DOCUMENTATION OF RARE TEXTILE ARTIFACTS: FOCUS ON PRESERVATION AND CONSERVATION

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Kirti Manek
M.Sc. (Home)

DOCUMENTATION OF RARE TEXTILE ARTIFACTS: FOCUS ON PRESERVATION AND CONSERVATION

A Thesis submitted to
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By
Kirti Manek

Department of Clothing and Textiles
Faculty of Family & Community Sciences
The Maharaja Sayajirao University Of Baroda
Vadodara -390002

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CERTIFICATE

This is to certify that the thesis entitled, **"Documentation of Rare Textile Artifacts: Focus on Preservation and Conservation"** being submitted in the partial fulfillment of the requirement for the degree of **Doctor of Philosophy** in **Clothing and Textiles**, **Faculty of Family & Community Sciences**, to The Maharaja Sayajirao University of Baroda, Vadodara, embodies the results of bonafide research work conducted by **Ms. Kirti Manek** under my guidance. The contents presented herein have not been submitted for the award of any other degree or diploma. The thesis is fit for submission and evaluation.

Dr. Amita Pandya
Professor and Guide
Department of Clothing and Textiles
Faculty of Family & Community Sciences
The Maharaja Sayajirao University of Baroda

Ms. Kirti Manek
Investigator
Reg. No.7603, Aug. 12th, 2004
Vadodara

Endorsement from the Supervisor

Ms. Kirti Manek, has done extensive work on her **research** topic entitled **"Documentation of Rare Textile Artifacts: Focus on Preservation and Conservation"** vide Registration No.7603, (Dated: August 12th, 2004) which have substantiated its originality. She has presented her progress of work in seminars well attended by teachers and students of the department. She has completed her course work and successfully cleared her Comprehensive Examination.

She has personally presented a Research Paper entitled ***"Digitization of Rare Textile Artifacts: Evoking the past; Preserving the memory"*** at an International Conference on the Convergence of Libraries, Archives and Museums organized by National Institute of Fashion Technology from 15-17 Feb. 2011 at Delhi and also presented a Poster entitled**, "** ***Degradation Parameters of Silk Fabric"***, at the 27th Biennial National Conference organized by The Home Science Association of India held at Jabalpur, from Dec. 27th to 29th, 2007.

She has published two research papers.

- Paper entitled **"*Digitization of Rare Textile Artifacts: Evoking the past; Preserving the memory*"** published in the Book entitled User Empowerment through Digital Technologies , 2011 , Pragun Publication, New Delhi. ISBN 978-93-8039-714-3.
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Ph.D. Guide
Dr. Amita Pandya
Professor

I/c Head
Dr. Madhu Sharan

Dean
Prof. Uma Joshi

DEDICATED TO

MY FAMILY

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~ Kirti Manek

ABSTRACT

Indian textiles produced since antiquity conveys the history, the culture and tradition of the past. A number of people in our society own an immense wealth of rare textile artifacts, collected or inherited over a period of time, not accessible to all interested in this field. Textiles are among the world's most fragile artifacts difficult to preserve even under the best of conditions. There is a dire need that these surviving and rare pieces of textile artifacts be preserved. Hence, in the present study an attempt was made by the investigator to document, digitize and analyze the rich textile artifacts of selected individuals of Gujarat with focus on preservation and conservation. Intensive efforts were made to develop a digital database for greater access as well as workshops were organized to raise awareness about preventive conservation amongst textile possessors at household level. The results pertaining to the adopted preservation and conservation practices revealed that preventive conservation can be practiced with the limited available resources by all, be it a museum or personal textile collector. Of the total 95 documented textiles, the maximum 47 were woven silk textiles from the states of Gujarat and Uttar Pradesh, followed by 40 embroidered, five resist dyed and three printed textiles. On analysis of the data pertaining to the category and type of damage reflected that 68 of the 95 had suffered various types of damages. Physical damage was noticed in 37 artifacts specifically creases, cuts, tears on folds, breakage of yarns and abraded areas attributed to various reasons; unstable climatic conditions, inadequate storage space, incorrect method of storage and faulty human interventions. Chemical damages was evident in six as an outcome of intrinsic qualities of the material, at times unstable and inherently harmful triggered by the impact of external factors and biological damages such as holes, brown stains were noted in seven. Data on condition rating code reflected that 32 textile artifacts were in Good, 27 in Excellent and 25 in Fair and 11 in poor condition. Hence, treatment priority of the majority artifacts was found to be Low which indicated the need of only preventive conservation treatment to stabilize them in its present condition. The treatment with 10 per cent Polyvinyl Acetate by cold method was found to be the most appropriate conservation treatment on the selected artifact that preserved as well as retained the authentic properties of the traditional silk textiles. Workshops on preventive conservation provided excellent information on basic household preventive care practices that enabled the respondents to maintain their precious heirlooms thereby contributing to the society at large.

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CHAPTER - I

INTRODUCTION

Our heritage is all that we know of ourselves; what we preserve of it, our only record. That record is our beacon in the darkness of time; the light that guides our steps. Conservation is the means by which we preserve it. It is a commitment not only to the past, but also to the future (Ward, 1989).

Textiles have enthralled mankind since ages in all civilizations.Handcrafted textile products are essential components of intangible heritage.It has been an indispensable part of our lives from the time man dressed themselves with bark of trees and leaves till the finest linen. It bears the testimony of human history, past and present. Hence, obliviousness towards importance of textiles means ignorance to its history. Through the civilizations, textiles have played an important function to merge into ones culture, tradition and heritage.

Highly developed civilizations produced remarkable, eminent and ornate textiles with its own distinct patterns, utilizing unique techniques with the accessible raw material in the region. India, wrapped in mystique enhanced with romance of fable crafts has one of the finest textile traditions in the world. There is a compelling magic about the rich and varied textile tradition of India, which can be traced back 5000 years to Harappa and Mohenjo-Daro in the Indus valley. The history of Indian textile crafts is as old as the history of civilized life in India that achieved prominence during the medieval period and continued till the end of late 19^{th} century. As stated by Gillow & Barnad, (2002) that no other land enjoys such a plethora of creative energies for the production of textiles as the subcontinent of India.

The intermingling of rituals and beliefs of the local people with various traders, conquerors, missionaries and nomads had scaled over the subcontinent down the ages had produced an amalgam of rich textile influences. The interaction of different groups of people such as invaders, indigenous tribes, traders and explorers had built a complex culture well-known for its vivacity, color and raw materials.

The superlative Indian textiles depict a story since centuries with a diverse impact of cultural influences, climatic condition, geographical factors and trade. Their sheer beauty, color and artistry won the hearts of both common people and monarchs across the country with the knowledge and skills passed down from one generation of master craftsmen to the next which will persist for a long time to come. A significant part of the wide range of Indian textiles produced seems to derive their distinctiveness from the local contours of their physical surroundings. Yet, the local environment made for divergences, emphasized the basic unity of the people. Thus, the physical element reflected the richness of diversity and the emotional, signified the wealth of likeness.

Antique Indian textiles narrate the history, culture and tradition of the past. They are physical links to the past providing meaning to the present and continuity to the future. Actually they are the physical records of the places, events and especially the people who helped to shape the country. They provide a sentimental or personal attachment to textile history and culture through objects used or seen in daily life as well as indicate cultural and technological advancement. Every stretch of our country has its own design, motif and characteristic fabric that entwines its history. The role and nature of textiles in

any society are both pervasive and diverse, for textiles serve individuals in many ways. Besides the function of protection and decoration to the body, textiles were an indicator of wearer's status and identity in terms of caste, community and regions. Certain textiles used for specific rituals were the finest creations of the craftsmen. "The unremarkable sensitivity of the weaver rooted in custom and ritual had its origin in religious fervor creating a relationship between him and the cloth he wove," as supported by Radhakrishna (2004). Fabrics were also believed to have magical and mystical power and the families preserved the most exquisite ones for generations as heirlooms.

An heirloom cloth although at times old, tattered or faded, is never considered a rag as stated by Kathleen, (2005), in the article, "Textiles with Attitude." Over years immense wealth of textile artifacts has been accumulated in spite of being amongst the world's most fragile, vulnerable and sensitive items of acquisition. It is unfortunate that despite of the large production of a varied range of textiles over the centuries by civilizations renowned for the excellence of their textiles, only a minuscule fraction of fabric samples have survived the degradation of time due to their fragility. However, the survival of any ancient textile against the ravages of climate, light, insects, microorganisms, improper storage and general human wear and tear is mere a matter of miracle. These agents are the forces that act upon objects causing physical, chemical and biological deterioration. Degradation is a major concern for historic textiles that causes dimensional changes leading to visible damage which is cumulative and irreversible.

The Canadian Conservation Institute has defined the agents of deterioration as:

Incorrect temperature that can be too high causing gradual disintegration or discoloration of organic materials; too low causing embitterment, which results in fractures of paints and delaminating brittle and solid materials.

Incorrect relative humidity that can be damp (over 65% R.H), causing mold and corrosion, above or below a critical value, hydrating or dehydrating some minerals and corroding metals that contain salts

Direct physical forces such as shock, vibration and abrasion that can break, distort, puncture, dent and scratch all types of objects.

Thieves, vandals or careless individuals who misplace objects.

Fire that destroys, scorches or deposits smoke on all types of objects.

Water that causes efflorescence in porous materials, swells organic materials, corrodes metals, delaminates or buckles layered component and loosens joined components.

Pests such as insects that consume, perforate, cut, graze, tunnel and excrete which destroys, weakens or disfigures or etches organic materials.

Contaminants that disintegrate discolor or corrode all types of objects especially reactive and porous materials.

Radiation including both ultraviolet radiation and visible light that disintegrates, fades, darkens or yellows the outer layer of organic materials and some inorganic materials. (51)

We treasure our textile heritage since they document art, craftsmanship and a way of life that no longer exists. We have a hoary tradition of textiles in India from Lucknow's Chikan to Bengal's Kantha, from Punjab's Phulkari to Kashmir's Pashmina, but somehow the awareness about conservation and restoration of textiles is lesser than it is for painting as quoted by Agarwal (2010), Director General of ICCI in an article on "The Infancy of Art Restoration in India." Hence to save our heritage, our past for our future, preservation and conservation is a must.

Conservation aims to reduce damage and loss of our cultural heritage. It protects the precious objects from the climate and slows down physical and chemical deterioration which is a continuous and natural process. The result of such degradation are manifested in loss of tensile strength, loss of surface texture, the fading of dyes and yellowing of white fabric. It can, however, be slowed; indeed, science has suggested ways in which the natural lifespan of these objects can be extended. Conservators use 'minimal intervention' methods, aiming to stabilise the object (chemically and physically) and keep its original material. They meticulously document the textiles, its condition and treatment in reports and photographs. The information is useful for the object's long-term preservation and conservation.When treating an object, a conservator respects its integrity, working with materials that age well and, if possible, using reversible techniques. (36)

Conservation is usually understood as a bi-partite action that includes preventive conservation and curative conservation. Preventive conservation aims to minimize deterioration and damage to works of art, therefore avoiding the need for invasive conservation treatment and ensuring works of art are protected for now and the future. The methods are based on the concept that deterioration and

damage to works of art can be substantially reduced by controlling some of the major causes like maintaining stable temperature and relative humidity levels, managing light exposure, controlling pests, disaster preparedness and protecting works of art from other physical or chemical damage. Curative conservation means active intervention in the physical state of the object by wet cleaning, consolidation, repair and support. (58)

Digitization is an encompassing approach to preservation. Digital copies play an imperative preservation role as it protects fragile and valuable originals from being handled while presenting their content to a large audience. Hence at a specific point of time, it might be the only record of an original object that deteriorates or is destroyed.

Digitization and documentation holds incredible promise for both collections and researchers through greater access, interaction and preservation of heritage for future generations. Textile documentation provides a written and photographic record of individual pieces and the artists who made them. Textiles with a known history have more value to scholars, families, and museums rather than those with unknown provenance. Collecting all possible information adds to the value and meaning of any individual textile, whether in a museum or family collection. (32)

The textile artifacts are otherwise difficult to access due to time and distance constraints but in present situation, digitization of collections enables easier reference of art items, designs and fusions of intercontinental cultural aspect development. It eases the dissemination of art information to thousands of users at any part of the globe at a particular time. Digitization of traditional textiles offers

the easiest and most user-friendly approach to enrich knowledge on rare material heritage and deploy them on database accessible to large audience. It also aids in prompt access and preservation of collections of yester years for future generations with decrease in handling these surviving frail pieces of textile artifacts as well as sustaining the cultural heritage knowledge of the country.

1.1 PURPOSE OF STUDY

India is a profolic of tradition and culture both in custom, art and craft. It possesses rich, varied and vibrant textiles, the most indicative of all historical artifacts. In ancient times the role of handcrafted textile products was more valuable, personal and a part of everyday life. Textiles personified the social values and customs of their times that included the opulent laces, richly woven fabrics displaying wealth and prestige, symbolic designs on fabrics used for dowries, births and deaths as well as richly hand embroidered and woven textiles for household decoration. Skilled craftsmen hailing from innumerable regions and diverse social and financial circumstances, created textiles that were a valued and indispensable part of their lives. Everything created to serve the daily and ceremonial needs of nearly all individuals, literally from birth to death bearing the impression of the makers' imagination and skill.

The value of the textile artifact lies not only in its creator but in the uniqueness of each and every individual artifact. It documents the style and culture of that particular region and simultaneously embodies in itself small yet unique characteristics that are extended to several generations of people who would have owned, used and personalized the artifact. The textile artifact incessantly

absorbs and gathers information with the passage of time. Possibly no other form of human expression is capable of recounting the past with such depth and intimacy as textiles. Since years ample documentation work has been carried on museum textile heritage but minimal information is available on personal textile collections. Hence, the inquisitiveness in the pertinent field encouraged the investigator to document, preserve and conserve the rare textile patrimony as artistic and educational evidence being a part of the individuals' collection today but may not be tomorrow.

Indian textiles be it woven, embroidered, painted, printed has always been the wealth of an individual, as well as the tradition of our country. Over the years immense wealth of evocative heirloom textiles have been passed down through individuals and families with the conscientiousness to accumulate and nurture. As stated by Singh (2011), Centre coordinator for INTACH Art Conservation Centre, "Textile conservation is a much neglected field of work where there's enough work but we still haven't realize the value of our textiles. Preventive conservation aimed at preservation of textiles is an immediate need. And all can do it at home through maintaining general cleanliness, proper storage and handling of ancient textiles." One of the major objective aims to raise awareness amongst textile possessors regarding preventive conservation of traditional textiles to be practiced at household level.

India's often-severe climate, marked by four months of rain in a year is not ideal for preservation of textiles unless fairly good conditions are met. Degradation is a major problem in historic textiles. The most common factors that are responsible for the deterioration are light, relative humidity, temperature, dirt,

dust, insects, microorganisms and other environmental factors both when the textile is in use or in storage, display or exhibition. These agents are the forces that act upon objects causing chemical, biological and physical damage. It may also include natural calamities like fire, earthquake, flood or man-made calamities like thefts.

Our responsibility for historic textiles is to hold these in stewardship for future generations, maintaining them in the best possible condition and assuring their permanence. Hence these surviving and frail pieces of textiles artifacts should be appropriately conserved.

It has also become a necessity to preserve the wealth of the country due to its rarity and great cultural significance. In absence of the original artifacts, it could be used as a reference material to designers for inspiration, weavers for design development, students, historians and art lovers for further research in their respective fields. Today with the collections on database, virtually unlimited research is possible.

In view of the above the researcher realized the dire need of the hour to address the problem with the following objectives.

1.2 SPECIFIC OBJECTIVES

1.2.1 To source and document the rare textile artifacts from collections of individuals.

1.2.2 To identify and analyze the damages that lead to deterioration of the textile artifacts.

1.2.3 To study the preservation and conservation practices adopted by museums and individuals.

1.2.4 To develop a database to disseminate information beyond its geographical borders.

1.2.5 To initiate workshops for preventive conservation of textile artifacts at household level.

1.3 DE-LIMITATION

1.3.1 The study was de-limited to individuals residing in Gujarat state only.

1.4 SCOPE OF THE STUDY

- Documentation of rare textile artifacts would serve as a resource material to academicians, researchers, weavers, art lovers, historians, fashion and textile designers interested in the field of traditional textiles.
- Preservation of rich textile heritage of the country would serve as a valuable asset for future generations.

CHAPTER - II

REVIEW OF LITERATURE

Review of literature is a prerequisite to gain an insight into the pertinent area of research. The chapter comprises of theoretical literature and related researches gathered from various secondary sources such as books, magazines, journals, thesis, museums and websites. The libraries visited were The Hansa Mehta, Faculty of Fine Arts, Baroda Museum & Picture Gallery Library, Vadodara; Calico Museum Library, Ahmedabad and National Museum Library, Delhi.

The review of literature related to the present study has been categorized and discussed under the following heads:

2.1 Theoretical Review

2.1.1 Factors assisting the degradation of textiles

2.1.2 Documentation and digitization of textiles

2.1.3 Development of Database for traditional textiles

2.1.4 Preservation and Conservation methods of textiles

2.2 Research Review

2.1.1 Factors Assisting Degradation of Textiles

Textiles are literally a part of the fabric of our everyday lives. From wedding dresses to upholstery, ancient shrouds to a tapestry, church vestment to trade union banners, textiles combine the traditions of art, culture and technology. They form a multidisciplinary subject integrating scientific knowledge with aesthetic

sensitivity and practical skills. Many own some form of antique textiles in their home being intentional collectors or not. An upholstered chair, an embroidered sampler, a woven carpet or a clothing item which may have been passed through generations that becomes instilled with an emotional and historical significance. The organic content of textiles and the unavoidable wear and tear upon them determine that the process of disintegration is more or less inevitable. (37)

2.1.1.a Climate (Temperature and Relative Humidity)

Scientific studies revealed that climatic conditions of the place where the textile objects are displayed or stored have a profound effect on them and their method of preservation. All works of art are affected by humidity and temperature, the two most important components of climate.

The climate of a place is resultant of many factors such as sunshine, precipitation, humidity and temperature governed by the altitude, latitude, surroundings, proximity to the sea and to the mountains.

Climate is a general term used to describe conditions in a wider area or region. However, variations of climate occur in a region and therefore a term "microclimate" is used for climatic conditions of a limited area i.e. a city, building or showcase. (4)

Temperature and humidity are interrelated. Air is never free from water vapour and seldom come across absolutely dry air i.e. air with no vapour in it. Air can retain more moisture at high temperature than at low temperature whereas, damp or dry atmospheric condition varies considerably according to the changes in temperature or presence of moisture in the air. In case of museums, it is not the

presence of moisture in the air that matters as much as the atmospheric conditions but, the extent to which moisture is absorbed or released by the exhibits in such conditions.

It is the relative humidity which affects art objects rather than absolute humidity. A 1^{o}F rise in temperature corresponds to neatly two per cent decrease in RH which shows that RH has a direct relationship with temperature and owing to this relationship we find that a sudden change in temperature brings about a change in RH simultaneously. Observations also revealed that RH factor had greater influence on the process of decay than temperature and sudden changes in RH were followed by marked deterioration. Humidity has been found responsible not only for chemical deterioration but, also for mechanical and biological reactions. (27)

Think of a textile artifact like a “skin”, says Beth (2008), senior textile conservator at the Midwest Art Conservation Center. Textiles are sensitive to ***ambient conditions*** either heat, cold, humidity and fluctuations. Most textile items are "mixed media" there are different fibers and components all affected in various ways by temperature and humidity. (29)

Textile fibers are susceptible to changes in the temperature and humidity around. They have a capacity for retaining a certain level of moisture. A high relative humidity causes textile fibres to swell into absorbed water; a low relative humidity will cause the fibres to give off moisture and shrink. Fast changes in the relative humidity cause rapid shrinking and swelling in the materials, resulting in damage to the fibres. (28)

Frequent changes in the temperature and humidity can also be detrimental to a textile because as fibres contract and respond in response to altering conditions, abrasion will occur. This is particularly damaging if sharp dust and dirt particles are present causing over a period of time cuts through moving fibres. In addition, high temperatures and high relative humidity levels may initiate dye bleeding, yellowing, browning or biological deterioration (mould and mildew growth). Similarly, low humidity can cause embrittlement and desiccation. (70)

2.1.1.b Light

Light, natural and artificial pose a threat to certain categories of art works. All objects of organic material such as textiles, paper, natural historical specimens, paintings etc. are liable to be affected by it. In tropical countries where the sun is bright almost throughout the year, the damage from light can be serious. Both natural and artificial light can fade colour and contribute to the degradation and permanent damage of many textile fibres. The rate at which damage occurs is determined by the level of illumination and duration of exposure. (4,33)

There are mainly three sources of light i.e. sunlight, fluorescent tubes and incandescent bulbs. Irrespective of the source of light either natural or artificial, the rays it emits generally contain visible radiations to which the human eye is insensitive. (4)

According to laws of electro-magnetism proportional to the wavelength higher energy is produced at shorter wavelengths. It has been observed that at wavelengths shorter than 500 nanometers, energy is sufficient to damage many of the organic compounds found in textiles, papers, leathers and similar

materials. Ultra-violet radiations of less than 300 nm are seldom found in normal light because such radiations are readily absorbed by the earth's atmosphere in case of sunlight and by the glass envelopes of lamps in case of artificial light. It is therefore, apparent that light in the wavelength range of 300-500 nm is mainly responsible for photo chemical degradation. This photo chemically active region of light covers the near ultraviolet (300-400 nm) and the violet and blue (400-500 nm) portions of the spectrum. It is found that sunlight, direct or indirect, from a clear or cloudy sky, is energy. Incandescent lamps also known as tungsten lamps do not contain much ultraviolet and blue light and it was found that they are the safest source of light. Yet they generate heat that sometimes causes problems in museum. (3,4)

All conservators will mention light as a major threat to textile objects. As stated by Vuori (2008), "In comparison to other materials present in museum collections such as metals, glass and ceramics, textiles and specifically colored textiles are amongst the most sensitive to light."

Light damage depends on the intensity of the light, the amount of ultraviolet radiation and the length of light exposure. "There is no level of light at which fading ceases to occurs," says Patricia (2008) of University of Nebraska. Ordonez (2008) of the University of Rhode Island also points out that "When fading is observed, what we see is the damage to the dyes. What is not seen but occurs is the oxidation process damaging the textile fibers." (29)

Unfortunately nothing can be done about the colour that fades away once, it is lost forever, says Vuori (2004). Initial fading occurs most rapidly. An aged textile that has already faded is not going to continue fading at the same rate. (28)

However, a balance must be maintained between the public's desire to see and enjoy the textile and meet the demands of preservation. Museums and historic dwellings require light for public accessibility. Light is one of the most degrading environmental influences hence an immediate conflict arises due to the opposing goals of maximizing public display while minimizing damage from lighting. (10)

2.1.1.c Insects

Textiles are generally made up of organic fibrous materials like cotton, linen, wool, silk etc. Though the fibre is the chief component of a textile, additive materials like dyes, starches, water repellents etc. also make up for the composition of fabrics. Several physical, chemical, biological agents that cause damage to textiles are mainly responsible for the deterioration of textiles. The biological agents causing damage to textiles are mainly insects and microorganisms. (5)

Of all the destructive agents, ravages caused by insects are amongst the greatest. The insect menace is greater in tropical climate than in temperate zone because high temperature and humidity favour insects' growth. Destruction of organic materials in museums by insects is not a problem of recent origin. The history of the ravages of cultural properties by biological agents is rooted in the remote past. Aristotle, Horace, Ovid and other classical writers make mention of the irreparable damage caused to books, documents and textiles. In fact, insects have surpassed fire and water in the destruction of cultural properties. This is one of the reasons why not many organic antiquities have survived. Insect ravages in warm and humid countries are much worse than in temperate zones. (3,27)

Fortunately, only certain species of insects constitute the worst enemies of museums. Major pests of textiles are the organisms that feed directly on the materials and secondary substances still, may damage because they thrive on secondary substances present. (5)

A variety of pests (insects) can cause structural damage to textiles. In general, insects are placed in the class Insecta or Hexapoda under the phylum Arthropoda. Their sizes vary from macro to microscopic and some of the most important types in the tropics are sliver fish, cloth moths, carpet beetles, termites and cockroaches. (3)

Silver Fish are normally white or grey in colour with flat scales over the body giving them a greasy feel and shiny appearance. They generally live in dark places where the humidity is greater than 55 per cent and temperature varies between 60^{o}F to 80^{o}F. Silver fish generally feeds on starchy materials such as glue and fabric sizing, starchy and sugary matter. Silver fish leave irregular holes by eating the surface material of the objects with a shaving off of the surface fibres. (27,75)

Cloth moths are well known as pests of stored woolens but they also attack wide range of other fibres including hair, fur, silk and feathers. Serious infestations of cloth moths can develop undetected in home causing significant damage to clothing, bedding, floor covering and other articles. (43)

They prefer dark, undisturbed areas such as closets, basements and attics and tend to live in corners or in folds of the fabric. The actual damage is done by the larvae which after coming out of the eggs, eat voraciously substances of many types especially protienacious materials, for instance woolen textiles, feathers and fur. Damage to the articles consists of irregular surface feeding or holes eaten completely through the fabric. (3,43)

Carpet Beetles can do extensive damage as it feeds without preference on wool, fur and silk. It leaves clean neat holes in the textiles with a fine powder of the same colour of the object. (75)

Cockroaches are very common in all tropical countries. They live in darks warm, humid places and cause damage to paper, book binding and textiles. They spoil materials by excrements which actually leave stains in presence of moisture. (27)

Termites feed fabrics of plant origin. They devour rapidly and silently everything composed of cellulose, digging out intricate communication trench and in some cases causing almost total destruction of the material attached, leaving intact an external thin cover which hides the devastation underneath. Another essential requisite for termite invasion is the presence of moisture, which assists in their proliferation. (4,27)

2.1.1.d Microorganism

In tropical countries with humid climate, damage to cultural property especially textiles caused by various types of microorganisms is a great danger. The inherent properties of the textile fibres provide room for the growth of microorganisms. Besides, the structure of the substrates, the chemical processes also induces the growth of microbes. Infestation by microbes cause cross infection by pathogens and development of odour on the textiles. In addition, the staining and loss of the performance properties of textile substrate are the results of microbial attack. (4,24)

Textiles made from natural fibres are generally more susceptible to bio deterioration than the synthetic man-made fibres. Products such as starch, protein derivatives, fats and oils used in the finishing of textiles promote microbial growth.

The microorganism may attack the entire substrate i.e. the textile fibres or they may attack only one component of the substrate such as plasticizers contained therein or grow on dirt that has accumulated on the surface of a product. Nevertheless even mild surface growth can make a fabric look unattractive by the appearance of unwanted pigmentation. Heavy infestation that results in rotting and breakdown of the fibres with subsequent physical changes such as loss of strength or flexibility that may cause the fabric to fail in service. The material is attacked chemically by the action of extra cellular enzymes produced by the microorganism for the purpose of food. (11)

Microbes are the tiniest creatures not seen by the naked eye. They include a variety of microorganisms such as bacteria, fungi, algae, moulds and mildews. (20)

Moulds and mildews spore growths that break down the cellulose found in cotton, linen and rayon for nutrition. They cause a stain, if left on a textile for long cannot be easily removed. They appear as irregular shapes of gray, black or green spots on fabric and even discolor a fabric and emit musty odour. Animal fibres are more resistant to mildew growth than plant fibres. Pure silk is less susceptible if completely degummed. Wool decays slowly but the chemical and mechanical damage during processing can increase its susceptibility to deterioration. (75,11)

Fungi bear microscopic spores that are produced in enormous quantities always present in air. They are unable to photosynthesize their own food and hence damage the material on which they grow. Usually, they are aerobic but some species are anaerobic, requiring no air for the growth. They degrade and cause stains on the textiles. (39)

Bacteria are unicellular organisms which grow very rapidly under warmth and moisture.

Algae are also typical microorganisms which are either fungal or bacterial. They require continuous sources of water and sunlight to grow and develop darker stains on the fabrics. Algae greening also occur on fabrics which remain wet for long periods. (11)

2.1.1.e Dust, Soil and other contaminants

Textiles are at risk from dust, dirt and airborne pollutants, such as sulphur di oxide in the air emitted from automobiles and industry.

Dust is more than simply cosmetic problem for clothing. It is easily absorbed by textiles because dirt is acidic and attracts moisture; hence there is an increased chemical activity. Some dust particles are large enough to cut the fibres. Dust particles act like small knives, cutting into the fibres as the textiles expand and contract in response to changes in relative humidity. (60)

According to Ewer (2004), a textile or costume object that is soiled or stained has a greater attraction as a food source for insects, rodents and mould. (28)

2.1.1.f Display, Storage and Handling

Most textiles at some time in their history have served as functional objects. This history of use along with environmental and handling factors can affect a textile's condition resulting in the need for special care to ensure its' long term preservation. Making careful and informed decisions regarding the handling, display and storage of a textile can make the difference between a short life span and a textile's preservation for future generations.

Textiles are best preserved when displayed and stored in clean, well ventilated areas that are routinely and adequately maintained controlling dust, clutter and other accumulations of extraneous material that will greatly reduce the possibility of damage caused by insects, rodents and microorganisms such as moulds and fungi. (33)

2.1.2 Documentation and digitization of textiles

2.1.2.1 Documentation of textiles

Art & Architecture Thesaurus Online defines documentation as a process of gathering and recording information, especially to establish or provide evidence of facts or testimony. (53)

An AIC definition of conservation terminology defines documentation as the recording in a permanent format of information derived from conservation activities. (46)

Documentation - "The conservation profession has an obligation to produce and maintain accurate, complete and permanent records of examination, sampling, scientific investigation and treatment. The records should be both written and pictorial. The kind and extent of documentation may vary according to the circumstances, the nature of the object, or whether an individual object or a collection that is to be documented." (35)

According to Workgroup at Getty Conservation Institute (2003), a collection of data and the assembly, analysis and interpretation of recorded data is referred to as documentation. (55)

According to Getty Conservation Institute, 2008, "Documentation refers to the already existing stock of information. As an activity, it stands for the systematic collection and archiving of records in order to preserve them for future reference. It can be said: today's recording is tomorrow's documentation." (55)

Documentation of historic textiles and costume can reduce the amount of handling and exhibition necessary for communicating the historical, cultural and technical aspects to scholars and the public. Photography, pattern-making, drawings and written descriptions are all good methods of documentation. Photography is often done by professionals with varying degrees of experience in museum work; it is imperative that costume curators and conservators be able to communicate the proper procedures and the desired end result. Historic costume should rather be well photographed once than be subjected to repeated sessions of handling and lighting. (47)

The type and extent of documentation depends on several factors.

- Purpose or reason for examination
- Overall condition of the piece
- Resources designated to the project
- Extent of previous documentation

There are several formats followed for documentation of textiles depending on the type and extent of information sought. They are as follows:

1. Checklist

Form with blanks for information and descriptors with boxes to check for condition and treatment. They are good for large surveys or mass treatment as

well as useful to the custodian to evaluate needs or proposal for future conservator depending on how the checklist is developed.

2. Outline

Sentences or phrase description for each heading; allows for more detailed description than the checklist format.

3. Narrative

Paragraph or essay format for the entire report with headings necessary to locate specific information.

4. Combination

It integrates checklist and phrase descriptions.

The types of documentation include the following:

1. Examination/condition report
2. Treatment plan or proposal
3. Post-treatment Report
4. Photographic documentation
5. Storage and Exhibition Records

1. Examination/condition report

According to American Institute for Conservation of Historic and Artistic works, condition report is made to assess the condition of a textile at a given moment. The report should include a description of the textile, construction details and descriptions of the types and causes of damage (from age and original use), areas

of loss and discoloration, changes or repairs it has sustained. It may be done as part of the acquisition process, as a precursor to a treatment proposal or prior to and following the exhibition. Standard sections for this report include:

A. Title or identifying description of an object, accession or job number, date (if known) and storage location.

B. Owner of object (or contact person) including address and phone number.

C. Description of the textile. The amount of detail may vary as per the artifact and requirement of the concerned person.

D. Name of examiner and date.

E. Historical documentation as it relates to conservation treatment.

F. History of piece, how it has been used and how it will be used. If privately owned, future use may affect the treatment.

G. Dimensions - Overall measurements given in inches and centimeters

H. Testing methods and material identification of components - Visual examination under various light sources.

I. Description of condition including extent and cause of damage.

- Losses, abrasions, tears, holes
- Usage, prior handling, storage or display conditions that may have affected the current state of the object, current mounting technique
- Previous repairs, alterations and conservation.

J. Visual aids to describe the condition and damage.

- Sketches and diagrams.
- Photographs.
- Color coded photocopies of photographs locating damage.
- Radiographs.
- Tracings of photo or overlay of textile.
- Digitalized annotated computer images. (48)

The condition of an object is an assessment or evaluation of whether or not the object has suffered damage. A condition report is a record of that state in which the object was found. Traditionally, information was recorded by filling in a condition card accompanied by photographs, but it can also be gathered by a variety of means including a tape recorder, video recorder or digital camera linked to a computer. Information gathered should be documented methodically; physical, chemical and biological damage should be noted and where possible the source of the problem identified. The nature and extent of the damage can determine the future role of that object.

The example of a condition report provided here is general to most objects and is fairly self-explanatory. Although quite detailed, it shows the approach most likely to taken up. Finally, apart from recording the current condition, an object may be given an overall condition rating in terms of priority of attention.

CONDITION REPORT

- Object
- Cat. No.
- Date of Object
- Location
- Artist/Manufacturer
- Dimension
- Labels, Identifying Marks
- Materials/Media
- Present storage system
- Damage description that includes:

Physical damage

Physical damage is caused by mechanical stress incurred by mishandling, inadequate storage support and unsuitable environmental conditions.

Major structural damage: (*e.g.,* parts detached, broken. Tears, fractures, pieces missing, holes)

Suggest cause \ source:

Minor structural damage: (*e.g.,* small tears, holes, creases, folds, loose parts, *etc.*)

Suggest cause \ source:

Surface damage: (cupping, flaking, abraded \ scratched surfaces, veneer lifting, delamination, cracked glazes)

Suggest cause/source:

Chemical damage

Chemical damage may arise as a result of intrinsic qualities within the objects, which are unstable and inherently harmful. (corrosion of metals, acidity in paper/ textiles, corrosion of inks, encrustation, tarnishing of metals and crizzling of glass)

Suggest cause/source: (internal or contaminant)

Biological damage

Biological damage is caused by microbial activity. These micro-organisms include fungi, such as moulds and mildew and insect life.

Suggest cause/source:

- Previous Repairs: (If made)
- Condition rating: (good, fair, poor, or do not handle)
- Treatment priority: (urgent, high, medium, low)
- Further comment or recommendations. (8)

Standardization of Terminology

Words used to designate condition rating and treatment priority may have different meanings to different people within textile conservation, as well as conservators in other specialties.

The use of subjective terms such as excellent, good, fair and poor and abbreviations are helpful in comparing condition among a group of objects, but they are open to interpretation. Providing a list with guidelines for what constitutes “good”, “fair” or “poor” condition would be useful to the reader for truly understanding the condition of the object. (48)

National Park Service Museum Handbook Part I (1999) has stated the following condition rating codes.

Excellent: EX

No damage or deterioration. No treatment needed; no change will occur with good preventive conservation practices in place.

Good: GD

Minor damage and no active deterioration. No change will occur with good preventive conservation practices. Minor cosmetic treatment may be needed before exhibit (for example, many historic objects that have been used).

Fair: FR

Some damage or slow but active deterioration. Treatment may be needed to stabilize or before object is displayed (for example, a decorative ceramic object with losses to the rim or slowly rusting iron objects).

Poor: PR

Significant damage or active deterioration. Treatment is needed to prevent additional damage or deterioration (for example, a table with one leg missing, making it structurally unstable or an archaeological copper alloy object with "bronze disease).

The following descriptions are for the object in hand regardless of whether it is complete, incomplete or fragmentary. Note that an object can be incomplete, yet still be in excellent or good condition. (67)

The condition rating and treatment priority codes as mentioned by Corr (1999) in the manual of preventive conservation entitled, “Caring for collections” are as follows:

Condition Rating Code:

Good: Object is stable, can be handled and exhibited with care.

Fair: Object may be damaged and is vulnerable to further damage, must be handled with caution and may need remedial attention.

Poor: Object is seriously compromised. Do not handle; object is extremely fragile and vulnerable.

Treatment Priority Code

Urgent: Requires immediate conservation treatment or removal from present conditions.

High: Object is actively deteriorating.

Medium: May be damaged but is not actively deteriorating. Will need remedial treatment.

Low: Proper storage and care will ensure preservation. (8)

Due to discrepancy in the meanings of certain terms, the conservator should also be specific and explanatory when using such terms as lining, backing, consolidating, etc. So, a glossary of accepted terminology of textile related terms is a must. (48)

2.1.2.2 Digitization of textiles

Digitization describes the process of transferring analogue data to digital data. It is the procedure of capturing a digital reproduction of an object so that it can be made available through a variety of media. (61)

Digitization is the process of converting information into a digital format. Digitizing information makes it easier to preserve, access and share. For eg. an original historical document may only be accessible to people who visit its physical location but if the document content is digitized, it can be made available to people worldwide. (76)

One of the main virtues of digital imaging is its ability to make collections more accessible. Nowadays this process is much simpler if the collection has been digitised and recorded onto a CD-ROM, placed on a web page or in a database. Collections that were once too remote to be viewed are now accessible; objects that were once too fragile to be handled or exhibited can now be seen by broad audiences. Digitisation enhances preservation and conservation strategies, since once digitisation has occurred, the handling of fragile originals can be minimised.

Digitisation projects yield substantial benefits in various fields.

Research

1. Research by curators, students, teachers, scholars and specialists will be made easier and more effective as disparate images can be studied in new contexts.

2. Widespread dissemination of images of local or unique collections will encourage scholarly use of resources.

3. Exploration of other collection materials related to those on exhibit will increase and information about the museum and its significant collections will be enhanced.

4. International museum professionals and researchers may find digital images useful in investigating links, similarities and contrasts with works at other institutions.

Preservation

1. The handling of originals will be minimised.

2. For two-dimensional objects, the digital image will provide a backup copy of the original.

3. The capture of high-quality images will improve the legibility of faded or stained documents.

4. Conservation of material is emphasised and enhanced.(52)

2.1.3 Development of Database for traditional textiles

A database is a collection of information organized such that it can easily be accessed, managed and updated. The databases can be classified according to types of content such as bibliographic, full-text, numeric and images. (72)

According to Encyclopedia Britannica, "A database is also called electronic database that contains any collection of data or information which is specially organized for rapid search and retrieval by a computer. Databases are structured to facilitate the storage, retrieval, modification and deletion of data in conjunction with various data-processing operations." (42)

As defined in Wikipedia, "A database is an organized collection of data for one or more purposes usually in digital form. The data are typically organized to model relevant aspects of reality in a way that supports processes requiring the information. The term "database" refers both to the way its users view it and to the logical and physical materialization of its data, content in files, computer memory and computer data storage. This definition is very general and is independent of the technology used." (54)

A collection of various types of data including photographic images, sketches, measurements, condition assessments and other pieces of information stored in a systematic way for security and easy retrieval. Individual records or data are separated into sets, themes and fields with unique identifiers to allow data to be linked together and queried. Databases can connect separate "pieces" of information together allowing new information to be derived as stated by Ogleby (2009) in "Ancestral Art." (58)

Some databases of traditional textiles have been collected from various museum sites to form a base and have a deeper understanding for developing researcher's own database of the documented rare textile artifacts. They are as follows:

Objects: Kashmir Shawls

Shawl
19th century

298.5 x 134.5 cm (117 1/2 x 52 15/16 in.)
Border designs width - Sides 19 cm Ends 60cm

Manufactured in: silk, wool

This shawl has a twill woven cream ground with a large patterned border at each end consisting of large pine cone "buta" motifs. A narrow patterned border of smaller pine cone motifs runs along all four edges of the cream centre. A differently patterned narrow border runs down each outer side edge. The patterning is colored red, green, blue yellow and black. It is self fringed.

Inv. No. 254

Plate 2.1: Database of University of Leeds International Textiles Archive

Source: http://ulita.leeds.ac.uk/wiki/mediawiki-1.10.1/index.php/Education

Grandmother's flower garden quilt (1861-1899)

Item Name	quilt
Category	Bedding
Date Made	1861-1899
Culture	Canadian
Maker / Manufacturer	Robertson, Green Ross, Mary (artist/maker)
Place of Origin	North America: Canada
Material	cotton, silk
Technique	woven, plain, crepe, woven, satin
Description	Patchwork quilt; hexagonal "Grandmother's flower garden" pattern; consisting of 1305 small silk multi-coloured hexgonal patches forming 6-petaled flowers; black satin backing; border of black silk crepe; cotton batting.
Gender	not applicable
Accession #	1980.4.1

Plate 2.2: Database of University of Alberta Museums

Source: http://www.museums.ualberta.ca/dig/search/cltx/browse.php

Larger Image | Add to Lightbox

Core Record

Collection	Constance Howard Resource and Research Centre in Textiles: Material Collection
Object Name	hat
Date	mid 20th century
Brief Physical Description	Small pill-box style hat covered in silver couched thread embroidery. Select this link for more description information.
Id Number Current Accession	1293
Location Creation Site	Possibly Patahn
Subject	dress, dress accessories, embroidery, children's wear
Measurements	160mm (diameter)
Number Of Items	1
Materials Used (aat)	metal, cotton
Rights	Goldsmiths College, University of London. Constance Howard Resource and Research Centre in Textiles.

Object Description Information A small pillbox style hat covered entirely in padded couched silver thread. The couching stitches are pink and have been positioned to form padded diamond shaped patterns, a double row around the brim of the hat and four larger diamonds on the crown. The embroiderer has used the tension caused by the couched diamond shapes to indent the top of the hat giving a rich and varied surface and allowing maximum light play on the metallic thread. Spots of pink, blue, green and black link diamond shapes together and the change from metallic thread to soft cotton thread allows the stiff diamond patterns to undulate.

Plate 2.3: Database of Constance Howard Resource and Research Centre in Textiles

Source: http://vads.ahds.ac.uk/collections/CHM.html

Sari fragment

Object Name:	Sari fragment
Local Name:	*Sari*
Place Made:	Asia: South Asia, India, Western India, Gujarat
Period:	Early 20th century
Date:	1900 - 1930
Dimensions:	52 cm x 117 cm
Materials:	Silk
Techniques:	Ikat
ID Number:	T91.0481
Credit:	Gift of Dr. Marjory Wybourn

Plate 2.4: Database of Textile Museum of Canada

Source: http://www.textilemuseum.ca/collection/

Name:	brooch
Maker Role:	jeweller
Maker:	unknown
Made:	[New Zealand], Circa 1870-Circa 1890
Media:	huia beak, 15 carat gold
Object Category:	miscellaneous
Measurements:	length 90 mm
Credit:	gift of Edith Lawes, 1986, collection of Auckland Museum, Tamaki Paenga Hira, 1989.208, M2540
Information:	William Mason studied painting and textile design at London's Goldsmith College and the Central School of Arts and Crafts. In 1961 he won both first and second prizes at a Festival of Wellington wallpaper design competition. With the prize money, Mason and his wife Maureen set up Mason Handprints in their Plimmerton garage and began printing furnishing fabrics. They produced textiles from 1961 and wallpapers from 1965.
Gallery Section:	The Elegancies of Fashion

Plate 2.5: Database of Auckland Museum Collections

Source: http://muse.aucklandmuseum.com/databases/general/basicsearch.aspx

Long band, part of embroidered cover

Long band, part of embroidered cover. Bobbin lace and embroidered linen with needle lace insertions. Size: 183 x 44 cm.

Origin: Italy

Place: Genoa

Object Type: lace

Actual Date: c.1620

Century: 17th century

Materials: Lace, Linen

Museum Accession Number: 1986.24.13/Lace

click to enlarge

Plate 2.6: Database of The Bowes Museum

Source: http://www.bowesmuseum.org.uk/collections

TEXTILE FRAGMENT

SOUTH AMERICAN ARCHAEOLOGICAL COLLECTION

Catalog No: 41.2/ 7326 D

Culture: CHANCAY

Locale: COQUI, CHANCAY VALLEY

Country: PERU

Material: CLOTH (COTTON)

Dimensions: L: 67 W: 11 [in CM]

Technique: DOUBLE FACED COMPLEMENTARY WARP PATTERNING

Subject: SCROLLS; INTERLOCKED SNAKES; DIAMONDS

Period: LIP 1000-1476

Accession No: 1972-42

Donor:

Plate 2.7: Database of American Museum of Natural History

Source: http://anthro.amnh.org/anthropology/databases/jesup/textile_object.htm

Robe, Emperor's 12-Symbol, 18th century; Qing dynasty (1644–1911) Chinese
Silk and metallic thread on silk; 56 5/8 x 63 1/2 in. (143.8 x 161.3 cm)
Gift of Lewis Einstein, 1954 (54.14.2)

Enlarge Zoom

Description

Description Official costume in imperial China was highly regulated, and the decorative motifs of court costumes were specific to rank. Among the emblems employed for the emperor's ceremonial robes were the twelve imperial symbols, as seen on this example: sun, moon, constellation, mountain, pair of dragons, bird, cups, water weed, millet, fire, ax, and the symmetrical "fu" symbol. A bright yellow was reserved for the emperor, but for occasions such as ceremonies performed at the Altar of Heaven, the requisite color was blue. The garment worn for the actual rituals was the more formal court robe ("chao pao"). The dragon robe ("qi fu") was used for the periods of fasting that preceded the ceremony.

Except for a few details in black, white, and pale blue silk, this robe is embroidered in very fine gold and silver threads, which are laid in pairs and couched. Besides the imperial symbols, the dragon robe required additional motifs: nine large dragons rendered full face or in profile; and clouds, waves, and mountains symmetrically arranged to represent an orderly universe. This example is further embellished with auspicious "wan" and "shou" medallions, Buddhist and Daoist symbols, and bats.

Plate 2.8: Database of The Metropolitan Museum of Art

Source: http://www.metmuseum.org/works_of_art/collection_database/antonio_ratti

2.1.4 Preservation and conservation methods of textiles

Conservation is defined as the profession devoted to the preservation of cultural property for the future. The activities include examination, documentation, treatment and preventive care, supported by research and education. (8)

Canadian Association for Conservation of Cultural Property refers that the purpose of conservation is to study, record, retain and restore the culturally significant qualities of the cultural property as embodied in its physical and chemical nature, with the least possible intervention. Conservation includes the following: examination, documentation, preventive conservation, treatment, restoration and reconstruction. (69)

International Council of Museums - Committee for Conservation (2008) defines conservation as all measures and actions aimed at safeguarding tangible cultural heritage while ensuring its accessibility to present and future generations. Conservation embraces preventive conservation, remedial conservation and restoration. All measures and actions should respect the significance and the physical properties of the cultural heritage item. (58)

Preventive conservation is an applied form of conservation that seeks to delay the natural or accidental degradation of cultural objects through proactive measures that address safe conditions for management, storage, use, transportation or exhibition of collections. (65)

Preventive conservation (Preservation) - All measures and actions aimed at avoiding and minimizing future deterioration or loss. They are carried out within the context or on the surroundings of an item. These measures and actions are indirect as they do not interfere with the materials and structures of the items. They do not modify their appearance.

All actions directly applied to an item or a group of items aimed at arresting current damaging processes or reinforcing their structure. These actions are only carried out when the items are in such a fragile condition or deteriorating at such a rate, that they could be lost in a relatively short time. These actions sometimes modify the appearance of the items referred as Curative conservation. (58)

The importance of preventive conservation is growing in virtually every region of the globe. Defined as the management of the environmental conditions under which collections are housed and used, preventive conservation has advanced in both research and application. The last few years have been a period of progress. Managing the environment now applies to all potential risks to collections, be they ubiquitous environmental parameters like relative humidity or temperature; phenomena that are periodic and rare (such as natural disasters); or simply access, handling and use by collection staff. (12)

2.1.4.a Climate

In India, climatic conditions vary so much that unless sufficient precautionary measures are taken in time against sudden changes of temperature and RH, there is every possibility of damage being caused to the museum materials. An ideal climate is one in which sudden fluctuations of RH and temperature do not occur and where the two factors are present within reasonable limits affording protection to exhibits and comfort to visitors. Considerable study has been done on the subject and as a result it is recommended that the relative humidity in museum, libraries or in private collections should range between 45 to 60 per cent and the temperature between 68^{o}F to 78^{o}F (20^{o}C to 24^{o}C). (27)

Climate can be best controlled through air conditioning. Norms for air conditioning should be chosen keeping in view the conditions outside the museum or the library. In humid climate a higher figure of relative humidity can be chosen for control at 55 per cent or more but always below 65 per cent. For dry climate a lower limit about 45 per cent can be tolerated. Similarly, for hot countries the temperatures should be maintained at the higher limit of 24^{o}C and in cool climate the temperature can be kept at 20^{o}C. (4)

The whole problem of temperature and humidity can be solved satisfactorily by air conditioning but, this is rather a costly proposition because the place will also require dust extractors. Hence, local control can be thought of for individual showcases or cupboards to produce a favorable microclimate. Small humidifiers enclosed in the bottom part of the showcase not visible from outside can be used successfully. Silica Gel placed inside the sealed showcase or cupboard can normalize the relative humidity. The chemical has the property of absorbing moisture from wet air and giving it off in dry air. For an enclosed space of one cubic metre about 500 gms of silica gel are desired. (4,27)

Quick lime lumps can also be used for dehumidification. A simple means of regulating humidity is also the use of sufficient quantity of cotton hidden from view inside sealed cases. As cotton is hydroscopic in nature therefore it absorbs moisture when conditions are wet and gives off moisture in dry conditions. (27)

Variations in relative humidity can be controlled by suitable adjustments of the ventilation system during summer and monsoon seasons. The use of ceiling and exhaust fans will assist in removing excess moisture and also expel stagnant air from such places. Humidity in small rooms can be increased by the introduction of potted plants, water humidifies, khus curtains or screens made of wood clippings or vegetable fibers kept moist to prevent evaporation. (4)

Better results can be obtained if windows are kept closed during the hot and monsoon weather. The movement of hot and wet air that intensifies during the dry and rainy season can be prevented from entering the storage area by closing the windows.

2.1.3.b Light

All light, irrespective of the source, natural or artificial is radiant energy and causes permanent and irreversible damage. Control of light in museums or in areas where vulnerable objects are to be stored or exhibited must take three forms.

1. Minimize the intensity of light falling upon the object.
2. Expose objects to the light for a minimum period of time.
3. Eliminate the photo-chemically active radiations from the light. (4)

It has been scientifically established that the most often recommended light level for displaying textiles is 50 lux. Most people are more used to viewing objects under 300 lux light levels. But the minimum intensity of light needed for visibility and good colour retention is about 15 lux. Hence, a level of 50 lux is therefore not too, low. The levels of light, recommended above are rather low and may seem inadequate to visitors but too low a level of interior illumination is particularly noticeable in tropics .This is because the levels of outdoor light are high and therefore, the eye, once it is accustomed to a high level of illumination finds it difficult to adjust to lower levels. (3)

In order to minimize the other destructive effects of light, it is advisable to expose highly susceptible materials to view for as short a period of time as possible, especially sensitive objects should not be kept on exhibition for a long time. After a brief display open to the viewers, the fragile textiles may be returned to

storage or else curtains be drawn on showcases. Such objects to be displayed only when a visitor wants to view them. Switches which turn off automatically after a brief period of time operated by visitors can also be used.

The third aspect of light control for better preservation of objects is the elimination of invisible but photo chemically active radiations using the ultra violet absorbing chemicals. These chemicals are added to acrylic sheets of films which are then put in front of or over light sources such as windows and tubes of lamps. Ultraviolet absorbing plastic sheets which can be slipped over fluorescent light tubes are also manufactured. Ultra violet observing varnishes can also be coated on glass panels to filter out ultraviolet rays. However, varnishes are less efficacious than sheets and are competively expensive than films with increased durability. (4)

Ensure that protective devices are kept continually in good order for efficient functioning, it is advisable to monitor at intervals the illumination and the ultraviolet radiations present in galleries and cases. Even the ultra-violet absorbing plastic filters deteriorate with time and lose their efficiency. (3)

Excessive light, often used for photographing art objects can be very dangerous and should never be allowed. It has been found that the electronic flash is safer than tungsten lamps for photographing art objects because the duration of exposure is very small.

2.1.4.c Insects

The treatment of museum objects against bio-deterioration follows two general causes of action: preventive measures aimed at averting the possibilities of destruction and control measures required to be undertaken if the infestation has already set in. (5)

The design of the building where the art objects are kept and the material used for construction of the building play an important role in prevention of insect attack. As far as possible insect proof materials like steel should be used for structures. All timber should be properly treated to make it insect proof, especially against termite attack. As high humidity promotes reproductive activity of insects, air conditioning and climate control is advisable but in poor developing countries air conditioning being very costly, other means of protection against insects will have to be employed. (4)

Prevention of insect attack by chemicals is one such method. Many chemicals, referred to as "insecticides", kill insects, while others which don't kill but repel them are known as repellants. A large number of insecticides can be used for general purposes, but preservation of colour, durability of object, non-toxicity to human being and ease of application are important considerations limiting the choice. (4,27)

Man's battle against insect pests is not a battle of today. He has been fighting on this front since the dawn of history. In India aromatic plants and their leaves were used as insect repellants since ancient times. Those known to them were *Gorbach or Shadgranth* (Acorus Calamus Linn; Family: Araceae) *Ashvogandha or Asana* (Withania Somnifer a Dun; Family: Solanacea), tobacco leaves etc.

"*Gorbach*" is well known as an effective insect repellent and in the Konkan district of Maharashtra it is known as "*Pandru*". It contains an aromatic volatile oil and a bitter substance known as "acorin", together they constitute a powerful pesticide. An attack by the white ants was often checked by use of powered "*Gorbach*". It was a common practice to keep *Gorbach* and *Ashvagandha* in our

ancient repositions and libraries to protect books and manuscripts from damage by insect pests. The exudation of the Indian Franchincese tree known as "*Gugal*" or "*Dhup*" is used in many parts of India and burnt as incense. It disinfects the house and serves as a fumigant to drive away insect pests. (27)

After the second World War, chemical control of pests has greatly advanced and now a wide variety of chemicals are available to exterminate the grave menace caused by insect pests and these are known as insecticides. The two main methods of treatment of museum objects with insecticides are fumigation and application in the form of a solution. (3)

Fumigation is a very effective, quick and safe method for control of insects. Certain chemicals evaporate at ordinary temperature and form gases which are lethal to insects, for e.g. par dichlorobenzene, carbon disulphide, carbon tetrachloride, methyl bromide etc. The infested objects if kept for a sufficient period of time in an atmosphere charged with these chemicals vapours, the insects are killed. (3,4)

Before the use of any fumigant, it is necessary to ascertain the nature of the materials of which the objects is composed, the type of insects and effect of the fumigant on the material. Another consideration in the use of fumigants should be their toxicity to human being. Concern has been expressed quite often and rightly so, that even very small dosages of certain fumigants are toxic. Further, it has one drawback that it doesn't have a lasting effect and has to be repeated periodically.

Application of an insecticide to an object in solution form is a more permanent protection. Here the application is done with the spray or brush. Insecticidal solutions containing a chemical like gamexane, mercuric chloride, pentachlorophenol and its

sodium salts are suitable. Hence, all storage cupboard, drawers, screens, shelves, walls should always be treated with liquid insecticides. In addition, insecticides in powder form, like pyrethrum can be sprinkled on the shelves, so that insects coming in contact with them are destroyed.

Another approach advocated these days for proper pest control is known as Integrated Pest Control. This approach takes into account the factors that encourage the development of biological agents on museum objects such as dust, lack of ventilation, low lighting conditions, high temperature and relative humidity, inferior material used for conservation and improper surroundings. The strategy is to control these factors in order to minimize the use of chemical insecticides thus emphasizing prevention rather than remedial action. (4)

2.1.4.d Microorganisms

The best means to prevent or control the spread of microorganism growth is to deny the spores and moisture necessary for germination. Therefore, regulating the environment especially the RH is essential to prevent the deterioration of a collection from microorganisms' growth.

Conditions recommended for textile storage include a temperature of 18^{o}C to 20^{o}C (64^{o}F to 68^{o}F). Temperature may be lower than these levels but the upper limit should be 24^{o}C (75^{o}F). The relative humidity should be kept below 65 per cent and a level of 50 per cent to 55 per cent is recommended. These conditions should be maintained consistently as functions may allow dormant spores to begin growth. Numerous methods such as dehumidifiers, desiccant bags, silica gel and other buggers help adjust RH conditions within a sealed space such as a

storage cabinet or exhibit case. It is also important to keep any area that houses textile collections clean and free of dust, dirt and organic debris that can nourish spores. (39,68)

The growth of microorganisms should be controlled by preventive conservation rather curative or remedial conservation. When growths are encountered on a textile, a combination of mechanical treatment methods should be attempted to eradicate the problem and prevent its' spread.

- Vacuuming the textile will remove most of the active growth. The procedure for vacuuming must be well thought and appropriate equipment must be used.

- Dry cleaning is another treatment option that will kill microorganism growth. However the use of dry cleaning solvents requires special procedures and temperature levels that must be adhered to when cleaning historic textiles. (68)

2.1.4.e Storage, Display and Handling

The materials used in exhibition cases, frames or storage units must be carefully selected to ensure environmental stability. Wood, cardboard and many plastic and metals are considered unsatisfactory because they emit volatile acids or chemicals. If these materials are the only ones available place a barrier of stable material such as heavy-duty aluminum foil between the object and support. Cotton sheets also provide protection for pieces in storage, but they need to be washed periodically as they absorb volatile emissions. (34)

Polyethylene plastic and acid free cardboard boxes are suitable for storage. So, is acid free tissue paper or pre washed unbleached cotton muslin when used as a box liner packaging material or dust cover. At any costs avoid regular paper, cardboard, wood and wood products and adhesives such as urea formaldehyde which emit damaging acids. Also, do not use plastics garment bags because there is no air circulation (which can encourage moisture to build up); they offer no protection from light and they are typical made of a non recommended plastic. (70)

There are two methods to store a garment: hanged or boxed. Each garment is unique and should be considered individually.

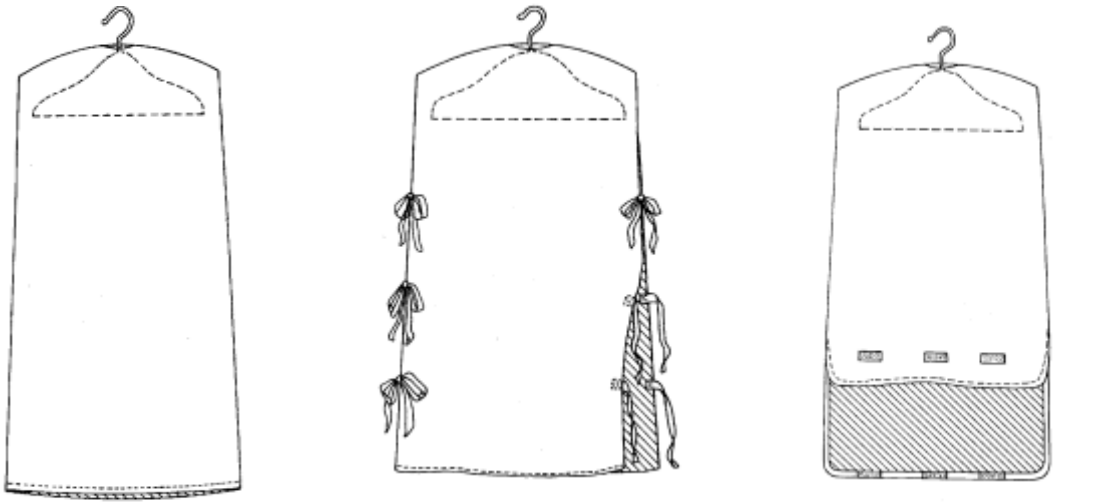
Vertical storage (hanged)

If the garment is very sturdy at the shoulder area, one can consider storing it on a hanger with a fabric cover. Avoid hanging fragile costumes, knits or decorated items or costumes that have weak shoulder seams. Remember that all the materials used to manufacture hangers can equally damage the textiles; wood is acidic, metal oxidizes and many plastics cause staining and accelerate chemical deterioration of the fibres. So, chose the hanger that will support the clothing and the padding will isolate the textiles from harmful materials. (50,14)

Avoid scented, padded hangers because the dried flowers as they contain attract pests.Wood or metal hangers can be padded with polyester batting and then covered with washed, unbleached muslin (Plate 2.1). Support the interior of the sleeves with crumpled acid free tissue and make sure that the garment sets on the hanger without putting strain on the shoulders, collars or sleeves. Then, place a loose muslin bag or dust cover (Plate 2.2) over the garment and hang in a well-ventilated place with ample room for hanging. (70)

Plate 2.9: Padded hangers with polyester batting

Source: http://www.heritagegown.com/products/Cotton-Padded-Hanger.html



A: Basic dust cover for costume B: Dust cover with ties C: Dust cover with fold up bottom flap

Figure 2.1: Types of dust covers for vertical storage

Source: http://www.nps.gov/museum/publications/conserveogram/dustcovers4-15.pdf

Horizontal storage (boxed)

Flat storage is recommended for most textiles because it provides support for the entire textiles. An acid free or polyethylene box with a lid, a sealed shelf or drawer can be used for flat storage. Line the box or shelf with unbleached muslin. Ideally, the textile should not be folded. But in unavoidable situations,

pad the creases with acid free tissue paper or muslin. It is best not to stack several textiles on top of each other. If textiles have to be layered use acid free paper in between with the heaviest item at the bottom. Store in a dark place where there is stable heat, humidity and good air circulation. (70)

All objects when stored on shelves or kept on tables should have soft padding under them. Padding protects the object from abrasion against the hard surface and possible damage. All objects kept in trays must be surrounded by resilient material (Plate2.3). Since storage of material plays an important part in its maintenance, due care must be given to proper storage facilities. In absence of these facilities objects are frequently damaged. Do not use mothballs when storing textiles, while they do discourage larvae but they are not a repellant and are a suspected carcinogen. (3)

Plate2.10: Textiles stored flat in a metal planchest padded and protected with acid-free tissue

Source: http://www.artlabaustralia.com.au/

Rolling textiles for storage is another option. It works well for larger pieces (shawls, quilts and rugs) and for small textiles such as lengths of narrow lace. Acid-free cardboard tubes are available and regular cardboard tube can be used if covered by a barrier like polyethylene plastic sheeting. Be sure that the tube is larger than the item itself so that there is no contact with the ends when hanging the tube.

To roll a textile place it face up on a flat clean surface. Smooth out bulges or creases and straighten the top and bottom as well as the edges. Place the tube parallel to either the warp or weft threads. Interleave rolled textiles with acid free tissue paper or pre washed cotton sheeting. Roll the flat textile onto the tube with the right side inwards (Plate2.11). Roll pieces with a raised texture such as pile carpets, velvets or embroideries with the right side outwards. For velvets and other fabrics with a pile, roll in the direction of the pile. If there are fringes, cut acid free tissue the width of the fringe and fold in half over the fringe. Once rolled, cover with muslin, cotton sheeting or acid free tissue and loosely secure with twill tapes. (Plate2.12). The roll should not support its' own weight; rather, provide support for the ends of the roll by using a hanging system or polyethylene foam blocks with corresponding carved recesses.

Plate 2.11: Rolling a textile onto a roller

Plate 2.12: Rolled & secured loosely with twill tapes

Source: http://www.powerhousemuseum.com/pdf/preservation/rolled_storage_for_textiles.pdf

Clean hands are important when handling textiles as human shins contains perspiration. Refrain from using creams as they may be readily absorbed by the textile fibres and later contribute to staining. Wash your hands frequently or wear inexpensive white cotton gloves that are available through photographic

and conservation suppliers. Remove jewelry or anything that may snag and do not to drag or rub your hands against the textile. Be aware that yarns and fibres can be easily pulled, frayed and weakened depending upon the condition of textile, its component material and method of construction.

Careless handling is one of the greatest causes of unnecessary damage to textiles. However, it is perhaps the easiest to prevent. The best advice is to handle textiles with care and avoid over manipulation. (70)

2.1.4.f Treatment (cleaning and stabilization)

With time or improper care and storage, textiles can become soiled. Cleaning can be a delicate operation depending on the condition of the artifact. Textiles that are in good condition can be surface cleaned by careful vacuuming but textiles that are powdering, splitting, fragmenting that have areas of loss, loose threads or broken seams should not be surface cleaned. (37)

Vacuuming is the primary means of cleaning textiles. It is effective in removing dust, other physical contaminants and discourages insects and moulds as well. Vacuuming is object specific. For many fragile or three-dimensional textiles, dusting the piece with a soft brush directly into the nozzle of a vacuum may be recommended. For large or sturdy textiles, vacuuming with an up and down motion (lifting, not dragging the nozzle) through a sheet of flexible plastic screen (Plate2.13) or net may be suggested (Plate2.14). Not all pieces can be readily vacuumed and not all vacuums are appropriate conservation tools. (34)

Plate 2.13: Barrier screen placed on the textile

Plate 2.14: Net or cheesecloth placed over the hose

Source: http://www.tepapa.govt.nz/SiteCollectionDocuments/NationalServices/Resources/CaringForTextilesAndClothing.pdf

Non coloured textiles that are in good condition can be wet cleaned (washed) by hands. Wet cleaning softens creases, realigns textiles and removes dirt and musty smells. In order to properly clean textiles in this way, it should be strong and be able to withstand the process. Proper cleaning techniques for antique textiles require a great deal of skill and experience; sometimes cleaning would be more harmful than allowing the textile to remain soiled. Dry cleaning is also dangerous for it applies considerable strain to the fabric and can dissolve some fabrics and trims such as early cellulose based sequins. Keep steaming and ironing to a minimum or refrain from doing it altogether. Heat accelerates the deterioration of textiles. Ironing also applies physical pressure to the structure and thus is harmful to the item. (37,50)

Stabilization of a textile artifact includes treatments that attempt to arrest or reduce the rate of deterioration. It may include reuniting parts, reinforcing and supporting a textile in order to achieve structural soundness or visual completeness. Pressure mounting, stitching, attaching full or localized support, consolidation and using adhesives are all methods of stabilization that are acceptable treatments under certain circumstances.

Stabilization or conservation can be carried out mainly by two methods. One is the conventional method with the use of needle and thread i.e. sewing or mending, a non adhesive method and the second one where consolidation is carried out by use of adhesives. (49)

Conservation of textiles by mending or repairing with needle and thread method involves the use of appropriate thread, support fabric and the correct sewing technique.

As a general rule, always use like with like. For example, a silk textile should be mounted on a silk fabric and stitched with silk thread. If the same fibre cannot be used, always use an inert synthetic fibre such as polyester. Using incompatible materials such as using silk with cotton accelerates the degradation of the textile. Silk and wool both are protein fibres and cotton, linen and other plant fibres are cellulose fibres, hence are compatible with each other. (45)

Support fabrics used for stabilization

The support fabrics to be applied should be chosen to correspond with the object to be stabilized. The properties like fiber, quality, yarn construction, fabric structure, texture, dimensional stability, weight, color and colorfastness, hand, sheen, finish must be considered when selecting a fabric to use in a stabilization treatment.

Some conservators prefer "like with like" and therefore match the fiber content of the stabilization fabric with that of the historic textile. Other conservators deliberately eschew protein-based fibers out of concern about the potential for insect damage. Many conservators follow no fixed rule but select fabrics to best suit the needs of the particular project, balancing the many fabric properties with

the properties, condition and needs of the textile for which the fabric will be used. Some consider transparency as the first requirement so that the object can be studied from face and back in order to analyze the structure of the object. (49,45)

Commonly used fabrics are sheer fabrics like nylon net, silk crepe line or polyester for backing. Light to medium weight high thread count cotton fabrics such as shirting or sheeting are chosen when dimensional stability and flexibility are considerations. Tightly spun and densely woven balanced plain weave fabrics such as cotton duck are chosen when structural stability and weight bearing considerations are important. On woven materials such as spun-bonded synthetic fibers are occasionally chosen for their smooth texture, inelastic nature and hydrophobic qualities. (49)

Threads used for stabilization

Threads commonly used by conservators are smooth, tightly spun, plied and finished. The properties allow the thread to withstand the abrasion that results when threads are passed repeatedly between the layers being attached to each other. Generally, these yarns are chosen to be visually and structurally compatible with the object being stabilized. (49)

When selecting threads remember to always use like with like, for example, silk with silk or polyester or cotton with cotton. As a general rule, finer the thread, the better but the appearance of the fabric will be judged by the most appropriate denier of thread. For example, fine silk will require a fine silk or polyester thread. A woollen tapestry will require a coarser woollen thread. (45)

Stitches used for stabilization

Before stitching the historic textiles, the following points should be kept in mind:

- To make sure that the needle passes in between the threads in the weave, not through them. If the needle passes through weakened fibres it can cause considerable damage.

- To keep the tension of the stitches fairly loose, so as not to damage the fabric.

- Do not use knots. Start your thread by leaving a tail at the back of your textile and stitch three small stitches in one position to anchor your thread. (45)

The main stitches used for stabilization are described below:

Self-couching stitch is used to secure torn, frayed or weak areas to a new support fabric and is consequently the most frequently used stitch in textile conservation. The self-couching stitch is worked parallel either to the warp or to the weft. As illustrated in Figure 2.2 a, the long stitch is laid first and extends into the stronger area surrounding the damaged area under repair. The stitch is then held down by small stitches that crosses it at right angles (Figures 2.2b and 2.2c). The process is repeated at regular intervals until the weak area is completely secured.

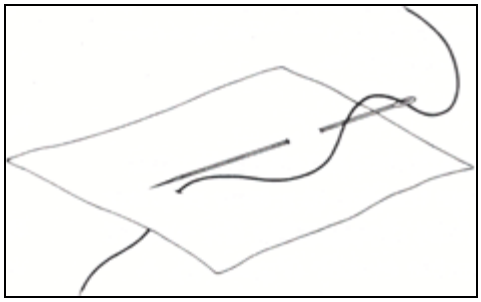


Figure 2.2a.: A long stitch is made first. It begins and ends in a sound area of the textile and spans the weak or damaged area. Support fabric and damaged area of textile not shown

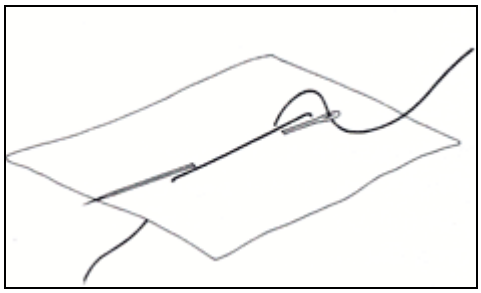


Figure 2.2 b: Small stitches hold down long stitch

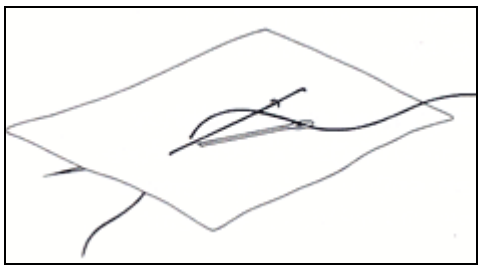


Figure 2.2c: Small stitches cross long stitch at right angles

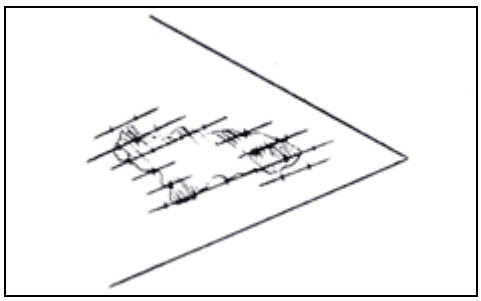


Figure2.2d: Damaged area of a textile that has been secured to its backing fabric by a series of self-couching stitches

Figure 2.2: Couching stitch

http://www.cci-icc.gc.ca/publications/notes/13-10-eng.aspx

Support stitch is used to hold large textiles to a new backing fabric while distributing the weight of the textile evenly (Figure2.3). A small, nearly invisible stitch is made on the top of the textile and a longer one is made on the back. Most frequently, the support stitch is applied in a staggered pattern parallel to the warp.

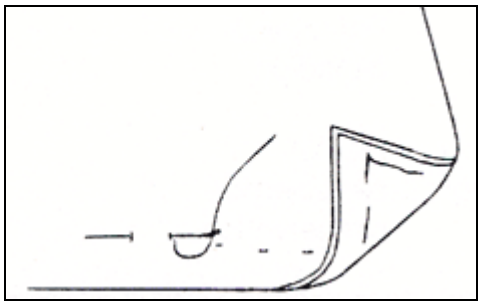


Figure 2.3: Support stitch

http://www.cci-icc.gc.ca/publications/notes/13-10-eng.aspx

Herring bone stitch is a simple interlacing stitch similar to a cross-stitch worked from left to right to secures raw edges (Figure2.4). It can be used to join two layers of fabric while maintaining flexibility. It is also frequently used to hold down single-fold hems or the edges of patches.

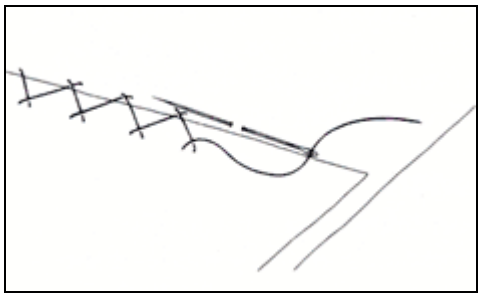


Figure 2.4: Herring bone stitch

http://www.cci-icc.gc.ca/publications/notes/13-10-eng.aspx

Slip stitch is almost invisible on the right side. It is used for blind hemming (Figure 2.5) and to attach linings to textiles. If worked loosely, it avoids undesirable tension between the backing fabric and the textile. (44)

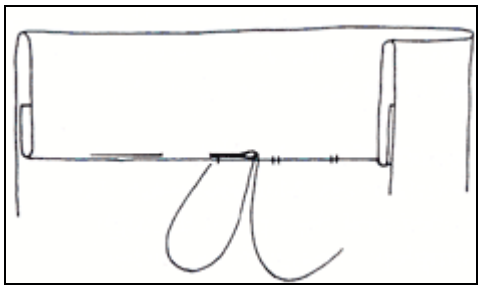


Figure 2.5: Slip stitch

http://www.cci-icc.gc.ca/publications/notes/13-10-eng.aspx

Adhesives used for stabilization

In general, we can say that we need to apply natural or synthetic adhesives only when the degradation of the old material has progressed too far to make a sewing technique successful. There are, however a lot of objects which are already in such a bad condition that the material has become too fragile and brittle to apply a sewing technique with good result. The old material has become so brittle that it is impossible to make stitches because the material will break off and the only result will be small holes all over. In such cases it seems that the application of adhesive can prove to be useful. Although this method of conservation has been severely criticized but it must be realized that the greater number of such objects would have been lost, if had not been preserved in this manner. (17)

Synthetic resins are widely used by conservators. Such resins are useful for conservation purposes when they have no noticeable influence on the appearance (visual and tangible), colours and flexibility of the textiles. Another very important demand is that the resins are not subject to degradation under the influence of light and surrounding atmosphere. This means that a film of the resin:

1. has to keep its solubility in its solvent.
2. must not yellow.
3. must not give noxious compounds on decomposition.
4. must not show a decrease of sticking power (bonding).
5. must not have an ill effect on the ageing of the textile material or on the fading of dyes.
6. must keep its flexibility.

There have been plenty of experiments with plastics with regard to their usefulness in textile conservation, but only a few members of the family of polyvinyl compounds and the acrylates derived from them meet the demands in an acceptable manner. (15)

The ones most commonly used in conservation (UNESCO 1968; Dowman 1970) are:

Polyvinyl Acetate (PVA) is the most commonly used thermoplastic polymer resin for organic material. It is used both as a consolidant and glue. It comes in a range of viscosities. The lower viscosity PVAs, however, have less bonding strength than those that are more viscous. It is also heat-sealable; for example, two pieces of cloth treated with PVA can be bound by ironing them together. PVA has good stability to light and does not yellow. It remains soluble and does not cross link and become irreversible. It is soluble in a number of organic

solvents. Its solubility is directly related to the volatility of the solvent; the more volatile the solvent, the more soluble the PVA. The more soluble the PVA, the better the penetration of PVA into the object being treated.

Acryloid B-72 is a methyl acrylate/ethyl methacrylate copolymer and is an excellent general-purpose resin. Durable and non-yellowing Acryloid B-72 dries to a clear transparency with less gloss than PVA and is resistant to discoloration even at high temperatures. It is very durable and has excellent resistance to water, alcohol, alkalis, acid, mineral oil, vegetable oils and grease. It retains excellent flexibility and can be applied in either clear or pigmented coatings by a variety of application methods.

Polymethyl methacrylate (PMMC) resins have similar properties to PVA. These resins are stronger but have fewer solvents. Many PMMC resins require mixed solvents such as 8 parts toluene and 2 parts methanol or a combination of chloroform and ethylene dichloride. In dilute solutions, PMMCs penetrate dense material well. The PMMC consolidants are particularly useful when more than one consolidant is required on the same object or cluster of objects.

Polyvinyl alcohol (PVAl) is a very useful resin in certain circumstances because water is the only suitable solvent. They are used as consolidants and adhesives both. In general (depending on brand), PVAl dries clearer than PVA. It is more flexible and shrinks less; therefore, it exerts less contractile force than PVA when drying. For this reason, it is often used in textile conservation. It can be used on damp or dry objects. It has been used for conserving paper and textiles with water-fast dyes that are alcohol-soluble.

There are indications of a slight tendency for some PVAls to cross link in 3 to 5 years if exposed to strong light, dryness and heat; especially temperatures over 100°C. If cross linking occurs, the resin becomes less soluble but most likely never becomes completely insoluble. Some conservators recommend that objects treated with PVAl be re-treated every 3-5 years to counteract any possible cross linking.

Epoxy Resins make excellent adhesives, consolidants and gap-fillers. There are cold-setting thermosetting resins that set up with the addition of a catalyst. The most desirable characteristic, aside from their strength, is that there is no shrinkage as they set. This is in contrast to all the thermoplastic resins that set through the evaporation of a solvent, thereby undergoing some degree of shrinkage. The main disadvantages of epoxies are that they are essentially irreversible and often discolor with age. As a general rule, epoxy resins should be avoided; however, epoxies are occasionally required by conservators because nothing else has the necessary strength. They are excellent when a very strong, permanent bond is required.

These are just a few of the most common adhesives used in conservation. They have a long, successful track record and are, therefore, widely used for an extensive variety of conservation purposes. (64)

The most suitable methods of adhesion on a base (supporting fabric) are heat and cold sealing techniques. A heat sealing technique is one whereby a weakened textile is secured to its impregnated supporting tissue with the aid of a warm iron. Moreover the adhesive being no more than a thin interlayer between the textile and its substrate, a greater degree of flexibility is retained and the surface appearance remains unchanged. Cold sealing technique involves the use of solvent that adheres the frail textiles to the reinforcing fabric. (17)

2.2 RESEARCH REVIEW

Leorna (1991) conducted an experimental research to investigate the abrasive nature of the backing surfaces for supporting historic textiles for conservation, display and storage.

Unbleached 100 per cent cotton fabrics of four different weights and construction were selected that included muslin, duck and sailcloth and warp sateen. They might function simply as a backing material for mounting, support a fragile item or even to bridge an open area where yarns or structure is lost.

Crock meter was the testing instrument adapted to test the abrasiveness of both the face and back sides of the backing fabrics. The methodology was accelerated from the actual museum conditions that allowed comparison and rating of backing fabrics while the measurement value used was the number of loosened fibre particles transferred during rubbing.

The results of the study revealed that there was no significant difference in the number of fibres removed for the face and back of the fabrics. Muslin, the plain weave fabric which was light in weight showed least abrasive nature when analyzed by one way analysis of variance. (16)

Miller et al (1989) undertook a research to characterize the physical and chemical degradation and changes in the properties of naturally aged silk. For the study 54 naturally aged, undyed, weighted and unweighted silk fabrics aging between 20 to 400 years old from various museums and historical societies were collected assuming that the manufacturing methods, use, care and storage conditions were similar. A new silk plain weave, unweighted and undyed fabric was also selected for comparison.

The methods of analysis included yarn tenacity and elongation dilute solution viscosity, amino acid content, photo acoustical infrared spectroscopy and optical and scanning electron microscopy. The metallic agents present on the weighted historic silks were identified using neutron activation analysis.

Analysis of the data revealed that of the total 54 undyed historic silk fabrics, 15 contained one per cent or more total weight of metallic elements and highest percentage of tin which was commonly used as weighting agent in late nineteenth and early twentieth centuries. The amino acid content of the new and historic silk fabrics were similar however, some of the samples exhibited a decrease in bulkier side chain amino acids with a corresponding increase in the simpler amino acids. The variety of fibre fracture patterns were observed with few differences in the infrared spectra except for flattened and less pronounced bands of tin weighted silks.

Visual assessment of the general condition of the fabric did not always correlate with tenacity, elongation or viscosity. Most of the fabric samples classified as in poor condition had low strength but, in some cases fabrics in good condition were also so weak that the yarns could not be raveled out for testing. Hence, visual examination may be inadequate to judge the condition of historic silk fabrics. (21)

According to Abdel - Kareem, (2000), there was a felt need to understand the potential of a polymer to act, play as a food source before a choice of an appropriate polymer was made for a given application. Resins of both natural and synthetic origin may be destroyed by biological agents and stimulate the growth of microorganisms on textiles. Hence the study evaluates the most suitable, effective polymer and resins that can be applied safely and successfully in treating ancient Egyptian Linen textiles.

Twelve polymers, resins and unbleached Egyptian linen fabric were selected for the study. Seven fungal strains isolated from ancient Egyptian textiles were selected and five samples were used for each fungus. The samples were treated using Agar Plate Test with application of pure strain method.

Spectrophotometer measurements of the samples were recorded as well as scanning electron microscope was used to record the changes in the surface morphology of control and treated samples. Finally tensile strength and elongation was measured.

The interpretations of the study revealed noticeable decrease in tensile strength, differences in colour change and considerable damage of surface among all consolidated samples after fungal deterioration. So, it was concluded that Linen textiles consolidated by maximum number of tested polymer are susceptible to fungal deterioration whereas Acryloid F-10 and Mowilith are the least resistant to fungal attack among the tested polymers and are more frequently used in conservation of archaeological textiles. Thus, attempts should be made to replace them with more resistant ones. (2)

Abdel - Kareem et al (2008) had conducted a study on Conservation of rare painted ancient Egyptian textile object from the Egyptian Museum in Cairo. An evaluation of the reactivation consolidation technique for reinforcement of ancient Egyptian textiles was performed.

A painted Egyptian textile object was chosen as a sample for the case study. Further, scoured unbleached plain linen fabric was selected to prepare aged model samples and two types of support fabrics used for testing were silk screen and polyester. The aged textile samples were treated with three selected adhesives and concentrations.

The results of the study confirmed that Lascaux 498HV (E) i.e. Butyl acrylate/Methyl methacrylate at a concentration of 10 per cent was found to be the most preferred choice among the tested adhesives i.e. Vinyl acetate and Methyl hydroxyethyl cellulose as well as the silk screen was found better than polyester. (1)

The rate of fading and degradation of textiles and other organic materials on display is influenced by the intensity and wavelength distribution of the light source to which they are exposed and by other environmental factors such as temperature, relative humidity and atmospheric pollutants. Hence, **Patricia & Barbara (1987)** undertook a research on Ultraviolet Absorbers: A Treatment to Reduce Fading and Degradation of Textiles to investigate the following objectives: (a) to screen commercially available ultraviolet absorbers and identify those with characteristics suitable for use by fiber artists and conservators, (b) to determine if ultraviolet absorbers applied by an immersion procedure could reduce fading of textiles coloured with natural dyes and (c) to determine if ultraviolet absorbers applied by an immersion procedure could reduce photo degradation in undyed cotton, linen, silk and wool and wool dyed with natural dyes.

For the experimental procedure**,** cotton, linen, silk and wool fabrics were selected as samples of the study and the natural dyes evaluated were cochineal, madder, fustic, weld, turmeric and indigo. Most ultraviolet absorbers commercially available in the United States were initially screened for potential use on textiles on the basis of colour, toxicity, solubility and ability to reduce fading. After preliminary evaluations, four benzophenone-based absorbers were selected for further study. The UV absorbers were applied to coloured wool textiles, undyed cotton, linen, silk and wool by an immersion procedure. After treatment, the specimens were exposed to light in a xenon-arc Weather-O-meter, an accelerated

light fastness testing instrument. Total colour change was instrumentally measured using a Hunter Lab tristimulus colorimeter. Strength loss was evaluated by breaking strength tests using a CRE Scott Tester.

Results of the study revealed that three of the UV absorbers modestly reduced fading in approximately fifty per cent of the dyed wool specimens. Although most of the absorbers failed to significantly reduce the strength losses in the majority of the wool, cotton and silk samples but they did slightly suppress degradation in these fabrics. Hence the treatment shows promise for the use on wool textiles such as tapestries coloured with natural dyes. (22)

Evenson & Patricia (2004) studied the effects of Light and ageing on selected quilting products containing adhesives. Conservators and conservation scientists have evaluated archival quality adhesive products and determined which ones are acceptable for use in conservation treatments but there were no published results concerning the long-term performance of adhesive-containing products available to quilt makers and home sewers. Consequently, they could not make informed choices. Therefore, the study was undertaken to determine whether the selected adhesive-containing products for quilters specifically quilt basting sprays, fusible webs and fusible battings contribute to discoloration or promote degradation of fabrics over time.

Fabric assemblies were created using three categories of adhesive-containing products. The adhesive in fusible webs and battings activate when an iron applies heat, thereby bonding fabric to the batting. Adhesive sprays are not heat activated; rather they are pressure sensitive adhesives. The adhesive spray products were sprayed on the backside of fabrics, left to dry until tacky and then attached to the batting.

Fabric assemblies were constructed using mercerized and bleached 100 per cent cotton muslin (Test fabrics) as the top layer and Hobbs Heirloom® bleached 100 per cent cotton batting as the bottom layer. The two layers were bonded together with an adhesive spray or a fusible web. Fourier transformed infrared (FTIR) spectroscopy was employed to determine the chemical classification of the adhesive sprays. The three adhesive sprays were identified as polyvinyl acetate (PVAC) products. Archival-quality PVAC is known to be a stable adhesive and has been used in conservation treatments for more than sixty years. Fusible batting adhesives were examined by proton nuclear magnetic resonance (NMR). The findings suggested that all three fusible battings incorporated similar adhesive compounds; all contained ether or epoxy groups. Specimens were exposed to 6 and 36 hours of accelerated ageing at 135^{o}C since this temperature did not exceed the recommended application temperature of the fusible webs. Similarly exposed to 40 and 80 hours of artificial light as selected household textiles (e.g. draperies) are expected to withstand 40 hours of accelerated xenon light exposure. Following light exposure and ageing, changes in colour, breaking strength and stiffness were also measured.

The results showed that some adhesive sprays yellowed more than others. The differences observed between adhesive sprays were probably due to differences in additives incorporated in the product formulations. None of the fusible webs exhibited significant yellowing, stiffening or strength losses following 6 hours of ageing or 40 hours of light exposure. On the other hand, following 36 hours of accelerated ageing all of the fusible webs exhibited undesirable yellowing that suggest the fusible webs should not be incorporated in quilts that makers

hope will become heirlooms. The adhesives used in the fusible battings proved to be the most stable to heat, light, strength and stiffness than any of the adhesive-containing products evaluated in this study.

Hence, the researchers concluded that the fusible battings evaluated were the only adhesive containing products that appear acceptable for quilts intended as heirlooms and those made for shorter term enjoyment during one's lifetime. (9)

Ragauskiene et al (2003) carried out a study on evaluation of the most preserving and secure method of adhesive lining for ancient textiles. The following series of samples prepared for investigation included ancient silk fabric, open weave supporting textile (gauze) sprayed and brushed by selected acrylic adhesive in solution or dispersion form, lined textiles where ancient textile was iron pressed to the supporting textile and detached textiles where supporting textile was carefully peeled off the ancient textiles lined by adhesive.

Scanning Electron Microscopy was used to observe a micro structural homogeneity and surface topography of the samples after various treatments. The results revealed that the method of application by brushing of dispersion solution covered the yarns of the supporting material evenly and in thinner layer of adhesive without forming webs. After application on the ancient textiles with warm iron, formed a film between the two layers and during peeling off; the ancient silk was left without any aggregations of adhesive.

Hence, concluded that the best method for lining of ancient textiles that enables to preserve and retain its authentic properties was the treatment of supporting textiles by brushing with dilute acrylic dispersion. (23)

Clare (2009) research entitled Digitized Historic Costume Collections: Inspiring the Future While Preserving the Past, discussed that many historic costume collections were found specifically to educate and inspire designers and students. However, conservators and curators knew that excessive handling was ultimately damaging the fragile antique garments and so preliminary research using these objects had been restricted if the objects were to be preserved for future generations. But the question arose to the investigator, "How can the maintenance of these collections be justified if equal access is not available to all researchers ?"

As well while traditional research took a hands-on approach to using these collections, students and designers increasingly these days rely on the Internet and other digital resources for inspiration. Hence the study developed database of Drexel Historic Costume Collection was found to be the easiest and most user-friendly approach to design research and allow users to discover items they might not have found otherwise and further a well-designed site would engage audiences, provide a forum for creative scholarship and preserve collections for future generations. (7)

Luxford et al (2009) studied the factors that led to the deterioration of silk causing embrittlement of the textile leading to splits and tears and eventually a powdery fragile fabric. Light has long been considered the major cause of damage to silk objects which has led to lower light levels for displays. However, recent research on medieval tapestries casts doubt on this. Other environmental factors are important and circumstantial evidence implicates raised humidity (RH), although there has been little research on this factor.

Thus the preliminary experiments investigated the effects of RH, as well as light, on the deterioration of new silk. Relative humidity was chosen to reflect a variety of typical display conditions. The temperature and RH dependent kinetics of silk ageing were determined by assessing the changes in mechanical properties and silk fibroin molecular weight. The initial results confirmed that light (with the UV component excluded) was not necessarily the critical factor causing damage to silk objects. The implications for the collections management and display of historic silks led to reassessment of the most appropriate environmental parameters for the preservation of silk objects. (18)

CHAPTER - III

METHODOLOGY

The present study was an endeavor to document, analyze, preserve and conserve the rare textile artifacts of personal collections of individuals.

In view of the above, the present chapter deals with an in depth information on various methodological aspects adopted to conduct the research. A detailed work plan and sequential procedure relevant to the research has been discussed under the following heads:

3.1 Pilot Study

3.2 Research Design

3.3 Selection of Sample

3.4 Documentation of Textile Artifacts

3.5 Analysis of Documented Textile Artifacts

3.6 Development of Database

3.7 Application of Conservation Treatment on Textile Artifact

3.8 Workshops on Preventive Conservation of Textile Artifacts at Household Level

3.1 Pilot Study

Pilot study was an essential step as the research was exploratory in nature. It created the base for the study enabling the investigator to become conversant towards the concept of preservation and conservation of traditional textiles.

Initially over a coffee table conversation and interaction with few textile lovers, the investigator established that residents of Vadodara and nearby places possessed vast collection of inherited valuable textiles not accessible to many. In due course of time, it also revealed that they had passion for textiles' collection but few had knowledge regarding its preservation and conservation.

The investigator's keen interest in the field of heritage textiles further led to undertake a study on aged traditional textiles of three families for preliminary work. The textile collection was documented both in descriptive and photographic form through observation method using structured interview schedule.

Museums selected from Gujarat, Maharashtra and Delhi were personally visited to elicit first hand information with regard to the standard practices adopted for preservation and conservation of textile artifacts all over India which would further aid the investigator to analyze the artifacts in a better informed way.

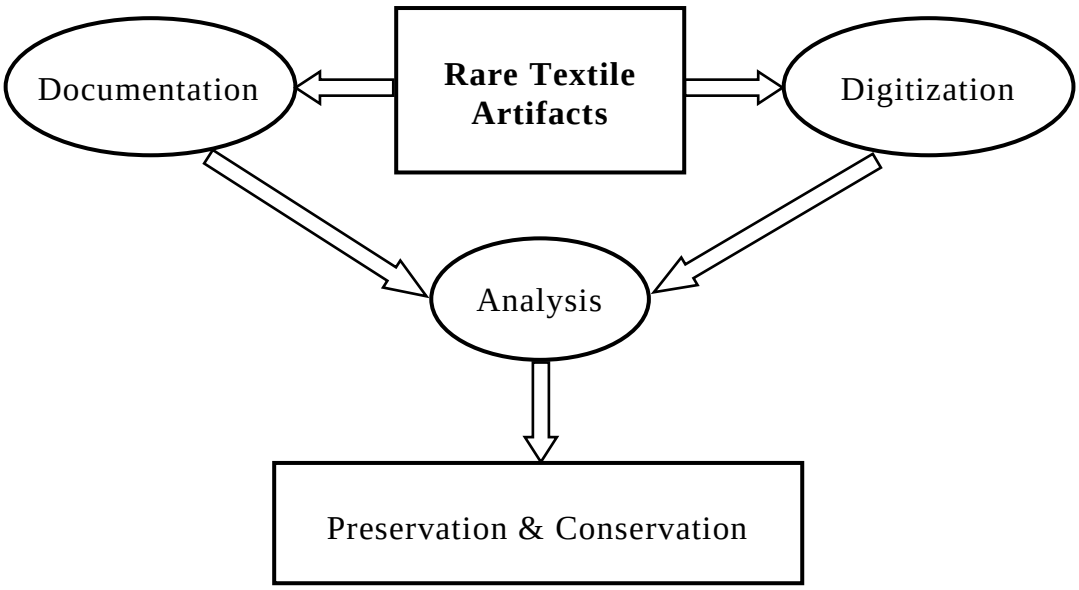
A workshop on "Conservation of Thanka Painting" organized by Baroda Museum and Picture Gallery, Vadodara was also attended by the investigator to get acquainted to the skills, materials and methods requisite for preservation and conservation of a specific textile artifact.

3.2 Research Design

The research was formulated with the key endeavor to document the rare aged textiles and to conserve them as national heritage of the country.

Exploratory cum Experimental research design with multi methodological approach was used for the study. The survey method employing observation, interview and case study was elected for the work.

3.2.1 Conceptual framework



- Development of Database
- Curative Conservation of an aged silk textile artifact
- Workshops on preventive conservation

Figure 3.1: Conceptual Framework

3.3.1 Locale of the study

Gujarat was purposively selected as a locale of the study on the basis of the information obtained through primary and secondary sources.

The data pertaining to the pilot study revealed that individuals in Gujarat possessed a valuable collection of textiles which were a part of their anthology during the time of study but, may not be tomorrow with no or limited public accessibility.

An in depth reference of secondary sources also revealed that Gujarat, being the state wealthy in cultural legacy is inhabitated by a population that had affluent reserves of innate aged textiles passed down through generations.

3.3.2 Sampling design

Purposive sampling design was followed to tap the respondents for the study. On the basis of the preliminary survey, six museums were selected to study the standard practices adopted for preservation and conservation of historic textiles for the partial fulfillment of the study. The selected museums were Baroda Museum and Picture Gallery, Vadodara; National Museum, Delhi; Calico Museum, Ahmedabad; Palace Museum, Jaipur; Kelkar Museum, Pune and City Palace Museum, Udaipur. Museum visits were made, personal interviews of the curators and conservators of the respective museums were conducted coupled with observation method to get an insight regarding the same.

Snowball technique was used to locate individuals from different background and geological locations of Gujarat. An attempt was made by the investigator to identify and persuade individuals in national spirit to share their possessions for academic endeavour. Persistent telephonic conversation enabled them realize the need of the

time while their rare textiles would degrade over a period of time and be a grave loss to the nation, in view of their accessibility to public for their general awareness perpetual to one's overall growth.

Deliberate sampling method was adopted for the selection of nine individuals based on their promptness to share their textile assets and feasibility of the investigator for a representative study. The selected individuals were

Mr. Kanubhai Salvi, Vadodara;

Ms. Usha Joshi, Vadodara;

Ms. Namrata Parikh, Vadodara;

Ms. Kalpana Bhatt, Bhavnagar;

Ms. Mandakini Devi Chauhan, Santrampur;

Ms. Gyaneshwari Devi Rana, Jambughoda;

Ms. Ambika Devi Parmar, Devgarh Baria;

Ranisahib Sugan Kunwar Singh, Devgarh Baria;

Ms. Alaukika Devi Khachar, Jasdan;

Rare textile artifacts selected purposively for documentation and digitization were 95. The criteria being historic in nature, more than 70 years old with limited or no public accessibility.

A sample size of 36 participants for the didactic workshop on preventive conservation of traditional textiles represented different strata of Gujarat. The decisive factors being interest, passion and inquisitiveness towards traditional textiles and its' preservation and conservation besides individual's exclusive aged textile possession.

3.4 Documentation of the Textile Artifacts

The investigator personally visited the individuals for data collection. The documentation of the textile artifacts was done through descriptive method supported with photography.

Structured interview schedule (Appendix I) was formulated and administered to attain detailed information regarding the artifact that included the date of acquisition, origin, possession, dimensions, material used, technique, type and degree of damage, present storage system and any other preservation practices coupled with observation method. The other tools employed were measuring tape, pick glass and magnifying glass.

Each artifact was laid on flat surface against a white bed sheet with minimum handling and creases under appropriate day light for photography by a digital camera bearing resolution of 5.0 mega pixels .The magnified image of the damaged area of the artifact was also captured for further identification and analysis. Corel Draw 13 was used as editing software of the pictures.

3.5 Analysis of the Documented Textile Artifacts

The documented textile artifacts were analyzed in terms of origin, material, technique, category, type and degree of damage based on the primary and secondary sources.

Visual assessment and observation methods were used to assess the physical, chemical, biological and multiple damages in the textiles. Magnifying and pick glass were used to report the type and extent of damage that had occurred in each textile artifact. Further, digitized images were also magnified to maximum

resolution to confirm the analysis. The investigator even attempted to categorize the type of damage for better analysis based on the relevant secondary sources as stated in the following table.

Table 3.1: Category and the type of damages

Category of Damage	Type of Damages
Physical Damage	Permanent Creases Permanent Folds Raveling or fraying of yarns Water logged stains Abraded areas Tears at folds Breakage of yarns
Chemical Damage	Colour fading Yellowing Zari tarnish Holes due to ageing
Biological Damage	Insect holes Brown stains

Qualitative analysis was used to judge the condition of the textiles. Condition rating code was devised for the present study based on the referred literatures (8, 67) and relevant interpretations of the type and extent of damage occurrence in a textile artifact as stated below:

Excellent: EX

- No visible damage or deterioration.
- Preventive conservation practices to be followed to maintain the textile artifact in excellent condition.

Good: GD

- Minor damage but no active deterioration.
- Damages like small holes, creases, tears, folds, colour fading, fraying of yarns are found.
- Preventive conservation treatment may be needed to stabilize the artifact.

Fair: FR

- Some damage but slow deterioration.
- Damages like tears at folds, large holes, abraded areas, worn down parts or multiple damages found.
- Preventive conservation treatment may be needed to stabilize the artifact like repairing a tear or mending a hole.

Poor: PR

- Significant damage or active deterioration.
- In such cases textiles are fragile and vulnerable, have suffered end to end deterioration and are in almost shattered condition or structurally unstable.
- Curative conservation treatment is needed to stabilize the artifact.

Treatment priority code was assigned to each artifact based on the present condition so that the artifact if necessary can get required remedial treatment. The investigator adopted the following operationally defined priority code.

High:

Needed for textile artifacts in poor condition. Requires immediate conservation treatment.

Medium:

Needed for textile artifacts in fair condition. Requires remedial treatment like mending or darning of holes or tears etc.

Low:

Needed for textile artifacts in good or excellent condition. Requires correct preventive conservation practices to ensure good condition.

3.6 Development of Database

The fabricated database incorporated the detailed documentation of the textile artifacts in both photographic and descriptive form.

A coding system was formulated for the documented textiles based on the classification of the traditional textiles. The coding system consisted of abbreviations for the classification such as WN for woven textiles, ED for embroidered textiles, RD for resist dyed and P for printed textiles. On the basis of this coding system, catalogue numbers were assigned to the textile in that specific collection (for example 1st woven textile = WN1).

In view of the present research need, the investigator designed a template that included a detailed yet accurate data about each artifact. It was as follows:

(1) Item Name

(2) Catalogue No.

(3) Date of Acquisition

(4) Place of Origin

(5) Material

(6) Technique

(7) Dimensions

(8) Description

(9) Credit

(11) Category of Damage

(12) Type of Damage

(13) Condition

(14) Treatment Priority

The collected and analyzed information with photographs were fed in the stated format of the template using Corel Draw 13 and Microsoft Office software for the development of the database.

3.7 Application of Conservation Treatment on Selected Textile Artifact

On analysis of the documented textiles, it was found that majority of the silk artifacts showed alarming signs of deterioration. Consolidating shattered silk has been a long standing difficulty in textile conservation due to the fact that most embrittle silk cannot withstand the stress of mechanical consolidation achieved through needle and thread. Hence, an experimental approach towards conservation of an aged silk saree with the application of adhesives for stabilization was carried out.

Selection of the artifact and treatment was based on the degree and type of damage, suitability of the textiles and feasibility of the treatment. Therefore, a woven Paithani saree of Gujarat acquired from an individual's collection was selected as an object for the case study.

3.7.1 Materials and methods

3.7.1.1 Materials

- The artifact under study was a rare Paithani Saree of early 20th century made in pure silk and zari from the state of Gujarat, India.
- Naturally aged seri silk was used to prepare samples for the study.
- Nylon net was used as a support fabric for the ancient silk textiles.
- Polyvinyl Acetate (PVA) and Polymethyl Methacrylate (PMMC) were used as adhesives in two concentrations 5 per cent and 10 per cent.

3.7.2 Methods

3.7.2.1 Methods of investigation

The condition of the object under investigation was assessed visually and detailed written as well as photographic record was maintained. The condition report of the artifact before treatment included the following details.

1) Item Name
2) Catalogue No.
3) Date of Acquisition
4) Place of Origin
5) Material
6) Technique
7) Dimensions
8) Credit
9) Category of Damage

10) Type of Damage

11) Condition

12) Treatment Priority

13) Present storage system

3.7.2.2 Evaluation of the consolidation method

Naturally aged fragile silk textile fabric that suited experimentation for conservation methods using adhesives was selected for the study.

The support fabric samples were treated with the adhesives based as the subsequent procedure.

- A clean wooden table was prepared with a non-stick plastic tightly secured with cello tape on all the four sides forming a layer between the table and the support fabric.
- The support fabric (nylon net) of required size was laid on it and the prepared concentration of the acrylic adhesive was lightly brushed onto it. The intent of this technique was to create a film from the adhesive to which the fabric was embedded.
- After drying the prepared support fabrics of different concentrations i.e. 5 per cent and 10 per cent were attached to the naturally aged silk textile by two methods that were cold and hot process. In cold process, the back side of aged textile was placed on the face side of the support fabric and bound to each other by brushing the acetone solution on it. Further it was allowed to dry.

- Similarly in the hot sealing method the adhesive coated supporting textile was pressed on the reverse side of the aged silk textile by pressing with light and warm iron.
- Then the consolidated samples were subjected to various tests like transparency, stiffness and tensile strength for evaluation of the most preserving and secure method of adhesive lining for aged silk textiles.

a) Tensile Tests

Test strips measuring 20cm x 2.5cm were conditioned for at least 24 hours at $27^{o}C \pm 2^{o}C$, 65% R.H. Data was then acquired under same ambient conditions on an Instron 1121 Universal Material Testing System as per ASTM 5035-95 that is standard test method for Breaking force and Elongation of Textile Fabrics with a gauge length of 3 cm and a cross head speed of 30 mm/min. Six replicates from each sample were analyzed discarding the results for the strips which broke close to the jaws and calculating average (mean) value for the remainder.

b) Stiffness Test

Test strips measuring 15cm x 2.5cm were conditioned for at least 24 hrs at $27^{o}C \pm 2^{o}C$, 65% R.H.±2% R.H. Data was then acquired under same ambient conditions on Cantilever Stiffness Tests as per the standard test method. Six replicates from each sample were analyzed and average (mean) was calculated.

c) Transparency

The transparency in terms of sustaining the textiles in the same form as the original one was visually evaluated.

3.8 Workshops on Preventive Conservation of Textile Artifacts at Household Level

Workshops on preventive conservation of textile artifacts entitled "Preserving our Heirlooms" was organized to create awareness about preventive care amongst textile collectors at household level.

Two workshops of four hours each were organized. One was organized at the Department of Clothing and Textiles, Faculty of Family and Community Sciences, The Maharaja Sayaijirao University of Baroda, Vadodara (Plate 3.1) and the other one with Jaycees Women Club, Baroda Metropolitan Chapter, Vadodara on March 1st and 9th, 2012 respectively.

Lecture cum demonstration method was used to enable participants understand the basic concepts of collection care, good housekeeping and plan long term future of their collection in an informed way, within the resources available to them.

The lecture was supplemented with a Power Point presentation highlighting the importance of traditional textiles, factors affecting its degradation, need and role of preventive conservation in today's world to save our textile heritage.

It was followed by demonstration on the different methods of preventive conservation that included basic cleaning (vacuuming) of the textile artifacts, different types of storage methods such as flat, rolled and hanged (Plate 3.2-3.4) depending on the condition of the artifacts and basic mending or stitching to prevent further loss to the damaged textiles.

A questionnaire schedule (Appendix II) was administered to all the participants on the completion to know their feedback regarding the workshop. The questionnaire included the demographic details of the respondents, awareness regarding the related terms, sources of information, possession and reason for preservation of traditional textiles. The data on present storage system and their keenness to implement the knowledge acquired during the workshop was also elicited.

A technical manual entitled "Preserving our Heirlooms" was prepared by the investigator to assist individuals for preventive care of their textiles at household level and maintain the textile heritage.

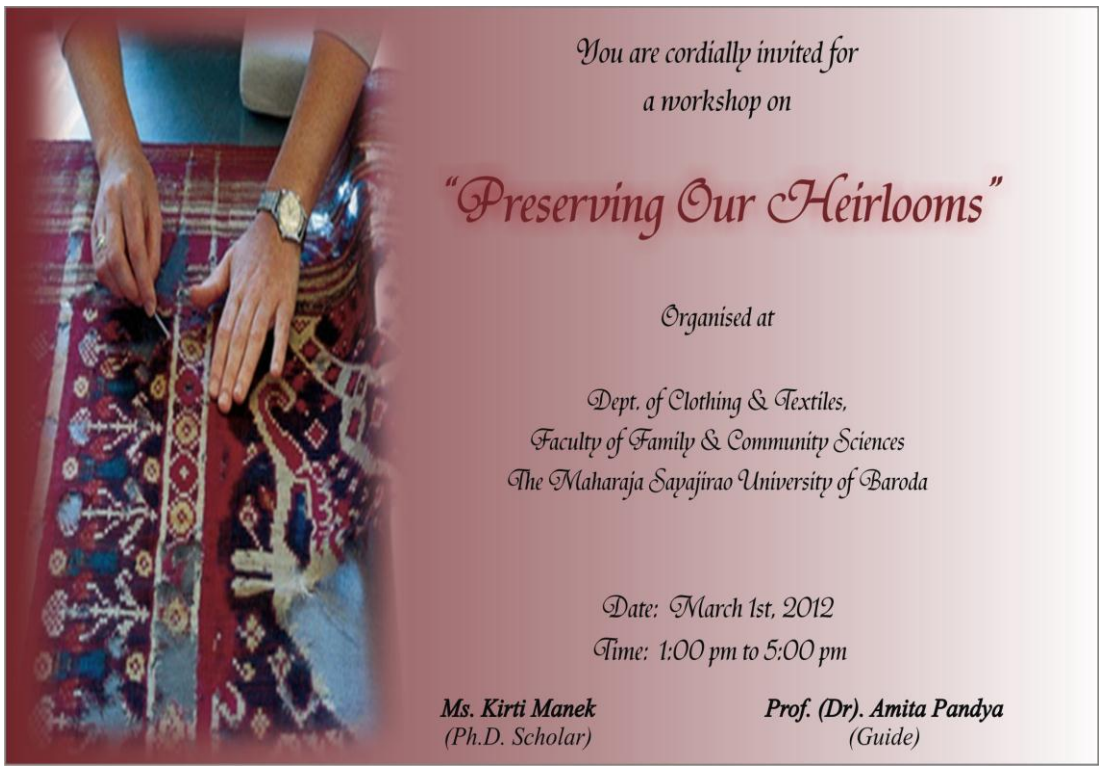


Plate 3.1: Invitation card designed for the workshop organized at the Dept. of Clothing and Textiles, Faculty of Family and Community Sciences, The Maharaja Sayaijirao University of Baroda, Vadodara

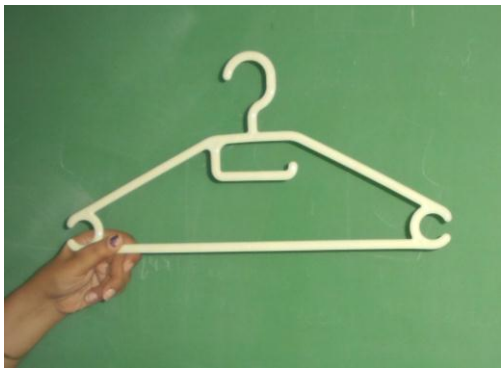


Plate 3.2a: Select the hanger as per the size of the garment

Plate 3.2b: Wrap narrow strips of polyester batting around the hanger

Plate 3.2c: Pad the hanger until it attains a rounded form without sharp ends

Plate 3.2d: Preparation of paper pattern for cover

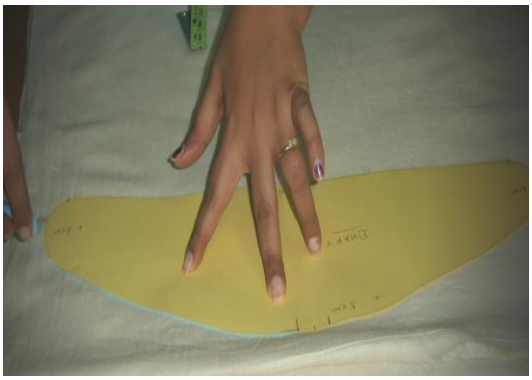


Plate 3.2e: Tracing of paper pattern on muslin for hanger cover

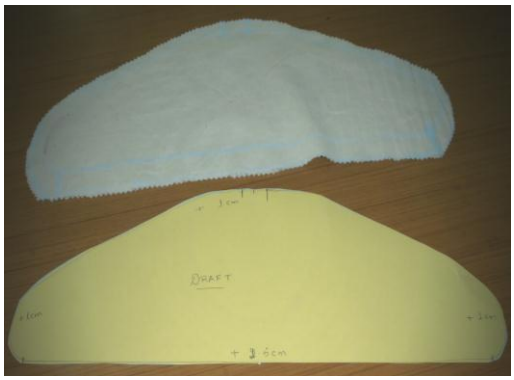


Plate 3.2f: Ready paper and muslin draft of the hanger cover

contd…

Plate 3.2g: Stitched muslin hanger cover

Plate 3.2h: Muslin cover placed over the padded hanger

Plate 3.2i: Lower hem finished with slip stitch

Plate 3.2j: Garment placed over a padded hanger

Plate 3.2k: Garment covered with dust cover, ready for storage

Plate 3.2: Preparation of padded hangers: Vertical storage

Plate 3.3a: Polyvinyl chloride tube covered with prepared unbleached, washed muslin cover

Plate 3.3b: Polyvinyl chloride tube ready for rolled storage

Plate 3.3c: Placing of textile to be stored on muslin fabric with right side inside

Plate 3.3d: Covered with muslin fabric and rolling the textiles over the prepared tube

contd…

Plate 3.3e: Fasten the wrapping in place with ties of cotton twill tape

Plate 3.3f: Textile roll ready for storage

Plate 3.3: Preparation of rolled storage: Horizontal storage

Plate 3.4a: Box to be used for storage

Plate 3.4b: Lining the box with unbleached, washed muslin fabric large enough to envelop the stored textiles

Plate 3.4c: Placement of crumpled muslin along major folds to prevent formation of hard creases

Plate 3.4d: Covering with the same lined muslin fabric before closing the box

Plate 3.4e: Box ready for storage

Plate 3.4: Preparation of boxed storage: Horizontal storage

CHAPTER – IV

RESULTS AND DISCUSSIONS

The results and interpretations of the study have been discussed under the following heads:

4.1 Pilot Study

4.2 Preservation and Conservation Practices adopted by Museums and Individuals

4.2.1 Preservation and conservation practices adopted by museums

4.2.2 Preservation and conservation practices adopted by individuals

4.3 Analysis of the Documented Textiles in terms of Classification, Origin and Fiber Content

4.4 Analysis of the Documented Textiles in terms of Category, Type of Damage and Condition of the Textile Artifact

4.5 Development of Database

4.6 Application of Conservation Treatment on Selected Textile Artifact

4.7 Outcome of the Workshops on Preventive Conservation of Textiles at Household Level

4.1 Pilot Study

The investigator attended a workshop on "Conservation of Thanka Painting" organized by Baroda Museum and Picture Gallery, Vadodara from 28th Feb. to 4th March, 2005 to gain an insight and develop a wider perspective on textile preservation and conservation. One of the eminent conservator along with his

team from National Museum, New Delhi was invited to conserve a rare and degraded 7th century Thanka Painting of Baroda Museum and Picture Gallery, Vadodara.

Tibetian Thankas, scroll paintings of Buddha done on a cotton fabric framed with silk brocade borders on all four sides are complex objects with intricate iconography, technical construction and lot of religious and cultural significance, a challenge to the conservators.

The workshop commenced with the preparation of a condition report of the painting to plan its conservation treatment strategy which included a brief summary on its present condition as follows.

On assessment, the present condition of the painting was declared as "poor" with the subsequent items of concern.

- Dirt and dust was found throughout the painting.
- The base cotton fabric had areas of losses forming large number of holes due to the attack of silver fish that were found in the displayed show case.
- The paint layers had got faded and flaked off at several places due to the fluctuations in the climatic conditions.

On observation the sequential treatment planned for the conservation of the artifact was as under:

The treatment work started with separation of the hand stitched brocade borders and the central painting of the Thanka followed by wet cleaning. The painting was carefully soaked flat in filtered water mixed with few drops of glycerin for

10 minutes, aided with gentle sponging on both sides for better cleaning. Finally rinsed in plain water, laid flat on the blotting paper for complete drying.

Next day, the painting was set aside for stabilization. It was placed flat on the table for realignment of the yarns in the damaged areas. Based on the conservation treatment plan, the damaged areas were sandwiched between fine nylon net with manual darning stitches to minimize the movement of fibres and prevent from further loss.

The selection of backing fabric was done on the principle of like with like. Cotton fabric was selected to support the painting and silk for the borders which was similar in content, weave structure, colour and weight. The cotton fabric support was attached to the painting with a paste of white refined flour and sodium chloride (used as a preservative) with nap pasting method at specific points to avoid mechanical stress of needle and thread to the entire weak area of the painting. Later, the brocade silk border was also lined with silk fabric using fine darning stitches as it was in sturdy condition.

Finally, the whole painting was assembled in the same manner as the original piece by hand stitching the borders to the central painting and was displayed in the showcase for public viewing. The complete process was carried out with the emphasis on reversibility of the treatment and avoidance of foreign matter that disturbs the authenticity of any historical item, a must for all working in the field of conservation sciences.

4.2 Preservation and Conservation Practices adopted by Museums and Individuals

4.2.1 Preservation and conservation practices adopted by museums

The investigator personally interviewed six museum curators and conservators to obtain first-hand information as well as gain in depth knowledge regarding the standard preservation and conservation practices followed by the museums in India.

Professionals in all the museums were aware of preservation, conservation practices and the detrimental effect of environment threats, pests and inappropriate display, storage and handling on the artifacts.

All the respondents had written guidelines (museum handbook) for the staff to follow preventive care but, the practices adopted were to the best of their knowledge within the available resources and constraints.

The information elicited by the curators on practices monitored for control of natural and artificial light revealed that all the museums had closed buildings structures with no windows to prevent from direct day light. None of them had instruments to measure the intensity of light yet, all adhered to proper light arrangements (within tolerable limits) for public viewing whereas one of the museums switched on the lights only when visitors entered the display area. This indicated that the museum personnel were aware of the perilous effect of light (both natural and artificial) on the exhibited textiles.

All museum curators revealed that they had installed RH measuring instruments in their display areas to measure the macro climate of the museum building

though none monitored the micro climate (climate inside the showcases or closed display space) nor practiced any method to control the same which is a threat to the physical integrity of the organic artifacts.

The investigator observed that all museums had made arrangements to control the macro climatic conditions (temperature and relative humidity) with various methods. Only one out of six museums had air-conditioner installed whereas three had ceiling fans and two had installed exhaust fans. According to the curators, all the stated methods assisted as preventive measures to control climatic fluctuations which were the greatest threat to textile materials in the tropical countries like India.

One of them opined that much effort to control humidity was not required in their case as the museum had favorable geological location whereas , one of the respondents also expressed that due to financial and other constraints they could not opt for air-conditioners despite of it being the best method.

Interviews and observation revealed that to ward off insects and microorganisms, two museums adhered to the usage of naphthalene balls, placed beside the displayed artifacts. The method practiced was considered highly uncommendable. Avoid naphthalene balls to preserve brocades and silk sarees since it releases noxious gas, instead dried neem leaves are suggested by Singh (2011), senior conservator of the India Council of Conservation Institutes (ICCI).

Three museums were observed placing small fabric bags in their showcases. On probing respondents revealed the content of the bags as equal mixture of neem and tobacco leaves whereas, one used crushed extracts of commonly available

plants such as fenugreek, custard apple and bitter gourd seeds with mango leaves placed next to the artifact to prevent fungal attack. Fumigation chambers were used in two museums as it is an effective, quick and safe method of treatment to treat pest menace while others did not state the reason for not having one.

Since Indian climatic conditions are favorable for pests to nurture and thrive, more precautionary measures were required.

Of the total museums visited, regular i.e. daily cleaning of the display, storage area and showcases was observed by only four. During a visit to an exhibition gallery of two renowned museums, lot of dirt and dust was noticed inside the showcases. When expressed concern regarding the same to the curators, it was informed that the prevailing situation was owing to the shortage of staff for housekeeping.

One of the museums had also limited the entry of the visitors in order to preserve their heritage for a longer duration being well aware of the fact that dirt and dust pose direct threat to the physical state of the artifacts. They believed in the philosophy of "prevention is better than cure."

Inspection of each and every artifact was done on a regular basis i.e. every three months to check the condition of the textiles. All conservators opined that vacuuming was carried out as a treatment for surface cleaning being the safest method for aged textiles .Wet cleaning was carried out only in situations when textiles had got so badly soiled that if not wet cleaned its preservation would be difficult.

On observation, results pertaining to the display methods practiced by all the museum curators revealed that small fragile artifacts were laid flat in the show cases whereas, sturdy artifacts (garments like *jama, sherwanis*) were hanged on padded hangers. Sarees were rolled and displayed along the walls depending

upon the condition while in one of the museums, large sized artifacts were mounted between pixel glass frames for better preservation.

Each displayed artifacts were supported with brief informative labels by all museum personnel. When inquired about the descriptive and photographic documentation, only two museums shared that they have carried out while others were reluctant to speak anything on the same.

On analysis of the data about their preference for preservation over conservation revealed that cent per cent preferred preventive conservation (preservation) over conservation. Two of the museums were noted to practice basic mending techniques for holes, tears, splits and provide backing fabric to the damaged textiles by trained darners on contrary others outsourced the services from reputed conservation centers. On probing it was found that darning stitch was used for mending with chosen polyester, cotton or wool threads corresponding to the damaged textiles to be stabilized.

Curative conservation on textiles was not recommended by the conservators. They believed in non-interference with the state of the textiles until it was unavoidable due to the fragile condition and becomes mandatory to save our heritage.

Curative conservation was practiced inhouse by only one museum while others expressed lack of equipment facilities thereby seeking help from professional conservation centers.

Therefore, the information attained from the museum personnel on the adopted preservation and conservation practices revealed that preventive conservation can be practiced with the limited available resources by all, be it a museum or personal textile collector.

4.1.2 Preservation and conservation practices adopted by individuals

The investigator personally visited nine individuals and conducted exhaustive documentation of their rare textile collection. During the course of casual probing on methods of preservation and conservation practices adopted by them, eight i.e. majority of the respondents revealed that they were aware of the two terms as they had read about it in the newspapers and heard from their friends and relatives but, were lacking clarity of meaning of two terms, preservation and conservation.

The responses regarding the threats and the common agents responsible for deterioration to their textile collections varied from dust, dirt, temperature, light, relative humidity and pests. Dust was considered as the greatest threat for them followed by insects, microorganisms, light, temperature and relative humidity. Surprisingly only one respondent knew that the fluctuating climatic conditions i.e. temperature and relative humidity was the major risk factor for deterioration of the textiles artifacts.

The data pertaining to the preservation and conservation practices adopted by individuals revealed that 11 per cent had the knowledge about the correct preservation practices and 89 per cent of them adopted methods learnt from their antecedents as follows:

The keepsakes were stored in metal trunks by two individuals ignorant of the fact that with passage of time it would stain the textiles with rust marks, seven used wooden wardrobes of which only two individuals had treated them against termite attack.

All lined their storage space with newspapers before arranging the textiles being oblivious of the fact that it attracts insects like silver fish.

The trunks and wardrobes were placed in the basements of their houses by six of the respondents asserting space as constraints for their large collection, unaware of the information that the impact of environmental conditions would be maximum in such areas due to minimum air circulation and light. Only three had placed their wardrobes in well-ventilated space sharing that they were aware of the fact that textiles also need to breathe.

The investigator observed during the process of documentation that seven of the nine respondents wrapped their valuables in white bleached mulmul fabric uninformed of the detrimental effect of emitted acid on the stored textiles. The remaining two stored them in non-recommended plastic saree covers which were equally harmful as there would be no air circulation encouraging moisture to build up. (70)

Similarly, it was found that eight of the total respondents stored the garments such as s*herwanis, achkans etc.* on plain hangers without considering its condition to take up the stress and strain whereas one folded and placed it flat on the shelf. Eight of them folded their textiles like sarees, blouses, *ghagra-cholis, kurti-kanchlis*, yardages etc. with minimum four to maximum six folds and piled them one on top of other. Only one had to his credit very degraded pieces, some of which were stored either with no or minimum folds (as the piece was larger in size), flat on the horizontal shelf of the wardrobe. None of them stored their zari artifacts separately. The damaged artifacts were not given any special treatment and were stored along with the ones in the good condition.

As learnt from their grandmothers, all respondents were conscious of the most common tear damage, set folds that usually occurred along the folds of the textiles that could be evaded by changing the folds regularly. But only five were able to manage while four expressed their inconvenience in following the practice as they had relocated and time was the constraint factor for them.

All of them were well aware of the airing of the textiles but, maximum (six) did not practice due to time limitations while others (three) exposed their artifacts under the sun post monsoons to preserve them in a better condition for longevity.

Common household insecticides and repellants to obviate the attack of insects and microorganisms like naphthalene balls, cloves, neem leaves, tobacco leaves, *kala jeera*, etc. were kept in and around the storage space by all the respondents. Cloves were directly placed by two respondents without wrapping them in cloth which led to permanent brown stains on their textiles.

Natural fumigants like '*gugal*' or '*dhup*' was also burnt as incense to drive away the insect pests by two respondents.

The data on good housekeeping practices revealed that cent per cent respondents kept the storage area clean and tidy as dust was the major threat to their collections. Vacuuming for cleaning of individual artifacts was practiced by none owing to their ignorance regarding the same, might cause further damage to the artifacts. They also did not seek any professional guidance to maintain them free of dirt and dust.

Majority (seven) of them did not carry regular inspection of their textile collection whereas, two followed once a year at the time of airing. The literature

reviewed states that it should be done every six months in order to stabilize the present condition ensuring longer life to the textiles.

It was further observed by the investigator that none of the documented artifacts had been mended or repaired, in fact no attempt was ever made to even darn or repair any of the minor damages found in the textiles.

The respondents when oriented regarding the damages which had occurred on their textiles during documentation reflected keen interest to learn the preventive conservation practices at household level that would aid to save their inheritance for years to come.

4.3 Analysis of the Documented Textiles in terms of Classification, Origin and Fibre Content

The documented textiles were classified on the basis of their manufacturing techniques namely weaving, embroidery, resist dyeing and printing. The data on classification of the documented textiles have been presented in Table 4.1.

Table 4.1: Analysis of documented textile artifacts in terms of Classification

Classification	N-95 Documented Textile Artifacts	
	f	%
Woven Textiles	47	50
Embroidered Textiles	40	42
Resist dyed Textiles	5	5
Printed Textiles	3	3
Total	95	100

The results in terms of classification of the documented textile artifacts revealed that of the total 95 textiles, maximum i.e. 47 were classified under woven category followed by 40 embroidered, five resist dyed and three printed textiles.

The data pertaining to origin of the documented textiles has been illustrated in the Table No.4.2.

Table 4.2: Analysis of documented textile artifacts in terms of Origin

Origin	**N-95** **Documented Textile Artifacts**	
	f	**%**
Kashmir	9	10
Rajasthan	11	12
Gujarat	40	42
Maharashtra	3	3
Andhra Pradesh	1	1
West Bengal	2	2
Uttar Pradesh	28	29
Madhya Pradesh	1	1
Total	95	100

It was elucidated from the above table that 42 per cent of artifacts were from the state of Gujarat attributing to the fact that all the respondents under study hailed from the same state, therefore possessed most of the textiles of Gujarat origin.

Similarly, 28 opulent textiles had their origin to the state of Uttar Pradesh, accredited to the respondents' association with the affluent strata of the society as well as the princely states of Gujarat hence their abundance was reflected through their rich textile collection.

Few textiles i. e. eleven belonged to Rajasthan since small section of the respondents belonged to Rajput community, thereby had acquisition of their traditional textiles.

Only one silk and eight woolen artifacts originated from Kashmir as the most beautiful and exquisite woolen pieces were made in that region only.

Other three were from Maharashtra, two from West Bengal, one each from Andhra Pradesh and Madhya Pradesh which were gifted to them by their friends and relatives on festivals and occasions as stated by the respondents.

The data on composition of the textile artifacts under study revealed that all were made of silk, wool and cotton fibres belonging to the group of natural source as shown in Table 4.3.

Table 4.3: Fibre content of the documented textile artifacts

Fibre Content	Woven Textiles	Embroidered Textiles	Resist dyed Textiles	Printed Textiles	N-95 Total
Silk	44	28	4	1	77
Wool	2	5	-	-	7
Cotton	1	7	-	2	10
Combination	-	-	1	-	1
Total	47	40	5	3	95

Results pertaining to the fibre composition of the total 95 artifacts stated that 77 were silk based, 10 had cotton, seven had wool base whereas one was union fabric composed of silk and cotton.

Of the 47 woven artifacts, the major constituent of 44 was silk since majority of the documented woven artifacts were brocades from the state of Gujarat and Uttar Pradesh whereas a shawl and a rug from Kashmir were woven from wool and only one cotton *khes* was found in their collection.

Similarly, in the embroidered category (40), silk fabric was used as the base for 28 artifacts embellished with gota, zardozi, kutch and kasida embroidery. Wool was found only in five elaborate Kashmir embroidered textiles while the raw material of other seven pieces was cotton.

Elegant resist dyed textiles consisting of four silk patolas and one mashru (union fabric i.e. silk and cotton) from Gujarat were found in the collection of only one respondent.

Out of the three printed textiles two were composed of cotton and one of silk.

4.4 Analysis in terms of Damage Category, Type and Condition of the Textile Artifacts

The detailed study of the damages from primary and secondary sources had enabled the investigator to report, evaluate and interpret the damages to the best of the knowledge.

Results of the investigation of the documented textiles in terms of category and type of damage have been reported in Table 4.4.

Table 4.4: Analysis of the documented textiles in terms of category and type of damage

Category of Damage	Type of Damage	Numerical number of Affected Artifacts	N-68 Catalogue Number of Artifacts
Physical Damage	Permanent Creases	-	-
	Permanent Folds	19	WN6, WN8, WN11, WN15, WN20, WN21, WN23, WN25 WN26, WN27, WN28, WN29, WN33, WN39, WN46, ED7,ED8, E22, ED26
	Raveling or fraying of yarns	-	-
	Tears at folds	2	WN37, WN41
	Abraded areas	3	WN45, ED12, ED17
	Breakage of yarns	6	ED34, ED35, ED36, ED37, ED38, ED39
	Multiple Damages	7	WN9, WN12, WN34, WN47, ED23, ED24 ,ED30
	Total	**37**	
Chemical damage	Colour fading	-	-
	Yellowing	-	-
	Zari tarnish	3	WN18, ED5, ED21
	Holes due to ageing	3	RD2,RD3,RD4
	Total	**6**	
Biological damage	Insect holes	7	WN13, ED1, ED2 , ED4, ED15, ED16, ED33
	Brown stains	-	-
	Total	**7**	
Multiple Damages	Physical & Chemical	12	WN1, WN2, WN3, WN4, WN7, ED3, ED6, ED25, ED27, ED28, ED29, ED40
	Physical & Biological	4	WN5, WN10, WN40, P3
	Biological& Chemical	1	ED31
	Physical, Biological& Chemical	1	ED32
	Total	**18**	-
Total		**68**	-

On analysis of the data pertaining to the category and type of damage reflected that 68 of the 95 had various types of damages categorized under physical, chemical and biological.

Physical damages were the most immediately apparent, frequent and avoidable of all the three categories of damages occurred on 37 textiles as shown in Plate 4.1. The threats leading to the above analyzed damages have been discussed as follows:

Folds were observed in 19 artifacts respectively owing to inadequate storage space, incorrect storage method followed by too many folds of the artifacts kept for long ignoring the necessity of changing the folds.

Raveling or fraying of yarns with other damages was identified in two resulting unintentionally due to general wear and tear and poor handling of the artifact.

Tear or split, a very common damage was identified at the fold lines in two artifacts at the place where they had been folded and kept in the same condition for quite a long period without rotating as stated by the respondents. Hence it was inferred that faulty storage practices with adverse climatic condition i.e. temperature, relative humidity, dirt and dust led to tear or split damage.

The damage as abraded areas had occurred in three of them due to inappropriate use, excessive usage, abrasion of one artifact against the other during storage and unsuitable environmental conditions.

Multiple physical damage was noticed in seven artifacts specifically creases, cuts, tears on folds, breakage of yarns and abraded areas attributed to various

reasons; unstable climatic conditions, inadequate storage space, incorrect method of storage and faulty human interventions.

Chemical damages as evident in Plate 4.2 were an outcome of intrinsic qualities of the material, at times unstable and inherently harmful triggered by the impact of external factors such as inappropriate environmental conditions and atmospheric pollutants.

Yellowing, an indication of unanticipated chemical degradation was spotted in two textiles attributing to their long term exposure to excessive heat and presence of atmospheric pollutants namely nitrogen oxide and sulphur dioxide inside the storage area. The possessor of both these artifacts confirmed that their storage area got intensely heated up during the summers that enabled the investigator to derive at the correct interpretation as supported by relevant review. (70)

The liberation of anxious gases such as nitrogen oxide and sulphur dioxide within the storage space had led to tarnishing of majority of gold and silver zari textile artifacts. It was witnessed during the field survey that none of the respondents stored their zari artifacts separately neither followed preventive measures; hence the emissions from the surrounding sources had degraded the textiles.

On observation three silk artifacts were found in shattered condition. They possessed major damage in terms of large holes due to the presence of metallic salts usually containing tin and iron used during the late nineteenth and early twentieth centuries, to give them a heavier and more luxurious feel. However, as

these fabrics aged, the metals in the fibres accelerated their decay that caused them to become extremely brittle leading to the damage. So, it could be concluded that many a times the inherent vice of the material itself lead to its deterioration.

Biological damages as observed in Plate 4.3 frequently occur on organic materials as the content itself is supportive to insects and microorganisms attack. The conducive environmental conditions of the Indian tropical country permit it to further thrive, resultant to visible damages such as holes and stains.

Of the total seven cotton, silk and wool artifacts were attacked by silver fish and cloth moths that fed on the cellulose and protein substances of the material to form small irregular holes all over the textiles. As observed by the investigator storage in dark, undisturbed areas such as basements with poor air circulation encouraged the presence of the same. Further, the unfavorable climate of such places and the respondents' irregular inspection encouraged their growth.

Plate 4.4 reflects the multiple damages in terms of physical & chemical, physical & biological damage, biological & chemical and physical, biological & chemical in combination, analyzed in 18 artifacts.

Plate: 4.1a
Item Name: Cradle Cloth (*Khoyu)*
Catalogue No. WN6
Type of Damage: Permanent folds found.

Plate: 4.1b
Item Name: Textile Fragment
Catalogue No. WN34
Type of Damage: Permanent folds & raveling of yarns found at edges

Plate: 4.1c
Item Name: *Kamarbandh*
Catalogue No. WN37
Type of Damage: Tears found on folds

Plate: 4.1d
Item Name: Cushion cover
Catalogue No. ED29
Type of Damage: Zari turned black & centre got abraded

Contd...

Plate: 4.1e
Item Name: Shawl
Catalogue No.: WN9
Type of Damage: Creases, breakage of yarns, tears & abraded areas found all over

Plate: 4.1f
Item Name: Shawl
Catalogue No. ED30
Type of Damage: Permanent folds & cuts found at few places

Plate: 4.1g
Item Name: Textile Yardage
Catalogue No.: WN23
Type of Damage: Permanent folds found

Plate: 4.1h
Item Name: Shawl
Catalogue No. ED17
Type of Damage: Abraded areas found at few places

Plate 4.1: Category of Damage: Physical damage

Plate: 4.2a
Item Name: Textile Fragment
Catalogue No. RD2
Type of Damage: Holes found at several places

Plate: 4.2b
Item Name: Jacket
Catalogue No. ED25
Type of Damage: Zari turned black &edges worn out

Plate: 4.2c
Item Name: Shirt (*Baby Kurta)*
Catalogue No. WN2
Type of Damage: Yellowing & folds found at several places

Plate: 4.2d
Item Name: Skirt (*Ghagra)*
Catalogue No. ED21
Type of Damage: Zari turned black

Plate 4.2: Category of Damage: Chemical damage

Plate: 4.3a
Item Name: Dhoti (*Abotiyu*)
Catalogue No. WN5
Type of Damage: Several small & large holes found in the field

Plate: 4.3b
Item Name: Shawl
Catalogue No. ED2
Type of Damage: Several small holes found all over

Plate : 4.3c
Item Name: Cushion cover
Catalogue No. ED33
Type of Damage: Badly eaten at the edges

Plate : 4.3d
Item Name: Cape
Catalogue No. WN13
Type of Damage: Small & large holes found at several places

Plate 4.3: Category of Damage: Biological damage

Plate: 4.4a
Item Name: Dhoti (*Abotiyu*)
Catalogue No. WN3
Type of Damage: Permanent folds & small holes found at few places

Plate : 4.4b
Item Name: Carpet
Catalogue No. ED6
Type of Damage: Abraded areas found all over & zari turned black.

Plate: 4.4c
Item Name: Cushion cover
Catalogue No. ED28
Type of Damage: Zari turned black & edges worn out

Plate: 4.4d
Item Name: Cushion cover
Catalogue No. ED32
Type of Damage: Zari turned black, centre worn out & holes found at the back.

Plate 4.4: Category of Damage: Multiple damages

The condition of an object was an assessment to judge the occurrence of damage if any in the object. The analysis of the category and type of damages assisted the investigator to ascribe condition rating code to each documented textile artifact on the basis of their degree of damage as presented in Table 4.5

Table 4.5: Analysis of the documented textiles in terms of condition of the textiles

Condition Rating	Numerical number of Artifacts	N-95 Catalogue Number of Artifacts
Excellent: EX	**27**	WN14,WN16, WN17, WN19, WN22, WN24, WN30, WN31, WN32, WN35, WN36, WN38, WN42, WN43, WN44, ED9, ED10, ED11, ED13, ED14, ED18, ED19, ED20, RD1, RD5, P1, P2
Good: GD	**32**	WN2, WN6, WN8, WN11, WN15, WN18, WN20, WN21, WN23, WN25, WN26, WN27, WN28, WN29, WN33, WN39, WN46, ED5, ED7,ED8,ED12, ED21, ED22 , ED23, ED24, ED26 , ED34, ED35, ED36, ED37, ED38, ED39
Fair: FR	**25**	WN1, WN3, WN4, WN10, WN13, WN34, WN37, WN40, WN41, WN45, WN47, ED1, ED2, ED4, ED15, ED16, ED17, ED25, ED27, ED28**,** ED29, ED30, ED31, ED32, ED40
Poor: PR	**11**	WN5, WN7, WN9, WN12, ED3, ED6, ED33, RD2, RD3, RD4, P3
Total	**95**	

The interpretation of the above data reflected that 32 textile artifacts were in Good, 27 in Excellent, 25 in Fair and 11 in Poor condition.

Hence, the treatment priority of the artifacts in Excellent (Plate 4.4) to Good condition (Plate 4.5) was found to be Low which indicated that majority of the textile artifacts needed only preventive conservation treatment to stabilize them in its present condition.

Some with minor damages such as holes, tears etc. being in Fair condition (Plate 4.6) called for medium treatment that could be repaired to maintain its individuality and preclude further damage whereas , 11 amongst the total sample selected were in Poor condition as shown in Plate 4.7 with high treatment priority demanding curative conservation to save them for posterity.

From the above analysis and discussion on category, type of damages and condition of the artifacts, the investigator inferred that majority of the damages in textiles had ensued due to respondents misconceptions, unawareness , lack of knowledge on the correct basic storage practices to preserve the particular textile heritage. So, this could be prevented by abiding to the right preventive conservation practices.

Hence, it called for a need to sensitize women at household level to practice an appropriate storage environment that would prevent physical and biological damage as well as slow down the chemical deterioration increasing the life span of traditional textile artifacts.

Plate: 4.5a
Item Name: Blouse
Catalogue No.: WN20
Category of Damage: Nil
Type of Damage: Nil

Plate: 4.5b
Item Name: Jacket (*Sadaria*)
Catalogue No.: WN21
Category of Damage: Nil
Type of Damage: Nil

Plate: 4.5c
Item Name: Shawl
Catalogue No. : RD1
Category of Damage: Nil
Type of Damage: Nil

Plate: 4.5d
Item Name: Kurti
Catalogue No.: ED14
Category of Damage: Nil
Type of Damage: Nil

Plate 4.5: Documented textiles in Excellent condition (EX)

Plate: 4.6a
Item Name: Textile Fragment
Catalogue No.: WN25
Category of Damage: Physical
Type of Damage: Permanent folds found

Plate: 4.6b
Item Name: Textile Yardage
Catalogue No.: WN26
Category of Damage: Physical
Type of Damage: Permanent folds found

Plate: 4.6c
Item Name: *Thal cover*
Catalogue No.: ED30
Category of Damage: Physical
Type of Damage: Permanent folds & creases found all over

Plate: 4.6d
Item Name: Cape
Catalogue No.: ED5
Category of Damage: Chemical
Type of Damage: Zari turned black

Plate 4.6: Documented textiles in Good condition (GD)

Plate: 4.7a
Item Name: Skirt (*Ghaghra*)
Catalogue No.: WN13
Category of Damage: Physical & Biological
Type of Damage: Badly torn at edges & holes found at few places

Plate: 4.7b
Item Name: Shoulder Cloth (*Khes)*
Catalogue No.: WN4
Category of Damage: Physical & Chemical
Type of Damage: Yellowing at several places & permanent folds

Plate: 4.7c
Item Name: Jacket
Catalogue No.: WN1
Category of Damage: Physical & Chemical
Type of Damage: Zari turned black, fraying of yarns & permanent folds.

Plate: 4.7d
Item Name: Cushion cover
Catalogue No.: ED39
Category of Damage: Chemical & biological
Type of Damage: Zari turned black & holes found at the back

Plate 4.7: Documented textiles in Fair condition (FR)

Plate: 4.8a
Item Name: *Ghoda ni Gaddi*
Catalogue No.: WN12
Category of Damage: Physical
Type of Damage: Tears, breakage of yarns & abraded areas found all over

Plate: 4.8b
Item Name: Shawl
Catalogue No.: WN9
Category of Damage: Physical
Type of Damage: Creases, breakage of yarns, tears & abraded areas found all over

Plate: 4.8c
Item Name Small Purse
Catalogue No.: RD3
Category of Damage: Chemical
Type of Damage: Holes found at several places

Plate: 4.8d
Item Name: Blouse
Catalogue No.: ED3
Category of Damage: Physical & Chemical
Type of Damage: Badly worn out at the underarms areas & water stains found on the front

Plate 4.8: Documented textiles in Poor condition (PR)

4.5 Development of Database

A database is a collection of data grouped together in an organized manner for a specific purpose that enables people to easily sort, browse and find related information. The main aim of any documentation work is to ensure long-term access to the information resource beyond any geographical borders.

In the present study, the investigator has developed a digital database where each artifact was accessioned with thorough documentation, including a coloured photograph, descriptive information and in depth analysis on the category, type and degree of damage with the treatment priority of each artifact. As stated by Nair (2011), Secretary General of the India Chapter of ICOM, "Digitization has changed the entire face of subjects like documentation which is vital to the study of heritage and conservation."

Further, the document containing exhaustive information on each of the artifact with which the collection was concerned has been produced using the suitable software. Then all the digitized collections were put onto a CD-ROM consisting of folders representing a particular classification of traditional textiles for ease of access. (Enclosed CD-1)

Digitized templates of the database under the category of woven, embroidered, resist dyed and printed textiles have been shown in Plate 4.9-4.28.

Item Name Saddle Cloth (*Ghoda ni Gaddi*)

Catalogue No. WN12

Date of acquisition 1900

Place of Origin Gujarat, India

Material Silk, Zari (pure gold), Resham

Technique Plain & Jacquard weave

Dimensions 112cm x 68cm

Description

Bright pink brocade was woven with overall floral design encompassed in geometrical compartments. The fabric used for construction of saddle cloth for horses by the royals was bordered on all four sides with a beige plain silk fabric. It was stuffed with cotton to provide comfort to the rider

Credit Ms. Gyaneshwari Devi Rana

Category of Damage Physical

Type of Damage Tears, breakage of yarns and abraded areas found all over.

Condition PR

Treatment Priority High

Plate 4.9: Digitized template of Woven Textile : WN12

Item Name Jacket (*Sadaria*)

Catalogue No. WN17

Date of acquisition 1800

Place of Origin Gujarat, India

Material Silk, Zari (pure gold) & Resham

Technique Plain & Jacquard weave

Dimensions 65cm x 100cm (chest girth)

Description

The jacket was constructed from a brocade yardage that had a gold zari base with all over pattern in green, cream, magenta and red known as *badrum ka jaal*. The design was inlaid into the fabric with extra weft and outlined with another colour i.e. black called as *minakar*i. The prominent style features of the jacket were mandarin collar, round yoke, extended front placket and edging with white silk pipin.

Credit Ranisahib Sugan Kunwar

Category of Damage Nil

Type of Damage Nil

Condition EX

Treatment Priority Low

Plate 4.10: Digitized template of Woven Textile : WN17

Item Name	Jacket (*Sadaria*)
Catalogue No.	WN18
Date of acquisition	1810
Place of Origin	Uttar Pradesh, India
Material	Silk, Cotton & Zari (pure gold)
Technique	Plain & Jacquard weave
Dimensions	65cm x 100cm (chest girth)

Description

Sleeveless, mandarin collar, round yoke jacket with extended front placket was constructed from a stunning piece of Varanasi brocade. The piece had design in gold on a red base woven in an uninterrupted diamond pattern with a leaf *butti* inside. The jacket was finished with a contrasting green pipin and lined with a red cotton fabric.

Credit	Ranisahib Sugan Kunwar
Category of Damage	Chemical
Type of Damage	Zari turned black
Condition	GD
Treatment Priority	Medium

Plate 4.11: Digitized template of Woven Textile : WN18

Item Name	Textile Fragment (2)
Catalogue No.	WN22
Date of acquisition	1720
Place of Origin	Uttar Pradesh, India
Material	Silk & Resham
Technique	Jacquard weave
Dimensions	18cm x 17.5cm (1^{st}) 40cm x 42cm (2^{nd})

Description

Rare piece of the Moghul era in fushia pink with a heavy border of *phoolwar* design edged with *jhalar* of leaf *buttis* on either sides worked with resham. Falcon, elephant, horse with rider and floral motifs decorated the field of the artifact.

Credit	Ranisahib Sugan Kunwar
Category of Damage	Nil
Type of Damage	Nil
Condition	EX
Treatment Priority	Low

Plate 4.12: Digitized template of Woven Textile : WN22

Item Name	Saree
Catalogue No.	WN29
Date of acquisition	1910
Place of Origin	Gujarat, India
Material	Silk, Zari (pure gold) & Resham
Technique	Jacquard weave
Dimensions	537cm x119 cm

Description

Orange coloured Ashavali saree was ornamented with overall pattern of roundels in the field with pure zari and the *kunai kalga* motif. The ground of the pallav was worked with rich golden thread in twill with multi coloured flowering shrubs and a heavy gold border.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Physical
Type of Damage	Permanent folds found.
Condition	GD
Treatment Priority	Low

Plate 4.13: Digitized template of Woven Textile : WN29

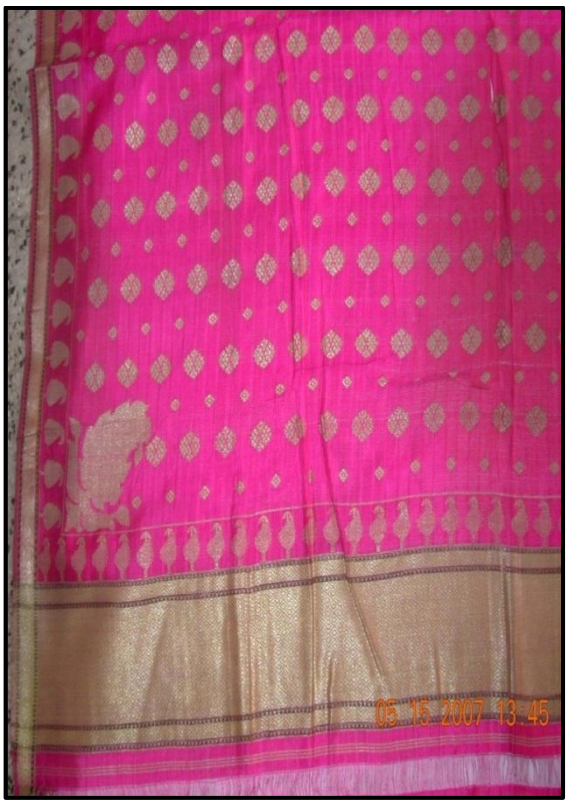
Item Name	Saree
Catalogue No.	WN33
Date of acquisition	1920
Place of Origin	Uttar Pradesh, India
Material	Silk, Zari (pure gold) & Resham
Technique	Jacquard weave
Dimensions	537cm x 119cm

Description

Brown colour Organza saree in plain weave with circular floral *buttis* in sky blue, green, pink and purple colours were patterned in a definite diagonal line in the field using extra weft technique. The centre of the pallav was worked with heavy gold thread in twill weave forming diamond pattern followed by few horizontal rows of flame motif *jhalar* and floral *butti* bands on the outer as well as the upper edge of the pallav had *jhalar* of *keris*.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Physical
Type of Damage	Permanent folds found.
Condition	GD
Treatment Priority	Low

Plate 4.14: Digitized template of Woven Textile : WN33



Item Name	Waist Cloth (*Kamarbandh)*
Catalogue No.	WN37
Date of acquisition	1910
Place of Origin	Uttar Pradesh, India
Material	Silk & Zari (pure gold)
Technique	Jacquard weave
Dimensions	200cm x 115cm

Description

The field of magenta self-striped woven silk waist cloth was arranged with rows of gold floral *buttis* and *kunia keri butta* with foliage on four corners. The side borders had narrow bands of chevron bound by *mothra* stripes in black and gold edged with a straight row of *keri buttis*. The horizontal ends had a gold brocade central panel of uninterrupted diaper of diamonds enclosed by two chevron *mothra* guard bands in gold and black edged with similar row of *keri buttis* as in the border on the upper edge.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Physical
Type of Damage	Tears found on folds
Condition	FR
Treatment Priority	Medium

Plate 4.15: Digitized template of Woven Textile : WN37

Item Name	*Odhana*
Catalogue No.	WN40
Date of acquisition	1920
Place of Origin	Gujarat, India
Material	Silk & Zari (pure gold)
Technique	Jacquard weave
Dimensions	250cm x 115cm

Description

Pure silk violet coloured *odhana* ornamented with broad border of flower & leaf scrolls on all four sides in gold zari with an added narrow edging of *keri* motifs and *kunai kalga* motif. The intricately central floral *butta* in gold enhances the overall look of the *odhana*.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Physical & Biological
Type of Damage	Permanent folds &small holes found in the field.
Condition	FR
Treatment Priority	Medium

Plate 4.16: Digitized template of Woven Textile : WN40

Item Name	Cap (*Topi)*
Catalogue No.	ED1
Date of acquisition	1940
Place of Origin	Kashmir, India
Material	Cotton & Untwisted silk floss
Technique	Plain weave
Dimensions	23cm x 8cm

Description

An exquisite *Sozni* embroidered cap origin of Kashmir worked with stem, cretan, fly and darning stitches in mauve, blue, orange & golden yellow colours. The floral and leaf motif well placed on the top centre and all round the edge beautifully outlined in black.

Credit	Ms. Namrata Parikh
Category of Damage	Biological
Type of Damage	Several small holes & brown stains found.
Condition	FR
Treatment Priority	Medium

Plate 4.17: Digitized template of Embroidered Textile : ED1

Item Name	Shawl
Catalogue No.	ED4
Date of acquisition	1921
Place of Origin	Kashmir, India
Material	Wool & Zari (pure gold)
Technique	Plain weave
Dimensions	260cm x 133cm

Description

The magenta coloured pashmina shawl had a plain field with elaborately zari embroidered end pallu, stylized corner *kalka botehs* and vertical and horizontal *hashias*. Pallu at the edge were intricately embroidered with loop and spiral stitches depicting overlapping pair of *kalka botehs* filled with pine motif and smaller *butties*. An additional border illustrated a row of *kalka boteh* ; the crescent and flower motifs between the corner and pallu. Finally the shawl was finished with a fine narrow brocade border on the vertical edge.

Credit	Ms. Gyaneshwari Devi Rana
Category of Damage	Biological
Type of Damage	Small holes found all over.
Condition	FR
Treatment Priority	Medium

Plate 4.18: Digitized template of Embroidered Textile : ED4

Item Name	Carpet
Catalogue No.	ED6
Date of acquisition	1905
Place of Origin	Uttar Pradesh, India
Material	Silk, Cotton & Zari (pure gold)
Technique	Plain & Pile weave
Dimensions	112cm x 68cm

Description

Brown velvet zardozi carpet (known as *Masnads*) intricately worked with *karchob* embroidery of Varanasi. The embossed corner motif of Lord Krishna playing a flute enclosed with floral-leaf border, worked with gold & silver gilt wires or spangles stitched to the base with running, couching, satin and stem. The either side of the border had one inch gotta patti. The border toward the field was edged with a narrow three petal floral zardozi strip. The four sides of the carpet were finished with beautiful crochet fringe. The piece was stuffed with cotton and lined with jute.

Credit	Ms. Gyaneshwari Devi Rana
Category of Damage	Physical & Chemical
Type of Damage	Abraded areas found all over & zari turned black.
Condition	PR
Treatment Priority	High

Plate 4.19: Digitized template of Embroidered Textile : ED6

Item Name	Blouse
Catalogue No.	ED12
Date of acquisition	1870
Place of Origin	Rajasthan, India
Material	Silk & Zari (pure gold)
Technique	Plain weave
Dimensions	52cm x 86cm (chest girth)

Description

Plain yellow silk blouse with mandarin collar, kurta placket and three fourth cuffed sleeves beautifully ornamented with zardozi embroidery using *salma*, *sitara*, twisted gold and silver wires.

Credit	Ranisahib Sugan Kunwar
Category of Damage	Physical
Type of Damage	Abraded areas found at few places.
Condition	GD
Treatment Priority	Low

Plate 4.20: Digitized template of Embroidered Textile : ED12

Item Name	Jacket (*Achakan)*
Catalogue No.	ED13
Date of acquisition	1810
Place of Origin	Rajasthan, India
Material	Silk & Zari (pure gold)
Technique	Jacquard weave
Dimensions	66cm x 92cm(chest girth)

Description

The fushia pink *achakan* had been ornamented with a beautiful floral gota border at the front opening, neckline, slits and hems of the sleeves as well as the garment. The corners were decorated with *kairi buttas*, some scattered *jaliwala phool* in the field and heart shaped floral *butta* on the centre back and sleeves. The neckline, slits and hems were finished with green broad *lehru* gota to complement to the overall design.

Credit	Ranisahib Sugan Kunwar
Category of Damage	Nil
Type of Damage	Nil
Condition	EX
Treatment Priority	Low

Plate 4.21: Digitized template of Embroidered Textile : ED13

Item Name	Border
Catalogue No.	ED19
Date of acquisition	1910
Place of Origin	Gujarat, India
Material	Silk & Untwisted silk floss
Technique	Plain weave
Dimensions	900cm x 14cm

Description

The exquisite blue saree border depicted the imaginative art of *Aari* embroiders of Kutch region. The centre was artistically embroidered with leaf and floral motifs of rose and hibiscus in multi colour shades. The ribbon border on its either sides were worked with four petalled flowers. The upper edge had flowers interspersed with leaves to enhance the beauty of the artifact. All worked in chain stitch with untwisted silk floss using *ari*.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Nil
Type of Damage	Nil
Condition	EX
Treatment Priority	Low

Plate 4.22: Digitized template of Embroidered Textile : ED19

Item Name	Cushion cover
Catalogue No.	ED33
Date of acquisition	1910
Place of Origin	Gujarat, India
Material	Silk, Cotton & Resham
Technique	Plain weave
Dimensions	30cm (diameter)

Description

Circular cushion cover with an orange base had intricately embroidered floral& leaf scroll border in shades of pink, purple, green and mustard done using chain stitch. The centre medallion was enhanced with a single floral design with concentric borders in same colours.

Credit	Ms. Mandakini Devi Chauhan
Category of Damage	Biological
Type of Damage	Badly torn at the edges.
Condition	PR
Treatment Priority	High

Plate 4.23: Digitized template of Embroidered Textile : ED33

Item Name	Door Hanging (*Sakhiya)*
Catalogue No.	ED39
Date of acquisition	1910
Place of Origin	Gujarat, India
Material	Glass beads & Cotton threads
Technique	Mono bead technique
Dimensions	132 cm x 65 cm x 29 cm

Description

Sakhiya were vertical striped decorations for the door, fine specimen of the bead work. The entire base was made up of white beads attached to a plain weave, red coarse cotton cloth. It had a border running all around divided into sections enclosing motifs of tiger, horse, elephant, human figures & small flowering plants in each section with red, green, orange, yellow and blue colours.

Credit	Ms. Alaukika Devi Khachar
Category of Damage	Physical
Type of Damage	Breakage of yarns found at few places.
Condition	GD
Treatment Priority	Low

Plate 4.24: Digitized template of Embroidered Textile : ED39

Item Name	Shawl
Catalogue No.	RD1
Date of acquisition	1938
Place of Origin	Gujarat, India
Material	Silk & Cotton
Technique	Ikat & Satin weave
Dimensions	195cm x 102cm

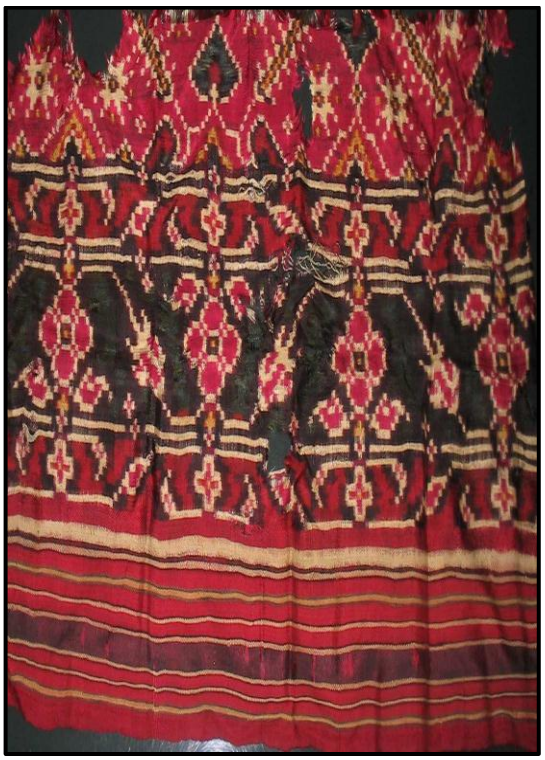
Description

Mashru shawl was woven with silk warp and cotton weft yarns in satin weave especially for the use of Muslim men as they were forbidden to wear silk next to skin.

The pattern showed vibrant multi coloured stripes of pink, purple, white and golden yellow. The stripes had an arrow head design which was achieved by sectional tying and dyeing of warp yarns prior to weaving.

Credit	Mr. Kanubhai Salvi
Category of Damage	Nil
Type of Damage	Nil
Condition	EX
Treatment Priority	Low

Plate 4.25: Digitized template of Resist Dyed Textile : RD1



Item Name	Textile Fragment
Catalogue No.	RD2
Date of acquisition	1900
Place of Origin	Gujarat, India
Material	Silk
Technique	Double Ikat & Plain weave
Dimensions	40cm x 45cm

Description

The fragment of patola saree was an exquisite piece of double ikat from the Salvi weavers of Gujarat region. The silk warp and weft yarns had been tie dyed as per a predefined pattern and then woven together. It has *pan* (leaf), *tara* (star) and round ball designs in maroon, white and orange worn by the Vora Muslim during the marriage ceremony.

Credit	Mr. Kanubhai Salvi
Category of Damage	Chemical
Type of Damage	Large holes found at several places.
Condition	PR
Treatment Priority	High

Plate 4.26: Digitized template of Resist Dyed Textile : RD2

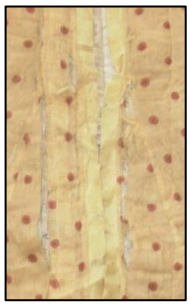
Item Name	*Odhana*
Catalogue No.	P1
Date of acquisition	1920
Place of Origin	Rajasthan, India
Material	Silk
Technique	Plain weave
Dimensions	250cm x 115cm

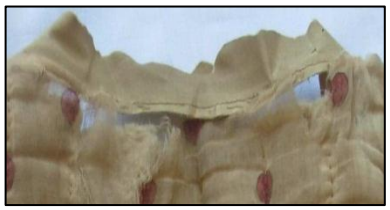
Description

Georgette magenta *odhana* known as *Phamri* was printed with pure gold khadi worn by Rajasthani brides. The field had well placed *keri buttis* in definite rows. The horizontal ends of the *odhana* were decorated with borders of *keri buttas* placed in geometrical format edged with golden fringes.

Credit	Ranisahib Sugan Kunwar
Category of Damage	Nil
Type of Damage	Nil
Condition	EX
Treatment Priority	Low

Plate 4.27: Digitized template of Printed Textile : P1





Item Name	Jacket
Catalogue No.	P3
Date of acquisition	1880
Place of Origin	Rajasthan, India
Material	Cotton & Silk
Technique	Plain weave
Dimensions	65cm x 102cm (chest girth)

Description

Quilted jacket known as *Atam Sukh* was constructed from beige and red dots printed fabric of Rajasthan. The jacket had multiple vertical quilting lines, stand collar, short sleeves, side slits, all edged with a narrow band of same colour silk fabric.

Credit	Ms. Gyaneshwari Devi Rana
Category of Damage	Physical & Chemical
Type of Damage	Tears and holes found at several places.
Condition	PR
Treatment Priority	Low

Plate 4.28: Digitized template of Printed Textile : P3

4.6 Application of conservation treatment on selected textile artifact

The artifact was a rare piece of early 20th century made in pure silk and zari from the state of Gujarat, India. It was an exquisite piece, very dear and treasured by one generation to the next .The Paithanis are woven today in a contemporary version losing its original form. Hence, a woven Paithani saree of Gujarat acquired from a personal collection was selected as a sample for the case study. The general condition of the saree was considered "Poor."

The results pertaining to the conservation of the selected artifact have been presented as under in the following sections:

4.6.1 Investigations prior to treatment

4.6.1.1 Condition Assessment

Condition assessment report of the selected artifact under study was prepared in detail to facilitate an appropriate treatment strategy. The report encompassed the following details.

Item Name	Saree
Catalogue No.	WN7
Date of acquisition	1900
Place of Origin	Gujarat, India
Material	Silk & Zari (pure gold and silver)
Technique	Jacquard weave
Dimensions	250cm x 90cm
Credit	Ms. Kalpana Bhatt
Category of Damage	Physical & Chemical
Type of Damage	Breakage of yarns, holes and tears found all over the field
Condition	PR
Treatment Priority	Urgent
Present storage system	Folded and stored flat in a cotton saree cover

The silk saree was assessed visually and the results established that it was in Poor condition. It had become fragile and stiff which might be a consequence of improper storage in too fluctuating atmospheric conditions.

There were holes and tears found all over the field of the saree but the pallav was in good condition. The piece exhibited many areas of losses and there was evidence of natural ageing due to the inherent vice of the material itself as shown in Plate 4.29. Otherwise, it was possible to handle the object under study.

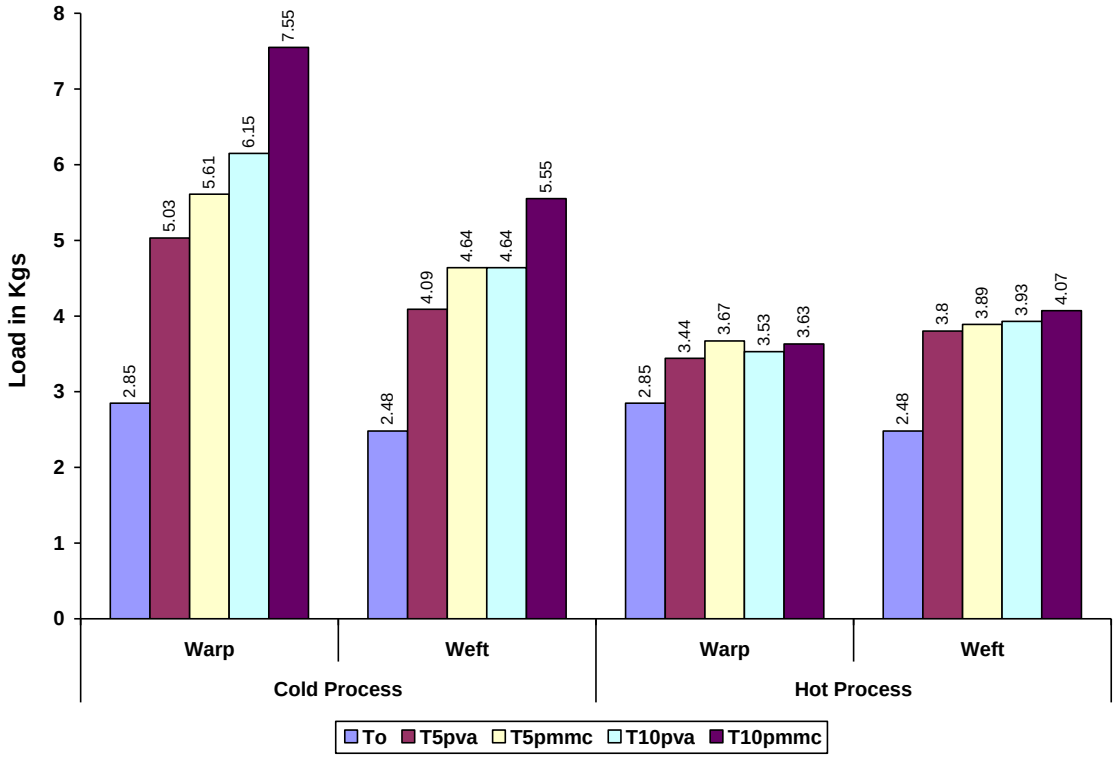
Plate 4.29: Parts of saree with damages such as holes, tears and breakage of yarns

4.6.1.2 Assessment of untreated and treated samples for Tensile Strength, Stiffness and Transparency Properties

The selected support fabric was treated with two adhesives i.e. Polyvinyl Acetate (PVA) and Polymethyl Methacrylate (PMMC) consolidated to the silk fabric with cold process (CP) and hot sealing process (HP). The lined silk samples were then subjected to standard test methods such as Tensile Strength, Stiffness and Transparency to determine the most preserving and secure method of adhesive lining for the object under study.

4.6.1.2.a Assessment of untreated and treated silk samples for Tensile Strength

The experimental data on tensile strength measurements in Graph 4.1 revealed that there was a marked increase in the strength of both the adhesive treated samples in comparison to untreated one with increase in concentrations irrespective of the methods of adhesion.



Graph 4.1: Tensile strength measurements of untreated and treated silk samples

Key:

To : Untreated sample
T5pva cp : Treated with 5% PVA and cold process
T5pva hp : Treated with 5% PVA and hot process
T5pmmc cp : Treated with 5% PMMC and cold process
T5pmmc hp : Treated with 5% PMMC and hot process
T10pva cp : Treated with 10% PVA and cold process
T10pva hp : Treated with 10% PVA and hot process
T10pmmc cp : Treated with 10% PMMC and cold process
T10pmmc hp : Treated with 10% PMMC and hot process

On comparison of the data between the consolidation methods, the treated samples at same concentration showed lower strength with the hot sealing process than to the cold process regardless of the adhesive used. This was attributed to the reason that application of heat decreases the bonding strength of the adhesives and hence showed reduction in tensile strength with the hot sealing process.

4.6.1.2.b Assessment of untreated and treated silk samples for Bending length

The data on bending length measurements as indicated in Table No.4.6 showed a noticeable increase in stiffness of the samples treated with the two adhesives Polyvinyl Acetate (PVA) and Polymethyl Methacrylate (PMMC) when compared to the control sample.

The increase in concentration of both the adhesives indicated marginal rise in the bending length but the stiffness of samples adhered with cold process were less than with hot sealing process.

Samples treated with PMMC were found to be stiffer than the ones treated with PVA irrespective of the concentrations and method of reinforcement which led the samples to lose its flexibility which was not the true representation of the object under investigation.

Table 4.6: Bending length measurements of untreated and treated silk samples

Sample	Warp		Weft	
	F-F (cm)	B-B (cm)	F-F (cm)	B-B (cm)
To	2.1	2.0	1.8	1.6
T5pva cp	6.5	7.5	6.7	7.2
T5pva hp	9.7	9.4	9.3	7.7
T5pmmc cp	7.0	9.6	7.0	9.5
T5pmmc hp	10.7	9.7	10.0	8.7
T10pva cp	7.3	8.0	7.7	8.0
T10pva hp	10.7	9.5	9.7	8.1
T10pmmc cp	13.0	11.0	13.2	11.1
T10pmmc hp	14.0	11.5	13.0	10.5

Key:

To : Untreated sample
T5pva cp : Treated with 5% PVA and cold process
T5pva hp : Treated with 5% PVA and hot process
T5pmmc cp : Treated with 5% PMMC and cold process
T5pmmc hp : Treated with 5% PMMC and hot process
T10pva cp : Treated with 10% PVA and cold process
T10pva hp : Treated with 10% PVA and hot process
T10pmmc cp : Treated with 10% PMMC and cold process
T10pmmc hp : Treated with 10% PMMC and hot process

4.6.1.2.c Assessment of untreated and treated silk samples for Transparency

Consolidated samples were visually evaluated for transparency to retain the object in its original form as well as enable the future study of design details of a particular artifact.

Results of comparative objective evaluation established that both concentrations of PVA treated samples performed better than PMMC ones as the latter gave a hazy appearance to the samples.

Similarly on comparisons between the processes of PVA treated samples, it was found that cold process gave the best results in terms of transparency, smoothness and visually satisfying appearance that mimic the original piece in both concentrations.

Hence the assessment of tensile strength, stiffness and transparency properties of untreated and treated samples confirmed that 10 per cent Polyvinyl Acetate (PVA) with cold adhesion process was the most suitable treatment for chemical consolidation of the aged silk textile under study as it preserved and retained the authentic properties of the silk artifact.

4.6.2 Treatment of the object

To achieve stabilization of the object, the treatment included reinforcement of the prepared support fabric to the original object with chemical and mechanical consolidation methods.

The nylon net support fabric was treated with the selected adhesive i.e. Polyvinyl Acetate at 10 per cent concentration and attached to the object under study with cold adhesion process.

The work surface was cleaned and prepared in the same manner as stated in the methodology. The required size of non-sticky plastic was taken to prevent

sticking of the object to the surface. It was held tightly on all the sides with the cello tape (Plate 4.30a).

The support fabric i.e. nylon net of same size and colour was placed uniformly on it without stretching as shown in Plate 4.30 b .Tested adhesive i.e. Polyvinyl Acetate of 10 per cent concentration was applied thrice evenly on it (wet on dry) to form a uniform film (Plate 4.30c-d).

As shown in Plate 4. 30e, the back side of object under study was placed against the face side of the of the dried support fabric, smoothly as flat as possible without any wrinkles. Then the two surfaces were adhered to each other by brushing the acetone solution completely on it and leaving to dry for 24 hours (Plate 4. 30h).

Later, the pallav of the saree was strengthened with the use of needle technique. Loose support stitches were taken with the matching polyester thread at regular intervals to hold the support fabric. The method followed was single strand, no knots, minimum tension and passing the thread between and not through the yarns as cited in the relevant reviews of conservation studies.

Finally, the reinforced artifact (Plate 4.30i) was ready to be laid for rolled storage.

Plate 4.30 a: Non-sticky film laid on the wooden table

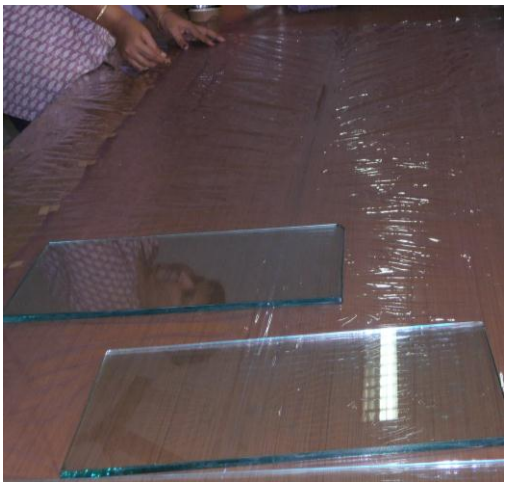


Plate 4.30 b: Smooth placement of nylon net on the film

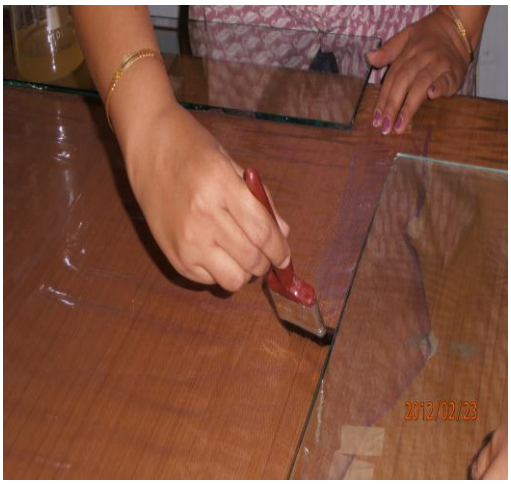


Plate 4.30 c: Even coating of PVA done on the nylon net

Plate 4.30 d: Evenly coated support fabric (nylon net)

Contd……

Plate 4.30e : Placement of original artifact over the support fabric

Plate 4.30f: Positioning of tears at the right place

Plate 4.30g: Alignment of yarns at areas of damage

Plate 4.30h: Even coating of acetone on the object for consolidation to the support fabric

Plate 4.30i: Paithani saree ready for rolled storage

Plate 4.30: Stabilization Process of the object under study

4.7 Outcome of the Workshop

The investigator organized two workshops entitled “Preserving Our Heirlooms” to sensitize individuals about preventive conservation practices that could be adopted at household level to preserve ones traditional textile collection. Questionnaires were administered to selected respondents to elicit their feedback regarding the workshop.

Table 4.7: Demographic Profile of the respondents

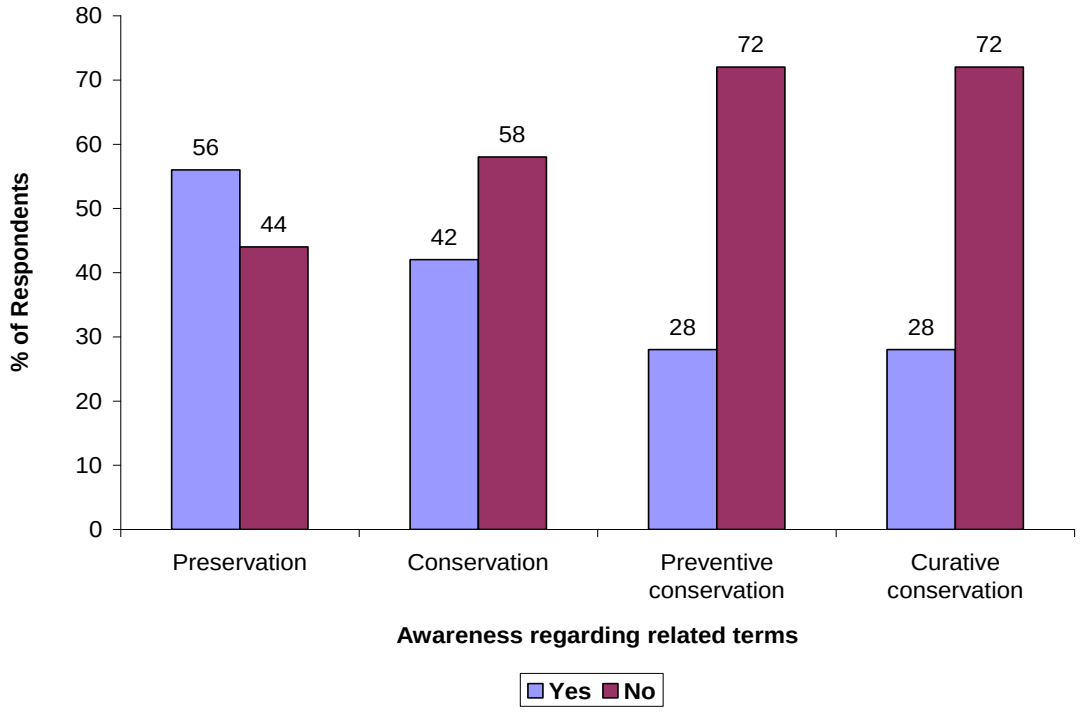
Demographic Details		**N-36** **Number of respondents**
Age (in years)	21-30	3
	31-40	16
	41 & above	17
	Total	**36**
Educational Qualification	Graduate	26
	Post Graduate	8
	Ph.D.	2
	Any other	-
	Total	**36**
Occupational Status	Home maker	20
	Professional	9
	Entrepreneur	3
	Social worker	4
	Total	**36**

The demographic profile of the respondents indicated that out of a sample of 36 respondents, nine per cent belonged to the age group of 21-30 years, 44 per cent fell in the age group of 31-40 years and 47 per cent were from the age group of 41 years and above. Hence it was observed that there was an equivalent participation from the age groups of 31-40 years and 41 years and above whereas few belonging to the age group of 21-30 years also attended the workshop. The said trend could be interpreted as the urge for art, design and textiles grows intensely with age and therefore maximum participation was from the age groups of 31-40 years and 41 years and above.

The data pertaining to educational qualification of the respondents revealed that 72 per cent had attained graduation, 22 per cent were post graduates and only six per cent achieved a doctoral degree. Graduation being the minimum qualification was based upon the rationality that educated respondents would have some awareness as regards to preservation and conservation leading to improved understanding during the workshop.

Majority of the respondents i.e. 56 per cent were proud homemakers, 25 per cent of the total were entrepreneurs managing one's own textile gallery, organizing training workshops on leadership and skill development in the area of capacity building, eight per cent were professionals working as textile researcher, museum curator, consultant to NGOs, teachers etc. and 11 per cent were social workers in field of mentally challenged children, handicap people, rehabilitation centers and NGOs.

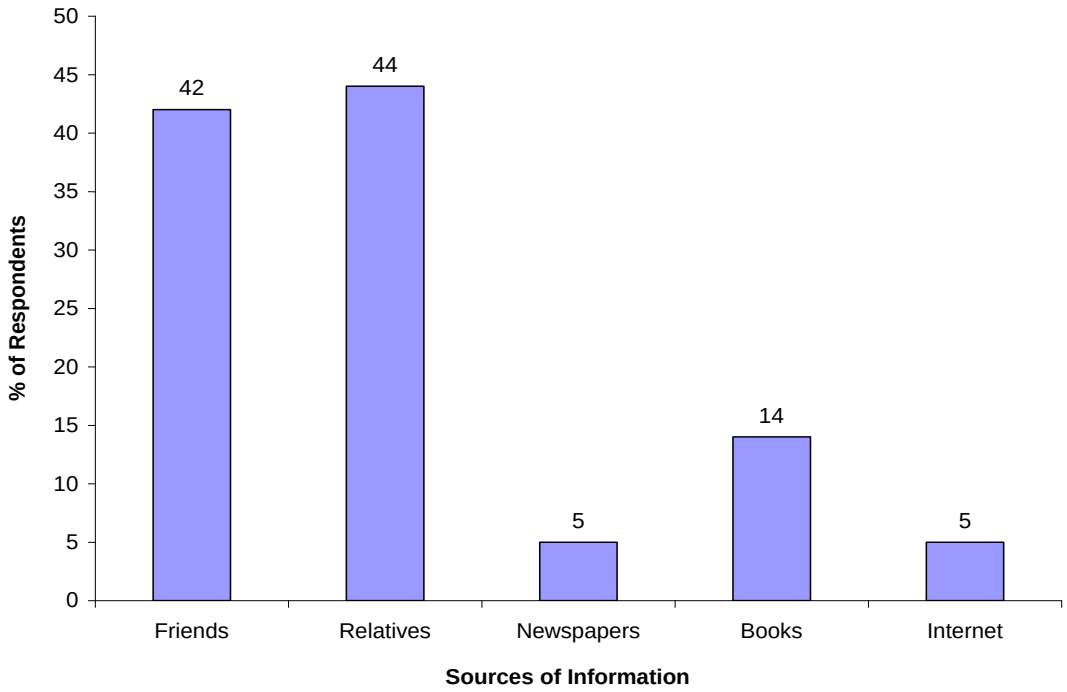
The data on occupational status revealed that it was a mixed bag still they shared a common interest and passion towards textiles irrespective of their different contributory roles to the society. This was attributed to the fact that textiles and women are interwoven with each other and hence they are inseparable.



Graph 4.2: Respondents' awareness regarding related terms

The data as shown in Graph 4.2 on awareness regarding the above terms indicated that 56 per cent and 41 per cent of the respondents gave positive responses for the terms Preservation and Conservation as these are most frequently talked about in respect to paintings, sculptures and architectural buildings whereas remaining were completely unaware about them.

The terms Preventive conservation and Curative conservation were known to few i.e. only 28 per cent of the total whereas majority i.e. 72 per cent were ignorant towards these terms.

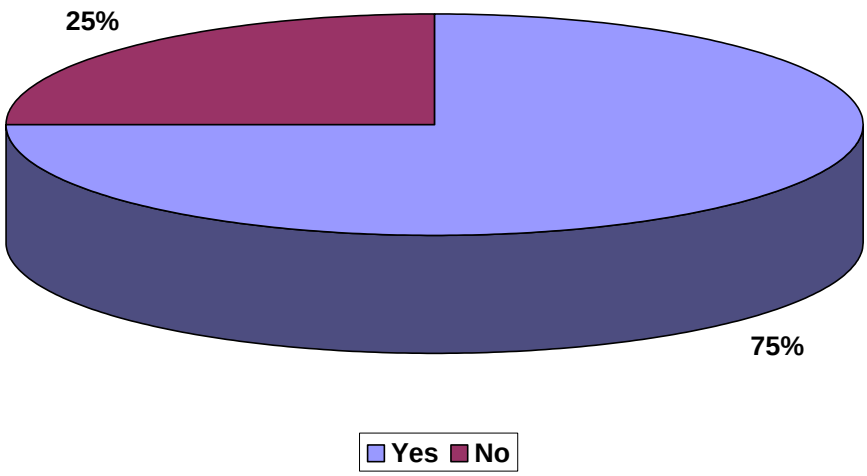


Graph 4.3: Distribution of respondents in terms of sources of information

The data as shown above in Graph 4.3 pertinent to the sources of information reflected that friends and relatives recorded almost equivalent percentage i.e. 42 per cent and 44 per cent respectively to acquaint the respondents to the terms confirming to the fact that information spreads faster with the word of mouth.

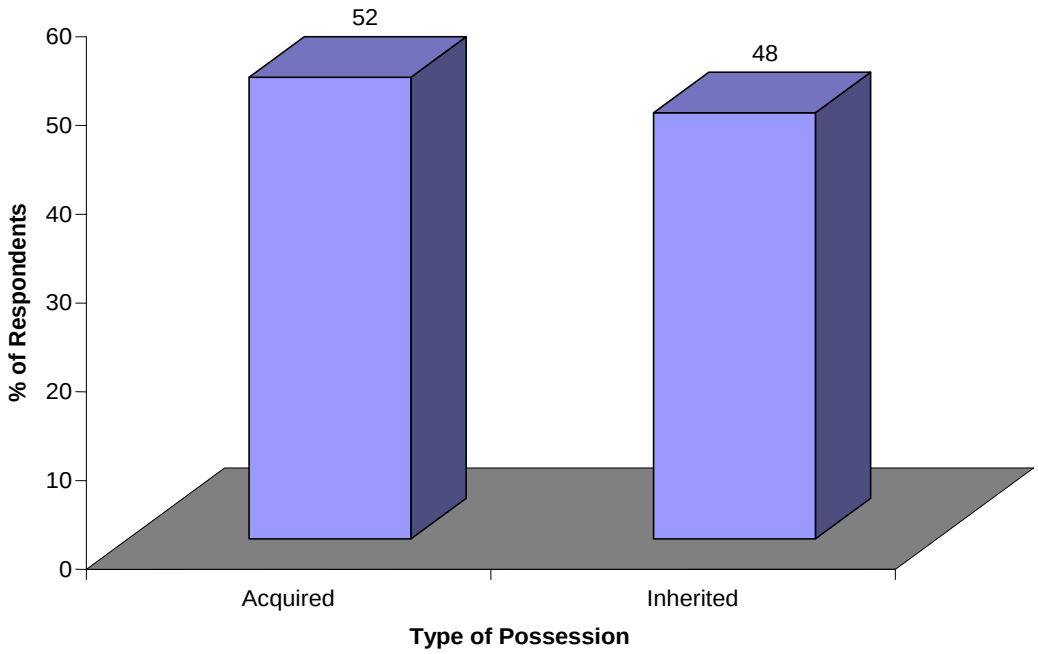
It was surprising to note that newspapers, books and internet exhibited low percentages in spite of being the most used and fastest media of communication Majority being home makers might not have an access to the above sources.

One of the respondents stated travelling abroad enabled her to familiarize with these terms.



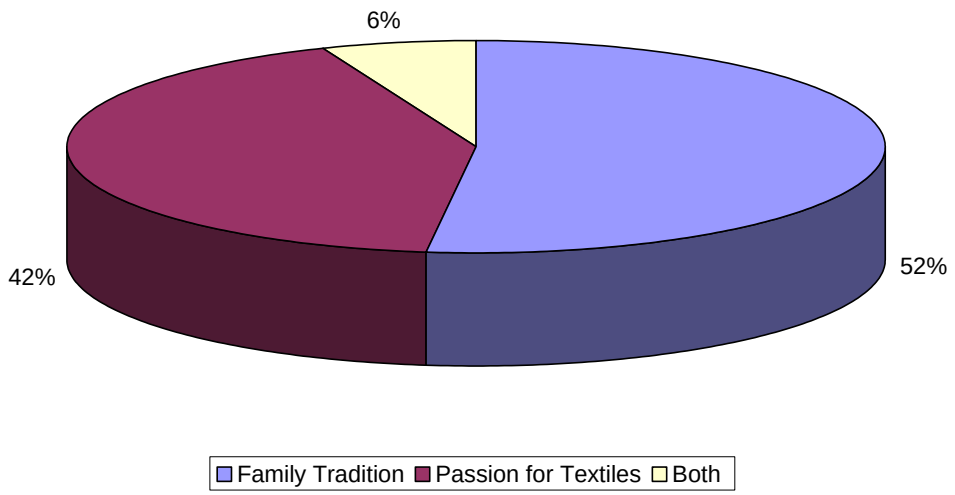
Graph 4.4: Distribution of the respondents towards possession of traditional textiles

As inferred from the above Graph 4.4, it was found that 75 per cent of the respondents possessed traditional textiles whereas only 25 per cent i.e. one quarter of the total showed their inability to have one. This could be attributed to their age as well as their priorities in life.



Graph 4.5: Distribution of the respondents for type of possession of traditional textiles

On probing about their possession of these precious textile artifacts, 52 per cent of the respondents conveyed that they purchased traditional textiles for their personal collection because of their interest and appreciation for the same while 48 per cent had inherited them from their mothers, grandmothers and in laws.



Graph 4.6: Distribution of the respondents in terms of reason for preservation of textile collection

Maximum number of respondents i.e. 52 per cent stated that the reason for preservation of their heirlooms was to carry forward their family tradition, 42 per cent were passionate towards their textile heritage while few i.e. six per cent opined that both reasons were valid for preservation of their valuables as illustrated in Graph 4.6.

Responses regarding the present storage system for their two dimensional textile artifacts like sarees reflected that 60 per cent of the respondents used thin white cotton cloth or dupattas whereas 36 per cent used plastic saree covers readily available in the local market being unaware of the degrading effect of plastic on

the textiles. Finally all the respondents placed them flat either in cupboards, trunks or suitcases.

One of the respondents who worked with the museum shared that large pieces like carpets were rolled on drums and stored vertically and not horizontally as space was a constraint.

Similarly for storage of three dimensional textiles, majority of the respondents preferred hangers for coats, suits, *sherwanis* while blouse covers were used for blouses and *cholis*.

All the respondents conveyed that none out of the total 36 had attended or heard about any such workshop on preservation and conservation of textiles. It was first of its kind.

All the respondents strongly opined and stated that the workshop had benefitted them and was of great relevance to their day to day life.

Affirmative responses were received from all the respondents when posed a question on the willingness to implement the methods demonstrated during the workshop on preservation of one's textile collection.

General comments regarding the workshop revealed that 72 per cent opined that the use of power point presentation and demonstration method (Plate 4.31a-b) led to better understanding of the workshop content reaching even to the layman whereas five per cent urged to get written instructions for storage methods as they might miss on any of the intermediate step unknowingly, causing damage to the textiles.

The respondents (85 per cent) felt that the workshop was very informative and interactive as they experienced hands on skills (Plate 4.32a-b) after the demonstration of storage techniques.

The respondents also felt that such workshops should be frequently conducted as they contribute not only to the individual, society but to the nation at large. Such workshops have a lot of social relevance.

The prepared technical manual (Enclosed CD 2) was circulated amongst the respondents during the workshop to elicit their opinions regarding the same. The respondents found it as a user friendly package. They also expressed that the presentation of the content was apt in simple language supported with relevant pictures comprehending even to a layman.

Hence, it was concluded from the above responses that there was necessity to bring awareness amongst women at household level to practice preventive care methods to maintain their heirlooms in best possible conditions.

Plate 4.31a: Demonstration on preventive conservation methods

Plate 4.31b: Demonstration on preventive conservation methods

Plate 4.32a: Participants' hands on skills and interactive session

Plate 4.32b: Participants' hands on skills and interactive session

CHAPTER - V

SUMMARY AND CONCLUSION

An heirloom cloth, although at times old, tattered or faded, is never a rag. A textile passed down through generations embodies memory and meaning. In many countries, a simple piece of cloth imparts status, even power to the wearer or possessor. It may contribute a sense of belongingness and give physical and spiritual protection.

Textiles delight the weaver, seller, owner, wearer, user and viewer. Fabric often plays a vital role in life transitions such as birth, coming of age, marriage, death and after life. Since ancient times, textiles have been an important item of trade and a potent status marker. A practiced eye can often tell where a piece of cloth came from, its placement in history and how it was made. Our country possesses an immense asset of rich textiles passed down to generations and these richly evocative heirloom textiles carry with them a wealth of information.

Textiles are among the world's most fragile artifacts and are difficult to preserve even under the best of conditions. However, in case an ancient textile over the years survives the ravages of insects, microorganisms, climate and general human wear and tear is merely a chance.

Since years ample documentation work has been carried on museum textile heritage but minimal information is available on personal textile collections. This inquisitiveness encouraged the investigator to document, digitize, preserve and conserve the rare textile patrimony as an artistic and educational evidence being a part of the individuals' collection today but, may not be tomorrow.

Thus, the dire need of the hour was envisaged with the following objectives of the research undertaken.

5.1 Specific Objectives

5.1.1 To source and document the rare textile artifacts from collections of individuals

5.1.2 To identify and analyze the damages that lead to deterioration of the textile artifacts

5.1.3 To study the preservation and conservation practices adopted by museums and individuals

5.1.4 To develop a database to disseminate information beyond its geographical borders

5.1.5 To initiate workshops on preventive conservation of textile artifacts at household level

5.2 Methodology

The research was formulated with the key endeavour to document the rare aged textiles and to conserve them as national heritage of the country.

Exploratory cum Experimental research design with multi methodological approach was used for the study. The survey method employing observation, interview and case study was elected for the work.

The study was conducted in three phases:

Phase-I dealt with an in depth documentation of rare textile artifacts of nine selected individuals of Gujarat through purposive sampling method. The 95 rare textile artifacts were selected through deliberate sampling method based on the criteria of it being historic in nature, more than 70 years old with limited or no public accessibility. The documentation of the selected textile artifacts was through descriptive method supported with photography to attain detailed information regarding the date of acquisition, origin, possession, dimensions, material used, technique, type and degree of damage and present storage system.

In **Phase-II** detailed analysis of the documented textiles in terms of classification, origin, fibre content, category, type and degree of damage was carried out through primary and secondary sources.

Visual assessment and observation methods were used to assess the physical, chemical, biological and multiple damages in the textiles. Magnifying and pick glass were used to report the type and extent of damage that had occurred in each textile artifact. Further, digitized images were also magnified to maximum resolution to confirm the analysis. Qualitative analysis was used to judge the condition of the textiles i.e. Excellent, Good, Fair and Poor based on the type and extent of damage occurrence in a textile artefact. Treatment priority code such as high, medium and low was assigned to each artifact based on the present condition so that the artifact if necessary can get required remedial treatment. The analyzed data was further fed into the fabricated template of digital database.

Phase-III dealt with experimental process for conservation of a rare silk artifact willingly spared by one of the respondent which was in poor condition. Workshops

on preventive care of textile artifacts were conducted to sensitize women at household level.

Naturally aged silk was used for the samples and nylon net as a support fabric. Polyvinyl Acetate (PVA) and Polymethyl Methacrylate (PMMC) were used as adhesives in two concentrations i.e.10% and 20%.The support fabric (nylon net) of required size was lightly brushed with the adhesive of prepared concentration. On drying the prepared support fabrics of different concentrations were attached to the naturally aged silk textile by two different methods which were cold and hot seal method. The intent of this technique was to create a film from the adhesive on which the fabric was embedded.

The consolidated samples were evaluated by subjecting them to various tests like transparency, stiffness, and tensile strength for evaluation of the most preserving and secure method of adhesive lining for the aged silk textiles.

Two workshops of four hours each were organized attended by 36 participants representing different areas of Gujarat. One at the Department of Clothing and Textiles, Faculty of Family and Community Sciences, The Maharaja Sayaijirao University of Baroda, Vadodara and the other with Jaycees Women Club, Baroda Metropolitan Chapter, Vadodara on March 1st and 9th, 2012 respectively.

Lecture cum demonstration method was used to enable participants understand the basic concepts of collection care, good housekeeping and plan long term future of their collection in an informed way, within the resources available to them.

A questionnaire schedule was administered to all the participants on the completion to know their feedback regarding the workshop.

5.3 Results and Discussions

The present section highlights the results and interpretations of the study under the following heads:

5.3.1 Pilot Study

The investigator attended a workshop on "Conservation of Thanka Painting" organized by Baroda Museum and Picture Gallery, Vadodara from Feb.28 to March 4, 2005 to gain an insight and develop a wider perspective on textile preservation and conservation.

The workshop commenced with the preparation of a condition report of the painting to plan its conservation treatment strategy. On assessment, the present condition of the painting was declared as "poor" with the subsequent items of concern such as dirt and dust, areas of losses with large number of holes and faded and flaked off paint layers at several places.

The sequential treatment planned for the conservation of the artifact included separation of the hand stitched brocade borders and the central painting of the Thanka followed by wet cleaning in filtered water mixed with few drops of glycerin and drying with due precaution of placing the artifact flat while cleaning for minimal handling.

The damages areas were sandwiched between fine nylon net fabric with manual darning stitches to minimize the movement of fibres and cotton fabric support was attached to the painting with a paste of white refined flour and sodium chloride (used as a preservative) with nap pasting method at specific points to avoid mechanical stress of needle and thread.

Finally, the entire painting was assembled in the same manner as the original piece by hand stitching the borders to the central painting and was displayed in the showcase for public viewing.

5.3.2 Preservation and conservation practices adopted by museums and individuals

5.3.2.1 Preservation and conservation practices adopted by museums

Professionals in all the museums were aware of preservation, conservation practices and the detrimental effect of environment threats, pests and inappropriate display, storage and handling on the artifacts.

All the respondents had written guidelines (museum handbook) for the staff to follow preventive care but, the practices adopted were to the best of their knowledge within the available resources and constraints.

Results pertaining to practices monitored for control of natural and artificial light revealed that all the museums had closed buildings structures with no windows to prevent from direct day light. None of them had instruments to measure the intensity of light yet, all adhered to proper light arrangements (within tolerable limits) for public viewing whereas one of the museums switched on the lights only when visitors entered the display area.

Relative humidity measuring instruments were found in the display areas of all museums to measure the macro climate of the museum building though none monitored the micro climate. Only one out of six museums had air-conditioned installed whereas, three had ceiling fans and two had installed exhaust fans.

Naphthalene balls to ward off insects and microorganisms were used by two museums whereas three museums were observed placing small fabric bags with equal mixture of neem and tobacco leaves in their showcases. Crushed extracts of commonly available plants such as fenugreek, custard apple and bitter gourd seeds with mango leaves were used by one.

Of the total museums visited, regular i.e. daily cleaning of the display, storage area and showcases was observed by only four. One of the museums had also limited the entry of the visitors in order to preserve their heritage for a longer duration. Inspection of each and every artifact was done on a regular basis i.e. every three months to check the condition of the textiles. All conservators opined that vacuuming was carried out as a treatment for surface cleaning being the safest method for aged textiles. Wet cleaning was carried out only in situations when textiles had got so badly soiled that if not wet cleaned its preservation would be difficult.

On observation, results pertaining to the display methods practiced by all the museum curators revealed that small fragile artifacts were laid flat in the show cases whereas, sturdy artifacts were hanged on padded hangers. Sarees were rolled and displayed along the walls depending upon the condition while in one of the museums, large sized artifacts were mounted between pixel glass frames for better preservation.

On analysis of the data about their preference for preservation over conservation revealed that cent per cent preferred preventive conservation (preservation) over conservation. Curative conservation was practiced in house by only one museum

while others expressed lack of equipment facilities thereby seeking help from professional conservation centres.

Therefore, the information attained from the museum personnel on the adopted preservation and conservation practices revealed that preventive conservation can be practiced with the limited available resources by all, be it a museum or personal textile collector.

5.3.2.2 Preservation and conservation practices adopted by individuals

The investigator personally visited nine individuals and conducted exhaustive documentation of their rare textile collection. Majority of the respondents revealed that they were aware of the two terms, preservation and conservation as they had read about it in the newspapers and heard from their friends and relatives but, were lacking clarity of meaning of two terms. The responses regarding the threats revealed that dust was considered as the greatest threat for them followed by insects, microorganisms, light, temperature and relative humidity. Surprisingly only one respondent knew that the fluctuating climatic conditions was the major risk factor for deterioration of the textiles artifacts.

The keepsakes were stored in metal trunks by two individuals and seven used wooden wardrobes that were placed in the basements of their houses unaware of the information that the impact of environmental conditions would be maximum in such areas due to minimum air circulation and light. Only three had placed their wardrobes in well-ventilated space.

The investigator observed during the process of documentation that seven of the nine respondents wrapped their valuables in white bleached mulmul fabric unaware of the detrimental effect caused by the emitted acid on the stored

textiles. The remaining two stored them in non-recommended plastic saree covers which were equally harmful as there would be no air circulation leading to moisture formation.

Similarly, it was found that eight of the total respondents stored the garments on plain hangers without considering its condition to take up the stress and strain whereas one folded and placed it flat on the shelf. Eight of them folded their textiles with minimum four to maximum six folds and piled them one on top of other. In fact none of respondents stored their zari artifacts separately. The damaged artifacts were not given any specific treatment for preservation instead stored along with the textiles in the good condition.

As learnt from their grandmothers, all respondents were conscious but only five were able to change the folds of their artifacts while four expressed their inconvenience in following the practice since they had relocated and time was a constraint factor for them.

All of them were well aware regarding the principle of airing the textiles but, maximum (six) did not practice with a pretext of busy schedule while three exposed their artifacts under the sun post monsoons to preserve them in a better state for longevity.

Common household insecticides and repellants to obviate the attack of insects and microorganisms like naphthalene balls, cloves, neem leaves, tobacco leaves, *kala jeera*, etc. were kept in and around the storage space by all the respondents. Cloves were directly placed by two respondents without wrapping them in cloth which led to permanent brown stains on their textiles.

The data on good housekeeping practices revealed that cent per cent respondents kept the storage area clean and tidy as dust was the major threat to their collections. Vacuuming for cleaning was practiced by none. Majority (seven) of them did not practice regular inspection of their textile collection whereas, two followed only once a year during the time of airing. It should be done every six months in order to stabilize the present condition ensuring longer life to the textiles as supported by reviewed literature.

It was further observed by the investigator that none of the documented artifacts had been mended or repaired, surprisingly no attempt was ever made to even darn or repair any of the minor damages found in the textiles.

The respondents when oriented regarding the damages which had occurred on their textiles during documentation reflected keen interest to learn the preventive conservation practices at household level that would aid to save their inheritance for years to come.

5.3.3 Analysis of the documented textiles in terms of classification, origin and fibre content

The results in terms of classification of the documented textile artifacts revealed that of the total 95 textiles, maximum being 47 were classified under woven category followed by 40 embroidered, five resist dyed and three printed textiles.

Data related to origin of the textile artifacts elucidated that 40 artifacts were from the state of Gujarat, 28 opulent textiles had their origin to the state of Uttar Pradesh, and eleven and nine belonged to Rajasthan and Kashmir respectively.

Whereas other three were from Maharashtra, two from West Bengal, one each from Andhra Pradesh and Madhya Pradesh

Results pertaining to the fibre composition of the total 95 artifacts stated that 77 were silk based, 10 had cotton, seven had wool base whereas one being union fabric was composed of silk and cotton.

5.3.4 Analysis in terms of damage category, type and condition of the textile artifacts

On analysis the data concerning the category and type of damage reflected that 68 of the 95 had various types of damages categorized under physical, chemical and biological.

Physical damages had occurred on 37 textiles. The threats leading to the above analysed damages have been discussed as follows:

Folds were observed in 19 artifacts respectively owing to inadequate storage space, incorrect storage method followed by too many folds of the artifacts.

Raveling or fraying of yarns with other damages was identified in two resulting unintentionally due to general wear and tear and poor handling of the artifact.

The reasons responsible for abraded damage among three samples were inappropriate use, excessive usage, abrasion of one artifact against the other during storage and unsuitable environmental conditions.

Tear or split was identified at the fold lines in two artifacts as the textiles were kept in the same condition for quite a long period without rotating as stated by the respondents. Multiple physical damage was noticed in seven artifacts specifically creases, cuts, tears on folds, breakage of yarns and abraded areas

attributed to various reasons; unstable climatic conditions, inadequate storage space, incorrect method of storage and faulty human interventions.

Chemical damages were found in six textile artifacts. Yellowing, an indication of unanticipated chemical degradation was spotted in two textiles attributing to their long term exposure to excessive heat and presence of atmospheric pollutants namely nitrogen oxide and sulphur dioxide inside the storage area. The possessor of both these artifacts confirmed that their storage area got intensely heated up during the summers enabling the investigator to derive at the correct interpretation.

The liberation of anxious gases such as nitrogen oxide and sulphur dioxide within the storage space had led to tarnishing majority of gold and silver zari textile artifacts. It was witnessed during the field survey that none of the respondents stored their zari artifacts separately neither followed preventive measures; hence the emissions from the surrounding sources had degraded the textiles.

On observation three silk artifacts were found in shattered condition due to the presence of metallic salts used during the late nineteenth and early twentieth centuries. However, as these fabrics aged, the metals in the fibres accelerated their decay resulting in brittleness leading to damage. Thus, it could be concluded that many a times the inherent vice of the material itself causes deterioration.

Biological damages frequently occur on organic materials as the content itself is supportive to insects and microorganisms attack. Of the total, seven cotton, silk and wool artifacts were attacked by silver fish and cloth moths that fed on the cellulose and protein substances of the material to form small irregular holes all over the textiles. As observed by the investigator storage in dark, undisturbed

areas such as basements with poor air circulation encouraged the presence of the same. Further, the unfavourable climate of such places and the respondents' irregular inspection encouraged their growth.

Multiple damages in terms of physical & chemical, physical & biological and physical, chemical & biological damages in combination were analyzed in 18 artifacts.

The interpretation of the data on condition of the documented textiles reflected that 32 textile artifacts were in Good, 27 in Excellent, 25 in Fair and 11 in Poor condition.

Hence, the treatment priority of the artifacts in Excellent to Good condition was found to be Low which indicated that majority of the textile artifacts needed only preventive conservation treatment to stabilize them in its present condition.

Some with minor damages such as holes, tears etc. being in Fair condition called for medium treatment that could be repaired to maintain its individuality and preclude further damage whereas 11 amongst the total sample selected were in Poor condition demanding curative conservation with high treatment priority to save them for posterity.

5.3.4 Development of Database

The main aim of any documentation work was to ensure long term access to the information resourced beyond any geographical borders. Hence in the present study, the investigator has developed a digital database where each artifact was accessioned with thorough documentation, including a coloured photograph, descriptive information and in depth analysis on the category, type and degree of damage with the treatment priority of each artifact, accessible to mass interested in the field of traditional textiles.

5.3.5 Application of conservation treatment on selected textile artifact

The artifact, a rare piece of early 20th century made in pure silk and zari from the state of Gujarat, India acquired from a personal collection was used for the case study. Condition assessment report on visual analysis of the selected artifact under study revealed that it was in Poor condition. There were holes and tears found all over the field of the saree but the pallav was in good condition. The piece exhibited many areas of losses and there was evidence of natural ageing due to the inherent vice of the material itself. Otherwise, it was possible to handle the object under study.

5.3.5.1 Assessment of untreated and treated samples for tensile strength, stiffness and transparency properties

The selected support fabric was treated with two adhesives i.e. Polyvinyl Acetate (PVA) and Polymethyl Methacrylate (PMMC) consolidated to the silk fabric with cold process (CP) and hot sealing process (HP). The lined silk samples were then subjected to standard test methods such as Tensile Strength, Stiffness and Transparency to determine the most preserving and secure method of adhesive lining for the object under study.

Data on tensile strength measurements revealed that the treated samples showed best results at 10 per cent concentration of PVA with the cold process than with hot sealing method that showed reduction in strength.

Samples treated with PMMC were found to be stiffer than the ones treated with PVA irrespective of the concentrations and method of reinforcement which led the samples to lose its flexibility which was not the true representation of the object under investigation.

Results of comparative objective evaluation between the two treatments established that both concentrations of PVA treated samples performed better than PMMC ones as the latter gave a hazy appearance to the samples. Similarly on comparisons between the processes of PVA treated samples, it was found that cold process gave the best results in terms of transparency, smoothness and visually satisfying appearance that mimic the original piece in both concentrations.

Thus, it confirmed that 10 per cent Polyvinyl Acetate (PVA) with cold adhesion process was the most suitable treatment for chemical consolidation of the aged silk textile under study as it preserved and retained the authentic properties of the silk artifact.

5.3.5.2 Treatment of the object

To achieve stabilization of the object, the treatment included reinforcement of the prepared support fabric to the original object with chemical and mechanical consolidation methods.

The nylon net support fabric was treated with the selected adhesive i.e. Polyvinyl Acetate at 10 per cent concentration and attached to the object under study with cold adhesion process.

The work surface was cleaned and required size of non-sticky plastic was laid tightly on all the sides with the cello tape to prevent sticking of the object to the surface. The support fabric i.e. nylon net of same size and colour was placed uniformly on it without stretching. Tested adhesive i.e. Polyvinyl Acetate of 10 per cent concentration was applied in three even coats on it (wet on dry) to form a uniform film. The back side of object under study was placed against the

face side of the of the dried support fabric which were adhered to each other by brushing the acetone solution completely on it and leaving to dry for 24 hours.

Later, the pallav of the saree was strengthened with loose support stitches of matching polyester thread at regular intervals to hold the support fabric. The method followed was single strand, no knots, minimum tension and passing the thread between and not through the yarns as cited in the relevant reviews of conservation studies. Finally, the reinforced artifact was ready to be laid for rolled storage.

5.3.6 Outcome of the Workshop

The demographic profile of the respondents indicated that of the sample comprising 36 respondents, maximum were graduates, homemakers and fell in the age groups of 31-40 years and 41 years & above. Awareness regarding the related terms revealed that friends and relatives served as the best source of information.

It was found that around 75 per cent of the respondents possessed traditional textiles whereas only 25 per cent, one quarter of the total showed their inability to own one due to other financial priorities in their early family life. Respondents (52 per cent) also conveyed that their basic interest and appreciation led to purchase traditional textiles for their personal collection while 48 per cent had inherited them from their mothers, grandmothers and in laws.

The reason for preservation of their heirlooms by 52 per cent was to carry forward their family tradition, 42 per cent were passionate towards their textile heritage while six per cent opined that both reasons were responsible for preservation of their valuables.

Fine white cotton cloth or dupattas were used for wrapping of their two dimensional textile artifacts by 60 per cent of the respondents whereas, 36 per cent used plastic saree covers which were finally placed flat either in cupboards, trunks or suitcases.

Similarly for storage of three dimensional textiles, majority of the respondents preferred hangers for coats, suits, *sherwanis* and blouse covers were used for blouses and *cholis*.

None of the total 36 had attended or heard about any such workshop on preservation and conservation of textiles and strongly stated that the workshop had benefitted them. Affirmative responses were received on the willingness to implement the methods demonstrated during the workshop on preservation of one's textile collection.

General comments regarding the workshop revealed that the workshop was very informative and interactive as they experienced hands on skills as well as the use of power point presentation and demonstration method led to better understanding of the content of the workshop reaching even to the layman.

The respondents also felt that such workshops should be frequently conducted as they contribute not only to the individual, society but to the nation at large. Such workshops had a lot of social relevance.

5.4 Conclusion

The conclusions derived from the study were as follows:

The information attained from the museum personnel on the adopted preservation and conservation practices revealed that preventive conservation can be practiced

over curative conservation with limited available resources by all, be it a museum or personal textile collector.

The data pertaining to preservation and conservation practices adopted by individuals enabled the investigator to conclude that the respondents were ignorant towards the technical care and storage of the traditional textiles hence, practiced methods learnt from their ancestors.

The analysis and discussions on category, type of damages and condition of the artifacts concluded that majority of the damages in textiles had ensued due to respondent' misconceptions, unawareness, lack of knowledge on the correct basic storage practices to preserve the particular textile heritage. So, this could be prevented by abiding to the right preventive conservation practices.

Database of traditional textiles aid in prompt access and preservation of collections of yester years for future generations with decrease in handling these surviving frail pieces as well as sustaining the cultural heritage knowledge of the country. Today, with the collections on a database, virtually unlimited research is possible.

The investigations of the most appropriate conservation treatment for the selected artifact revealed that the adhesive to be applied on the lining for ancient silk textiles was 10 per cent Polyvinyl Acetate with cold adhesion method, preserved as well as retained the authentic properties of the traditional silk textiles. The technique could be applied using simple tools, commonly available in conservation laboratory.

Workshops on preventive conservation provided excellent information on basic household practices that enabled the respondents to give longer life to their precious heirlooms thereby contributing to the society at large.

5.5 Recommendation

- Various traditional textile crafts of India are on the verge of extinction. Studies on digital documentation of rare textile craft pieces could be undertaken.

- Further study on curative conservation of degraded woolen and cotton textile artifacts could be researched.

ફેકલ્ટી ઓફ ફેમીલી સાયન્સમાંકપડાની જાળવણી પર વર્કશોપ

સાડીની આવરદા વધારવા તેની શક્ય હોય તેટલી ઓછી ગડી વાળો

(પ્રતિનિધિદ્વારા) વડોદરા,ગુરુવાર

એમ.એસ.યુનિવર્સીટીની ફેકલ્ટી ઓફ ફેમીલી સ્ટડીઝ એન્ડ કોમ્યુનીટી સાયન્સમાં(હોમસાયન્સ) આજે કપડાની જાળવણી કેવી રીતે કરીને તેની આવરદા વધારી શકાય તેના પર એક અનોખા વર્કશોપ પ્રીવેન્ટીવ કન્ઝર્વેશન ફોર હાયર લૂમ્સનુ આયોજન કરવામાં આવ્યુ હતુ.

સામાન્ય રીતે માંઘાદાટ કપડાની ખરીદીમાં ઉત્સાહ બતાવ્યા બાદ આપણે એ કપડાની સાચવણીમાં એટલુ ધ્યાન આપતા નથી.આજના વર્કશોપમાં હાજર રહેલી સ્વૈચ્છિક સંસ્થાઓની મહિલાઓને તેમજ ગૃહિણીઓને આ અંગેની ટીપ્સ આપવામાં આવી હતી.ભારતમાં વર્ષો પહેલા અસ્તિત્વમાં અને હવે ઝડપભેર લુપ્ત થઈ રહેલા ટેક્સ્ટાટાઈલ પર પીએચડી કરી રહેલા કિર્તીબેન માણેકે વર્કશોપમાં સાડીઓની સાચવણી અંગે રસપ્રદ સૂચન આપતા કહ્યુ હતુ કે સાડીઓની શક્ય હોય તેટલી ઓછી ગડી વાળવી જોઈએ.બને તો સાડીઓને બોક્સમાં મુકીને સાચવવી જોઈએ.વોર્ડરોબમાં સાડીઓને હેંગર પર લટકાવવી પણ હિતાવહ નથી.હેંગરની જગ્યાએ પીવીસી પાઈપ પર માદરપાટ બીટાળીને તેના પર સાડીને રોલ કરીને રાખવામાં આવે તો તે વધારે સારી રીતે સચવાય છે.

તેમણે વધુમાં કેટલાક સૂચનો આપતા કહ્યુ હતુ કે કપડાને પ્રકાશથી બચાવવા જોઈએ.કારણકે કૃત્રિમ અથવા તો કુદરતી પ્રકાશમાં રહેલા અલ્ટ્રાવાયોલેટ કિરણો કપડાના રંગને ઝાંખો કરી દે છે.કપડાના લેબલ પર આ માટેની સૂચના પણ લખેલી હોય છે.

જોકે મોટાભાગના લોકો તેને વાંચતા નથી.આ જ રીતે કપડાને ક્યાં સ્ટોર કરવામાં આવે છે તે પણ અગત્યનુ છે.કપડા એવી જગ્યાએ મુકાવા જોઈએ જ્યાં સીધો પ્રકાશ ના આવતો હોય.

ડીપાર્ટમેન્ટના પ્રા.અમિતા પંડ્યાએ કહ્યુ હતુ કે આ પ્રકારના વર્કશોપમાં મહિલાઓને બોલાવવાનો હેતુ એ છે કે તેમના થકી અન્ય મહિલાઓ અને ગૃહિણીઓ સુધી પણ તેનો સંદેશો પહોંચે.

મહિલાઓને વિવિધ ટીપ્સ અપાઈ : વોર્ડરોબ એવી જગ્યાએ હોવો જોઈએ જ્યાં સીધો પ્રકાશ ના આવે

Preserving textile for posterity

TIMES NEWS NETWORK

Vadodara: 'Store in a cool, dry place' is a phrase one commonly reads on packets of medicines and food items. But it holds true even for precious textile items you have procured by paying through your nose or inherited from your parents.

The department of clothing and textile of M S University's Faculy of Family and Community Sciences on Thursday held a workshop on preventive conservation of precious textile items. The event 'Preserving Your Heirlooms' had invited homemakers, NGOs and design consultants to give them tips on preservation of various textile items.

Research scholar Kirti Manek, who held the workshop, said that there were several steps that could be taken at the household level to prevent damage to textiles by microbes, insects and environment. She added that at times, incorrect storage methods led to damage to textiles.

"If one wants to preserve textiles handed over to them by their previous generations or wants to ensure that it is inherited by their future generations, there are some simple steps that can be taken to prevent any damage to them. These can be done at the home itself," said Manek who is dong her thesis on documentation of rare textile artefacts with a focus on their preservation and conservation under the guidance of professor Amita Pandya.

Bharat Pathak

Workshop on 'Preserving Your Heirlooms' being held at MSU's department of clothing and textile

Manek said that simple steps like ensuring that the textiles are not exposed to direct sunlight and are stored in a cool environment with minimum temperature fluctuations and low humidity can go in a long way in preserving them. She added that the clothes should also have minimum number of folds as damages usually begin at folds. "Rolling items like sarees is a good idea," she added.

The workshop also informed participants how tobacco and neem leaves as well as aromatic items like cloves and 'guggal' can prevent damage from microbes and insects. Using 'dhoop' or incense sticks also helped in a similar way.

Plate 5.1: Press coverage on the workshop conducted

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APPENDIX - I

Name of the Individual:

Address:

Details about the artifacts:

- Type
- Origin
- Date of acquisition
- Fibre content
- Weave
- Colour
- Type of damage
- Condition
- Preservation & conservation methods adopted

APPENDIX - II

Dear Respondent,

The undersigned is a Ph.D. research scholar at the Dept. of Clothing and Textiles, Faculty of Family and Community Sciences, The M.S. University of Baroda, Vadodara.

The questionnaire is the feedback from the participants of the workshop. Kindly furnish the feedback form with your valuable responses, opinions and suggestions.

Thanking you,

Yours sincerely,

Kirti Manek

Respondents' Profile:

Name:

Age:	21-30 years	☐	
	31-40 years	☐	
	41years & above	☐	
Educational Qualification:	Graduate	☐	
	Post Graduate	☐	
	Ph.D.	☐	
	Any other	☐	
Occupational Status:	Home maker	☐	
	Professional	☐	(specify)
	Entrepreneur	☐	(specify)
	Social worker	☐	(specify)

Awareness regarding the following terms:

- Preservation Yes ☐ No ☐
- Preventive conservation Yes ☐ No ☐
- Conservation Yes ☐ No ☐
- Curative conservation Yes ☐ No ☐

How did you get to know about the following terms?

Friends ☐

Relatives ☐

Newspaper ☐

Books ☐

Internet ☐

If any other, specify: ☐

Do you possess any of the traditional textiles?

Yes ☐ No ☐

Possession of these precious traditional textiles has been:

Acquired ☐

Inherited ☐

Reason for preservation of your textile collection.

Family tradition ☐

Passion towards textile heritage ☐

Present storage system being used for the collection.

Two dimensional textiles like borders, sarees, carpets, yardages	
Three dimensional textiles like coats, *sherwanis*, *cholis*, blouses	

Any other workshops attended on preservation and conservation of textiles.

Yes ☐ No ☐

Was the present workshop beneficial to you?

Yes ☐ No ☐

Keen to implement the methods demonstrated during the workshop on preservation of textile collection.

Yes ☐ No ☐

Any suggestions on the workshop module to enhance your understanding.

GLOSSARY

abotiyu(dhoti)	:	a draped garment worn by men
achakan	:	long jacket worn by men
ari	:	a small awl with a notch near the point used to embroider chain stitch
badla	:	untwisted flat wire
bharat karachi	:	a type of zardozi embroidery worked with gold satin stitch over a foundation of cotton threads giving a raised surface to the design
boteh/butta	:	a large motif
butti	:	a small motif
chakla	:	a square hanging
choli	:	blouse
dadabhat	:	round ball with diamond design
doriya	:	zari stripes
fita	:	narrow gold or silver zari border
garo	:	embroidery done by Parsi community mainly using satin and chain stitch
ghagra / lehanga	:	full skirt worn by women
ghoda ni gaddi	:	saddle cloth
sadaria	:	short jacket worn by men
badrum ka jal	:	ogival network of design
gulwadi	:	chrysanthemum
hashia	:	the narrow lateral borders that run along the length of the shawls

jadh	:	tree
jal	:	network of design
jaliwala	:	net
jhalar	:	scroll
jharmarwel	:	combination of leaf and flower motifs
kachli/kamkha	:	blouse worn by women
kalabatun	:	pure gold and silver zari
kalka/kairi/keri	:	mango
kamarbandh	:	waist cloth
karchob	:	a type of zardozi embroidery done with foundation padding using gilt wire or spangles stitched with running,couching,satin and stem stitch.
katan	:	pure silk
khes	:	shoulder cloth
khoyu	:	cradle cloth
ganga-jamuna	:	combination of gold and silver zari
kunjar	:	elephant
kurti	:	upper garment worn by women
lagdi	:	solid gold or silver
lehru	:	gota with diagonal stripes
masnad	:	cloth floor coverings
menawel	:	row of myna birds
minakari	:	gold or silver zaributtis outlined with single or double coloured thread known as enameling.

mor	:	peacock
mothra	:	interrupted design
odhana	:	long scarves used by women to cover the head
pagdi	:	turban
pan	:	leaf
patta	:	broad border
patti	:	narrow border
phamri	:	a special bridal dupatta, an important part of the Rajasthani bride's trousseau
phoolwar	:	overall pattern of flowers and leaves
pichavai	:	backdrop of Vaishnav temples
popat	:	parrot
ruiphool	:	cotton flower
safa	:	a draped headgear worn on special occasions by men
sakhiya	:	door hanging
salma	:	twisted circular metallic wire
sherwanis	:	long male coat
sozni	:	fine needlework of Kashmir done with chain stitch using a hook instead of a needle
swari ghodo	:	horse with the rider
tara	:	star
thal cover	:	square fabric used for covering plates during ceremonies
topi	:	cap