	XXVI
11	2.09	XIX	26	2.28	VIII
12	1.88	XXV	27	2.13	XVI
13	2.32	VI	28	2.24	X
14	2.69	I	29	2.60	III
15	2.07	XX	30	1.93	XXIII

Note: Refer page number 12-17 of design catalogue for full scale designs.

The other developed designs obtained declining order of preferences were design number 13 (WMS 2.32), 9 (WMS 2.29), 26 (WMS 2.28), 21 (WMS 2.25), 28 (WMS 2.24), 7 (WMS 2.23), 10 (WMS 2.23), 17 (WMS 2.19), 8 (WMS 2.18), 4 (WMS 2.14), 27 (WMS 2.13), 5 (WMS 2.12), 18 (WMS 2.11), 11 (WMS 2.09), 15 (WMS 2.07), 19 (WMS 2.03), 3 (WMS 1.95), 30 (WMS 1.93), 2 (WMS 1.90), 12 (WMS 1.88), 25 (WMS 1.87), 16 (WMS 1.83), 1 (WMS 1.81) and 24 (WMS 1.81). Design number 6 with lowest weighted mean score 1.72 was ranked XXX.

The data envisaged that the design number 14, 20, 29, 22 and 23 were five top ranked designs (Plate 7) and selected for development of design placements for stoles.

Selected Designs for Placement on Stoles

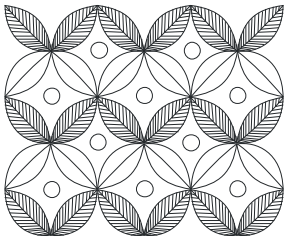
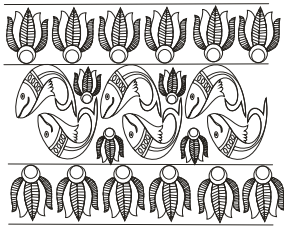
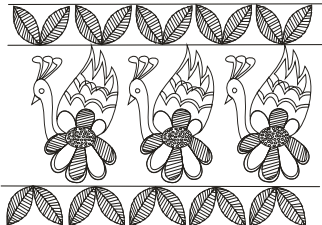
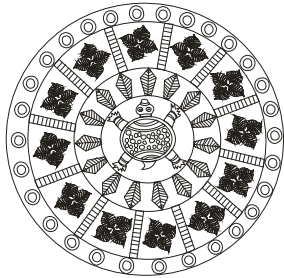
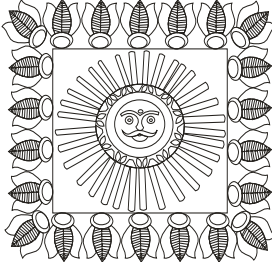
Design No.	Selected Designs	WMS	Rank
14		2.69	I
20		2.65	II
22		2.44	IV
23		2.33	V
29		2.60	III

Plate-7

4.3 Creation and Selection of Design Placements for Stoles

This section includes preferential choices of experts for created design placements. Total twenty five placements were developed by arranging selected five designs in five different manners on stoles. The developed placements are presented in the Design Catalogue. All the developed design layouts were got evaluated by thirty experts and their preferential choices for placement of designs are presented in Table 6

Table 6: Preferences of experts for created design placements for stoles (n=30)

Design No.	Placements of selected designs (WMS)				
	Placement I	Placement II	Placement III	Placement IV	Placement V
14	2.13	2.26	2.50	2.23	1.93
20	2.00	1.93	2.33	1.86	1.80
22	2.26	2.20	2.06	2.13	2.15
23	1.98	2.13	1.93	1.86	1.96
29	2.31	2.02	2.06	2.13	2.35

Note: Refer page number 19-23 of design catalogue for full scale placements.

The data about preferences of experts for created design layouts depicted in the Table 6 highlight that the most preferred placement of design number 14 was placement III scoring highest weighted mean score 2.50, followed by placement II scoring with weighted mean score 2.26, placement IV with weighted mean score 2.23 and placement I with weighted mean score 2.13. The placement V was the least preferred placement scoring weighted mean score 1.93.

The table represents that design number 20 was most preferred in placement III scoring weighted mean score 2.33 followed by placement I with weighted mean score 2.00, placement II with weighted mean score 1.93 and placement IV with weighted mean score 1.86. The placement V was least preferred placement as it scored lowest weighted mean score 1.80.

Data reveal that design number 22 was preferred most by the experts in the placement I scoring highest weighted mean score 2.26 followed by placement II with weighted mean score 2.20, placement V with weighted mean score 2.15, placement IV with weighted mean score 2.13. The placement III got lowest weighted mean score 2.06.

The data in Table 6 clearly elucidate that for design number 23 the most preferred placement was placement II as it scored highest weighted mean score 2.13 followed by placement I with weighted mean score 1.98, placement V with weighted mean score 1.96 and placement III with weighted mean score 1.93. The least preferred placement was placement IV with weighted mean score 1.86.

Further the table shows that design number 29 with placement V was preferred the most (WMS 2.35) followed by placement I (WMS 2.31), placement IV (WMS 2.13), placement III (WMS 2.06) and the least preferred placement was placement II (WMS 2.02).

It is thus concluded that the most preferred design layouts of selected five designs were placement III of design number 14 and 20, placement I of design number 22, placement II of design number 23 and placement V of design number 29 (Plate-8). Hence these design placements were selected for development of different colourways for screen printing and hand embroidery.

Selected Design Placements for Stoles

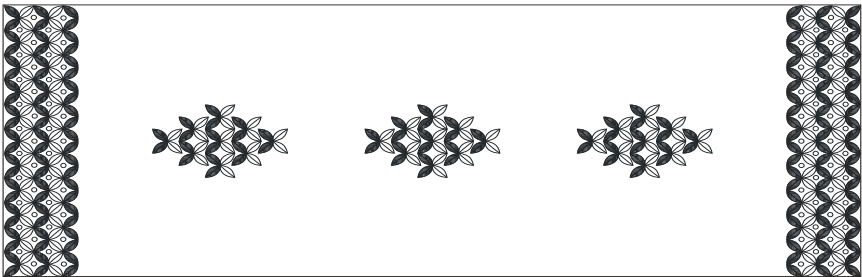
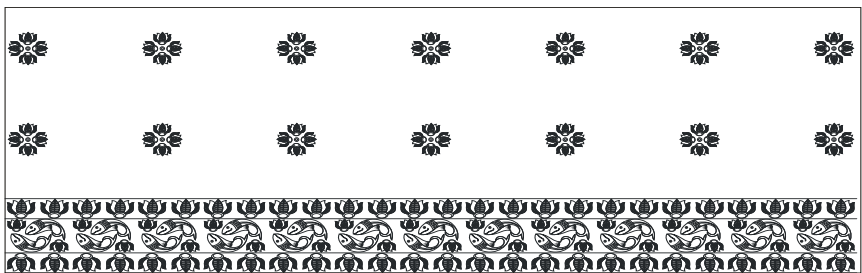
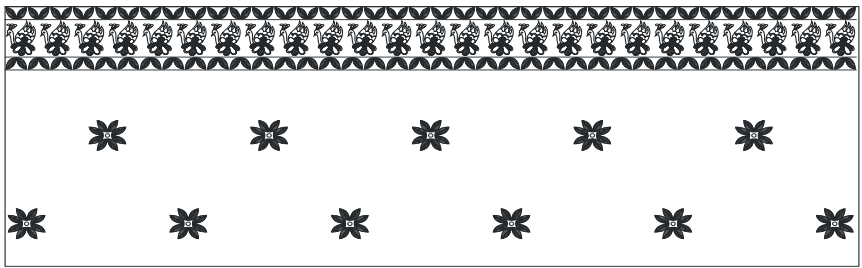
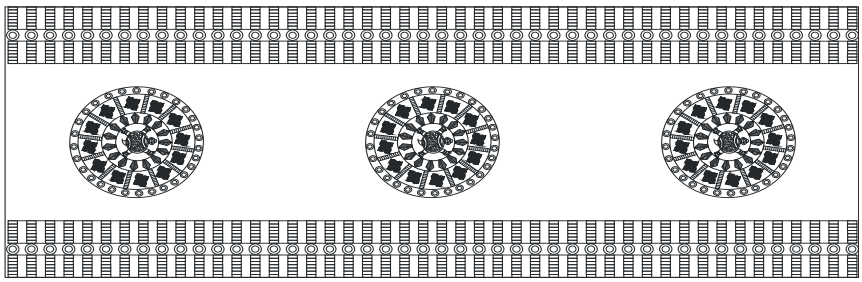
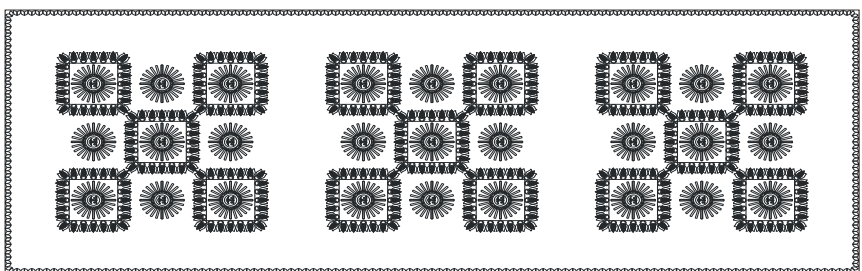
Design No.	Selected Placements	WMS
14	 <p align="center">Placement III</p>	2.50
20	 <p align="center">Placement III</p>	2.33
22	 <p align="center">Placement I</p>	2.26
23	 <p align="center">Placement II</p>	2.13
29	 <p align="center">Placement V</p>	2.35

Plate-8

4.4 Selection of Material for Stoles

The preferential choices of experts for selection of fabric and base colour of fabric for development of stoles have been presented in this section (Table 7 to 9).

4.4.1 Selection of fabric for stoles: For selection of fabric, all the five collected fabric samples were screen printed and there after hand embroidery was done. The prepared samples were shown to the experts for selection of suitable fabric. The data regarding preferences of experts for fabric for stoles is furnished in Table 7 and figure 1.

Table 7: Preferences of experts for fabric for stoles

Fabric	WMS	Rank
Sample 1	1.89	III
Sample 2	1.70	IV
Sample 3	1.65	V
Sample 4	2.79	I
Sample 5	2.65	II

The table elucidates that for stoles, sample 4 of art silk was the most preferred fabric scoring highest weighted mean score 2.79 and ranked I followed by sample 5 with weighted mean score 2.65 ranked II, sample 1 with weighted mean score 1.89 ranked III, sample 2 with weighted mean score 1.70 ranked IV and the sample 3 was assigned rank V with lowest mean score value 1.65.

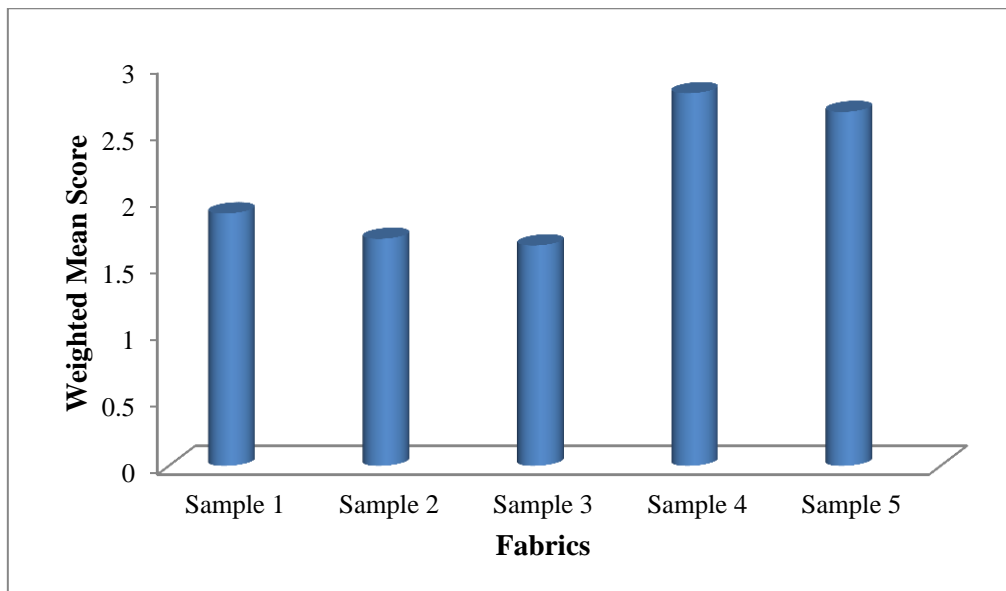















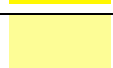






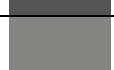




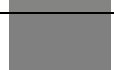













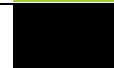









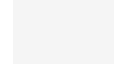
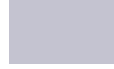



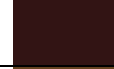






Fig. 1: Preferences of experts for fabric for stoles

4.4.2 Selection of base colour for stoles: The data regarding preferential choices of experts for base colour have been presented in Table 8.

Table 8: Preferences of experts for base colour for stoles

(n= 30)

Colour Name	Colour	WMS	Colour Name	Colour	WMS	Colour Name	Colour	WMS	Colour Name	Colour	WMS	Colour Name	Colour	WMS
Red		1.23	Navy Blue		1.41	Golden Yellow		1.27	India Green		1.24	Brown		1.50
Cadmium Red		1.30	Oxford Blue		1.29	Canary Yellow		1.50	Dark Pastel Green		1.40	Golden Brown		1.85
Candy Apple Red		1.64	Midnight Blue		1.40	Lemon		1.71	Dark Spring Green		1.31	Pastel Brown		1.76
Ferrari Red		1.39	Royal Blue		1.05	Pastel Yellow		2.30	Dark Olive Green		1.30	Davy'S Grey		1.83
Dark Pastel Red		1.23	Sky Blue		1.63	Pastel Orange		1.55	Bright Green		1.24	Battleship Grey		1.95
Dark Pink		1.36	Dark Magenta		1.38	Dark Orange		1.52	Lawn Green		1.27	Dim Gray		1.47
Flamingo Pink		1.26	Purple Heart		1.42	Portland Orange		1.25	Apple Green		1.31	Cool Grey		1.79
Pastel Magenta		1.70	Dark Lavender		1.39	Cadmium Orange		1.37	Android Green		1.51	Ash Grey		1.88
Cherry Blossom Pink		1.21	Dark Pastel Purple		1.61	Green		1.15	Black		1.44	Beige		2.24
Baby Pink		1.51	Lavender		2.27	Dark Green		1.20	White		2.68	Pastel Gray		2.20
Pastel Pink		2.35	Yellow		1.33	British Racing Green		1.17	White Smoke		2.38	Lavender Gray		1.91
Blue		1.33	Chrome Yellow		1.57	Cadmium Green		1.51	Seal Brown		1.00			
Duke Blue		1.44	Titanium Yellow		1.20	Forest Green		1.43	Dark Brown		1.10			

WMS = Weighted Mean Score

Table 8: Preferences of experts for base colour for stoles

The data depicted in table 8 highlighted that as per preferences of experts, white colour was most preferred with highest weighted mean score i.e. 2.68. The other colours preferred in descending order were smoke white (WMS 2.38), pastel pink (WMS 2.35) pastel yellow (WMS 2.30) and lavender (WMS 2.27). The least preferred colour for base fabric was seal brown (WMS 1.00).

It is thus inferred that most preferred base colour of fabric used for the development of stole was white.

Table 9: Dry rubbing fastness grades of fabric samples

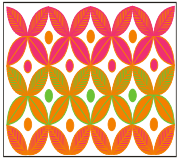
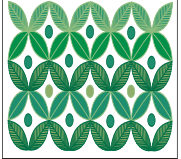
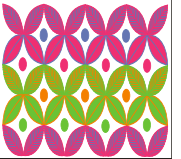



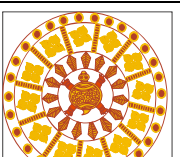
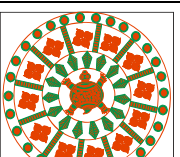
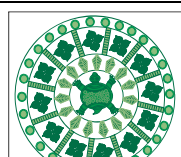

Fabrics	Dry rubbing fastness grades	
	Colour change	Colour staining
Sample 1	4/5	5
Sample 2	3/4	4/5
Sample 3	4	4/5
Sample 4	5	5
Sample 5	4/5	5

It is observed from the table that dry rubbing fastness grades for colour change was 5 i.e. excellent for sample 4, 4/5 (very good) for sample 1 and 5 whereas good (4) for sample 3 and fairly good (3/4) for sample 2. The colour staining rating was 5 indicating excellent rubbing fastness to colour staining for sample 4, sample 5 and sample 1 whereas 4/5 (very good) for sample 2 and sample 3. Thus fabric sample 4 which was preferred the most and also exhibited excellent rubbing fastness grades was selected for preparation of stoles.

4.5 Preparation and Selection of Colourways

This section of the chapter comprises of creation of colourways for development of stoles using screen printing and hand embroidery technique of fabric enrichment along with preferential choices of experts for developed colourways. Twenty five colourways, five colourways for each selected design placement, were prepared using various colour schemes i.e. analogous, complementary, monochromatic, tetrad and triad with the help of CorelDRAW X5 software and presented in Design Catalogue. The preferences of experts for developed colourways were sought and data have been furnished in Table 10 and figure 2.

Table 10: Preferences of experts for colourways for screen printing and hand embroidery on stoles (n=30)

Design No.	Colourway I (Analogous)	Colourway II (Complementary)	Colourway III (Monochromatic)	Colourway IV (Tetrad)	Colourway V (Triad)
14	 2.53	 1.86	 2.26	 1.60	 1.93
20	 2.13	 2.40	 1.80	 2.06	 1.80
22	 2.26	 2.00	 1.73	 2.11	 2.00
23	 1.86	 2.20	 2.06	 2.13	 2.06
29	 1.66	 2.06	 1.80	 2.00	 2.28

Note: Refer page number 25-29 of design catalogue for full scale colourways.

The data depicted in the Table 10 regarding the preferences of experts for colourways indicate that the most preferred colour way for design number 14 was colourway I scoring highest weighted mean score 2.53. It was followed by colourway III with weighted mean score 2.26, colourway V with weighted mean score 1.93, colourway II with weighted mean score 1.86 and colourway IV with weighted mean score 1.60.

In case of design number 20, colourway II scored the highest weighted mean score 2.40 followed by colour way I with weighted mean score 2.13, colourway IV with weighted mean score 2.06, and colourway III and V with weighted mean score 1.80.

It is apparent from the data in Table 10 that for design number 22 colourway I was favoured most by the experts which scored highest weighted mean score 2.26 followed by colourway IV with weighted mean score 2.11, colourway II and V with weighted mean score 2.00 and colourway III got lowest weighted mean score 1.73.

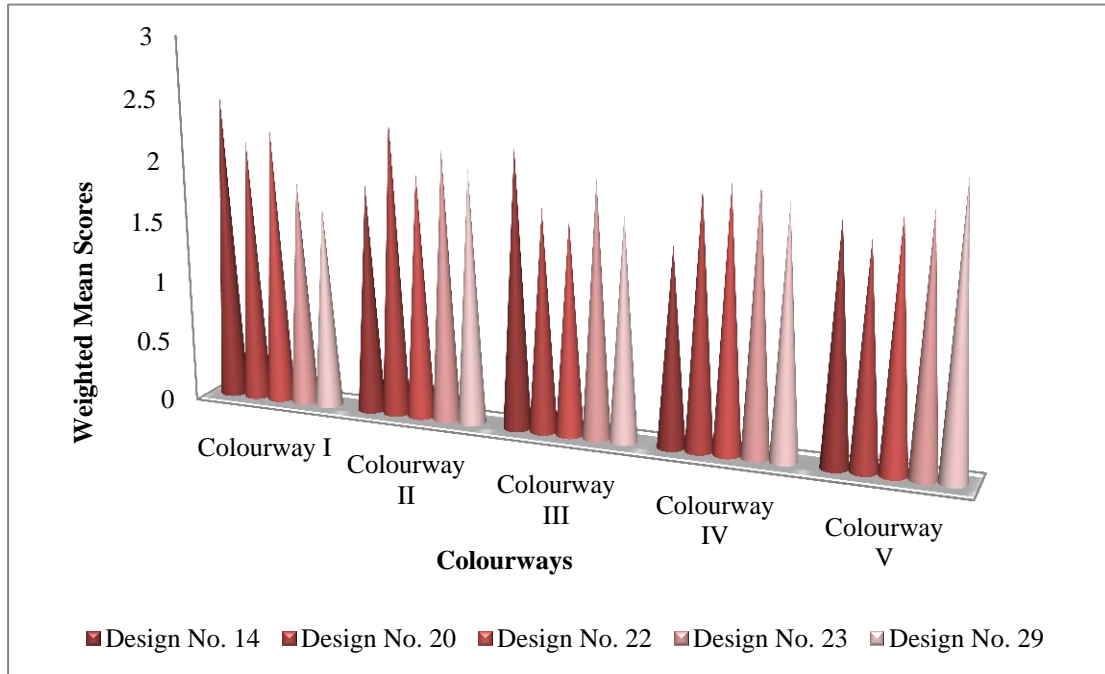


Fig. 2 Preferences of experts for colourways for stoles

Colourway II of design number 23 was highly preferred colourway with weighted mean score 2.20, followed by colourway IV with weighted mean score 2.13, colourway III and V with weighted mean score 2.06, whereas colourway I was least preferred with lowest weighted mean score 1.86.

As per preferences of experts colourway V with weighted mean score 2.28 was adjudged the best colourway for design number 29 followed by colourway II with weighted mean score 2.06, colourway IV with weighted mean score 2.00, colourway III with weighted mean score 1.80 and the least preferred was colourway I with weighted mean score 1.66.

It is inferred that for each selected design the most preferred colourway for development of stoles using screen printing and hand embroidery was colourway I with analogous colour scheme for design number 14 and 22, respectively. Whereas colourway II with complementary colour scheme was top preferred for design number 20 and 23, respectively. Similarly colourway V with triad colour scheme was most preferred for design number 29.

Hence, analogous colour scheme for design number 14 & 22, complementary colour scheme for design number 20 & 23 and triad colour scheme for design number 29 were selected for development of stoles through screen printing and hand embroidery (Plate 9)

Selected Colour Ways for Screen Printing and Hand Embroidery on Stoles

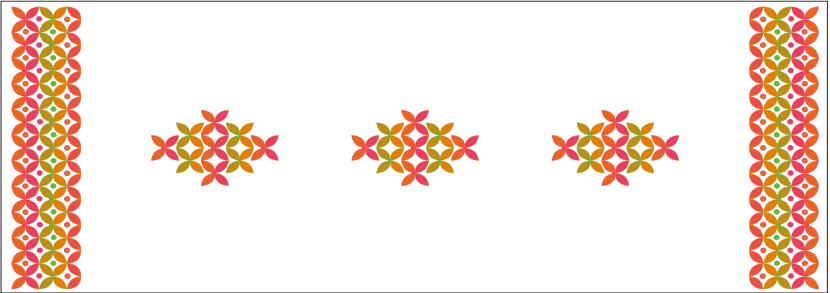
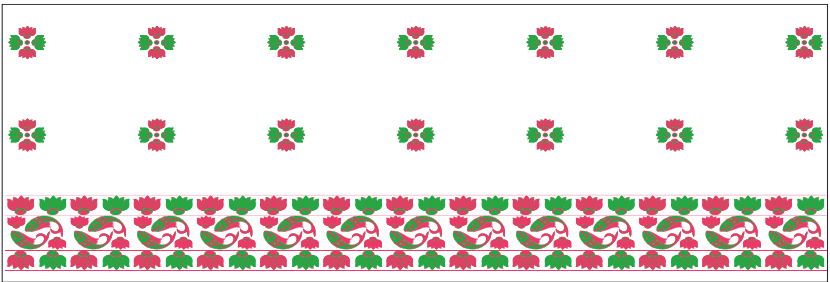
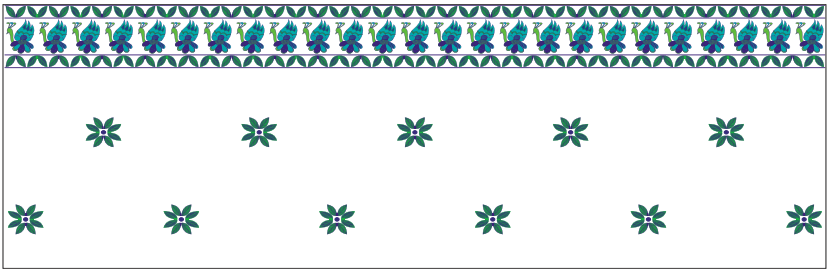
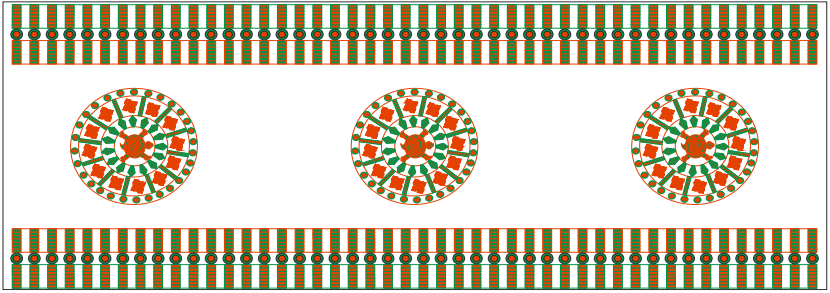
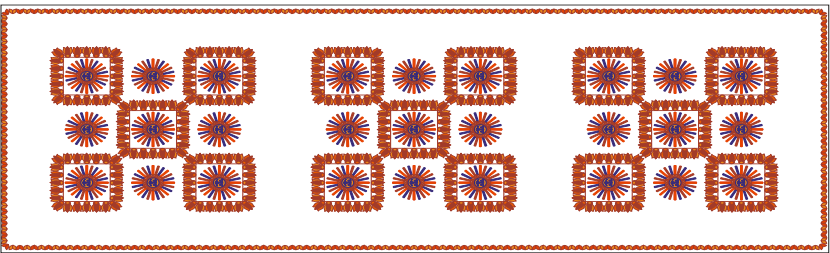
Design No.	Selected Colour Ways	WMS
14	 <p align="center">Colourway I (Analogous)</p>	2.53
20	 <p align="center">Colourway II (Complementary)</p>	2.40
22	 <p align="center">Colourway I (Analogous)</p>	2.26
23	 <p align="center">Colourway II (Complementary)</p>	2.20
29	 <p align="center">Colourway V (Triad)</p>	2.28

Plate-9

Table 11: Preferences of experts for selection of finishing/ embellishment material for developed stoles (n=30)

Finishing/embellishment materials	WMS	Rank
A. Finishing material		
Lace	2.76	II
Piping	2.87	I
Facing	2.52	IV
Frills	2.65	III
<i>Gotta</i>	2.43	V
B. Embellishment material		
Tassels	2.77	I
Pompom	2.63	II
Crochet	2.38	V
Braid	2.49	IV
Cords	2.55	III

The data depicted in the Table 11 regarding the preferences of experts for finishing material for developed stoles indicate that the most preferred finishing material was piping with highest weighted mean score 2.87 ranked I. Lace with weighted mean score 2.76 was placed at rank II, frills with weighted mean score 2.65 ranked III, facing with weighted mean score 2.52 ranked IV and *gotta* was least preferred with weighted mean score 2.43 ranked V.

The data regarding embellishment material indicate that tassels were favored most by the experts which scored highest weighted mean score 2.77 and ranked I. Pompom with weighted mean score 2.63 was placed at rank II, cords with weighted mean score 2.55 ranked III, braid with weighted mean score 2.49 ranked IV and crochet got lowest weighted mean score 2.38 ranked V. Hence, piping and tassels were selected for finishing/embellishment of developed stoles.

4.6 Development of Products and their Cost Determination

Five stoles were developed through screen printing and hand embroidery technique of fabric enrichment on white art silk fabric with selected five designs in their most preferred placements and most preferred colourways. Running and back stitches were used for embellishment of screen printed stoles. The developed stoles are presented in Table 12 to 15.

4.6.1 Determination of cost of the developed stoles: Costing of developed stoles was done on the basis of cost of raw material (fabric+ finishing/embellishment material), printing and embroidery charges. The cost of each stole was calculated and is presented in Table 12.

The developed stoles are presented in plate 10 to 14.

Table 12: Cost of developed stoles

Developed Stoles	Cost parameters(₹)		Total Cost (₹)
	Raw material (Fabric + Finishing/ Embellishment material)	Printing + Hand Embroidery	
I	750	550	1300
II	750	700	1450
III	750	700	1450
IV	750	600	1350
V	750	700	1450

The data in Table 12 envisage that the total cost of stoles II, III and V was ₹1450/-. The total cost of stole IV was ₹1350/- and for stole I the total cost was ₹1300/-. The cost of stole II, III, and V was highest whereas the cost of stole I was lowest. The main factor responsible for variation in the total cost of stoles was printing and embroidery charges for selected designs.

4.7 Assessment of Developed Stoles for Consumers' Acceptability

The developed stoles were got assessed from the thirty consumers on different parameters. Consumers' opinion for each stole were also taken regarding suitability of Madhubani motifs for screen printing and hand embroidery, design, placements of designs, colour combination, suitability of screen printing and hand embroidery technique, marketability etc. All the parameters were assessed on three point rating scale. Opinion of consumers regarding appropriateness of cost of developed stoles was analyzed using percentages. The results related to assessment of developed stoles are presented in Table 13 to 15.

4.7.1 Assessment of screen printed and hand embroidered stoles on designing parameters and overall appearance: The screen printed and hand embroidered stoles were assessed by consumers on designing parameters and overall appearance and the results are given in Table 13 and figure: 3.

Table 13: Assessment of developed stoles on different parameters**(n=30)**

Developed stoles	Designing Parameters								Overall Appearance	
	Motifs		Design		Placement of Designs		Colour ways			
	WMS	Rank	WMS	Rank	WMS	Rank	WMS	Rank	WMS	Rank
I	2.53	III	2.33	V	2.46	IV	2.52	III	2.40	V
II	2.66	II	2.60	II	2.73	I	2.64	II	2.73	I
III	2.46	IV	2.40	IV	2.53	III	2.40	IV	2.53	III
IV	2.80	I	2.66	I	2.60	II	2.81	I	2.66	II
V	2.40	V	2.53	III	2.33	V	2.33	V	2.46	IV

WMS- Weighted Mean Score Very appealing: 3.00-2.33, Appealing: 2.33-1.66, Least appealing: 1.66-1.00

- (i) **Designing parameters:** The consumers evaluated each developed stole on the basis of motif, designs, placements and colourways for screen printing and hand embroidery on three point rating scale.
- (a) **Motif:** It is apparent from the data furnished in Table 13 that on the basis of motifs used, stole IV was found most appealing as it scored highest weighted mean score 2.80 and obtained I rank followed by stole II (WMS 2.66) ranked II, stole I (WMS 2.53) ranked III, stole III (WMS 2.46) ranked IV and the stole V ranked V with weighted mean score 2.40.
- (b) **Design:** The table elucidates that developed design of stole IV was found to be most appealing by the consumers as it scored highest weighted mean score 2.66 and ranked I followed by stole II (WMS 2.60) ranked II, stole V (WMS 2.53) ranked III, stole III (WMS 2.40) ranked IV and the stole I (WMS 2.33) obtained V rank in terms of developed design.
- (c) **Placement of designs:** The data pertaining to preferences of experts regarding placements of designs incorporated in Table 13 reveal that stole II was adjudged as most appealing by consumers as it obtained I rank with weighted mean score 2.73 followed by stole IV (WMS 2.60) ranked II, stole III (WMS 2.53) ranked III, stole I (WMS 2.46) ranked IV whereas stole V got V rank with lowest weighted mean score 2.33.

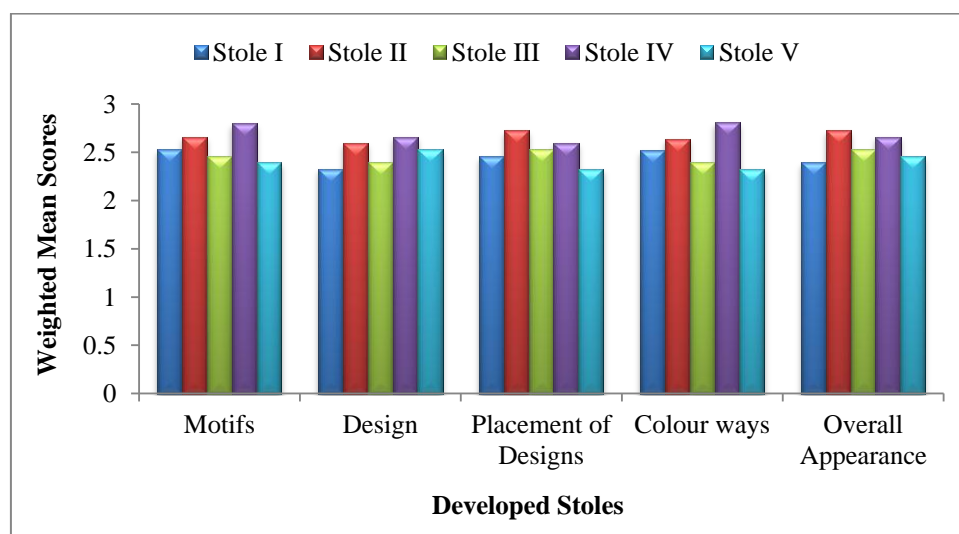


Fig. 3: Assessment of developed stoles on different parameters

- (d) **Colourways:** The data indicate that colourway of stole IV was adjudged the best by the consumers as depicted by its highest weighted mean score 2.81 ranked I followed by stole II (WMS 2.64) ranked II, stole I (WMS 2.52) ranked III, stole III (WMS 2.40) secured IV rank and stole V was least preferred (WMS 2.33) in terms of colourways.
- (ii) **Overall appearance:** The developed stoles were also got evaluated for their overall appearance by the consumers.

The weighted mean scores for overall appearance of developed stoles furnished in Table 13 predict that stole II was rated as most appealing by the consumers as it scored

Stole-I



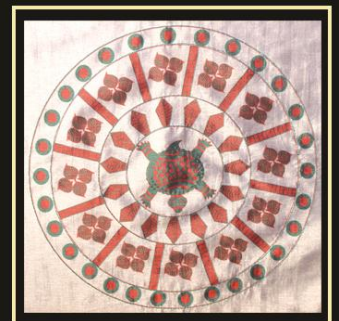
Stole-II



Stole-III



Stole-IV



Stole-V



highest weighted mean score (2.73) ranked I followed by stole IV (WMS 2.66) ranked II, stole III (WMS 2.53) ranked III and stole V (WMS 2.46) ranked IV while stole I was at V rank with weighted mean score 2.40.

It is thus summarized that stole II was rated most appealing with respect to placement of designs and overall appearance, whereas motif, design and colourway of stole IV were highly appreciated. It is also inferred that all the developed stoles were highly appreciated by the consumers as depicted by the values of weighted mean score which were above 2.33 for all the developed stoles.

4.7.2 Opinion of the consumers regarding developed stoles: The opinion of consumers for screen printed and hand embroidered stoles regarding suitability or appropriateness of motifs, designs, placements of designs, colour combinations, quality of workmanship, market potential etc. was taken on three quantum scale. The data related to the opinion of the consumers regarding developed stoles are presented in Table 14 and figure: 4.

Table 14: Opinion of the consumers regarding developed stoles (n=30)

Statements	Developed stoles (WMS)					AWMS
	I	II	III	IV	V	
Use of Madhubani motifs for screen printing and hand embroidery is unique	2.53	2.63	2.46	2.43	3.00	2.61
The selected motifs are suitable for development of design for stoles	2.70	2.36	2.53	2.50	2.70	2.55
Designing effect produced by selected motifs is innovative	2.40	2.43	2.36	2.40	2.56	2.43
Developed design is appropriate for stole	2.76	2.60	2.50	2.40	2.50	2.55
Developed design give an elegant and sophisticated look to stole	2.60	2.46	2.33	2.43	2.40	2.44
Developed design is suitable as per technique	2.40	2.36	2.43	2.63	2.46	2.45
Placement of designs is unique and proportionate to the stole	2.60	2.40	2.40	2.36	2.36	2.42
Colour combination of screen printing and hand embroidery with base colour is appropriate	2.63	2.70	2.60	2.53	2.73	2.63
Size, shape, placement and colour way of design has created harmony	2.80	2.66	2.40	2.36	2.56	2.55
Screen printing and hand embroidery is suitable for stole	2.70	2.46	2.46	2.56	2.33	2.50
The screen printed and hand embroidered stole is attractive and unique	2.73	2.53	2.36	2.60	2.43	2.53
Screen printing and hand embroidery is innovative and as per fashion trend	2.33	2.50	2.33	2.46	2.60	2.44
The fabric selected is suitable for stole and technique	2.53	2.53	2.56	2.66	2.46	2.54
Designing effect produced by combination of screen printing and hand embroidery enhanced the aesthetic appeal of the developed stoles	2.70	2.73	2.75	2.69	2.82	2.73
The use of embroidery stitches is appropriate as per design	2.68	2.70	2.71	2.64	2.79	2.70
The quality of workmanship is very good	2.46	2.56	2.43	2.36	2.50	2.46
The developed stole is acceptable as per market trend	2.50	2.43	2.50	2.33	2.56	2.46
The developed stole have good market potential	2.56	2.63	2.60	2.76	2.46	2.60
I would like to purchase this type of stole	2.50	2.46	2.63	2.50	2.63	2.54
Average mean score for acceptability of developed stoles	2.58	2.53	2.49	2.50	2.57	

WMS- Weighted Mean Score Strongly agree: 3.00-2.33, Agree: 2.33-1.66, Somewhat agree: 1.66-1.00

The data in the Table 14 highlight that consumers had very high opinion about developed stoles as weighted mean score values were above 2.33 indicating that consumers strongly agreed for each parameter of assessment and a very little difference was observed between weighted mean scores of developed stoles on each opinion statement. The average weighted mean score of all the stoles ranged from 2.49 to 2.58 highlighting that all the developed stoles were very well accepted by consumers.

It is thus concluded that the respondents had very high opinion regarding the developed stoles in terms of designing effect produced by combination of screen printing and hand embroidery enhanced the aesthetic appeal of the developed stoles (AWMS 2.73), the use of embroidery stitches is appropriate as per design (AWMS 2.70), colour combination of screen printing and hand embroidery with base colour is appropriate (AWMS 2.63), use of Madhubani motifs for screen printing and hand embroidery is unique (AWMS 2.61), the developed stole have good market potential (AWMS 2.60), size, shape, placement and colour way of design has created harmony, the selected motifs are suitable for development of design for stoles, developed design is appropriate for stole (AWMS 2.55 each), the screen printed and hand embroidered stole is attractive and unique, I would like to purchase this type of stole (AWMS 2.54 each), screen printing and hand embroidery is innovative and as per fashion trend (AWMS 2.53), the quality of workmanship is very good, the developed stole is acceptable as per market trend (AWMS 2.46 each), developed design is suitable as per technique (AWMS 2.45), developed design give an elegant and sophisticated look to stole, the fabric selected is suitable for stole (AWMS 2.44 each), designing effect produced by selected motifs is innovative (AWMS 2.43) and placement of designs is unique and proportionate to the stole (AWMS 2.42).

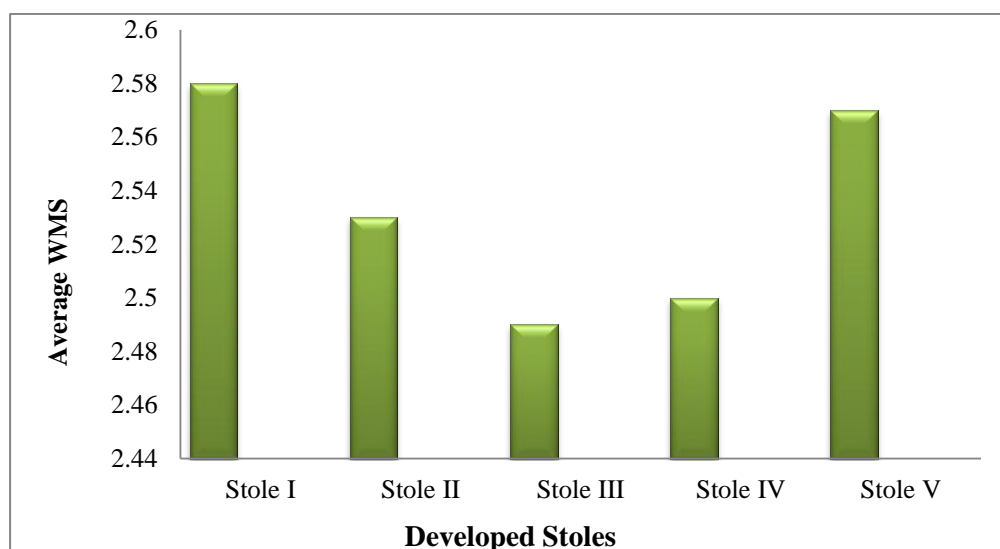


Fig. 4: Acceptability scores for developed stoles

4.7.3 Opinion of consumers regarding the cost of developed stoles: The developed stoles were got evaluated by the consumers for the cost whether high, appropriate or low and results are presented in Table 15.

Table 15: Opinion of consumers regarding the cost of developed stoles

(n=30)

Developed stoles	Cost (₹)	Opinion regarding cost	
		Appropriate	
		Frequency	Percentage
I	1300/-	30	100
II	1450/-	30	100
III	1450/-	30	100
IV	1350/-	30	100
V	1450/-	30	100

It is clear from the table that cent percent respondents adjudged the cost of all the developed stoles as appropriate and none of the respondents rated the cost of developed stoles as high or low. It is thus inferred from the data that all the consumers rated the cost of developed stoles as appropriate and none of them rated it as low or high.

4.8 Preparation of Design Catalogue

A design catalogue on ‘Innovative Designs for Stoles’ was prepared. It comprised of 120 traditional Madhubani motifs classified under floral & foliage (30), geometrical (30) animal & birds (30) and religious motifs (30) categories; 30 designs developed using selected sixteen motifs; 25 design placements- five for each selected five designs and 25 colour ways five for each selected five design placements with the help of suitable CAD software i.e. CorelDRAW X5 and Adobe Photoshop to develop a repository of designs.

The present investigation was conducted to create the innovative designs utilizing traditional motifs of Madhubani for application on stoles through screen printing and hand embroidery technique. The results of the present investigation have been discussed as under:

- 5.1 Collection and selection of Madhubani motifs
- 5.2 Development and selection of designs
- 5.3 Creation and selection of design placements
- 5.4 Selection of material for stole
- 5.5 Preparation and selection of colourways
- 5.6 Development of products and their cost determination
- 5.7 Assessment of developed stoles for consumers' acceptability
- 5.8 Preparation of design catalogue

5.1 Collection and Selection of Madhubani Motifs

Motifs play an important role in designing and provide significant elements for creating designs. Each motif, has an origin and variety in shape and presentation. Designing is a deliberate creation wherein feelings, information, minds and acumen are used for organization of lines, frames, hues, shapes and surfaces in a decorative way. The traditional Madhubani motifs were collected from secondary sources and screened for their suitability for stole and screen printing and hand embroidery technique. The collected 120 motifs were categorized in four categories i.e. floral & foliage, geometrical, animal & bird and religious motifs. Out of 120 motifs, sixteen motifs i.e. top ranked four motifs from each category were chosen as per the experts' preferences for design development. The motifs selected from floral & foliage category were motif number 8, 11, 29 and 30, from geometrical category motif number 2, 8, 15 and 26, from animal & bird category motif number 1, 18, 19 and 26 and from religious category motif number 2, 13, 28 and 30 were selected for design development. These motifs may have been favored by the experts being appealing, selective and portraying the social and cultural legacy of Madhubani.

Latif *et al.*, 2012 described that motifs play a significant role in designing as beauty of any design depends on its motifs. The traditional motifs provide stability and discipline, give attention in detail and adhere to high standards. The traditional Indian motifs give motivation to design textiles for personal and household uses and can be changed to make them appealing to masses.

Chaudhary and Pant, 2014 described that various animals and birds motifs are used in almost all traditional Indian embroideries signifying that nature has been a main source of inspiration.

According to **Anonymous, 2016** Indian artisans have created varied motifs and patterns which were exclusive in their styles and colour combinations like creeping vines and floral patterns, which remind us of Mughal history and the Islamic portrayals. Motifs like lotus, conch shells, fish, elephant and horse etc. which represents the philosophy of Hinduism and the concept of good-luck, health and prosperity are typically found in the textiles worn in the occasional ceremonies.

Rani, 2016 emphasized that folk arts in India apparently has a great potential in international market because of its traditional aesthetic sensibility and authenticity. As a motivation from henna arts, 186 traditional henna motifs were screened from secondary sources. The screened motifs were classified as floral & foliage, *kunj/paisley*, animal, bird & insect and human motifs. Twenty motifs were got selected from express for creation of designs for sari.

Sushila et al., 2016 collected traditional Chikankari embroidery motifs from books, journals, internet, museums, art galleries etc. for development of designs for *kurti*. As per experts preferences, 15 motifs were selected and sketched in CorelDRAW-12. Thirty designs were developed for adaptation in *kurti* using fabric painting.

Pooja et.al., 2019 collected 70 motifs of Kathiawar embroidery and found that floral and animal & bird motifs are commonly found in Kathiawar embroidery as compared to geometrical motifs especially on apparel.

5.2 Development and Selection of Designs

Design is the creation of a plan or approach for the construction of an object, system or measurable human interaction. Design has different connotations in different fields. The execution of a good design needs the consideration of certain essential factors such as the motif or subject matter, arrangement of motifs and style of rendering combined with the use of colour. All the selected Madhubani motifs were analyzed critically and each of the preferred motif was combined with different motifs using computer technology for creating innovative designs for stoles. Thirty new designs were made with chosen sixteen motifs i.e. four from each category. It was inferred that design number 14, 20, 22, 23, and 29 were five top favoured designs which were selected for preparation of design placements for stoles. The inclinations of experts for these designs might be due to the reason that the designs were distinctive and innovative.

Gupta and Joseph, 2015 developed designs for table cloth using Auto CAD software. Forty Greek motifs in eight different categories *i.e.* animal, human figure, pottery, foliage, stylized, architectural, geometrical and stylized floral fauna were used to develop

twenty designs. The developed designs were shown to the respondents for their preferences with reference to different parameters *i.e.* innovation, placement of motifs and overall appearance.

Sharma and Paul, 2015 collected motifs from Madhubani and Warli Paintings from the available literatures, paintings and from web for the designing of apparel. Collected motifs were arranged in varied combinations for creation of designs. The designing was done through CAD softwares *i.e.* CorelDRAW and Adobe Photoshop. A total of 9 designs, three for each apparel *i.e.* *saree*, dress material and *kurti* were developed. Two most favoured designs were selected from each category on the basis of arrangements of motif, designs, colour combinations, appropriateness of designs for specific item and suitability of created designs to Madhubani and Warli designs.

Singh, 2018 collected Madhubani motifs through books, internet and magazines. Total three designs were selected for designing three garments. The selected motifs were traced on garments *i.e.* *sari*, *kurti* and *poncho* and embellished through button and fabric painting.

5.3 Creation and Selection of Design Placements

Placements of designs refer to arrangement/layouts of a design in the outline of a design plan for selected articles. Placement of any designs is formed into one standard unit containing a particular course of action for desired plans. The selected five designs were put in five different arrangements on stole. A total twenty five placements were created and out of twenty five placements most preferred one placement of each design was selected for development of stole. The preferential choices of experts revealed that placement III of design number 14 and 20, placement I of design number 22, placement II of design number 23 and placement V of design number 29 were favoured the most. The inclinations of experts for these design placements might be appealing and innovative placements on stole. Further, these design placements were chosen for development of various colourways for screen printing and hand embroidery.

Dave and Babel, 2013 made an attempt to simulate textile designs from Mewar paintings for sari using CAD software. Developed 15 designs were placed on sari using CorelDRAW software to choose the best five placements, before real embroidery on sari. Findings of the study revealed that the designs were very innovative, creative and as per the current market need and were highly appreciated by the judges.

Sharma and Garg, 2014 designed indo western garments with tantric motifs using stencil printing technique. On the basis of motifs, placements of motifs, printing and overall aesthetic appeal all the garments developed with tantric motifs in black and white colour were found marketable and liked by the respondents.

Sharma *et al.*, 2016 developed contemporary designs using traditional motifs. Top preferred designs were used for creation of design placements on sari. The selected design

placements were created on saris using appliqué in selected colour way. The developed saris were appreciated by majority of consumers on various design parameters.

5.4 Selection of Material and Base Colour for Stole

For development of stole the most preferred fabric was sample number four and most preferred colour was white. The experts might have preferred the fabric due to its good drapability, fine texture, smooth clarity and sharpness of design outline and printing effect reflected on the surface. The reason for choosing white colour for stole may be due to the fact that the neutral colours always remain in trend and different printing and embroidery colours looks progressively appealing on lighter base. Women of all age groups can use this colour and white base colour can be used with different dresses in matching or contrast colour combination.

According to **Rani, 2017** net fabric in beige colour with light intensity was most preferred fabric for preparation for digital embroidery and cutwork multipurpose border.

5.5. Preparation and Selection of Colourways

Colour scheme is the selection of hues used in designs to create not only the styles but various sorts of illustration as well. Five colourways for each chosen five design placements were made for screen printing and hand embroidery on stoles using distinctive colour schemes i.e. analogous, complementary, monochromatic, tetrad and triad with the assistance of CorelDRAW X5. Thus using five design placements, total twenty five colourways were created and got evaluated from the experts. The most preferred colourways for screen printing and hand embroidery of chosen design placements on stoles were colourway I of design number 14 and 22, colourway II of design number 20 and 23, and colourway V of design number 29. The colour schemes used in chosen colourways were analogous in design number 14 and 22, complementary in design number 20 and 23 and triad in design number 29. These preferred colourways were used for the development of stoles through screen printing and hand embroidery. The judges might have favoured these colour ways the most for the reasons that these made the designs more appealing, enriched the fabric surface and improved the aesthetic appearance.

Devi and Srivastava, 2011 created sari designs utilizing traditional motifs of Manipur. The created designs and placements were applied in four distinctive colourways and according to liking of judges, top preferred three colourways were chosen for developing final products.

Srivastava and Rajvanshi, 2014 collected ten Rajasthani miniature paintings to reproduce two designs from each one of the selected miniature painting for creating colourways using CAD technology for use on fashion apparel.

5.6 Development of Products and their Cost Determination

Five screen printed and hand embroidered stoles were developed utilizing the most liked colourways of selected five design placements through screen printing and hand embroidery technique. Piping and tassels were used for finishing of prepared stoles. The cost of each developed stole was calculated by adding expenses incurred on raw material, printing and finishing of the stoles. The actual cost of all the five developed stoles ranged between ₹ 1300/- to 1450/-. The variation in total cost was due to difference in printing and embroidery charges as per intricacy of selected designs and number of colours used for printing the design. A stole is conceived as an integral accessory for the Indian women's attire and has been well accepted by the women of almost all the age groups. In spite of the limited scope for any change in the garment, stole seems to have a limitless future because of the endless experimentation used to recreate its beauty for every new generation of women.

Vedika et al., 2014 developed thirty designs using Warli motifs with the assistance of Adobe Photoshop and CorelDRAW softwares, ten each for *kurti*, *suit* and sari. The selected designs were applied on selected attire using block printing technique. The adaptation of Warli motifs on women's attire through block printing has found the way for product diversification

Sharma and Paul, 2015 applied designs on saris, dress materials and *kurti* using digital printing technique and cost of each prepared product was calculated on the basis of money spent on raw materials including fashion fabric, lining materials and trimmings used, digital printing of the fabric, design conversion charges and stitching etc. The cost of each article was calculated separately. The prepared articles were highly appreciated and well accepted with regards to colour combination and cost effectiveness.

Boruah and Kalita, 2016 concluded that the traditional designs were found suitable for printing on the eri silk fabric with screen printing, which enriched the surface of the fabric as well as added beauty to the fabric. In respect of design evaluation brilliancy of colour, clarity of design and sharpness of design outline were also acceptable.

Gayathri and Sunitha, 2018 developed designs inspired from Madhubani art for hand painting on skirts for adolescent girls. The cost of developed hand painted skirts ranged from ₹ 1155/- to 1500/- which was found affordable by middle income group.

Patil, 2018 reported that seventy five student trainees prepared Madhubani painting samples using fabric colors on unbleached fabric. Motifs selected for painting were two headed peacock, single headed peacock, fish and lotus. The prepared samples were analyzed by the experts of Textile science and Apparel Design Department and renowned fashion designers of Nashik. It was concluded that the selected samples can be used for value addition on apparel viz. crop top, palazzo, *kurti*, sari blouse etc.

Sharma, 2018 used different finishing and embellishment material i.e. lace for curtain, *gotta*/ band for table mat and piping for cushion cover, *mudha* cover and ladies shirt.

Singh, 2018 calculated the cost of developed apparels on the basis of expenses incurred on raw materials and other essential items. 20 percent labour charges were added in the total cost of the final products. The total cost of sari was ` 1,122/- *kurti* was ` 708/- and Poncho was ` 389/-. It was concluded that the cost of all the garments was appropriate.

5.7 Assessment of Developed Stoles for Consumers' Acceptability

The screen printed and hand embroidered stoles were got evaluated from the consumers based on designing parameters and overall appearance. All the developed stoles were rated extremely appealing in relation to motifs, designs, placement of designs, colourways and overall appearance. Stole IV was ranked I in respect to motif, design and colourway, stole II obtained I rank for placement of design and overall appearance. The consumers also had very high opinion about the developed stoles in relation to use and appropriateness of Madhubani motifs, design development, uniqueness of designs, placements, colourways used for printing, suitability of screen printing and hand embroidery technique, quality of workmanship and market potential etc. The cost of all the developed stoles with screen printing and hand embroidery was considered as appropriate by all the respondents.

Renu, 2016 worked on adaptation of *kasuti* embroidery motifs for hand painted textile articles using CAD. A total of six articles, three fabric painted jackets and three fabric painted file folders were developed as per the selected designs, their placements and colourways. Developed articles were assessed by sixty consumers for their acceptability on various parameters. Created designs and fabric painting technique were highly acceptable parameters while design placements, colourways and embroidery technique were acceptable parameters of all the designs by consumers.

Sharma, 2016 prepared fusion designs by CAD using Madhubani and Warli painting designs. The developed designs were effectively applied on different clothes and handicraft articles using digital printing. Prepared articles were exceptionally valued and very much acknowledged as to visual assessment and cost effectiveness. The adaptation of prepared designs on the clothing using advanced printing methods facilitated the faster production with high precision in short span.

Babel and Chouhan, 2017 stated that Kalamkari painting is a beautiful art form of Andhra Pradesh. The study was carried out for documentation of Kalamkari painting and develops value added shoes through hand painting. Total thirty designs were developed keeping in mind their suitability for shoes. Developed design sheets were subjected to visual

evaluation and finally ten pair of shoes were prepared using ten most suitable designs and all the prepared shoes were highly preferred by the consumers.

Gayathri and Sunitha, 2018 prepared skirts for adolescent girls inspired from traditional Madhubani motifs. The selected designs were beautifully hand painted on fabrics for skirts. The selected Madhubani designs, colours and constructed fashion garments were liked by the adolescent girls.

5.8 Preparation of Design Catalogue

A design catalogue on 'Innovative Designs for Stoles' was prepared using appropriate textile designing software i.e. CorelDRAW X5 and Adobe Photoshop to build up a repository of designs. It included 120 traditional Madhubani motifs classified under floral & foliage (30), geometrical (30) animal & bird (30) and religious motifs (30) categories; 30 developed designs; 25 designs placements- five for each selected five designs and 25 colourways- five for each selected five design placements. This catalogue will be helpful in referring the developed Madhubani designs in various placements, colour ways and use on different articles. Indian traditional motifs can be innovatively used by entrepreneurs and designers for adaptation on different surfaces for serving the universe of style and expanding mindfulness about our rich social legacy.

Sharma and Paul, 2015 highlighted that CAD innovation opens the roads for the designers to satisfy the regularly changing requests of customers particularly for the individuals who are in search for the ethnic motifs in designs in their clothing and other textile items and to save these designs by creating a digital design library, which could be accessed as and when required.

Islam et al., 2018 concluded that CAD is a technology for design and technical documentation, which replaces manual drafting with an automated process. CAD helps to construct documentation, explore design ideas, visualize concepts and simulate how a design performs in the real world. CAD allows engineers to design variants with nominal physical models to achieve lower product development costs, better speed, better productivity, quality guarantee, and faster time-to-market.

Khemani, 2019 highlighted that CAD software is being used on large scale by professionals for various applications. The most common application of CAD software is designing and drafting. The CAD software helps the designer in synthesizing, analyzing, visualizing the final product that is to be made and documenting the design. All these factors help in drastically improving the productivity of the designer that translates into fast designing, lower designing cost and shorter completion times. The CAD systems offer greater accuracy; the errors are reduced drastically in the designed product leading to better design. Eventually, better design helps carrying out manufacturing faster and reducing the wastages.

India has one of the finest textile traditions in the world with respect to fabric construction and surface embellishment. Printing and embroidery are most preferred techniques used for the fabric enrichment to make it more attractive and fascinating. Printing is the process of transferring design through rollers, screen, block and so on onto a textile material with print paste and it includes roller printing, screen printing, block printing, heat transfer printing, polychromatic, electronic printing, etc. Screen printing is a most versatile method of fabric decoration that enhances the appeal of the particular product to a great extent. Hand embroidery is a means of creative expression of nature; patience and perseverance in making beautiful articles, expressed through the art of embroidery. It is a media of decorating fabric and other materials with needle and thread. Screen printing with the combination of hand embroidery has an advantage to express one's creativity or ideas to develop something unique to cater to the needs of consumers who are always in search of new and innovative.

Creative designing is where the designers play with the arrangement of line, form and colour to give magnificence to the final result. Introduction of CAD extend extraordinary precision in designing and quick visualization of the placement of designs facilitating the creations of new designs and improving existing designs with shortened time duration. CAD technology is highly advantageous in relation to speed, design creation, editing, repeating, adaptability, assortment, colour ways and cost effectiveness. Therefore, a study on 'Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles' was conducted with following specific objectives:

- To create designs for stoles using Madhubani painting motifs
- To develop silk stoles through combination of screen printing and hand embroidery
- To assess the acceptability of developed stoles

To achieve the planned objectives, a deliberate strategy was pursued. The traditional Madhubani motifs were gathered from, books, journals, magazines, websites etc. and screened for their suitability to screen printing and hand embroidery on stoles. The distinguished motifs were classified under four categories viz. floral & foliage, geometrical, bird & animal and religious motifs. For selection of motifs, a preferential choice index was developed and the screened motifs were shown to a panel of thirty experts which included faculty members and P.G students of I.C. College of Home Science, CCS Haryana Agricultural University, Hisar. Sixteen motifs i.e. four motifs from each category were chosen based on preferences of experts. All the chosen traditional Madhubani motifs were thoroughly

analyzed and used as a source of inspiration for creating innovative designs for stoles. Thirty designs were created in CorelDRAW X5 using whole or parts of selected sixteen motifs. The created designs were got evaluated by the experts and five top favoured designs were selected for placements of designs on stoles. Each preferred design was put in five distinct ways according to suitability of design. In this way, using five preferred designs, total twenty five design placements were made for stoles and these developed design placements were assessed by the experts using self structured preferential choice index. One best design placement of each selected design was chosen for the preparation of colourways. Preferences of experts were also sought for determination of fabric and its base colour for the preparation of stoles. Five colour ways for each five selected design placements were prepared using distinctive colour schemes viz. analogous, complementary, monochromatic, tetrad and triad. The top favoured colourway for each chosen design placements was used for screen printing and hand embroidery on stoles. Five stoles were developed through screen printing and hand embroidery technique using most liked colourways for the preferred five design arrangements. The calculation of cost was done for the screen printed and hand embroidered stoles including the cost of raw material, printing, embroidery and finishing charges. The developed stoles were got assessed from thirty consumers on various parameters like, motif used, designs developed, created placements and colourways using three point rating scale. The opinion of the consumers with respect to screen printed and hand embroidered stoles was taken using self-developed opinion scale. The created stoles were also assessed for appropriateness of cost.

The major findings of the study are summarized as follows:

6.1 Collection and Selection of Madhubani Motifs

From the collected 264 Madhubani motifs, 120 motifs were screened as per their suitability for application on stoles with screen printing and hand embroidery technique. Results of the study highlighted that out of one hundred twenty motifs, sixteen most favoured motifs were motif number 8 (WMS 2.46), 11 (WMS 2.56), 29 (WMS 2.76) and 30 (WMS 2.60) in floral & foliage category, motif number 2 (WMS 2.66), 8 (WMS 2.80), 15 (WMS 2.56) and 26 (WMS 2.73) in geometrical category, motif number 1 (WMS 2.80), 18 (WMS 2.56), 19 (WMS 2.60) and 26 (WMS 2.66) in animal & bird category and motif number 2 (WMS 2.76), 13 (WMS 2.65), 28 (WMS 2.60) and 30 (WMS 2.57) in religious category of motifs. Hence, these motifs were chosen for development of designs.

6.2 Development and Selection of Designs

Total thirty designs were created using the whole or part of selected sixteen motifs with the help of suitable CAD software. The preferences of experts revealed that design number 14 (WMS 2.69), 20 (WMS 2.65), 22 (WMS 2.44), 23 (WMS 2.33) and 29 (WMS 2.60) got most noteworthy five positions and were chosen for preparation of design arrangements on stoles.

6.3 Creation and Selection of Design Placements

Total twenty five placements were prepared for the stoles by arranging selected five designs in five different layouts on stoles and out of these top five placements were selected for preparation of colourways. Results of preferences of experts for design placements inferred that the most liked placements of five designs were placement III of design number 14 (WMS 2.69) and 20 (WMS 2.65), placement I of design number 22 (WMS 2.44), placement II of design number 23 (WMS 2.33) and placement V of design number 29 (WMS 2.60). Therefore, these five placements were used for preparation of colourways for screen printing and hand embroidery on stoles.

6.4 Selection of Material for Stoles

Results of preferential choices of experts regarding type of fabric and its base colour indicated that sample IV of art silk fabric in white colour was most preferred for preparation of screen printed and hand embroidered stoles.

6.5 Preparation and Selection of Colourways

Five colourways for each selected design placement were prepared with the help of CorelDRAW X5 software and got evaluated by the experts to select best colourway of each design for application on stole through screen printing and hand embroidery. Results of preferences of experts for colourways of selected design placements of chosen five designs for stoles revealed that colourway I of design number 14 (WMS 2.69) and 22 (WMS 2.44), colourway II of design number 20 (WMS 2.65) and 23 (WMS 2.33) and colourway V of design number 29 (WMS 2.60) were selected by the experts. The colour schemes used in selected colourways were analogous in design number 14 and 22, complementary in design number 20 and 23 and triad in design number 29. Thus these colourways were used for preparation of stoles using screen printing and hand embroidery technique.

6.6 Development of Products and their Cost Determination

Five stoles were created through screen printing and hand embroidery technique using the preferred design placements and colourway of chosen five designs. The cost was highest for stoles II, III and V i.e. was ₹ 1450/- and lowest for stole I i.e. ₹ 1300/-. The main factor responsible for variation in cost of stoles was intricacy of designs and colours used for printing of selected designs.

6.7 Assessment of Developed Stoles for Consumers' Acceptability

The developed stoles were got assessed by consumers based on designing parameters and overall appearance. The outcomes clearly demonstrated that all the developed stoles were adjudged very appealing in terms of motifs used, developed designs, placement of designs, colourways and their overall appearance as expressed by weighted mean score above 2.49. Results further highlighted that all the consumers had extremely high opinion regarding all the developed stoles for the use of Madhubani motifs, design innovation, uniqueness, size and shape of developed designs, placements, colour combination, suitability of screen printing

and hand embroidery technique as per selected fabric, motifs, design, quality of workmanship, market potential and so on. All the consumers rated the cost of all the screen printed and hand embroidered stoles as appropriate.

It is thus concluded that Indian traditional Madhubani art played an important role in creating new and innovative designs, to fulfill the urge of high- end consumers as well as designers own need of creating something new and innovative. The positive and overwhelming response of the consumers has clearly indicated that there is an endless possibility for the designers for aesthetically combining the Madhubani motifs to form designs for application on apparel, accessories, home furnishing and utility articles.

The use of CAD has helped in creating new and complex designs using Madhubani motifs and shortened the time associated with the whole procedure of designing. The adaptation of CAD made it possible to visualize the created designs in various colour combinations on monitor as well as to develop new patterns by systematic arrangement of different motifs proportionately; hence entire designs could be stored for future reference.

All the stoles developed using screen printing and hand embroidery techniques of Madhubani are commercially viable. The decent variety of designs and textile designing technique were used to make one of a kind and contemporary stoles to satisfy the passion of style seekers.

6.8 Preparation of Design Catalogue

A design catalogue on ‘Innovative Designs for Stoles’ was developed using computer technology for documentation containing 120 Madhubani motifs; thirty developed designs; twenty five design placements of five most favoured designs with different arrangements and twenty five colourways of five chosen design placements for screen printing and hand embroidery.

The recommendations based on the finding of the present investigation are:

Recommendations:

- The use of traditional Madhubani motifs is recommended for development of designs for stoles.
- The screen printing and hand embroidery technique of surface enrichment is recommended for development of innovative products.
- The created designs and design layouts can also be employed for designing variety of apparel, accessory, utility and home furnishing articles.
- Developed designs can be applied to textile products through different techniques of surface enrichment like digital embroidery, hand embroidery, printing, painting and combination of printing and embroidery.
- The developed designs can be given to entrepreneurs for mass production to help them to establishing small scale enterprises for developing a wide range of textile items.
- The findings of the study can be disseminated to the persons/ agencies working for revival of traditional crafts.

BIBLIOGRAPHY

- Agarwal R. 2015. Madhubani painting: Women dominated folk art. *International Journals of Applied Research*, **1**(11): 736-738.
- Ankita, Anamika and Mohan A. 2018. Mithila painting- A famous painting of Madhubani Bihar, influencing the fashion world. *University Research Resource Journal*,**1**(2): 7-12.
- Anonymous, 2019 b. CAD for textile designing. Retrieved from www.fkgroup.com on May 22, 2019.
- Anonymous, 2017. Retrieved from www.workwithcolour.com on May 20, 2017.
- Anonymous, 2019 a. The fine art of serigraphy. Retrieved from www.royalart.com on May 15, 2019.
- Anonymous. 2016. Colouremotion. Retrieved from www.colouremotion.com on Dec 5, 2016.
- Ashitey S. 2013. Innovative methods of developing patterns for textile screen printing. M.Sc.Thesis, Kwame Nkrumah University` of Science and Technology, Kumasi, Ghana.
- Babel R and Chouhan C. 2017a. Acceptability and marketability of the developed Madhubani shawls. *Asian Journal of Home Science*, **12**(2): 466-468.
- Babel R and Chouhan C. 2017b. Designing shoes through hand painting using Kalamkari designs. *Asian Journal of Home Science*, **12**(2): 579-582.
- Bhandari V. 2017. Development of borders through extra yarn figuring using adapted Aipan designs for application on apparel and accessories. M.Sc. Thesis, G. B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand.
- Bhargav D and Goel A. 2014. Computer aided designing of carpets for the weavers of Uttarakhand. *Textile Trends*,**57**(1-7): 37-41.
- Boruah S and Kalita B. 2016. Utilization of natural printing paste for textile application. *Asian Journal of Home Science*, **11**(1): 136-141.
- Chacko N and Garg S. 2010. Development of products for interior enrichment using Madhubani painting for budding entrepreneurs. *Asian Journal of Home Science*, **4**(2): 278-280.
- Chaudhary JB and Pant S. 2014. Animals and birds as design ornamentation in traditional Indian embroideries. *International Multidisciplinary Research Journal*,**3**(9):1-10.
- Chouhan C. 2016. Development of shawls through hand painting using Madhubanimotifs. M.Sc. Thesis, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan.
- Das N. 2013. Madhubani paintings: Its existence and possibility. *International Journal of Scientific and Research Publications*, **3**(2): 1-7.
- Dave J and Babel S. 2013. Computer aided designing of sarissimulated from Mewar paintings. *Asian Journal of Home Science*, **8**(2): 499-501.
- Devi AI and Srivastava M. 2011. Adaptation of traditional designs on sarees of Meitei community of Manipur. *Asian J of Home Sci*,**6**(2): 254-257.
- Devi S, Punia P, Pruthi N and Sisodia N. 2017. Development of Kantha embroidery motifs to designs: Traditional to contemporary. *International Journal of Current Microbiology and Applied Sciences*, **6**(7): 4479-4488.

- Dormor C. 2014. Warp and weft: Woven textiles in fashion, art and interiors, *Journal of Textile, Cloth and Culture*, **12**(2): 255-257.
- Gayathri M and Sunitha R. 2018. Madhubani art- A design inspiration to develop motifs for hand painting on skirts for adolescent girls. *International Journal of Applied Home Science*, **5**(1): 124-136.
- Ghosh S. 2013. An interactive need assessment survey and design study of Madhubani painting of Jitbarpur, Madhubani district, Bihar. Design Clinic Scheme of MSME, 1-31.
- Gupta M and Gangwar S. 2016. Adaptation of designs for textile products inspired from Madhubani painting. *International Journals of Research Granthaalayah*, **4**(5): 115-125.
- Gupta V and Joseph R. 2015. Development of designs for table cloth through CAD software. *Asian Journal of Home Science*, **10**(1): 60-64.
- Indrie L, García PD, Kazlacheva Z, Montava I and Iliev J. 2019. The use of CAD/CAM for textile designs and fabrics. *Journal of the Faculty of Techniques and Technologies*, **7**(1): 24-28.
- Islam S, Urmy Z, Islam A, Ahmed S, Billah A and Islam R. 2018. A comparative study on different dimensions of CAD. *Trends Textile Eng Fashion Technol*, **1**(1): 5-5.
- Jain, J. 2011. Madhubani a contemporary history. *Proceedings of the Indian history congress*, **71**(10): 1243-1250.
- Jha V. 2015. Indigenous colours in Mithila - A historical perspective. *Indian Journal of History of Science*, **37**(1): 37-55.
- Jyoti GE and Grover ME. 2017. Designing and printing of bed cover using CAD technology. *Textile Trends*, **59**(7): 29-32.
- Kala S and Babel S. 2018. Development of Rajasthani folk motifs and its variations with computer aided designing. *International Journal of Advances in Agricultural Science and Technology*, **5**(11): 43-51.
- Kavita, 2016. Adaptation of traditional canvas embroidery motifs for fabric painting. M. Sc. Thesis, CCS Haryana Agriculture University, Hisar, Haryana.
- Khanna S. 2018. Contemporary apparel designing with traditional craft. *International Journal of Applied Home Science*, **5**(1): 148-154.
- Khemani H. 2019. Benefits of using the CAD Software: Advantages of the CAD Software. Retrieved from www.brighthubengineering.com on May 8, 2018.
- Kishore N, Paul S, Grover E and Maurya S. 2013. Adaptation of monumental motifs for textile application. *Asian Journal of Home Science*, **8**(2): 726-730.
- Latif S, Khan R, Durani F and Wahab Z. 2012. Textile designs based on Kashmiri wood work motifs identified and collected from the traditional buildings located at Muzaffarabad and Neelum Valley, Azad Kashmir. *Greener Journal of Art and Humanities*, **2**(1): 1-7.
- Matheson R. 2019. Customizing computer-aided design. Retrieved from [www. News.mit.edu](http://www.News.mit.edu) on April 4, 2019.
- Mathur K and Seyam AF. 2011. Colour and weave relationship in woven fabric. Retrieved from www.intechopen on July 13, 2017.
- Pandey R, Tomar SA and Sharma N. 2016. A recent role of CAD/CAM in designing, developing and manufacturing in modern manufacturing technologies. *Imperial Journal of Interdisciplinary Research*, **2**(3): 398-401.

- Pant S and Gahlot M. 2013. Aipan: Approaching towards fashion world. *Abstracted in 3rd National Conference on Recent Innovations in Engineering and Technology*, Ambala. March 24, 2012, p: 54.
- Patil K. 2018. Madhubani: A traditional art form from walls to apparels. *Journal of Humanities and Social Science*, **23**(12):73-76.
- Pooja, Singh V and Arya N. 2019. Adaptation of Kathiawar embroidery motifs to fabric painting. *International Journal of Microbiology and Applied Sciences*, **8**(2): 2073-2080.
- Rajvanshi R, and Srivastava M. 2013. Phad painting of Bhilwara, Rajasthan. *Asian Journal of Home Science*, **8**(2): 746-749.
- Rani D. 2016. Adaptation and application of Henna motif for fabric painting. M.Sc. Thesis, CCS Haryana Agriculture University, Hisar, Haryana.
- Rani R. 2017. Development of multipurpose borders through digital embroidery. M.Sc. Thesis, CCS Haryana Agricultural University, Hisar, Haryana.
- Renu, 2016. Adaptation of Kasuti embroidery motifs for hand painted textile article. M.Sc. Thesis, CCS Haryana Agricultural University, Hisar, Haryana.
- Sangama EM and Rani A. 2012. Development of designs for textile designing. *Textiles Trends*, **54**(3): 29-34.
- Sharma E. 2016. Digitalization of motifs based on Indian folk paintings through CAD and their adaptation on apparels using digital printing technique, *Research Journal of Family, Community and Consumer Sciences*, **4**(1): 1-10.
- Sharma A and Bains S. 2018a. Development of cotton *kurti* using Madhubani motifs. *International Journal of Home Science*, **4**(1): 145-150.
- Sharma A and Bains S. 2018b. Madhubani motifs: Documentation and their significance. *Asian Journal of Home Science*, **13**(1): 90-97.
- Sharma A and Gandotra V. 2017. Commercial viability of screen printed silk stoles using blue pottery motifs. *International Journal of Home Science*, **3**(2): 565-567.
- Sharma A, Singh SSJ and Rose NM. 2016. Development of motifs: Traditional to contemporary for saris. *Research Journal of Recent Sciences*, **5**(7): 44-46.
- Sharma A. 2017. Development of screen printed silk stoles using blue pottery motifs. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, Punjab.
- Sharma E and Paul S. 2015. Adaptation of Indian folk paintings for designing and digital printing of apparels using computer added designing. *International Journal of Applied Research*, **1**(9): 989-995.
- Sharma E, Paul S and Sheikh S. 2014. Fusion of indian folk arts madhubani and warli for designing of apparels using CAD. *International Journal of Interdisciplinary Research*, **1**(8): 1-6.
- Sharma E. 2015. Tribal folk arts of India. *Journal of International Academic Research for Multidisciplinary*, **3**(5): 300-308.
- Sharma M and Garg N. 2014. Designing of indowestern garments by using tantric motifs. *Asian Journals of Home Science*, **9**(1): 237-240.
- Singh A. 2018. Assessment of Madhubani motifs on apparels using garment accessories. *Periodic Research*, **6**(3):73-78.

- Srivastava M and Rajvanshi R. 2014. Developing colourways from Rajasthani miniature paintings using CAD technology. *Asian Journal of Home Science*, **9**(1): 169-178.
- Srivastava M and Vaishnav S. 2015. Adaptation of Warli motifs with computer aided designing for its contemporary uses. *International Journal of Applied Home Science Research*, **2**(5&6): 156-164.
- Sushila, 2016. Adaptation of Chikankari embroidery motifs for fabric painting. M.Sc. Thesis, CCS Haryana Agricultural University, Hisar, Haryana.
- Sushila, Yadav S, Khambra K and Rose NM 2016. Development of Designs using Chikankari embroidery motifs for fabric painting. *Annals of Biology*, **32**(1): 110-116.
- Thakur M. 2017. Mithila- a globalized art form. *International Journal of Research - Granthaalayah*, **5**(2): 208-212.
- Thakur U. 1982. Madhubani painting, Abhinava Publication, New Delhi. p:11-13, 27-29.
- Vaishnav S. 2015. Development of customized software on Warli folk art of Maharashtra for value addition. Ph.D. Thesis, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan.
- Vedika E, Grover E and Paul S. 2014. Adaptation of Warli art for the development of blocks for printing of apparel. *Asian Journal of Home Science*, **9**(2): 417-421.
- Yadav S and Gaba G. 2016. Annual report, All India Coordinated Research Project in Home Science, Department of Textile and Apparel Designing, I.C. College of Home Science, CCS Haryana Agricultural University, Hisar, Haryana.

ANNEXURE-I

Preferential Choice Index for Selection of Traditional Madhubani Motifs for Stoles

General Information

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

Specific information

Please rank the motifs in order of your preference. Selected motifs will be used to develop design for Stoles.

Madhubani Motifs

Motif No.	Motifs											
	Floral & foliage motifs			Geometrical motifs			Animal & Bird motifs			Religious motifs		
	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												

HP= Highly Preferred, P= Preferred, LP= Least Preferred

ANNEXURE-II

Preferential Choice Index for Selection of Designs for Stoles

General Information:

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

Specific information

Please rank the designs according to your preference. Selected designs will be used for development of stoles using screen printing and hand embroidery.

Motifs / parts of motifs	Design No.	Rank			Motifs / parts of motifs	Design No.	Rank		
		HP	P	LP			HP	P	LP
G2 R1,4	1				R1, 3	16			
B1 G1	2				G1, 3	17			
F2 G3 B 2	3				G1 B4	18			
G1,2	4				F1G3A2	19			
F1,3 G1	5				F2 A2	20			
F1,2	6				F3 A3 R1	21			
R1, 2	7				B1 R1	22			
F2 R1	8				F1 G1 R5	23			
F1,3	9				F3 G3	24			
F1 R4 G3	10				G2 R1	25			
G3 R1, 2	11				F2 R1	26			
G2 B5	12				F1,2 B1	27			
F1 2 R1	13				G1 R1	28			
R1 G3	14				F2 G1	29			
A2 R1	15				F2 G2 B1	30			

ANNEXURE-III

Preferential Choice Index for selection of Placements for Stoles

General Information:

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

Specific information

Please give your preferences for placements of designs on Stoles.

Design No.	Placements														
	I			II			III			IV			V		
	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)
14(I)															
20(II)															
22(III)															
23(IV)															
29(V)															

HP= Highly Preferred, P= Preferred, LP= Least Preferred

ANNEXURE-IV A

Preferential Choice Index for Selection of Fabric and Colour for Stoles

General Information:

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

Specific information

1. Please give your preference for fabric to be used for preparation of stoles.

Fabric	HP	P	LP
Sample 1			
Sample 2			
Sample 3			
Sample 4			
Sample 5			

ANNEXURE-IV (b)

Preferential Choice Index for selection of Colour of Fabric for Stole

General Information:

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

2. Please give your preferences for colour of fabric for stole

Colour	HP	P	LP	Colour	HP	P	LP	Colour	HP	P	LP	Colour	HP	P	LP	Colour	HP	P	LP
Red				Navy Blue				Golden Yellow				India Green				Black			
Cadmium Red				Oxford Blue				Canary Yellow				Dark Pastel Green				White			
Candy Apple Red				Midnight Blue				Lemon				Dark Spring Green				White Smoke			
Ferrari Red				Royal Blue				Pastel Yellow				Dark Olive Green				Seal Brown			
Dark Pastel Red				Sky Blue				Pastel Orange				Bright Green				Dark Brown			
Dark Pink				Dark Magenta				Dark Orange				Lawn Green				Brown			
Flamingo Pink				Purple Heart				Portland Orange				Apple Green				Golden Brown			
Pastel Magenta				Dark Lavender				Cadmium Orange				Android Green				Pastel Brown			
Cherry Blossom Pink				Dark Pastel Purple				Green				Beige				Davy'S Grey			
Baby Pink				Lavender				Dark Green				Pastel Gray				Battleship Grey			
Pastel Pink				Yellow				British Racing Green				Lavender Gray				Dim Gray			
Blue				Chrome Yellow				Cadmium Green				Cool Grey							
Duke Blue				Titanium Yellow				Forest Green				Ash Grey							

HP= Highly Preferred, P= Preferred, LP= Least Preferred

ANNEXURE- V

Preferential Choice Index for Selection of Colour Ways for Screen Printing and Hand Embroidery on Stoles

General Information

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualification:

Family type:

Specific information

Please give preference for developed colour ways for screen printing and hand embroidery of selected designs for development of stoles.

Design No.	Colour ways														
	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)	HP (3)	P (2)	LP (1)
14															
20															
22															
23															
29															

HP= Highly Preferred, P= Preferred, LP= Least Preferred

ANNEXURE-VI

Assessment Index for Evaluation of Screen Printed and Hand Embroidered Stoles for Consumers' Acceptability

General Information

Name of the respondent:

Occupation:

Age:

Monthly family income:

Educational qualifications:

Family type:

Specific Information

1. Please assess the developed stoles on designing parameters and overall appearance:

Developed stoles	Designing Parameters												Overall Appearance		
	Motif			Designs			Placements of Designs			Colourways					
	VA	A	LA	VA	A	LA	VA	A	LA	VA	A	LA	VA	A	LA
I															
II															
III															
IV															
V															

VA- Very Appealing, A- Appealing, LA- Least Appealing

2. Please give your opinion regarding developed stoles

Sr. No.	Statements	Developed stoles														
		Design no.14			Design no.20			Design no.22			Design no.23			Design no.29		
		SA	A	SWA	SA	A	SWA	SA	A	SWA	SA	A	SWA	SA	A	SWA
1.	Use of madhubani motifs for screen printing and hand embroidery is unique															
2.	The selected motifs are suitable for development of design for stoles															
3.	Designing effect produced by selected motifs is innovative															
4.	Developed design is appropriate for stole															
5.	Developed design gives an elegant and sophisticated look to stole															
6.	Developed design is suitable as per technique															
7.	Placement of designs is unique and proportionate to the stole															
8.	Colour combination of screen printing and hand embroidery with base colour is appropriate															
9.	Size, shape, placement and colour way of design has created harmony															
10.	Screen printing and hand embroidery is suitable for stole															

11.	The screen printed and hand embroidered stole is attractive and unique																		
12	Screen printing and hand embroidery is innovative and as per fashion trend																		
13	The fabric selected is suitable for stole and Technique																		
14	Designing effect produced by combination of screen printing and hand embroidery enhanced the aesthetic appeal of the developed stoles																		
15	The use of embroidery stitches is appropriate as per design																		
16	The quality of workmanship is very good																		
17	The developed stole is acceptable as per market trend																		
18	The developed stole have good market potential																		
19	I would like to purchase this type of stole																		

SA =Strongly Agree, A =Agree, SWA =Somewhat Agree

3. Please tick the acceptability level of the cost of screen printed and hand embroidered stoles:

Developed Stoles	Cost parameters(₹)					Total Cost (₹)	Opinion regarding cost		
	Fabric	Printing material	Labour cost				Appropriate	High	Low
			Embroidery	Printing	Finishing				
I									
II									
III									
IV									
V									

ABSTRACT

Title of thesis	:	Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles
Full name of degree holder	:	Pooja Rani
Admission No.	:	2016HS21M
Title of degree	:	Master of Science
Name and address of major advisor	:	Dr. Saroj Yadav, Assistant Professor Department of Textile and Apparel Designing I.C. College of Home Science, CCS Haryana Agricultural University, Hisar-125004, India
Degree awarding University/ Institute	:	CCS Haryana Agricultural University Hisar - 125004
Year of award of degree	:	2019
Major subject	:	Textile and Apparel Designing
Total No. of pages in thesis	:	58+iv+VIII+29
No. of words in the abstract	:	591

Key words: Motifs, Designs, Placements, Colourways, Adaptation, Madhubani, Screen Printing, Hand Embroidery, Stole

India had always been known as the land that portrayed cultural and traditional vibrancy through its conventional arts and crafts. Every region in India has its own style and folk art which are very ethnic and simple, and yet colorful and vibrant enough to speak volumes about the rich heritage. Folk art in India apparently has a great potential in the international market because of its traditional aesthetic sensibility and authenticity. The two most famous folk painting are Warli art of Maharashtra and Madhubani art of Mithila. The present study was conducted on adaptation of Madhubani motifs on stole through screen printing and hand embroidery. The 120 traditional Madhubani motifs were collected from secondary sources like books, journals, magazine and internet etc. and screened for their suitability to stole using screen printing and hand embroidery. The identified motifs were sketched manually and scanned from books, magazines etc. which were recreated and modified in CorelDRAW X5 and Adobe Photoshop to get the required complexity and elegance. The selected motifs were categorized in four categories viz. floral & foliage, geometrical, animal & bird and religious motifs and shown to the thirty experts to sought their preferences for selection of four top preferred motifs i.e. four from each category. Total thirty designs were prepared using selected sixteen motifs and got assessed from thirty experts for selection of five top preferred designs for preparation of design layout on stole. The base colour and fabric for stole were selected as per preferences of experts. Twenty five developed design placements were again shown to the experts and one best design placement of each selected five designs was selected for development of colour ways. Five colour ways for each selected five design placements were prepared and colour way that secured 1st rank was selected for development of stole through using screen printing and hand embroidery technique. The cost of each stole was determined by adding the cost of raw material, screen printing, hand embroidery and finishing charges. The screen printed and hand embroidered stoles were assessed for consumers' acceptability on different parameters. Out of the one hundred twenty motifs, sixteen motifs selected for design development were motif number 8, 11, 29 and 30 in floral & foliage motifs, motif number 2, 8, 15 and 26 in geometrical motifs category, motif number 1, 18, 19 and 26 in animal & bird motifs category and motif number 2, 13, 28 and 30 in religious motifs category. The five top preferred designs were design number 14, 20, 22, 23 and 29. Preferences of experts for placement of selected five designs were placement III of design number 14 and 20, placement I of design number 22, placement II of design number 23 and placement V of design number 29. Most preferred colour ways for screen printing and hand embroidery as per experts' choice were colour way I of design number 14 and 22, colour way II of design number 20 and 23 and colour way V of design number 29. Five stoles were developed through screen printing and hand embroidery as per preferred placements and colour ways of selected five designs. All the screen printed and hand embroidered stoles were found very enthralling and accepted by consumers on different assessment parameters. The cost of the stoles was rated appropriate by all the consumers. Thus, traditional Madhubani motifs adapted for development of designs for stole has expanded the design base for textile products and cater to the urge of high-end clients through variety of designs and unique combination of screen printing and hand technique.

MAJOR ADVISOR

DEGREE HOLDER

HEAD OF THE DEPARTMENT

CURRICULUM VITAE

- a) **Name of the Student** : Pooja Rani
b) **Date of Birth** : 10th August, 1994
c) **Place of Birth** : Hisar, Haryana
d) **Mother's Name** : Mrs. Kirshna Devi
e) **Father's Name** : Mr. Bhoop Singh
f) **Permanent Address** : House No. 819, VPO. Kirmara, Hisar Haryana
g) **Telephone** : ----
h) **Mobile** : 9467127106
i) **E-mail** : poojajanagal0@gmail.com
j) **Academic qualifications** :



Degree	University/ Board	Year of passing	Percentage of marks	Subjects
Matric	HBSE	2010	68.60	Hindi, English, Math, Social Science , Science & Technology and Sanskrit
Senior Secondary	HBSE	2012	71.60	English, Hindi, Accountancy, Business Studies and Mathematics
B.Sc. (Hons.)Home Sc.	CCS HAU, Hisar	2016	67.60	All Home Science and related subjects
M.sc (Textile and Apparel Designing)	CCS HAU, Hisar	2019	7.00	Textile and Apparel Designing

k) Co-curricular activities:

- i. Personality Development Training in CCSHAU, Hisar, 2013.
- ii. Attended NSS camp in village Kharia, Hisar, 2014.
- iii. Participated in Intensified Pulse Polio Immunization Campaign, Hisar, 2014.
- iv. Attended Training in Self defence, CCSHAU Hisar, 2014.
- v. Attended Interior Decoration Training in I.C. College of Home Science, CCSHAU, Hisar, 2015.
- vi. Implant Training in Rehabilitation Centre for Special Children, Chandigarh, 2016.
- vii. Attended Rural Home Work Experience training in village Bhichpadi, Hisar, 2016.

l) List of publications: Nil

POOJA RANI

UNDERTAKING OF THE COPY RIGHT

I, **Pooja Rani**, Adm. No. **2016HS21M** undertake that I give copy right to the CCS Haryana Agricultural University, Hisar of my thesis entitled '**Adaptation of Madhubani Motifs for Screen Printing and Hand Embroidery on Stoles**'. I also undertake that, patent, if any, arising out of the research work conducted during the program shall be filed by me only with due permission of the competent authority of CCS Haryana Agricultural University, Hisar.

(Pooja Rani)
Signature of student

**DESIGN CATALOGUE
ON
INNOVATIVE DESIGNS FOR STOLES**

Pooja Rani

Saroj Yadav

Neelam M. Rose



**Department of Textile and Apparel Designing
I.C. College of Home Science
CCS Haryana Agricultural University
Hisar**

2019

CONTENTS

Sr. No.	TITLE	PAGE No.
1	INTRODUCTION	1
2	COLLECTED TRADITIONAL MADHUBANI MOTIFS	2-10
3	DEVELOPED DESIGNS	11-17
4	PLACEMENTS OF SELECTED DESIGNS	18-23
5	COLOUR WAYS OF SELECTED DESIGN PLACEMENTS	24-29

INTRODUCTION

Textile designing is the most demanding and emerging field which is based on aesthetic sensibility of a person with a strong/immense knowledge of the technology. Use of computer for creating the design is one such technological approach by which decorative designs can be created for varied applications. Computer aided designing is not only used for creating the simple and complex designs but also advantageous with respect to speed, pattern creation, editing, repeating, variety, colour ways, time and cost effectiveness.

Arts serve both as a decoration and communication of emotion and ideas. Indian civilization being one of the oldest existing civilizations in the world today is blessed with rich culture and heritage. The rich treasure of traditional arts and crafts can be a source of inspiration to express creativity or ideas to develop something unique. Adaptation of traditional motifs using CAD is a new horizon to fulfill the demands of contemporary designs in the fashion industry to meet the rapid changing mood of the consumers for innovative designs both nationally and internationally (Mathur and Seyam, 2011 and Kishore *et al.*, 2013).

Painting in India has a very old tradition and evolved over the years to become a fusion of various cultures and traditions. The wall-painting or Mural paintings popularly known as Mithila painting or Madhubani painting is practiced in the Mithila region of Bihar state, India. Madhubani painting is the indication of the philosophical heights achieved by Indian civilization for the universal power of love, longing and peace. The beauty of the Madhubani painting is the exploration of the relationship between nature, culture and human psyche and the use of raw materials available to them in plenty. The Indian folk art form of Madhubani is now recognized worldwide and succeeded in creating a place for itself in the international house of fame (Gupta and Gangwar, 2016).

Traditional motifs of Madhubani can be used by the designer by interchanging motifs and their application through different colouration techniques for serving the fashion world. Design catalogue on 'Innovative Designs for Stole' is an attempt to develop design base for application of traditional Madhubani motifs on textile items through various fabric surface enrichment techniques like, embroidery, block printing, screen printing and fabric painting, etc. The developed design catalogue will give an idea to consumers about the traditional Madhubani motifs, developed designs from the motifs, possible design arrangements and different colour ways on the stoles. This developed design repository will ensure the preservation of the traditional motifs of Madhubani at the same time will fulfill the need of designers to create something new.

**Collected Traditional
Madhubani
Motifs**

Floral and Foliage Motifs



Motif No. 1



Motif No. 2



Motif No. 3



Motif No. 4



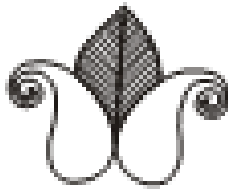
Motif No. 5



Motif No. 6



Motif No. 7



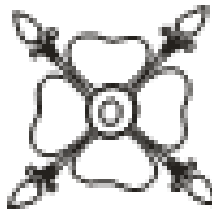
Motif No. 8



Motif No. 9



Motif No. 10



Motif No. 11



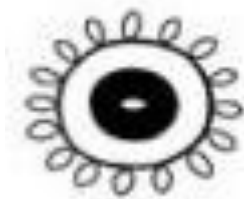
Motif No. 12



Motif No. 13



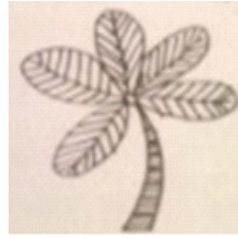
Motif No. 14



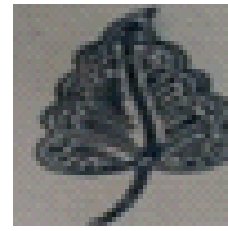
Motif No. 15



Motif No. 16



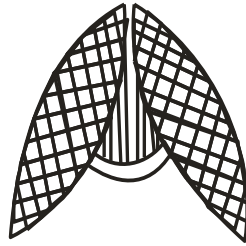
Motif No. 17



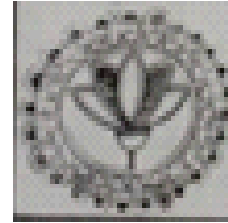
Motif No. 18



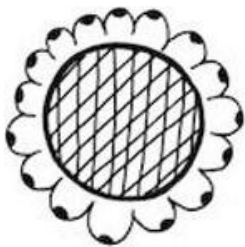
Motif No. 19



Motif No. 20



Motif No. 21



Motif No. 22



Motif No.23



Motif No. 24



Motif No. 25



Motif No. 26



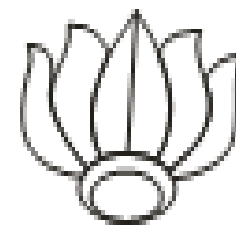
Motif No. 27



Motif No. 28



Motif No. 29

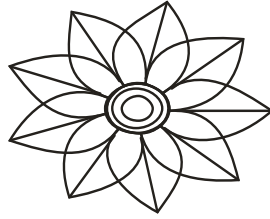


Motif No.30

Geometrical Motifs



Motif No. 1



Motif No. 2



Motif No. 3



Motif No. 4



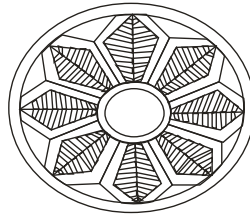
Motif No. 5



Motif No. 6



Motif No. 7



Motif No. 8



Motif No. 9



Motif No. 10



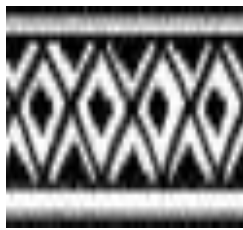
Motif No. 11



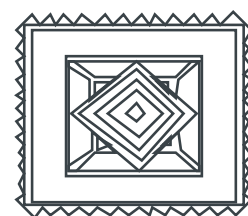
Motif No. 12



Motif No. 13



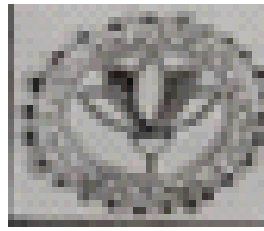
Motif No. 14



Motif No. 15



Motif No. 16



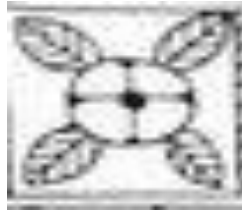
Motif No. 17



Motif No. 18



Motif No. 19



Motif No. 20



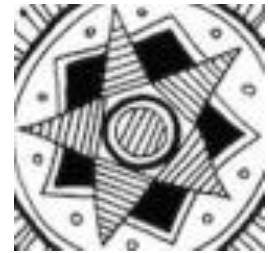
Motif No. 21



Motif No. 22



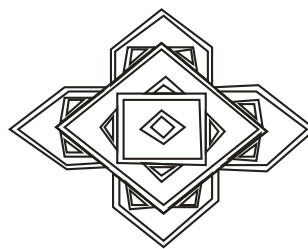
Motif No. 23



Motif No. 24



Motif No. 25



Motif No. 26



Motif No. 27



Motif No. 28

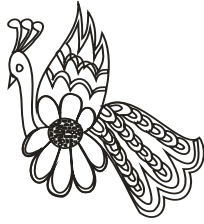


Motif No. 29



Motif No. 30

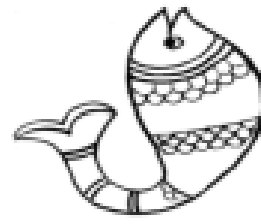
Animal & bird motifs



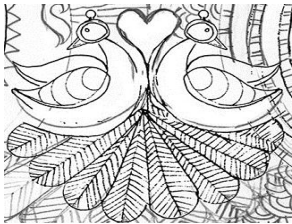
Motif No. 1



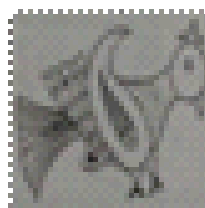
Motif No.2



Motif No. 3



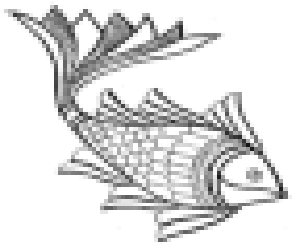
Motif No.4



Motif No. 5



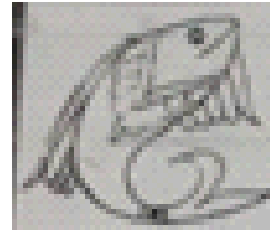
Motif No. 6



Motif No. 7



Motif No. 8



Motif No. 9



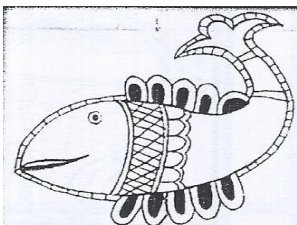
Motif No. 10



Motif No. 11



Motif No. 12



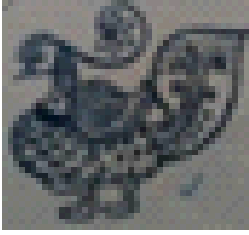
Motif No. 13



Motif No. 14



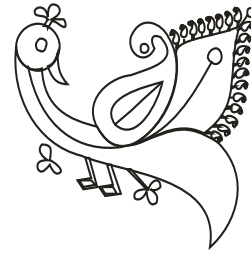
Motif No. 15



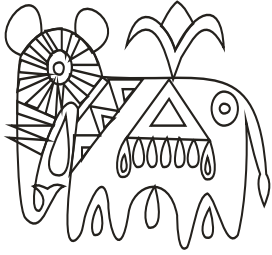
Motif No. 16



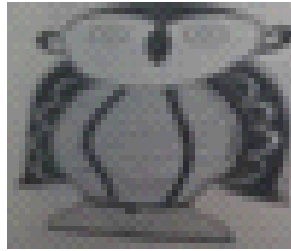
Motif No. 17



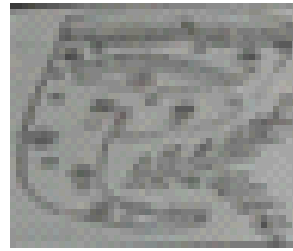
Motif No. 18



Motif No. 19



Motif No. 20



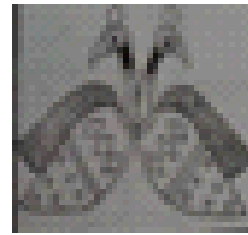
Motif No. 21



Motif No. 22



Motif No. 23



Motif No. 24



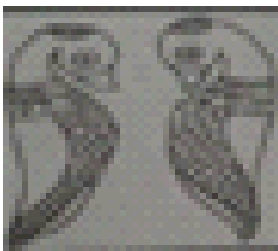
Motif No. 25



Motif No. 26



Motif No. 27



Motif No. 28



Motif No. 29

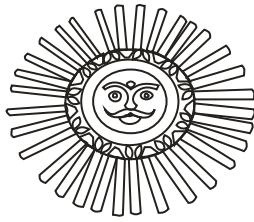


Motif No. 30

Religious motifs



Motif No. 1



Motif No. 2



Motif No. 3



Motif No. 4



Motif No. 5



Motif No. 6



Motif No. 7



Motif No.8



Motif No. 9



Motif No. 10



Motif No. 11



Motif No. 12



Motif No. 13



Motif No. 14



Motif No. 15



Motif No. 16



Motif No. 17



Motif No. 18



Motif No. 19



Motif No.20



Motif No. 21



Motif No. 22



Motif No. 23



Motif No. 24



Motif No. 25



Motif No. 26



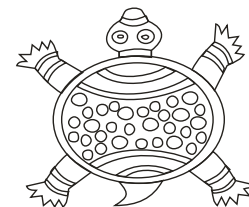
Motif No. 27



Motif No. 28



Motif No. 29



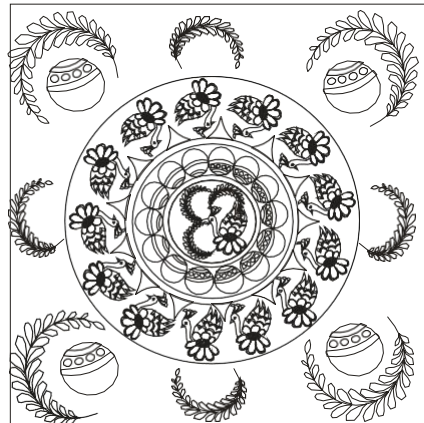
Motif No. 30

Developed Designs

DEVELOPED DESIGNS



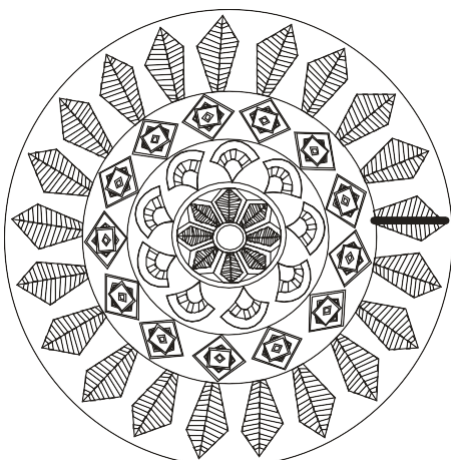
Design No.1



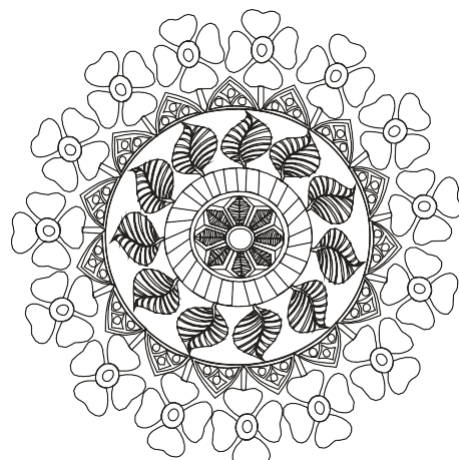
Design No.2



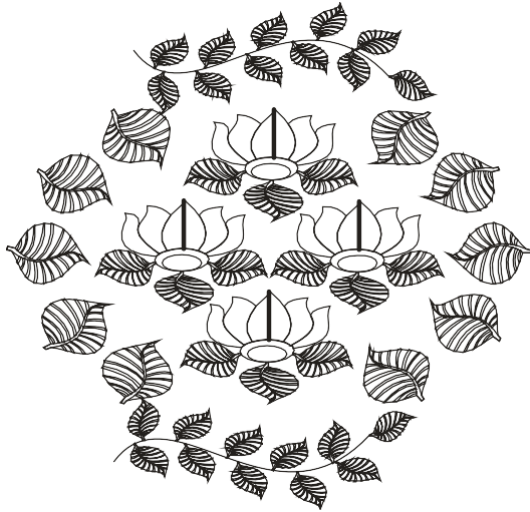
Design No.3



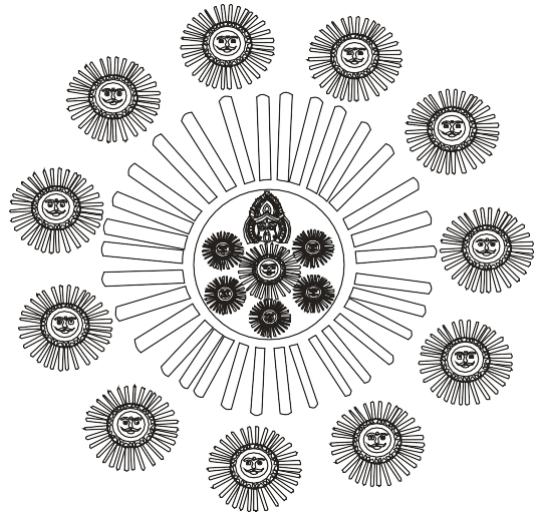
Design No.4



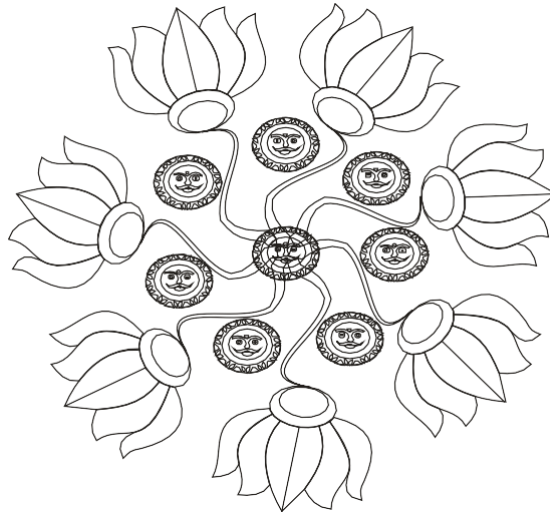
Design No.5



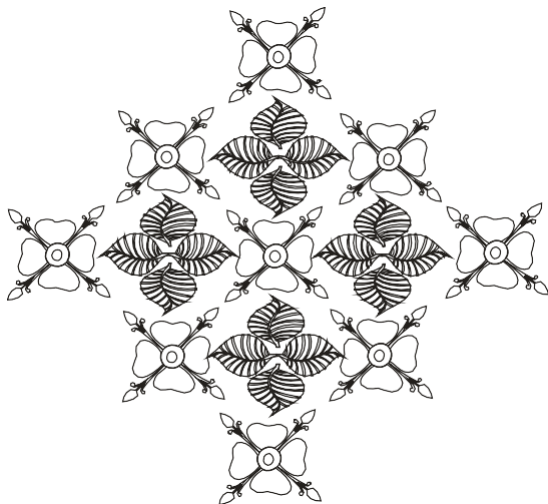
Design No.6



Design No.7



Design No.8



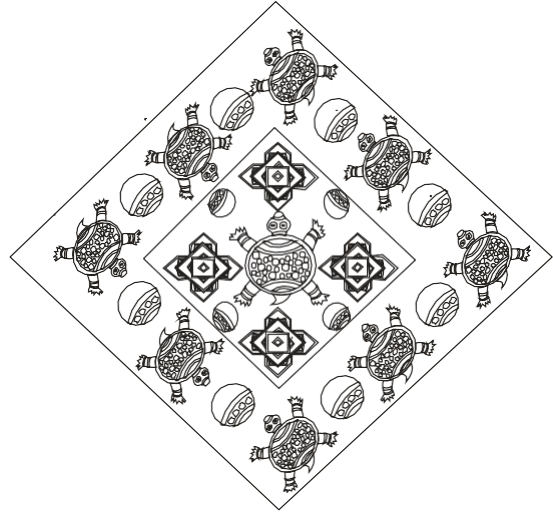
Design No.9



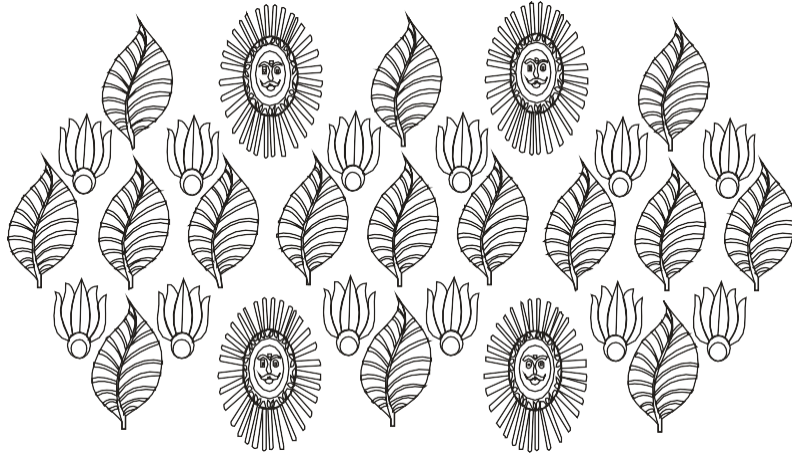
Design No.10



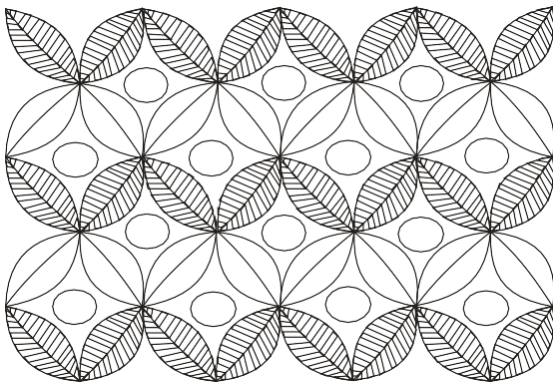
Design No. 11



Design No. 12



Design No. 13



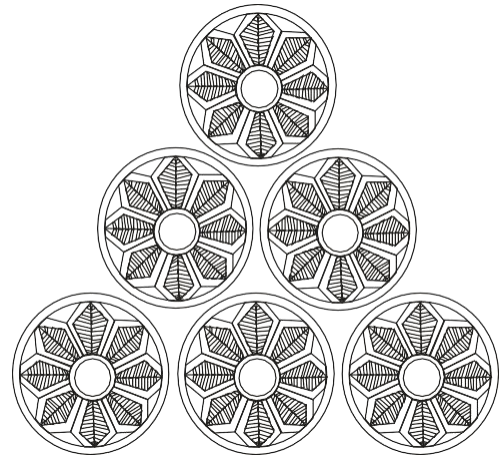
Design No.14



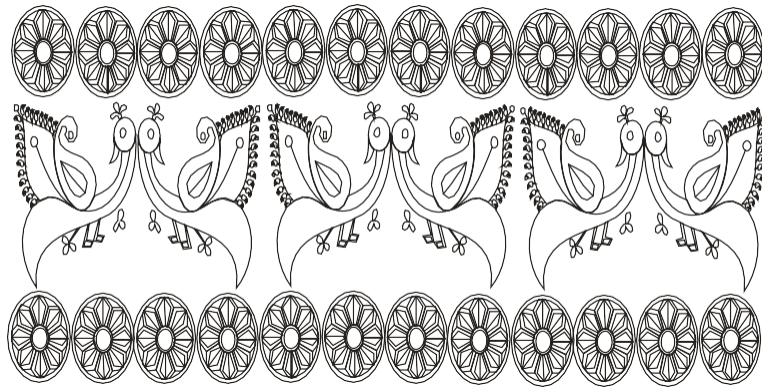
Design No.15



Design No.16



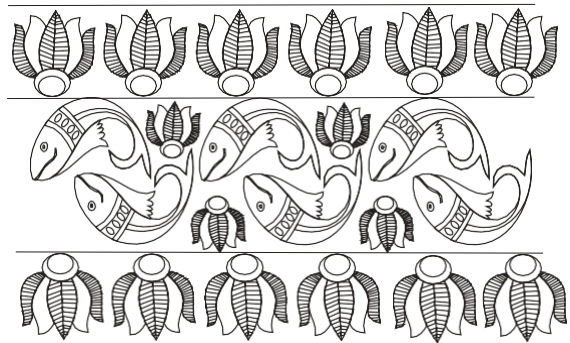
Design No.17



Design No. 18



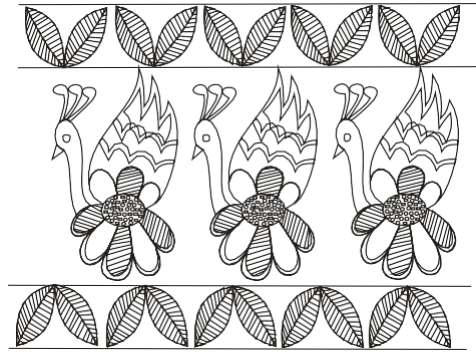
Design No.19



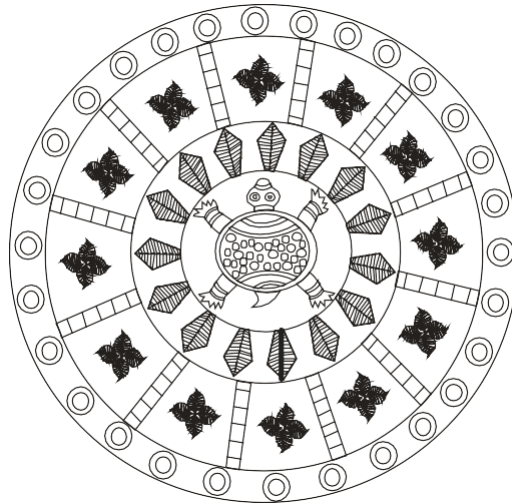
Design No.20



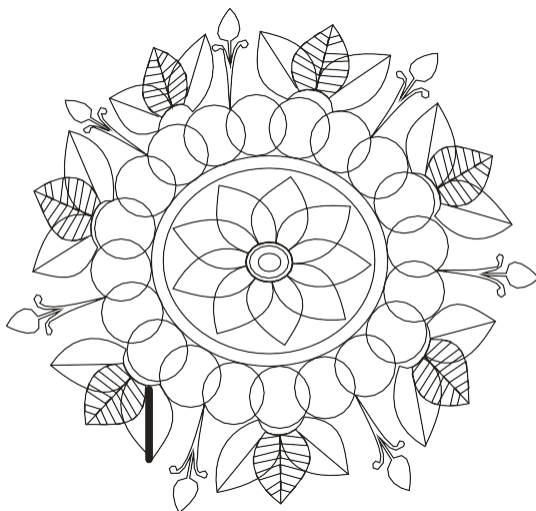
Design No.21



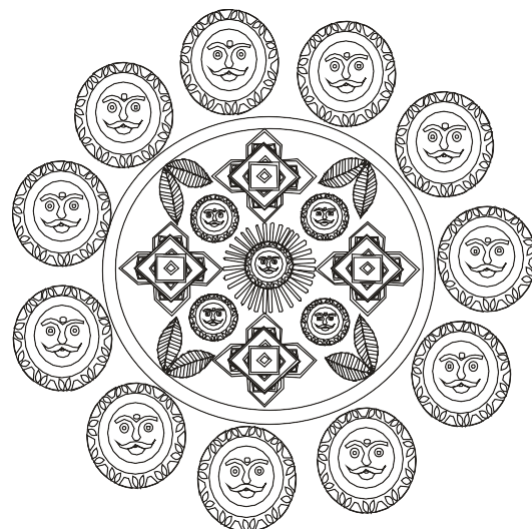
DesignNo.22



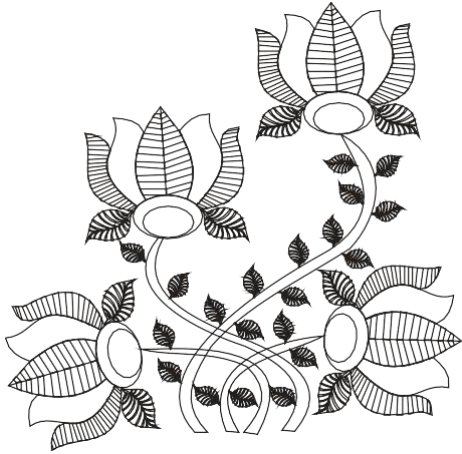
Design No.23



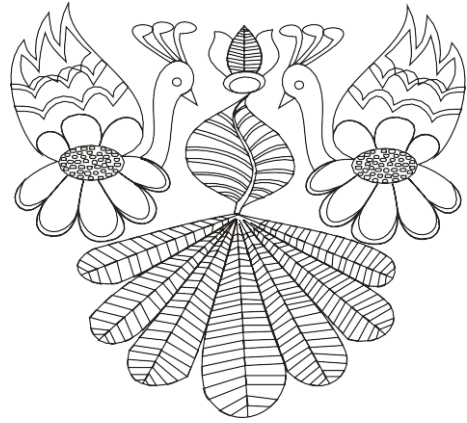
Design No.24



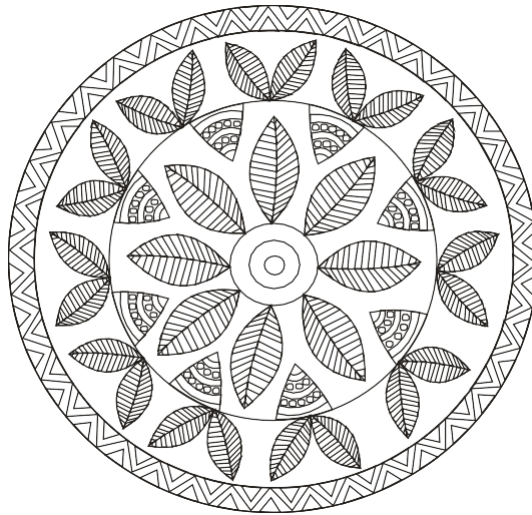
Design No.25



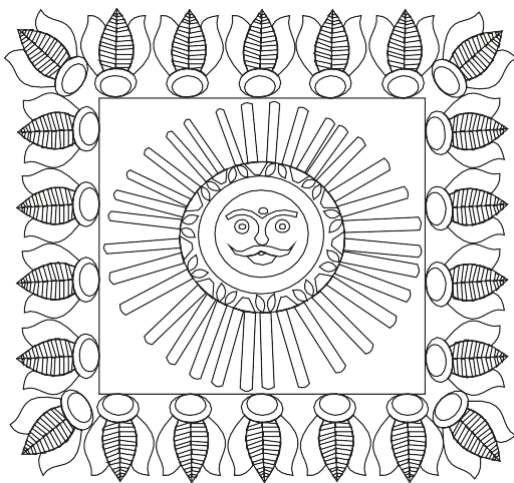
Design No.26



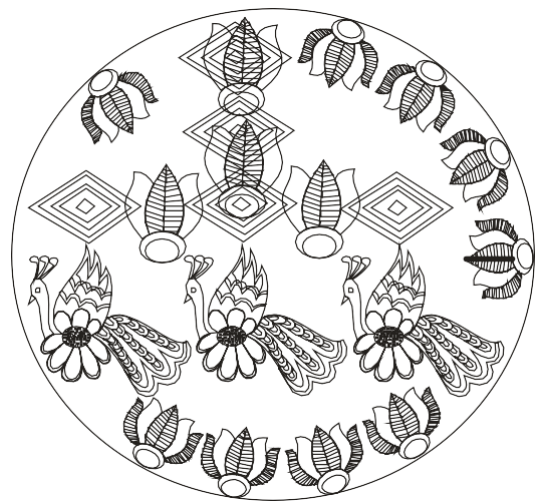
Design No.27



Design No.28



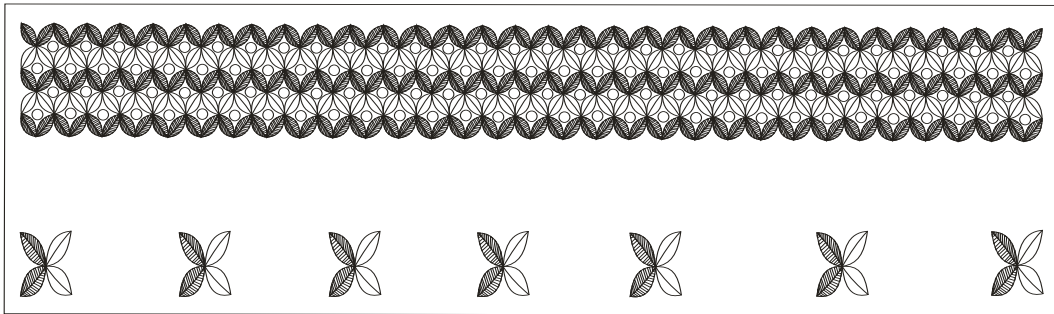
Design No.29



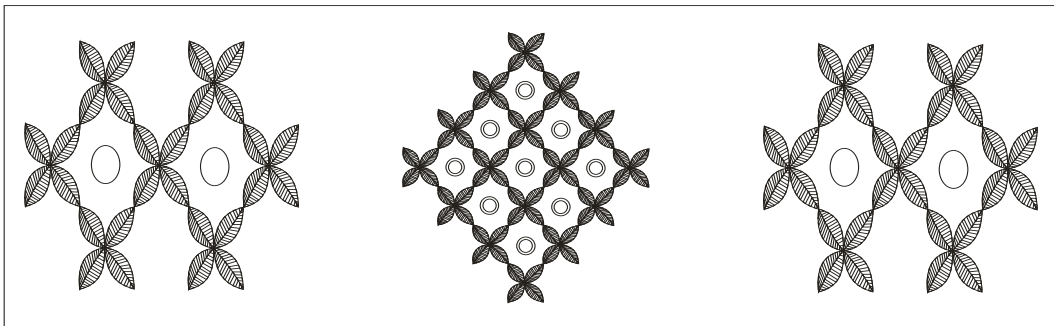
Design No.30

**Placements
of
Selected Designs**

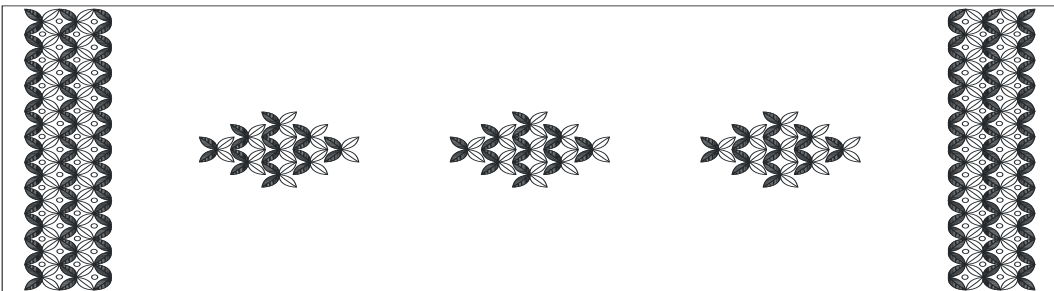
Placements of Design No. 14



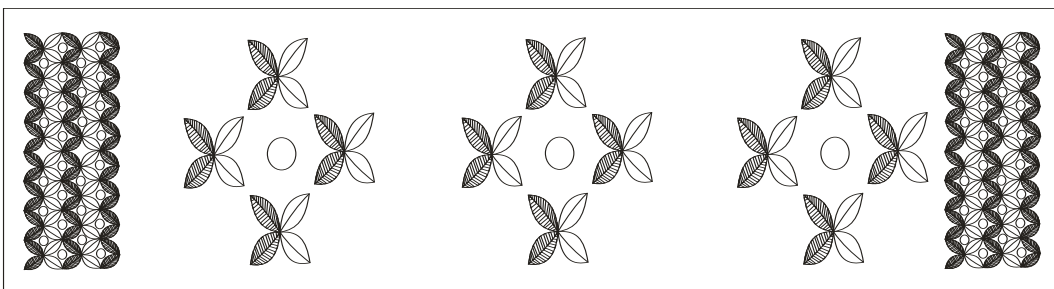
Placement I



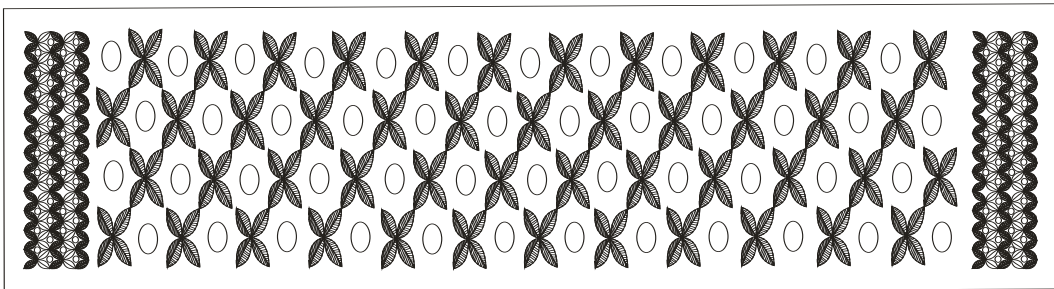
Placement II



Placement III

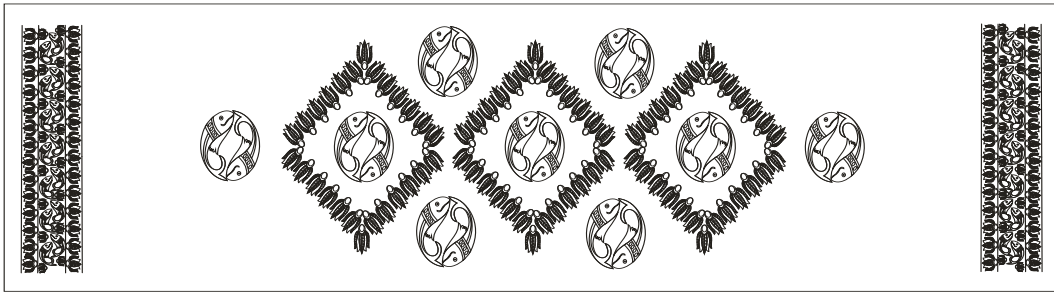


Placement IV

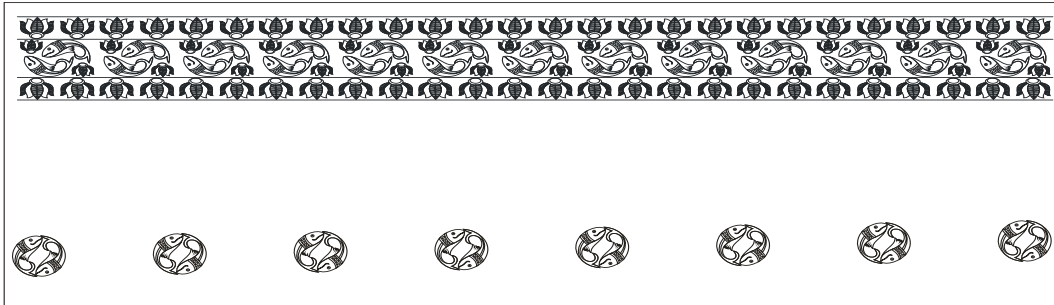


Placement V

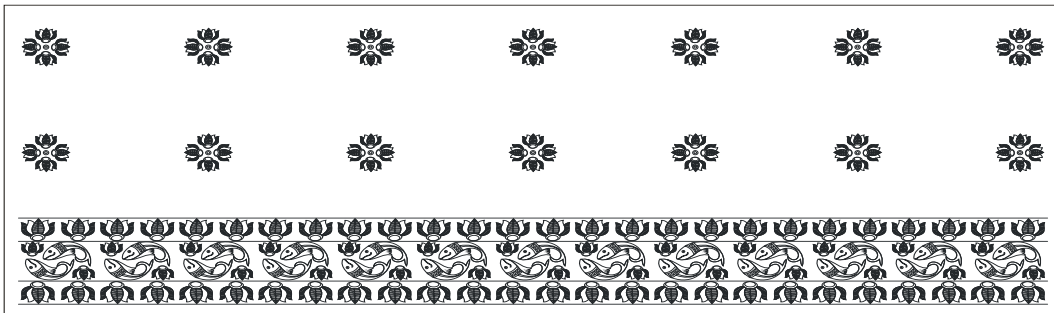
Placements of Design No. 20



Placement I



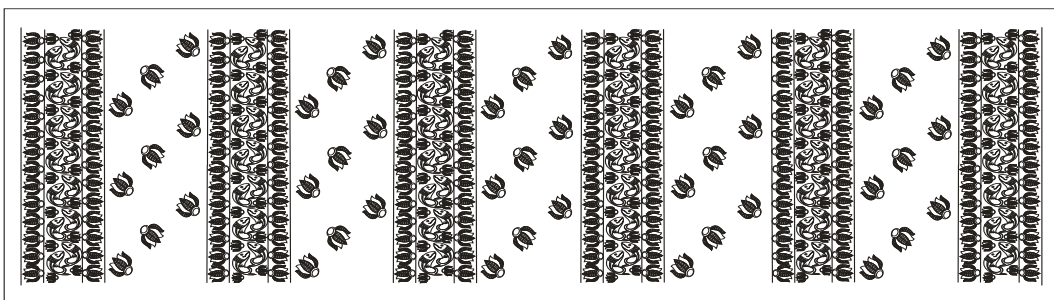
Placement II



Placement III

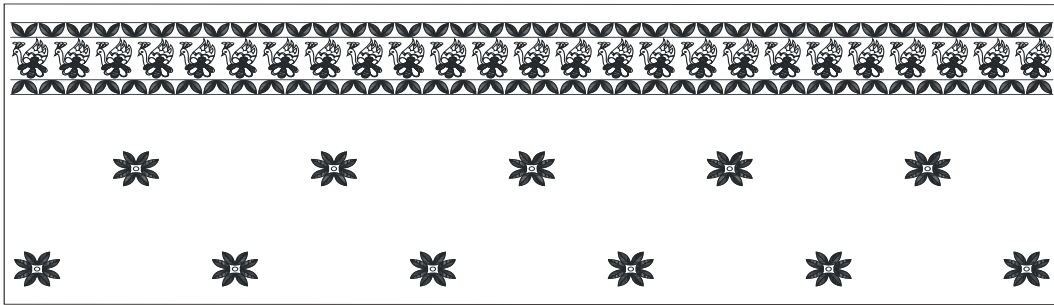


Placement IV

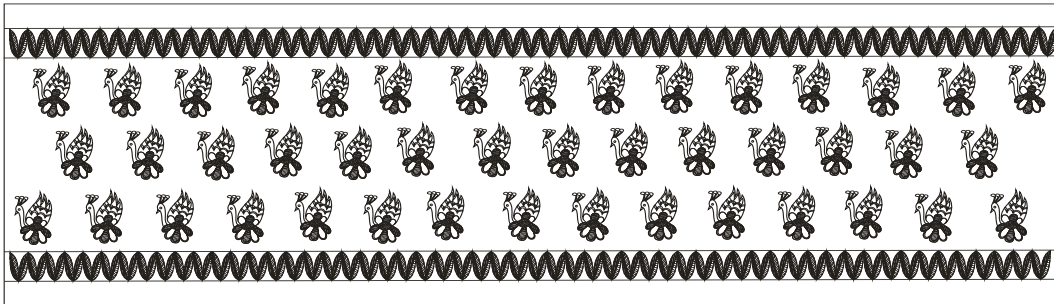


Placement V

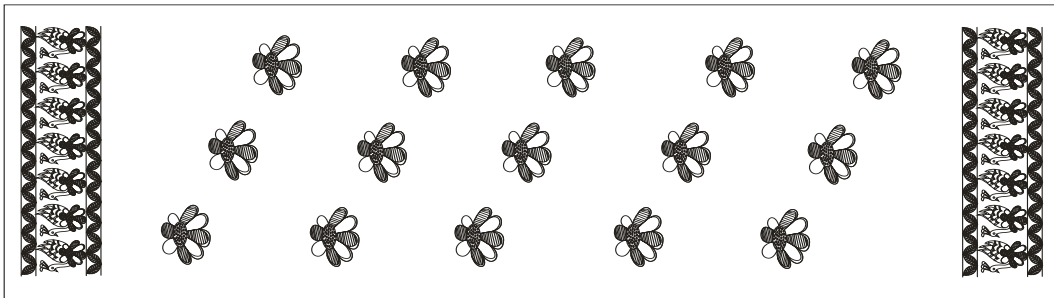
Placements of Design No. 22



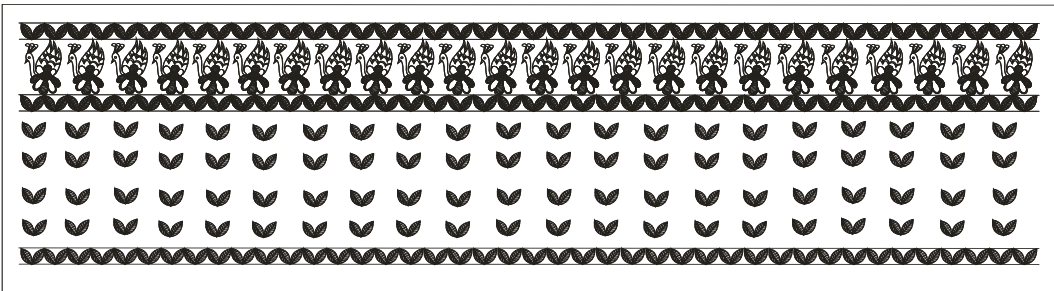
Placement I



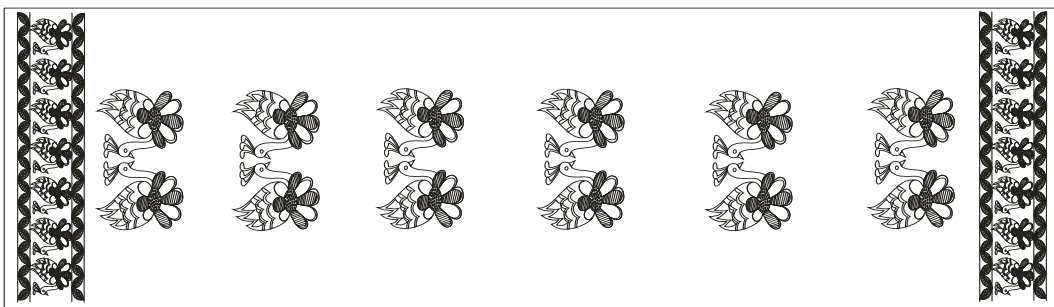
Placement II



Placement III

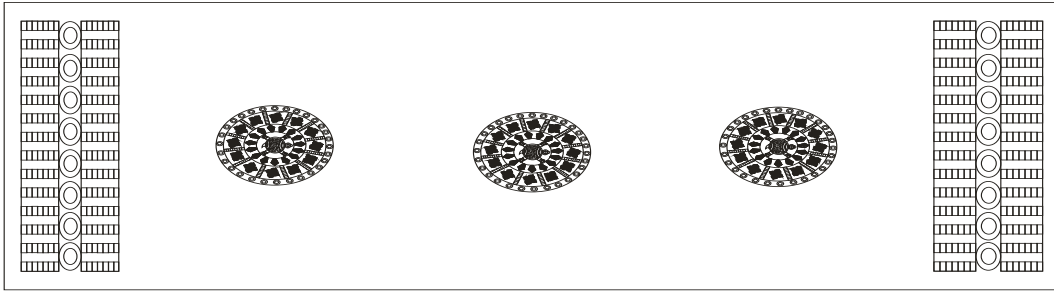


Placement IV

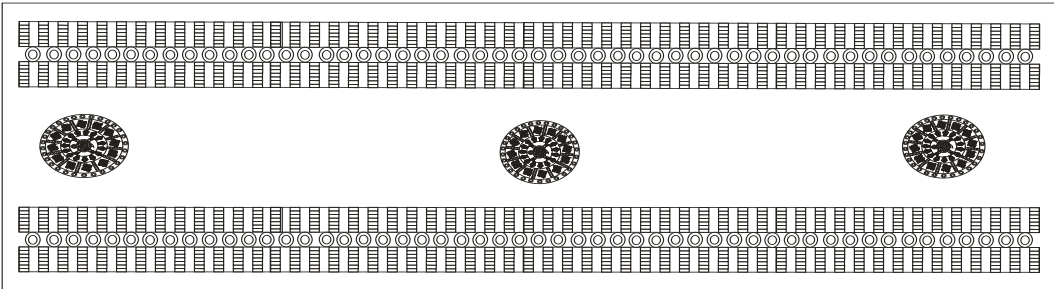


Placement V

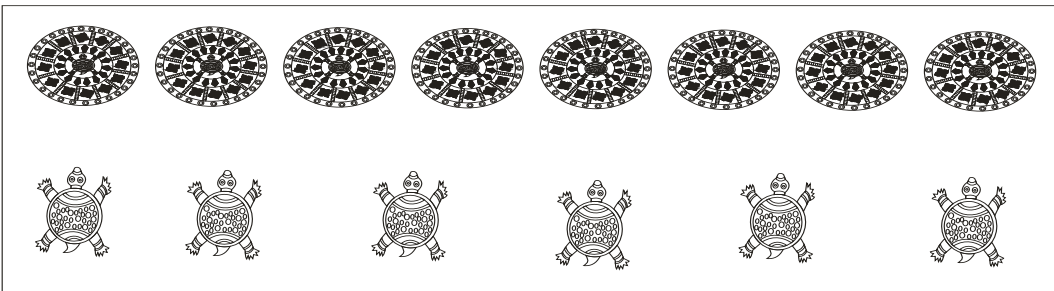
Placements of Design No. 23



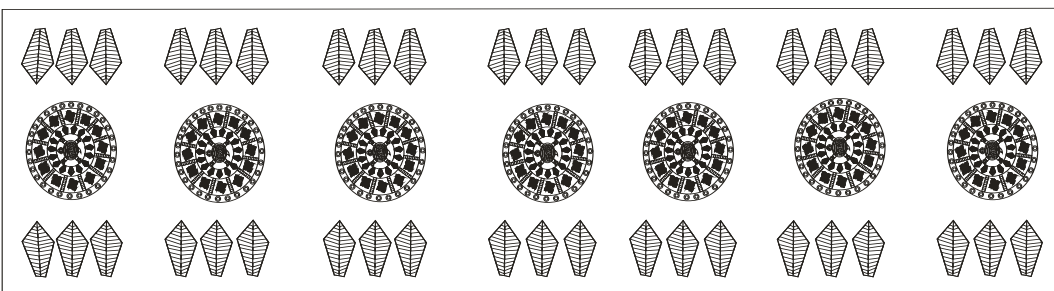
Placement I



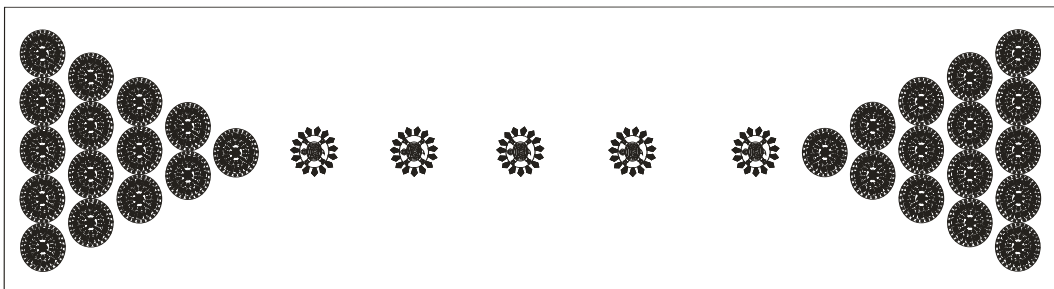
Placement II



Placement III

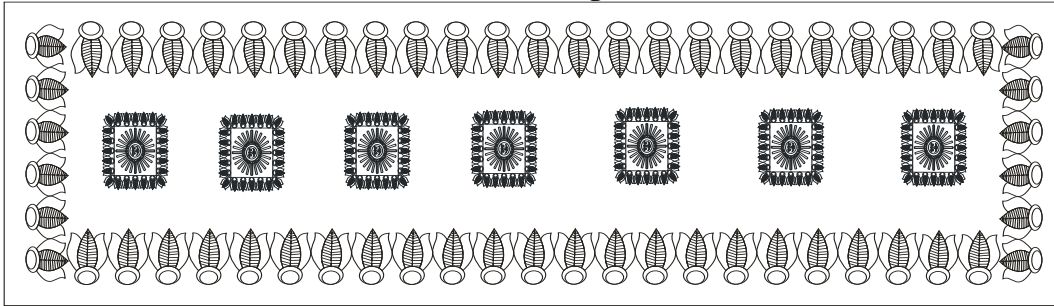


Placement IV

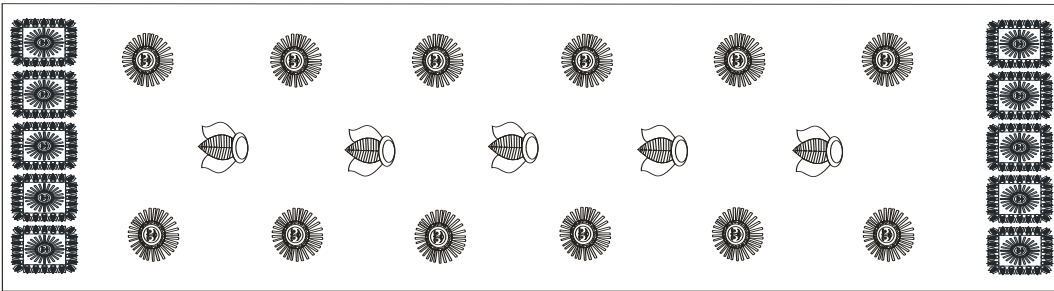


Placement V

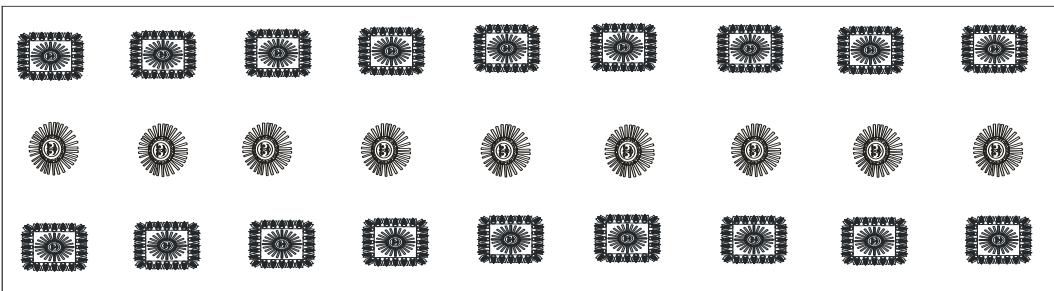
Placements of Design No. 29



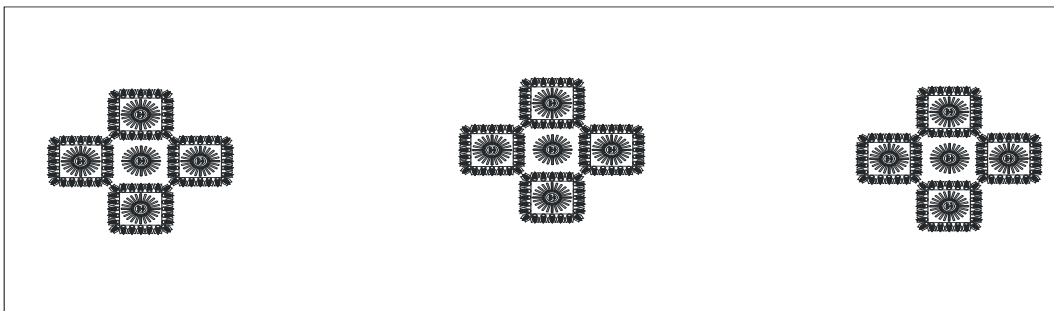
Placement I



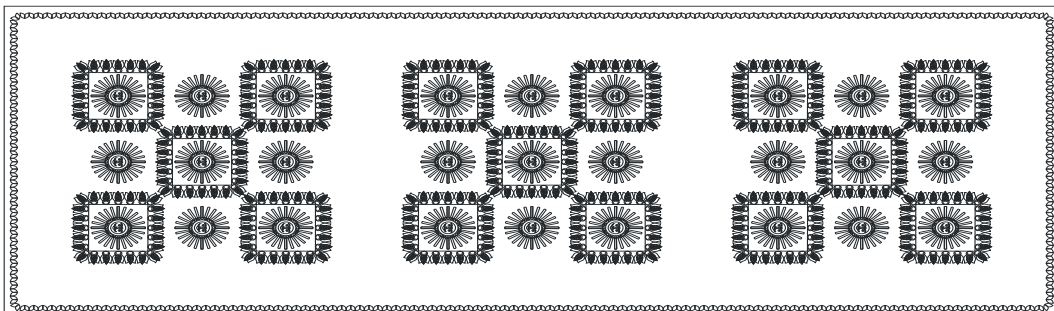
Placement II



Placement III



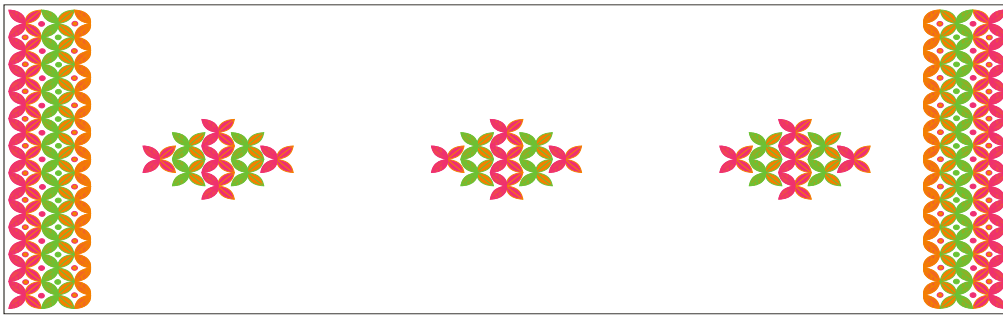
Placement IV



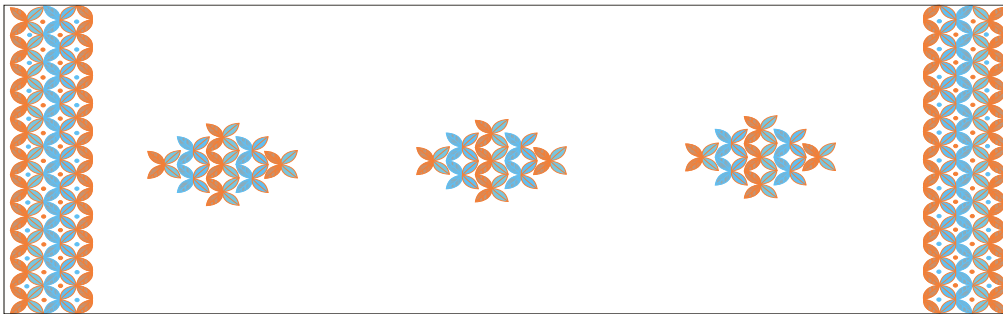
Placement V

Colourways of Selected Design Placements

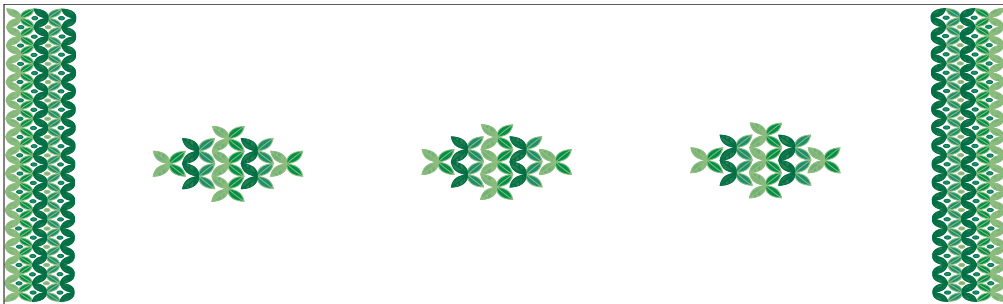
Colourways of Design No. 14



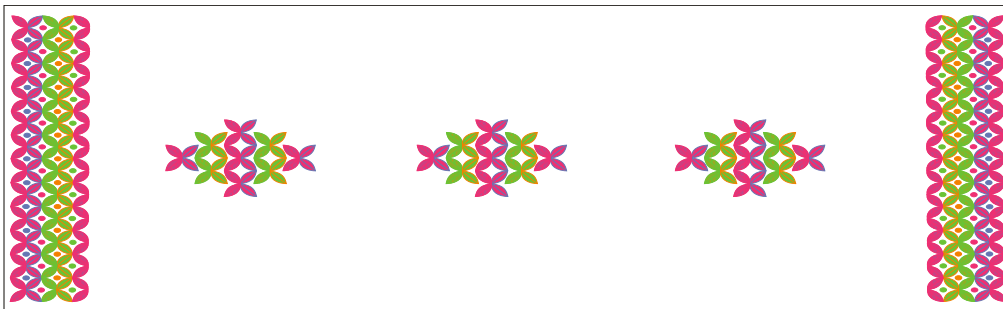
Colourway I (Analogous)



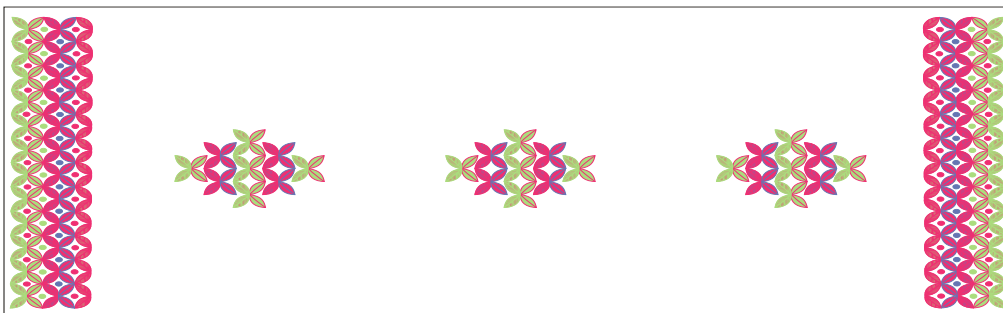
Colourway II (Complementary)



Colourway III (Monochromatic)

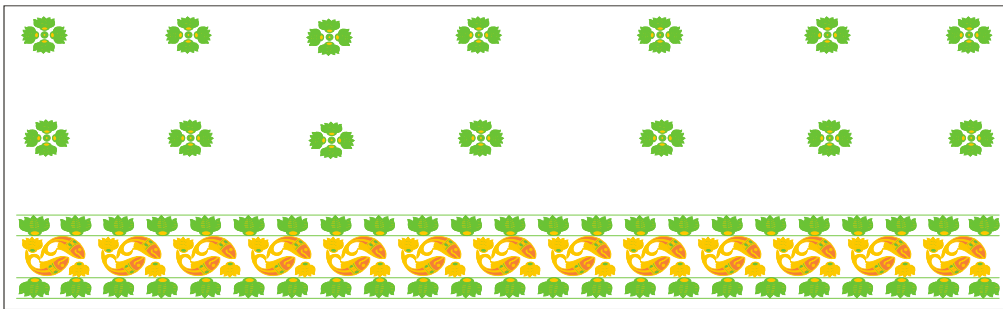


Colourway IV (Tetrad)

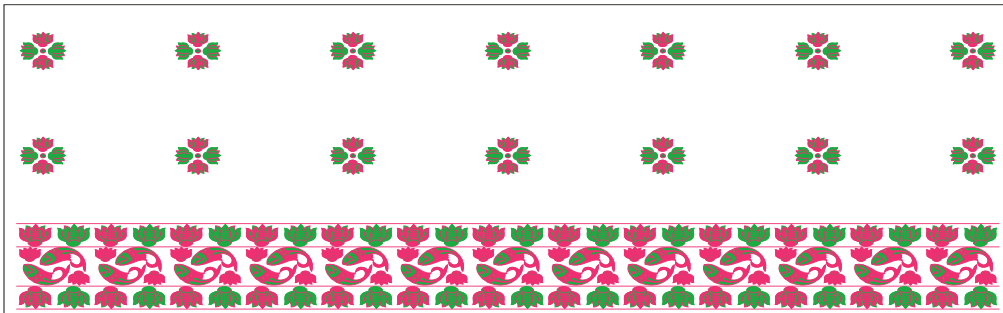


Colourway V (Triad)

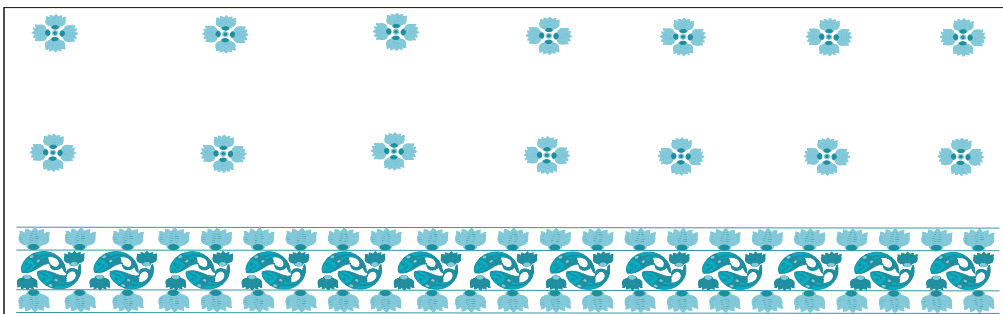
Colourways of Design No. 20



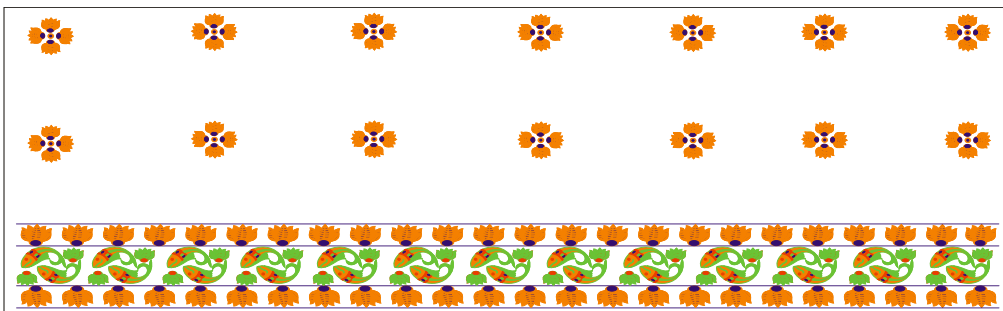
Colourway I (Analogous)



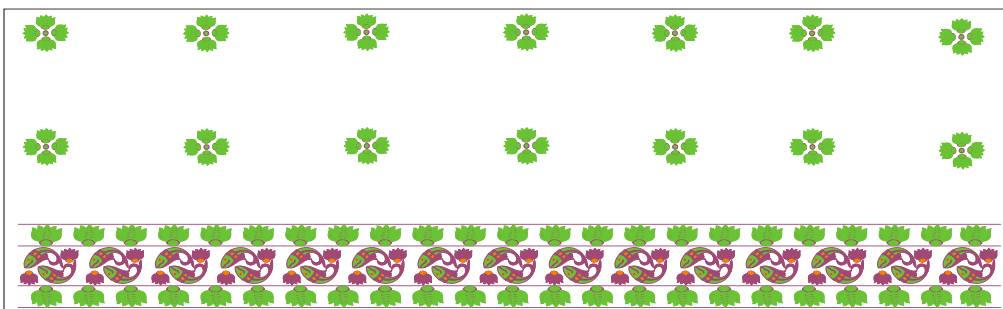
Colourway II (Complementary)



Colourway III (Monochromatic)

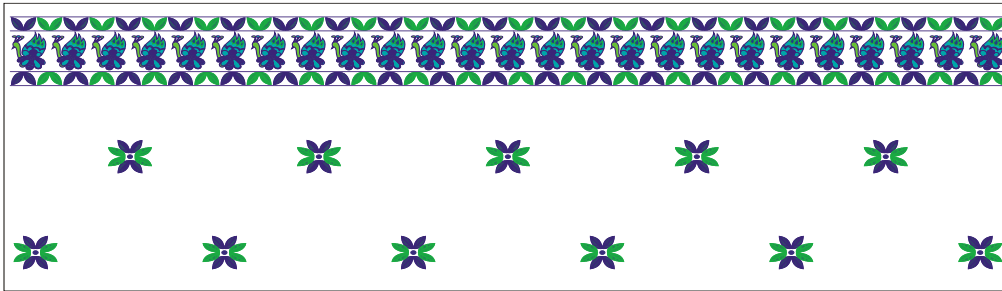


Colourway IV (Tetrad)

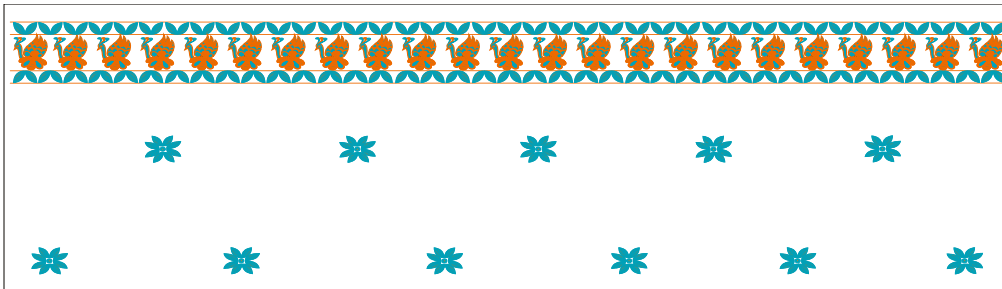


Colourway V (Triad)

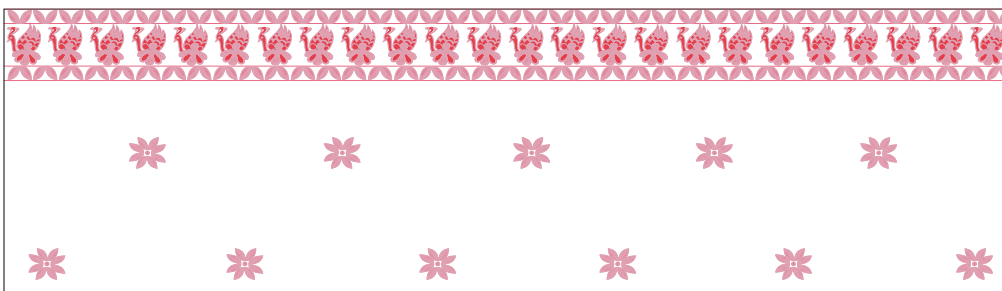
Colourways of Design No. 22



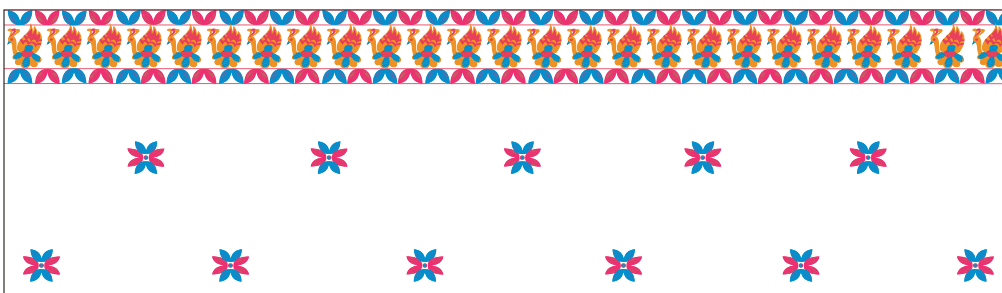
Colourway I (Analogous)



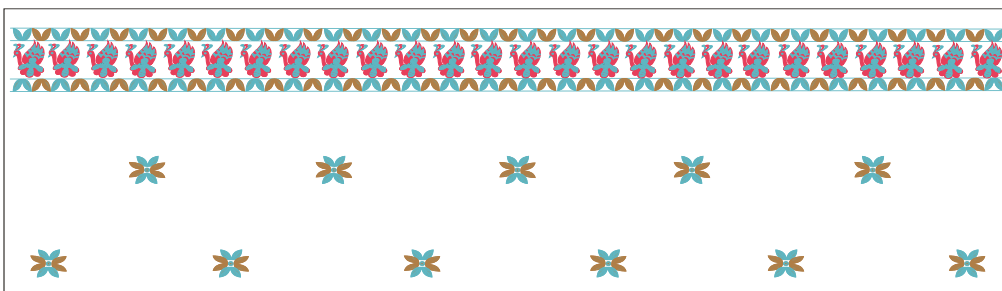
Colourway II (Complementary)



Colourway III (Monochromatic)

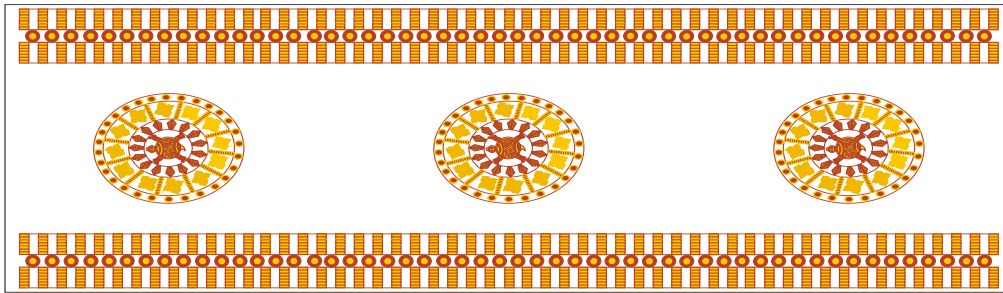


Colourway IV (Tetrad)

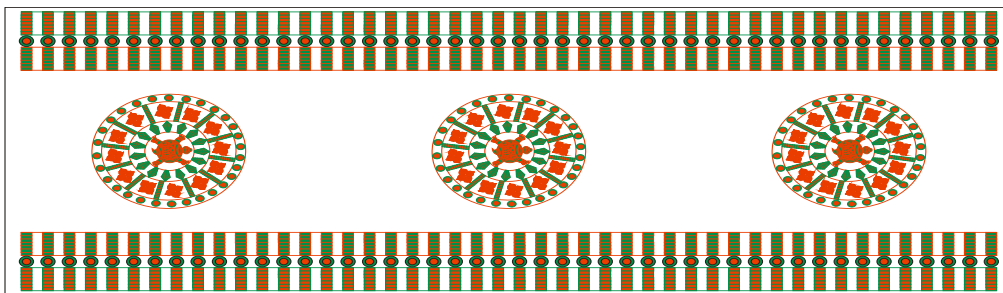


Colourway V (Triad)

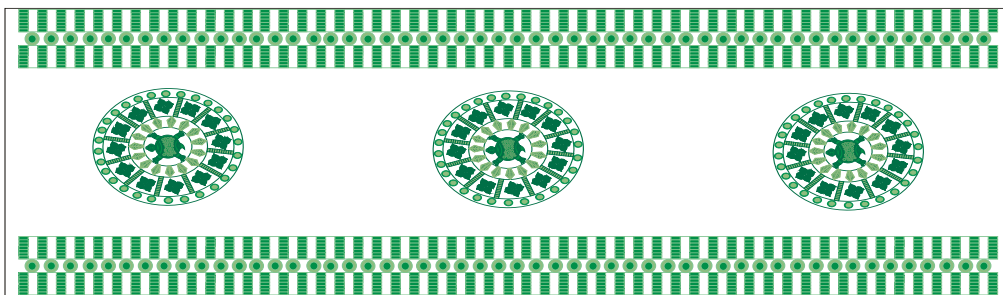
Colourway of Design No. 23



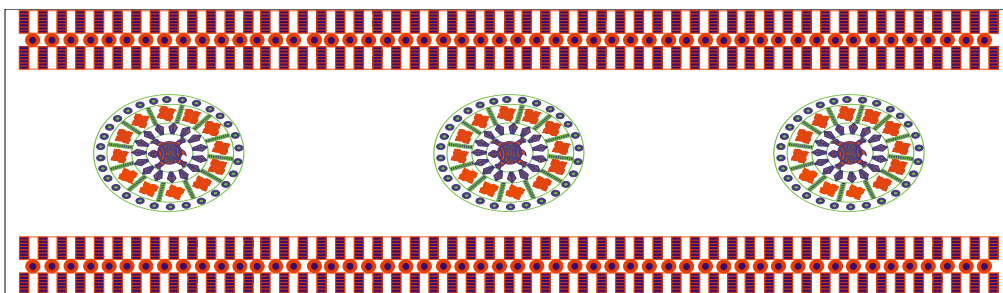
Colourway I (Analogous)



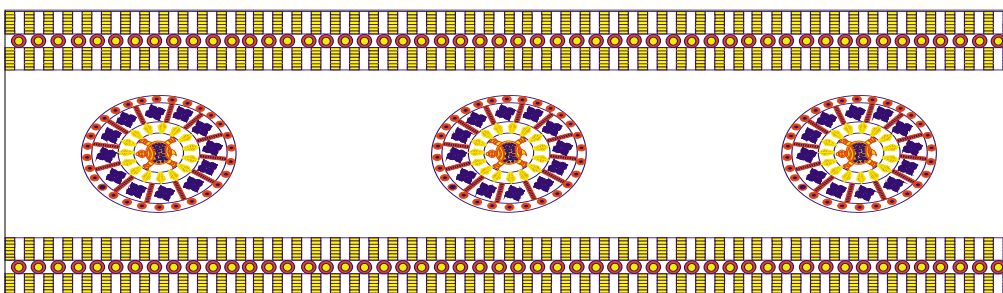
Colourway II (Complementary)



Colourway III (Monochromatic)

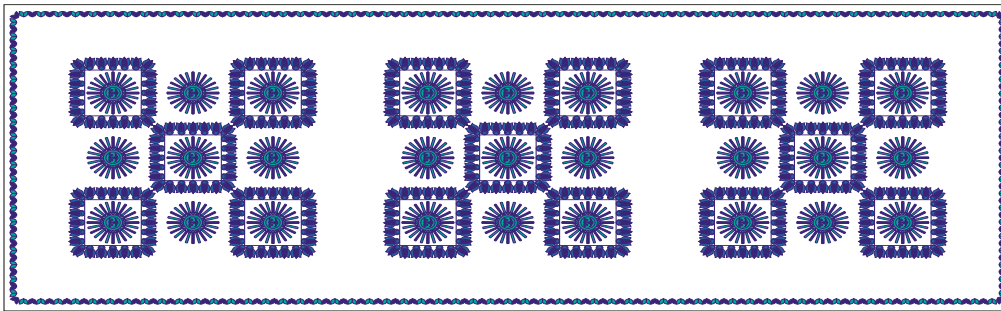


Colourway IV (Tetrad)

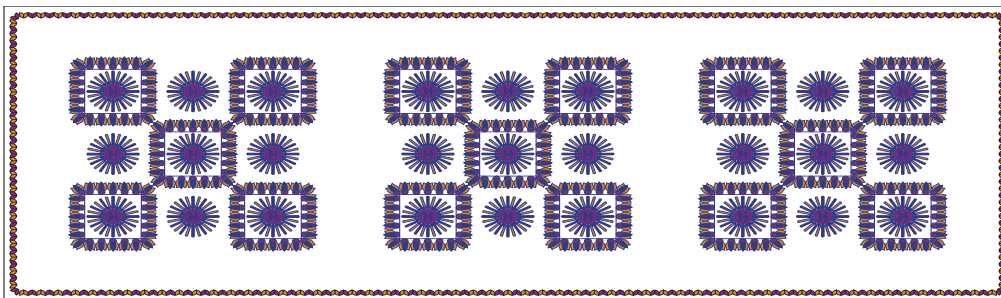


Colourway V (Triad)

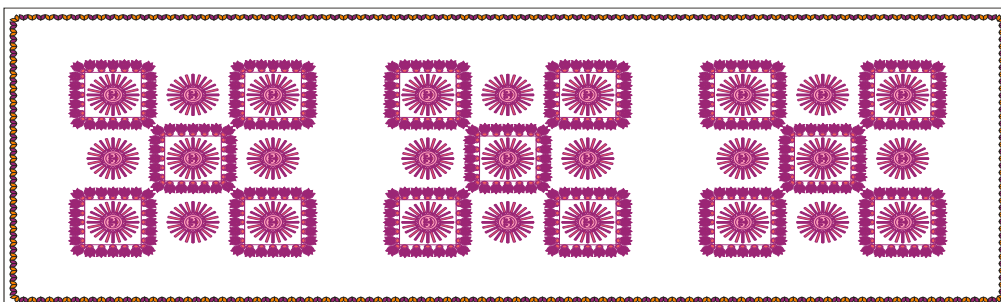
Colourway of Design No. 29



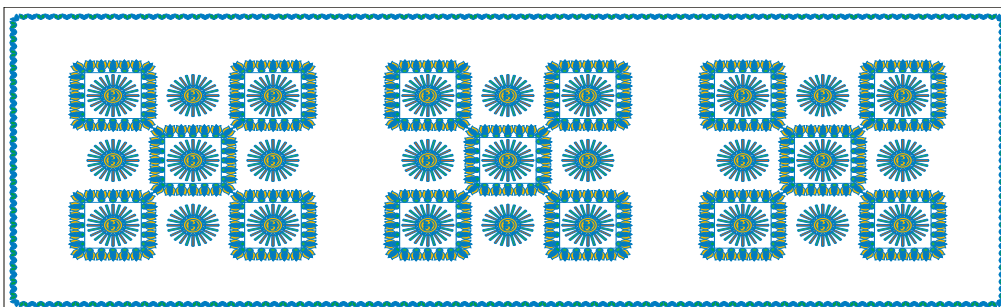
Colourway I (Analogous)



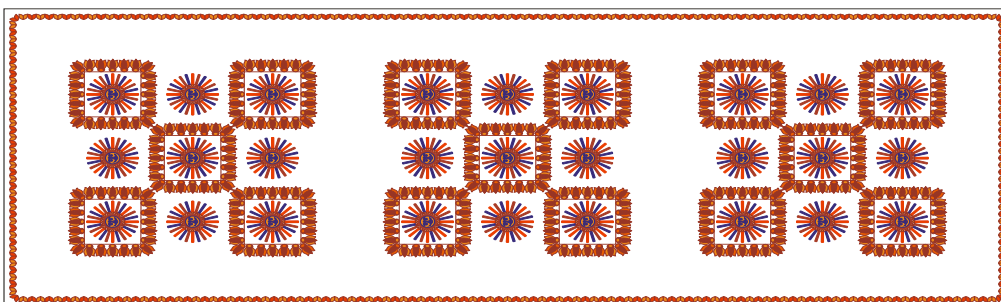
Colourway II (Complementary)



Colourway III (Monochromatic)



Colourway IV (Tetrad)



Colourway V (Triad)