CHAPTER I

INTRODUCTION

As per the old adage, the three primary needs of Man are food, clothing and shelter. The fact that clothing precedes shelter goes to prove that it indeed man’s “second skin”. Clothing, as used today across the world, is made of a piece of fabric or textile, both the terms are used interchangeably. According to Mark Twain, "Clothes Make a Man." In today's society Twain would agree that clothes make the woman, too. How a person presents himself or herself says a lot about him/her. It is nonverbal communication at work, telling the world who he/she is. We live in a visually oriented world and people think what they see is what they get. Similarly Benjamin Franklin said "Eat as you relish, but dress to please others, given the fashion trend in force" For a variety of clothing or dressing, textiles is essential. Hence textile plays a major role in everybody’s routine life. Textile is a flexible material consisting of a network of natural or artificial fibres often referred.

1.1 TEXTILE INDUSTRIES

Textile industry can be broadly classified into two categories, the organized mill sector and the unorganized decentralized sector. The organized sector of the Textile industry represents the Mills. It could be a spinning mill or a composite mill. Composite mill one where the spinning, weaving and processing facilities are carried out under one roof. The decentralized sector is engaged mainly in the weaving activity, which makes it heavily dependent on the organized sector for their yarn requirements. This decentralized sector is comprised of the three major segments viz., power loom, hand loom and hosiery. In addition to the above, there are ready made Garments, Khadi as well as Carpet manufacturing unit in the decentralized sector.
The Indian Textile Industry has an overwhelming presence in the economic life of the country. It is the second largest textile industry in the world after China. Apart from providing one the basic necessities of life i.e. cloth, textile industry contributes about 14% to the country’s industrial output about 17% to the export earning. After agriculture this industry provides employment to maximum number of people in India employing 35 million people. Besides another 50 million peoples are engaged in allied activities. India is the largest producer of Jute, the 2nd largest producer of Silk, the 3rd largest producer of Cotton and Cellulosic Fibre / yarn and 5th largest producer of synthetic Fibres / yarn.

1.1.1 Origin and Development

The word textile is derived from the Latin word textilis, ‘woven’ and root word textere, “to weave” (Joseph, 1977). A textile or cloth is a flexible woven material consisting of a network of natural or artificial fibres often referred to as thread or yarn. Yarn is produced by spinning raw fibres of wool, flax, cotton, or other material to produce long strands. Textiles are formed by weaving, knitting, crocheting, knotting, or pressing fibres together.

1.1.2 Textile History in India

India can boast of a rich and varied textile heritage. The first literary reference to textile is seen in Rig Veda, the oldest of the four Vedas. The fact that a host of rich textiles were used is further corroborated by the two eminent Indian epics, Viz., Ramayana and Mahabharata. The Spinning of cotton in India dates back to 3000 BC. As far as the actual artefacts are concerned, excavations have revealed that elaborate textile construction practices were followed as long back as the Indus Valley civilization. Bone needless and wooden spindles have been found from the Harappan
and Mohenjodarosites. The depiction of richly decorated garments in sculptures of Mauryan and Gupta ages as well as Ajanta caves bear testimony to the fact that India has a diverse textile tradition. There has been a close association between textiles and ritualistic events from ancient times. This association still continues in the form of specific colours and forms of dress during important occasions such as marriage, birth, puberty and death. It is a common practice to wrap religious texts in bright textile pieces. Strips of cloth are hung on trees, poles, gates and bridges as offerings around the shrines (Chattopadhyay, 1985) Many poets and saints of ancient India have composed numerous songs referring to textiles. Salient among these mystics is Kabir, a weaver from Benaras.

In the International commerce of the pre-industrial era, textiles assumed a position of importance. The Indian pieces soon became known to the outside world. The earliest evidence has been obtained from excavations of the importance. The Indian regained supreme for her superior quality of exquisite textiles. Towards the end of the seventeenth century, the British East India Company began exporting Indian cotton and silks to other countries. With time, it’s strong hold increased and led to a complete capture by the British colony still she gained her independence in 1947. Once again textile figure importantly in the annals of our history Book with Mohandas Karamchand Gandhi championing the Swadeshi movement. At the central fulcrum of this nationwide stir was khadi i.e., hand-spun, hand-woven fabric. The spinning wheel or Charkha became a symbol of self-reliance and independence.

Textiles have an assortment of uses, the most common of which are for clothing and containers such as bags and baskets. In the household, they are used in carpeting, upholstered furnishings, window shades, towels, covering for tables, beds, and other flat surfaces, and in art. In the workplace, they are used in industrial and
scientific processes such as filtering. Miscellaneous uses include flags, backpacks, tents, nets, cleaning devices such as handkerchiefs and rags, transportation devices such as balloons, kites, sails, and parachutes, in addition to strengthening in composite materials such as fibre glass and industrial geo textiles. Children can learn using textiles to make collages, sew, quilt, and toys.

Textiles used for industrial purposes and chosen for characteristics other than their appearance, are commonly referred to as technical textiles. Technical textiles include textile structures for automotive applications, medical textiles (e.g. implants), geo textiles (reinforcement of embankments), agro textiles (textiles for crop protection), protective clothing (e.g. against heat and radiation for fire fighter clothing, against molten metals for welders, stab protection, and bullet proof vests). In all these applications stringent performance requirements must be met. Woven of threads coated with zinc oxide nano wires, laboratory fabric has been shown capable of "self-powering nano systems" using vibrations created by everyday actions like wind or body movements.

1.2 TEXTILE SOURCES AND TYPES

Textiles can be made from many materials. These materials come from four main sources: animal (wool, silk), plant (cotton, flax, jute), mineral (asbestos, glass fibre), and synthetic (nylon, polyester, acrylic). In the past, all textiles were made from natural fibres, including plant, animal, and mineral sources. In the 20th century, these were supplemented by artificial fibres made from petroleum. Textiles are made in various strengths and degrees of durability, from the finest gossamer to the sturdiest canvas. The relative thickness of fibres in cloth is measured in deniers. Micro fibre refers to fibres made of strands thinner than one denier.
1.2.1 Animal Textiles

Animal textiles are commonly made from hair, fur or skin. Wool refers to the hair of the domestic goat or sheep, which is distinguished from other types of animal hair in that the individual strands are coated with scales and tightly crimped, and the wool as a whole is coated with a wax mixture known as lanolin (aka wool grease), which is waterproof and dirt proof. Woolen refers to a bulkier yarn produced from carded, non-parallel fibre, while worsted refers to a finer yarn which is spun from longer fibres which have been combed to be parallel. Wool is commonly used for warm clothing. Cashmere, the hair of the Indian Cashmere goat, and mohair, the hair of the North African Angora goat, are types of wool known for their softness.

Silk is an animal textile made from the fibres of the cocoon of the Chinese silkworm which is spun into a smooth fabric prized for its softness. There are two main types of the silk: ‘mulberry silk’ produced by the Bombyx Mori, and ‘wild silk’ such as Tussah silk. Silkworm larvae produce the first type if cultivated in habitats with fresh mulberry leaves for consumption, while Tussah silk is produced by silkworms feeding purely on oak leaves. Around four-fifths of the world’s silk production consists of cultivated silk.

1.2.2 Plant Textiles

Grass, rush, hemp, and sisal are all used in making rope. In the first two, the entire plant is used for this purpose, while in the last two, only fibres from the plant are utilized. Coir (coconut fibre) is used in making twine, and also in floor mats, doormats, brushes, mattresses, floor tiles, and sacking. Straw and bamboo are both used to make hats. Straw, a dried form of grass, is also used for stuffing, as is kapok.
Fibres from pulpwood trees, cotton, rice, hemp, and nettle are used in making paper. Cotton, flax, jute, hemp, modal and even bamboo fibre are all used in clothing. Piña (pineapple fibre) and ramie are also fibres used in clothing, generally with a blend of other fibres such as cotton. Nettles have also been used to make a fibre and fabric very similar to hemp or flax. The use of milkweed stalk fibre has also been reported, but it tends to be somewhat weaker than other fibres like hemp or flax. Seaweed is used in the production of textiles. A water-soluble fibre known as alginate is produced and is used as a holding fibre; when the cloth is finished, the alginate is dissolved, leaving an open area.

Lyocell is a man-made fabric derived from wood pulp. It is often described as a man-made silk equivalent and is a tough fabric which is often blended with other fabrics – cotton for example. Fibres from the stalks of plants, such as hemp, flax, and nettles, are also known as 'bast' fibres.

1.2.3 Mineral Textiles

Asbestos and basalt fibre are used for vinyl tiles, sheeting, and adhesives, "transite" panels and siding, acoustical ceilings, stage curtains, and fire blankets. Glass fibre is used in the production of spacesuits, ironing board and mattress covers, ropes and cables, reinforcement fibre for composite materials, insect netting, flame-retardant and protective fabric, soundproof, fireproof, and insulating fibres. Metal fibre, metal foil, and metal wire have a variety of uses, including the production of cloth-of-gold and jewellery. Hardware cloth (US term only) is a coarse weave of steel wire, used in construction. It is much like standard window screening, but heavier and with a more open weave. It is sometimes used together with screening on the lower part of screen doors, to resist scratching by dogs.
Weaving is a textile production method which involves interlacing a set of longer threads (called the warp) with a set of crossing threads (called the weft). This is done on a frame or machine known as a loom, of which there are a number of types. Some weaving is still done by hand, but the vast majority is mechanised. Knitting and crocheting involve interlacing loops of yarn, which are formed either on a knitting needle or on a crochet hook, together in a line. The two processes are different in that knitting has several active loops at one time, on the knitting needle waiting to interlock with another loop, while crocheting never has more than one active loop on the needle. Spread Tow is a production method where the yarn are spread into thin tapes, and then the tapes are woven as warp and weft. This method is mostly used for composite materials; Spread Tow Fabrics can be made in carbon, aramide, etc. Braiding or plaiting involves twisting threads together into cloth. Knotting involves tying threads together and is used in making macrame. Lace is made by interlocking threads together independently, using a backing and any of the methods described above, to create a fine fabric with open holes in the work. Lace can be made by either hand or machine.

Carpets, rugs, velvet, velour, and velveteen are made by interlacing a secondary yarn through woven cloth, creating a tufted layer known as a nap or pile. Felting involves pressing a mat of fibres together, and working them together until they become tangled. A liquid, such as soapy water, is usually added to lubricate the fibres, and to open up the microscopic scales on strands of wool. Nonwoven textiles are manufactured by the bonding of fibres to make fabric. Bonding may be thermal or mechanical, or adhesives can be used.
1.2.4 Synthetic Textiles

A variety of contemporary fabrics cotton, velvet, printed cotton, calico, felt, satin, silk, hessian, polycotton all synthetic textiles are used primarily in the production of clothing. Polyester fibre is used in all types of clothing, either alone or blended with fibres such as cotton. Aramid fibre (e.g. Twaron) is used for flame-retardant clothing, cut-protection, and armor.

Acrylic is a fibre used to imitate wools, including cashmere, and is often used in replacement of them. Nylon is a fibre used to imitate silk; it is used in the production of pantyhose. Thicker nylon fibres are used in rope and outdoor clothing. Spandex (trade name Lycra) is a polyurethane product that can be made tight-fitting without impeding movement. It is used to make activewear, bras, and swimsuits.

Olefin fibre is a fibre used in activewear, linings, and warm clothing. Olefins are hydrophobic, allowing them to dry quickly. A sintered felt of olefin fibres is sold under the trade name Tyvek. Ingeo is a polylactide fibre blended with other fibres such as cotton and used in clothing. It is more hydrophilic than most other synthetics, allowing it to wick away perspiration. Lurex is a metallic fibre used in clothing embellishment. Milk proteins have also been used to create synthetic fabric. Milk or casein fibre cloth was developed during World War I in Germany, and further developed in Italy and America during the 1930s. Milk fibre fabric is not very durable and wrinkles easily, but has a pH similar to human skin and possesses anti-bacterial properties. It is marketed as a biodegradable, renewable synthetic fibre. Carbon fibre is mostly used in composite materials, together with resin, such as carbon fibre reinforced plastic. The fibres are made from polymer fibres through carbonization.
1.3 CLASSIFICATION OF TEXTILE FIBRES

Broadly speaking, textile fibres can be divided into two groups viz. natural and manufactured.

1.3.1 Natural Fibres

Natural fibres are obtained from nature in fibrous form. All natural fibres (except silk from undamaged cocoons) are short and measured in inches. These are also known as staple fibres. These can be further divided into four groups depending on their source and chemical composition. These are animal/protein fibres, plant/cellulose fibres, rubber and mineral fibres.

1.3.2 Animal / Protein Fibres

These can be further divided into hair fibres (named on the basis of the animal from which they are obtained) and extruded fibres. The larvae of silk moth extrude a continuous filament from their mouth to form a cocoon which is processed to recover silk fibres.

1.3.3 Plant/cellulosic Fibres

These can be subdivided according to the part of the plant that produces the fibre. Thus, there exist the categories of seed hair fibres, bast or stem fibres, leaf fibres and miscellaneous category.

1.3.4 Natural Rubber

This is processed from the latex of the rubber tree. Slashes are given on the stem and the thick, milky exudates is collected and converted into rubber.
1.3.5 Natural Mineral

Asbestos is a natural mineral fibre which is obtained from a variety of rocks that contain silicates of magnesium and calcium. It is inherently non-flammable but is being replaced because of its carcinogenic properties.

1.3.6 Manufactured Fibres

There are created by technologists under controlled conditions. Manufactured fibres are extruded as filaments. Filament fibres are long and may be cut into staple lengths if required. They can be broadly divided into three groups depending on their raw material, viz., regenerated fibres, synthetic fibres and inorganic fibres.

1.3.7 Regenerated Fibres

Here, raw materials are dissolved through a series of chemical reactions and then extruded to produce a continuous fibre strand. The starting materials and the fibres produced have the same chemical polymer. Raw materials are obtained from nature and include small cotton fibres (linters), wood, milk protein and other diverse substances which cannot be used for textiles in their original form. Hence the need for reforming or regenerating them. Rayon is the first regenerated fibre produced in 1905. It was followed by Acedate, another cellulosic fibre. Several protein based fibres have also been experimented with. Varied sources have been tried out for these, like proteins obtained from milk, soyabean, cornmeal and peanuts. Only the casein fibre from milk has attained some commercial status.

1.3.8 Synthetic Fibres

These are fibres produced from chemicals to form a polymer not previously existing in a natural state. Nylon was the first synthetic fibre to be invented. It was marketed in 1938 by Du Pont USA. In general, the era after World War II (mid-twentieth century) witnessed increasing introduction of manufactured fibres. This was to combat the problem of acute shortage of natural textile materials.
1.3.9 Inorganic Fibres

There are some inorganic substances which do not have the conventional long chain molecules. However, it is possible to soften them by heat application and then form into thin, long strands which are pliable and resemble organic fibres. Uses of inorganic fibres normally do not include apparel. But there are numerous industrial uses for them.

Except natural mineral fibres and man-made inorganic fibres such as glass and some metals, all textile fibre polymers are organic compounds. This means that they are predominantly composed of carbon and hydrogen atoms with some oxygen, nitrogen, chlorine and/or fluorine atoms.

1.3.10 Weaving Technology

Weaving is a textile production method which involves interlacing a set of longer threads (called the warp) with a set of crossing threads (called the weft). This is done on a frame or machine known as a loom, of which there are a number of types. Some weaving is still done by hand, but the vast majority is mechanised. Knitting and crocheting involve interlacing loops of yarn, which are formed either on a knitting needle or on a crochet hook, together in a line. The two processes are different in that knitting has several active loops at one time, on the knitting needle waiting to interlock with another loop, while crocheting never has more than one active loop on the needle.

Spread Tow is a production method where the yarn are spread into thin tapes, and then the tapes are woven as warp and weft. This method is mostly used for composite materials; Spread Tow Fabrics can be made in carbon, aramide, etc.
Braiding or plaiting involves twisting threads together into cloth. Knotting involves tying threads together and is used in making macrame. Lace is made by interlocking threads together independently, using a backing and any of the methods described above, to create a fine fabric with open holes in the work. Lace can be made by either hand or machine. Carpets, rugs, velvet, velour, and velveteen are made by interlacing a secondary yarn through woven cloth, creating a tufted layer known as a nap or pile. Felting involves pressing a mat of fibres together, and working them together until they become tangled. A liquid, such as soapy water, is usually added to lubricate the fibres, and to open up the microscopic scales on strands of wool. Nonwoven textiles are manufactured by the bonding of fibres to make fabric. Bonding may be thermal or mechanical, or adhesives can be used.

1.3.11 Textile Manufacturing

Textile manufacturing is one of the oldest human activities. The oldest known textiles date back to about 5000 B.C. In order to make textiles, the first requirement is a source of fibre from which a yarn can be made, primarily by spinning. The yarn is processed by knitting or weaving to create cloth. The machine used for weaving is the loom. Cloth is finished by what are described as wet processes to become fabric. The fabric may be dyed, printed or decorated by embroidering with coloured yarns.

1.4 APPLICATIONS OF TEXTILES

Broadly speaking, there can be the following uses for textiles:

1.4.1 Apparel

This category can be further subdivided into innerwear and outerwear for infants, children, women and men.
1.4.2 Home textiles

Also referred to as domestics, linens, household textiles or home furnished textiles. The major categories in this segment are bed, bath, table and kitchen linens, floor coverings, window treatments and outdoor furnishings.

1.4.3 Industrial textiles

These are fabrics designed with specific end uses in mind. Salient among these are filters, conveyor belts, geotextiles, building materials, tyre cords, agriculture, fibre reinforced plastic (FRP), synthetic turf, parachute fabrics, medical textiles and sports.

1.5 CURRENT SCENARIO

Today, the Textile industry enjoys a special place in our country. As the second largest employment generator after agriculture, this industry contributed to nearly 30% of the total exports. If all segments of this ‘elephantine’ industry, from growth and production of fibres to processing into yarns, fabrics and finally garments are considered, then it definitely involves more money and people than any other industry. Under the umbrella of this industry, both organized as well as decentralized sectors spanning urban and rural areas coexist. At the helm of this industry is the Ministry of Textiles.

The Ministry of Textiles is responsible for the growth, policy formulation and planning of its various sectors. The primary areas of the Ministry cover the following:

- Textile policy and formulation
- Man-made fibre/filament yarn industry
• Cotton textile industry
• Jute industry
• Silk and Silk textile industry
• Wool and woolen industry
• Decentralized Powerloom sector
• Export promotion
• Planning and export analysis
• Integrated finance matters
• Information technology

There are two categories of organizations under the Ministry of Textiles.

I. Public sector undertakings

a) National Textile Corporation Limited, New Delhi
b) British India Corporation, Kanpur
c) Cotton Corporation of India Limited, Mumbai
d) Jute Corporation of India Limited, Kolkata
e) Birds, Jute Manufactureres Corporation, Kolkatta
f) National Jute Manufactureres Corporation, Kolkatta
g) Handicrafts and handlooms Export Corporation, New Delhi
h) Central Cottage Industries Corporation, New Delhi
i) North Eastern Handicrafts and Handlooms Development Corporation, Shillong.
J) National Handloom Development Corporation, Lucknow
II. Textile Research Associations:

The main objective of these associations to carry out research and render consultancy services (quality management series_ISO 9001) to the industry on various aspects of textile technology. There are eight such associations, spread across India. These are:

a) Ahmadabad Textile Research Association, AITRA, Ahmedabad
b) Bombay Textile Research Association, BTRA, Mumbai
c) South India Textile Research Association, SITRA, Coimbatore
d) Northern India Textile Research Association, NITRA, Ghaziabad
e) The Synthetic and Artificial Mills Research Association, SASMIRA, Mumbai
f) Man-made Textile Research Association, MANTRA, Surat
g) Indian Jute Industry’s Research Association, IJIRA, Kolkata
h) Wool Research Association, WRA, Thane

These associations work with a view to reducing the cost, improving quality as well as durability, reducing pollution, conserving energy and utilizing water, adopting new technology and improving the techniques in the decentralized sectors.

1.5.1 Textile Technology Research

The global textile research activities rose over the years in comparison to the previous one. It is interesting to note that research productivity in Textile technology in Asia is negligible when compared to developed countries. The success of the textile industries is mainly based on Textile research. Therefore, it is essential to strengthen the Textile technology which necessitates the implementation of latest Technology to improve the textile production, marketing and services. Hence the scholar has chosen the topic entitled “Scientometric analysis of the literature on textile technology based on bibliographic databases” to bring the research in textile technology to the world.
1.6 BIBLIOMETRICS

The term Bibliometrics was introduced by Alan Pritchard in 1969\textsuperscript{1}. Although it seems that the term’s history is new, its origin goes back to Campbell’s study in 1896 according to (Sengupta, 1992).\textsuperscript{2} He states that Campbell’s (1896) statistical studies in publications subject categories was the first time for conduction of bibliometric study. Up to Pritchard (1969), bibliometric studies called as statistical bibliography. The literature contains various definitions on the term. Firstly, (Pritchard, 1969) explained the term as the application of mathematical and statistical methods to books and other media of communication”. (Broadus, 1987)\textsuperscript{3} criticized the definition of Pritchard in terms of vagueness of phrase, other media. He used the term quantitative study while defining Bibliometrics. He explained the term as bibliographic and/or physical published units’ quantitative study. (White & McCain, 1989)\textsuperscript{4} also defined the term as quantitative study but emphasizing on the literature’s quantitative study.

Bibliometric methods have been applied in various forms for a century or more (Pritchard & Wittig, 1981). Sengupta (1992) claims that Campbell (1896)\textsuperscript{5} produced the first bibliometric study, using statistical methods for studying subject scattering in publications. Some of the early work includes that of Cole & Eales (1917)\textsuperscript{6}, which is claimed by Lawani (1981)\textsuperscript{7} and Khurshid & Sahai (1991)\textsuperscript{8} to be the first bibliometric study (although using the older terminology of ‘statistical bibliography’). Cole & Eales (1917) studied the growth of literature in comparative anatomy for the period 1550-1860. Hulme’s (1923)\textsuperscript{9} work is another early study, using document counts to provide insight into the history of science and technology.
Shapiro (1992)\textsuperscript{10} reminds us of the legal precedents of bibliometrics, a topic that has been otherwise neglected by information science historians. The use of citation indexes have been demonstrated as far back as 1743 and publication counts have also been located in legal writings since at least 1817. Weinberg (1997)\textsuperscript{11} shows that Hebrew citation indexes are even earlier still and date from about the 12th century.


However, Wilson (1995)\textsuperscript{15} indicates that this term has a French precedent. Fonseca (1973)\textsuperscript{16}, in a criticism of the tendency of English language authors to ignore works in Romance languages, draws attention to the use of the French equivalent of the term, ‘bibliometrie’, by Paul Otlet (1934)\textsuperscript{17} in his Traitée de Documentation. Though Otlet (1934) had previously employed the term ‘bibliometrie’, Pritchard (1969b, p. 348) defined the new bibliometrics widely, to be “the application of mathematical and statistical methods to books and other media of communication”. In the same year, Fairthorne (1969, p. 341) widened its ambit claim even further to the “quantitative treatment of the properties of recorded discourse and behaviour appertaining to it”. By 1970 bibliometrics had become a heading in both Library Literature and in Library and Information Science Abstracts, (Peritz, 1984)\textsuperscript{18}and by 1980 Library of Congress Subject Heading (Broadus,1987).
1.7 SCIENTOMETRICS

The international Encyclopedia of the Social and Behavioral sciences defines “Scientometrics” as the “study of the quantitative aspects of scientific communication, R&D practices, and science and technology (S&T) policies” (Leydesdorff, 2001). Vassily V. Nalimov & Z. M. Mulchenko introduced the term Scientometrics in 1969\(^\text{19}\). In 1978, a new journal with the name Scientometrics has been published by Tibor Braun in Hungary. There has been a high interest all around the world for the term after a dedicated journal publication. (Bellis, 2009)\(^\text{20}\) used the phrase institutionalization of Scientometrics for the foundation of the journal. The recognition and application of the discipline continued to widen by the foundation of International Society for Scientometrics and Informetrics (ISSI) in 1993.

By it is nature, the literature of science and technology is the focus of Scientometrics as a field. According to (Tague-Sutcliffe, 1992)\(^\text{21}\), Scientometrics deals with quantitative aspects of science. (Van Raan, 1997)\(^\text{22}\) also emphasized the quantitative study of science and technology while defining the term. Similarly, Wilson.S (1999)\(^\text{23}\) stated that all quantitative aspects of science, communication in science and science policy are in the content of Scientometrics. Finally, (Vinkler, 2010)\(^\text{24}\) stated that Scientometrics cannot be restricted with the scope of a scientific discipline. He broadened the definition as quantitative study of people, groups, matters and phenomena in science and their relationships.

Scientometrics is the study of the quantitative aspects of science as a discipline or economic activity. It is part of the sociology of science and has application to science policy-making. It involves quantitative studies of scientific
activities, including, among others, publication, and so overlaps Bibliometrics to some extent.

As an example, (Tague-Sutcliffe, 1992) claimed that they were overlapped since they both involve publications’ quantitative studies. (Concepcion S Wilson, 1999) differentiated the terms in terms of their focus points. They restricted Bibliometrics’ focus area with literature of science and scholarship whereas Scientometrics has a wider range of focus dimensions such as researchers’ practices, socio-organizational structures, management, policy, national economy. Vinkler, (2010) also stated that Scientometrics could be a source of data and indicator for science policy for each level such as performance monitoring, research priority selection, science-society or science-economics relation studies.

1.8 INFORMETRICS

The term Informetrics was first proposed by Otto Nacke of West Germany in 1979. The term ‘informetrics’ is perhaps the most general of the three terms. Informetrics may subsume scientometrics and more especially, bibliometrics; however, workers in the three metric areas will continue to use the term they feel most closely describes their understanding of their work. In particular, researchers outside the information science discipline will continue to use the more familiar (and established) term, bibliometrics.

Informetrics covers the empirical studies of literature and documents, as well as theoretical studies of the mathematical properties of the laws and distributions that have been discovered. Tague-Sutcliffe(1992) defines “Informetrics is the study of the quantitative aspects of information in any form, not just records or bibliographies, and in any social group, not just scientists. Thus it looks at the quantitative aspects of informal or spoken communication, as well as recorded, and of information needs and uses of the disadvantaged, not just the intellectual elite. It can incorporate, utilise, and extend the many studies of the measurement of information that lie outside the boundaries of both bibliometrics and scientometrics. Two phenomena that have not, in the past, been seen as a part of bibliometrics or scientometrics, but fit comfortably within the scope of informetrics are: definition and measurement of information, and types and characteristics of retrieval performance measures.” Ingwersen and Christensen (1997) defines “The term informetrics designates a recent extension of the traditional bibliometric analyses also to cover non-scholarly communities in which information is produced, communicated, and used.” Wilson (2001) informetrics is the quantitative study of collections of moderate-sized units of potentially informative text, directed to the scientific understanding of informing processes at the social level.

At the First International Conference on Bibliometrics and Theoretical Aspects of Information Retrieval in 1988, Brookes suggested that an ‘informetrics’ which subsumes bibliometrics and scientometrics, for both documentary and electronic information, may have a future. Informetrics 87/88 was adopted as the short title for the published conference proceedings (Egghe & Rousseau, 1988), the editors noting that “in promoting a new name, it is a classical technique to use the new name together with the old one”. By the second conference (Egghe &
Rousseau, 1990)\(^3\), Brookes (1990) endorsed ‘informetrics’ as a general term for scientometrics and bibliometrics, with scientometrics taken as leaning to policy studies and bibliometrics conceded more to library studies. The status of the term ‘informetrics’ was enhanced in the third conference proceedings in the series, The Third International Conference on Informetrics (Rao, 1992), but reduced in the fourth conference title, International Conference on Bibliometrics, Informetrics, and Scientometrics. The proceedings of the fourth conference were published in four separate volumes, three of which were whole issues of regular journals in English (Glanzel & Kretschmer, 1992; 1994). At this conference, the International Society for Scientometrics and Informetrics (ISSI) was founded, and subsequent conferences (Koenig & Bookstein, 1995; Peritz & Egghe, 1997; Macías-Chapula, 1999) have been held biennially under the society’s auspices. A special issue on informetrics appeared in the journal Information Processing & Management (Tague-Sutcliffe, 1992). In summary, by the early 1990s, the term ‘informetrics’ clearly enjoyed widespread recognition (Wilson, 2001).

1.9 LIBRAMETRICS

The term ‘librametry’ was proposed by Ranganathan in 1948 as the application of Mathematical and statistical techniques to library problems (Sengupta, 1992). Wilson (2001) indicates there may be value in retaining the terms ‘librametrics’ or ‘librametry’ for such studies not specifically analyzing literatures, or at least not specifically directed to the goals of bibliometrics and of information retrieval. These include analyses of book circulation, of library collection overlap, of library acquisitions, of fines policy and of shelf allocation frequently using optimization techniques from operations research.
1.10 WEB BASED METRICS

There is an incredible increase in use of World Wide Web and related technologies. According to Internet World Stats the number of internet users about 2 billion and the growth in number of internet users are 399.3% in the years between 2000 and 2009 Internet usage World Stats, Internet and Population Statistics. In parallel to penetration in use of internet, new trends have been emerged, as in scientific issues. Scientist, scientific groups and institutions have benefited from internet as a way of scientific communication and dissemination. Internet also became a global library including billions of scholar and non-scholar publications. These amazing developments led the people who are dealing with quantitative studies on scholar publications to develop new web based metrics.

1.10.1 Netometrics

In 1995 Bossy introduced the term Netometrics to describe Internet- mediated scientific interaction, which she sees as becoming the main source of data for studies of ‘science in action’. In 1997 Almind and Ingwersen suggested Webometrics for the study of the World Wide Web, and all network-based communication, by informetric methods.

1.10.2 Webometrics

In 1997\textsuperscript{31} just after two years later than first web based metric introduced, a new metric called Webometrics was coined by Almind & Ingwersen. They described the term as study of all network-based communications including World Wide Web by the help of Informetrics methods. According to (Björneborn, 2004)\textsuperscript{32} Webometrics is the study of the quantitative aspects of the construction
and use of information resources, structures and technologies on the Web drawing on Bibliometrics and Informetrics approaches. He also put Webometrics on the focal point of all other related terms. Additionally, Webometrics was defined as a subfield of Informetrics by (Bar-Ilan, 2008). Then, in the light of above descriptions it could be asked that what a webometrician do. (Thelwall, 2008) explained it as analysis of link and web citations, evaluation of search engines and descriptive studies of the web.

1.10.3 Cybermetrics

In 1997 by the Centro de Información y Documentación Científica (CINDOC) in Madrid, under the editorship of Isidro Aguillo. The journal, appropriately electronic-only, covers research in scientometrics, informetrics and bibliometrics a regrettable triumvirate – but with special emphasis on their interrelations with the Internet, on the evaluation of electronic journals on the web, and on the application of informetric techniques to cyberspace communication in general.” According to (Björneborn, 2004), as illustrated in Figure, Cybermetrics covers the term Webometrics. While Webometrics studies on the Web, Cybermetrics deals with whole internet.

1.10.4 Indicator Terminology

There are terms strongly related with metric terminologies in previous section. They are main part of ranking systems; hence they can be called as - Indicator Terminology.
1.11 CITATION DATABASES

The citation indexing goes back to Frank Shepard Company’s Shepard’s citations in 1873 and there had been other studies through the history. The most innovative study was stated with Eugrne Garfield’s paper on citation Indexing in 1995 and pilot projects conducted in 1960s (Yancey, 2005). With the developments in computer and internet technologies, the citation databases have been improved in terms of coverage, functionality and timeliness. Today, citation databases tracks millions of publications in thousands of journals for hundreds of areas and fields in tens of disciplines. They provide functionalities such as searching, analyzing and reporting of records. The records may include latest publications as well as publications in 1800s.

At the present time, there are many multidisciplinary or discipline based databases. The three of the most known multidisciplinary citation databases are examined.

1.11.1 Web of Science (wos)

Eugene Garfield’s studies led to foundation of Institute for Scientific Information (ISI) in 1960. After four years, the first multidisciplinary database, named Science citation Index, was introduced by ISI (acquired by Thomson Reuter in 1992). By following it, Social Sciences and Arts & Humanities citation indexes were developed and all of them were combined as Web of Science in web environment (Yancey, 2005). Up to 2004, Web of Science was the sole product serving as comprehensive multidisciplinary citation database.
1.11.2 Scopus

In 2004, a leading company in scientific, technical and medical information services production, named Elsevier, announced the launch of commercial database Scopus. Scopus comes of age. Scopus has gained high interest in a short time period and have become a competitor of Thomson Reuter’s Web of Science.

1.11.3 Google Scholar (GS)

Another database introduced in 2004 was Google Scholar which is a free service sponsored by Google. It has attracted wide attention in the world due to its coverage and free of use. The service provides the users to search for articles, theses, books, abstracts and court opinions across many disciplines. The documents that the service provides can be from various sources as: academic publishers, professional societies, online repositories, universities and other web sites.

1.11.4 Publication

It is the scientific publications of an institute for defined time range. The coverage of the term varies according to how it is described in a ranking system. While some systems counts all types of documents, only peer reviewed articles are taken into account in some other systems. Publication can be perceived as an indicator of size and productivity. It means that if an institution is crowded in terms of faculty members it is most likely that the number of publication will be much. It does not tell anything about the quality of institution.
1.11.5 Citation

Citation is an expression of providing reference to a study if it is used as a source. In other words, it defines a relation between two studies, citing and cited ones. A document’s number of citations represents how the idea in that document is gained attention of others and is worth to refer. Thus, it can be perceived as a quality or impact indicator to some extent. However, the size of an institution can affect the citation count because of publication number is highly correlated with citation number.

1.11.6 Self Citation

An author’s reference to other documents published by himself is called as self citation. The term is also valid for journals as well as authors. The databases can provide citation counts by subtract the number of self citations.

1.11.7 Citation per Publication (CPPP)

It is the average number of citations received by one document. It is used as an impact indicator for evaluating average impact of documents published.

1.11.8 H Index

It was introduced to measure scientific research output impact of an individual (Hirsch, 2005). The author defined the index as: — A scientist has index h if h of his or her Np papers have at least h citations each and the other (Np − h) papers have ≤ h citations each.
1.12 REGRESSION ANALYSIS

In statistics, regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. The use of mathematical and statistical techniques to estimate one variable from another especially by the application of regression coefficients, regression curves, regression equations, or regression lines to empirical data.

1.12.1 Trend analysis

Trend analysis is a mathematical technique that uses historical results to predict future outcomes. It uses run charts to analyse variances in cost and schedule performance when compared to the baseline. It can also track technical performance by analysing the variance between defects reported and the defects corrected. In project management trend analysis is a mathematical technique that uses historical results to predict future outcome. This is achieved by tracking variances in cost and schedule performance. In this context, it is a project management quality control tool.

1.13 STATEMENT OF THE PROBLEM

The last Fourteen years have observed an overwhelming volume of publications addressing Textile technology. Many of the publications have revealed the issue of literature on Textile Technology research. Due to scattered publications, the findings of this research have not been visible to the policy makers. In order to overcome this problem, this study attempts to convert the publications into a comprehensive database. This would be a major work towards consolidating the
research output process on one side and facilitating the visibility of the publications on the other. This database covers information relating to the titles, authors, author affiliation, methodology adopted and the continent and country coverage of the global publications during the study period.

With respect to the above problem, this research attempts to analyze the implication towards Textile technology research publications. It aims to evaluate the research activity of the Continent wise and Country wise research output on the research area of Textile technology.

Scientometric analysis as a subject of study and its application, when compared with many other subject fields, is of recent origin in Information Science attracting scholars to work on its various aspects as evaluation of information plays a vital role in policy making and economic planning. The topic for research investigation is "SCIENTOMETRIC ANALYSIS OF THE LITERATURE ON TEXTILE TECHNOLOGY BASED ON BIBLIOGRAPHIC DATABASES".

1.14 NEED FOR STUDY

Expansion of a knowledge base requires resources: human efforts, properly equipped labs, access to computing, office support staff, examination of primary documents in remote locations, socialization and communication with peer researchers, and access to the field’s knowledge base. Even in relatively well funded areas such as weapons development, corporate law, and intellectual property studies; there remains the basic need to manage resources in the face of almost limitless directions of study. For the clothing and textile research field, a growing importance has been placed on academicians to produce publications and other knowledge in order to gain full professor rank and tenure. This pressure to produce coincides with a
pressure on all academic units to reduce resource usage in terms of space, staff, and costs. These problems have been documented for the clothing and textile field by Laughlin & Kean (1996), Feather (1996), and Lennon & Burns (2000).

In addition to pressures on lead researchers, department chairs, and dean’s of schools there is also a significant need for research metrics for academic administrators, policy makers, and grant review committees who may not know the roots, agenda, or missions of the clothing and textile research field. Again, International Textile and Apparel Association (ITAA) committees have reported that clothing and textile department chairs are increasingly asked to submit data speaking to the productivity and competitive position of their faculty (Laughlin & Kean, 1996). Even when such data are available, it is unlikely that it would be informative to all parties involved without user-specific transformations. Faculty, research managers, administrators, and policy makers may all want to know “what is happening” but will probably expect the answer in diverging ways. Creating scalable metrics that contain the same information but meet the format needs of different end users is an ongoing problem that this research proposes to address.

1.15 OBJECTIVES OF THE STUDY

The major objectives are framed with the unique principle of the present study as mentioned below:

- To study the growth of literature on the Textile technology research during the study period 1999 to 2012.

- To study the characteristics of authors in terms of number of contributions and nationality.
➢ To rank the authors in different fields.

➢ To develop a methodology based on Bibliometric indicators, help detect new and emerging research fields in future.

➢ To analyze the changing Pattern in scholarly communication of the discipline over a period of time.

➢ To measure and compare the analysis both continent and country wise output of literature on Textile technology research.

➢ To suggest a strategy for research and development on Textile and allied technology research on the basis of analysis and findings of the study.

1.16 HYPOTHESES

The researcher has formulated following set of hypotheses fulfilling the purposes of the study:

1) There is an inverse relationship in the number of authors and the number of papers published in the field of Textile Technology.

2) Collaborative research output has replaced individual research in many areas in Science and technology. Hence, in Textile technology research literature output too.

3) The scientific productivity of authors in Textile technology research literature confirms to the Lotka’s inverse square law of scientific productivity.

4) There is an inverse relationship in the number of papers published and number of journals in the field of Textile Technology.

6) Scientists in the field of Textile technology research prefer to publish their research findings in journals published from developed countries.

7) There is a significant association between the most prolific authors and number of citations.

8) Research literature output from a country is related to its economy.

1.17 SIGNIFICANCE OF THE STUDY

It was hoped that the following organizations and individuals might find this study useful to them: i) policy makers and research funding institutions, such as the Institutions and Associations in the developed as well as developing countries who would see the need to provide funding, skills and equipment to textile researchers wishing to publish ii) journal publishers, who would benefit by publishing this study iii) researchers, as it would help them identify other researchers within the region or outside the region with whom they could collaborate in research; and iv) employers, who could use this study to identify the development in the field of textile Industry (both in terms of the qualities that they possess, and in identifying existing top researchers).

1.18 LIMITATIONS OF THE STUDY

There are various sources contributing to the research output in the field of Textile technology by global Scientists. In this study has secondary sources are taken for analysis. The study covers a period of fourteen years only spanned between 1999 to 2012, both years inclusive. Records for the analysis of this investigation have been extracted from Web of Science. Database of records taken for analysis is exclusively from Web of Science which follows its own standard for the inclusion or exclusion of
sources. Though the data may exist outside Textile technology in ample, this investigation has not included any from other sources or online database.

1.19 ORGANISATION OF THE STUDY

**Chapter I:** Deals with Introduction of Textile technology, Bibliometrics, Scientometrics, Need for the study, Statement of the Problem, Objectives, Hypotheses, Significance of the study, Limitations and organization of the study.

**Chapter II:** Reviews the important studies conducted in Scientometric, Bibliometric studies to answer the questions, where did the problem come from? What is already known about this problem? What other methods have been tried to solve it? and how much of the work done over the years?

**Chapter III:** Presents the methodology covering data bases, collection of Data and Statistical Tools and Techniques applied to obtain results for this study.

**Chapter IV:** Deals with analysis of data relating to research productivity in Textile technology over the period of 1999 to 2012.

**Chapter V:** Summaries the finding of the study and based on the finding offer some recommendations and presents the conclusion.
REFERENCES


20. **Bellis, N.D. (2009)**. Bibliometrics and Citation analysis: from the Science Citation Index to Cybermetrics. The Scarecrow Press, Inc.


