

## ***Recent Trends and Technological Innovations in World Textile Industries-Review***

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### ***Abstract***

*Purchasing new generations of machines for the purpose of enhancing productivity and quality through modern technology can increase the research and advancement for improvement of the industrial growth of the countries. In the textile industry technological innovations have been substantial especially during the last three decades since 1967 in the areas of machines, labour productivity, quality, costs and services. In the textile industry large amount of electricity, fuel and water uses with corresponding greenhouses gas emissions and also contaminated affluent. In order to reshape the prospect of the textile industry and garment manufacturing industry, technology plays the role of master architect. The scientific and technological innovations made a havoc change in the textile industry. A highly competitive market deals with constituents to propagate the changes in order to differentiate themselves and also attract a target part of the market. Innovation and application of nanotechnology in textile industry has changed the present market of growth trends. In the European Union alone the technical textile fulfils around 30% of the total turnover in the textile market. At present the textile industry made ground breaking scientific innovations. Nowadays, the textile industry is currently suffering from the area of threats and opportunities.*

***Keywords:*** *Product Quality, Greenhouse Gas, E-Marketing, Technology Trends, Fashion Trends, Sustainable Manufacturing.*

## INTRODUCTION

The textile industry is a major foreign exchange earner of the country. More than 35% of the total earning of the country comes from export revenue by the textile industry. Due to globalization throughout the world apparel industry has made a vital place from the ancient era to till the moderns days. Textile industry started from the year 3000 BC and became a traditional industry. Compared to agricultural industry textile products'' industry became the second largest economic industry in the World. It provides large employment to the extent of ten millions of both men and women workers around two hundred countries. Due to globalization and huge competition textile industry is changing every now and then due to the growth rate. China, India, Pakistan and Vietnam are the traditional giants in the manufacturing of textile products and machineries and they are always having competition with each other. The important factor that is contributed to lagging in the cotton industry throughout the World has become outdated technology of machines and skilled labour as compared to certain positive growth factors.

Technological innovations in the textile industry have become sustainable particularly over the last three decades. This article quantifies and explains the impact that these that these technological innovations have made from the year 1967 on machines and labour productivity, quality, costs and services. These improvements have succeeded to make the textile industry as the developed high-wage countries competitive from the cost point of view with the textile industries having lower wage countries of South-East Asia.

The textile industry and especially textile wet processing is one of the largest consumers of water manufacturing and therefore one of the biggest producers in industrial waste water. Due to various chemicals used in different textile processing such as pre-treatment, dyeing, printing and finishing, the textile waste water contain many toxic chemicals. When these are not treated properly before discharging to environment may cause serious environment damage. In many countries the changes for water supply and affluent discharge are increasing. Therefore, organizations for saving costs and remain competitive they require to save water and address issues related to waste water disposal. EIPPCB in 2003 provides a good overview of water consumption and waste water pollution for different textile wet-processing processes.

In the textile industry traditional looms and sewing machines are giving way to soft robotics and AI, where fabrics are becoming smarter and more functional. Technology is considered to be the master of architect of progress, which has become a driving force in reshaping the future progress of the textile and garment manufacturing techniques in the industry. Moreover, the fusion of technology with textiles and garments revolutionized the path of textile industry. The top ten technological trends in the textile and garments are such as sustainable manufacturing and green house practices, end to end digital transformation, the interplay of digital twins, AR/VR and I o T, Circular economy and waste reduction, transparent supply chains and traceability and many more.

The textile industry was the very first to embrace industrial revolution and many economics depended on its evolution for their political dominance for a very long time. The scientific and technological advances made the time frame are unprecedented. The role of textile universities and research institutes in the process of innovation can discussed together with some models for successful implementation of ideas in industrial applications. Moreover, final discussions on future innovations challenge related to the textile industry are considered to be the progress in the textile garment manufacturing areas.

The geographic distribution of T & C global value chain depends on the workforce's specialization, production costs, negotiation power, etc. For instance, comparing manufacturing costs in the low cost countries, can be seen that while Eastern European countries have lower energy costs. They practice higher wages and interest rates than other countries as India, Sri Lanka and Pakistan, with higher energy costs and lower wages and interest rates. Therefore cost efficiency of each value chain element needs to be carefully analyzed by interested companies.

Nanotechnology innovation and application in textile industry, a survey of the global textile industry sector and related nanotechnology research in key markets followed by an examination of the textiles value chain to identify where nanotechnology has began to play an important role. The processes by which a generic technological revolution penetrates and diffuses across sub-segments of an existing traditional sector may be discussed. To this end, causal determinates of nanotechnology based innovation and application in textile product categories and markets are examined. Emerging Nanotechnology enabled performance

improvements and new categories in textile will increasingly drive R & D and communication. Current applications of nanotechnology in textiles are surveyed.

Energy harvesting textiles are gaining more importance due to the huge demand for efficient portable energy storage solutions, developed by increasing research and interest in piezoelectric and photovoltaic technology. To fulfil the demand research at Nan Yang Technological University developed a groundbreaking fabric that converts energy from body movement into electrical power. During their research works, they developed several non-core companies involved developing Energy Textiles and some of which are named as Intel, IBM and Samsung. In the areas of reusing and recycling textiles, government world wise are responding with stricter regulations on waste management and sustainable practices. Companies are being pushed to explore more efficient textile recycling methods. Caribous, the biochemistry start up, utilizing „Cut Cutinise“ enzyme to break down polyester material found in textile waste. The method enables the recovery of virgin quality material that can be recycled indefinitely creating process.

The textile industry drove ground breaking scientific innovations. The fly-shuttle was patented in 1733 by John Kay and saw a number of sub-sequent improvements including an important one in 1747 that doubled the output of a weaver. It became widely used around Lancashire after 1760, when Johnson Robert designed a method for deploying multiple shuttle simultaneously enabling the use of weft of more than one colour and making it easier for the weaver to produce cross-striped materials. The technology was developed with the help of John Walt of Birmingham. Paul and Walt opened a mill in Birmingham that used the new rolling machine powered by a donkey. In 1743, a factory opened in Northampton with 50 spindles on each five of Paul and Walt’s machines. It operated until about 1764.

The textile industry is extremely varied with hand-spun and hand-woven textile sectors at the end of the spectrum, which the capital intensive sophisticated mills sector on the other end. The decentralized power looms/hosiery and knitted sector forms the largest component in the textile sector. The close linkage of textiles industry and agriculture with the ancient culture and traditions of the country makes it makes it unique in comparison to other industries in the country. India is the World’s second largest producer of textiles and garments and the World’s

third largest producer of cotton after China and USA. The Indian market is also the second largest in terms of consumption of cotton after China.

### **EMERGING TECHNOLOGIES IN TEXTILE INDUSTRY**

The world textile industry is on continual intestinal changes everyday due to globalization and heavy competition. The Government will devise suitable measures to facilitate that the Textile industry grows at the rate 18% per annum. The Government will also take efforts to address the labour force will be generated by creating new infrastructure and also by strengthening the existing ones. India is one of the world's largest manufacturers and exporters of textile products and it has invested in more spinning and weaving machines and second to China. India's textile sector is one of the mainstays of the national economy. It is also one of the largest contributing sectors of India's exporting market. The efforts of our exporters to diversify into new markets in the context of the demand recession in our traditional markets in recent years have started showing positive results. The growth and all round developments of the industry has a direct bearing on the improvement of the India's economy.

Technological developments in the textile industry have been substantial particular during the last three decades and the important technological developments have made since 1967 on machine and labour productivity, quality, costs and services. The improvements were great, have they been succeeded in making the textile industry of developed high wage countries comparative from a cost point of view with the textile industries of lower wage countries of South East Asia?. A comparison was made in the case of producing a basic apparel product, a cotton/polyester fibre dress shirt in the United States and in South East Asia. The results shows that for all practical purposes a state of the art mill for the dress shirt but that the advantage of the low wage country in making up the shirt is still sufficient to make final products, i.e the dress shirt, competitive from a pure cost point of view. It has also pointed out that the cost advantage can be offset to a substantial degree by improved service.

A composite textile plant houses spinning, weaving/knitting and wet processing at a site. The breakdown of typical electricity and thermal energy use a composite textile plant. Spinning consumers the largest share of electricity followed by weaving preparation and weaving. Wet processing preparation and finishing together consume the greatest share of thermal energy. A

significant amount of thermal energy is also lost during steam generation and distribution (35%). These percentages will vary plant wise.

The textile and garment industry are embracing sustainability and green practices to reduce environmental impact and meet consumer demand for eco-friendly products. Sustainable manufacturing and green practices cover the areas like energy efficiency, water saving, renewable electricity, end packaging waste, etc. Digital transformation is revolutionizing textile and garment manufacturing by integrating digital technologies throughout the entire value chain from design to distribution. This comprehensive shift is enhancing efficiency and customers' satisfaction through various means. The various means are like cloud based tools, data analytics, etc. The interplay of digital twins, AR/VR and IOT are related to the convergence of digital twins, augmented reality (AR), virtual reality (VR) and the internet of things (IOT) enables certain of digital replicas of real-world objects and environment, fostering real-time monitoring, simulation and enhanced-making processes. Circular Economy and waste Reduction means that in a world grappling with environmental challenges, the circular economy. Has emerged as a powerful concept to mitigate waste generation and promote sustainable practices. It focuses on reduction of waste through recycling. It includes reduce waste, resale/repair, disposal first approach, etc. Another important area is the transparent supply chain and traceability and many more.

## **THE IMPORTANCE OF RESEARCH AND DEVELOPMENT IN THE TEXTILE INDUSTRY**

The textile industry was the first to embrace industrial revolution and many Worlds' Economy depends on the evolution for their political dominance for a very long time. The area of discussion attempts to innovation driven research and development for sustainable growth of textile and clothing industry and reviewing the definition of innovation in general and looking at important innovations in the sector over the last 60 years. The scientific and technological advances made during this time frame are unprecedented. The role of textile universities and research institutes in the process of innovation is explained together with some modules for successful implementation of ideas in the industrial applications. This part of the discussion finally promotes the future innovative challenges to the textile industry.

For a long time, the main factors influence change in the textile and clothing industry have been the changing habits and needs of consumers and also the short life cycles due to fashion trends and fashion being practically synonymous with change. Currently even trends in fashion start to be influenced by any and more factors, like volatility of global economy, China's trading and production politics, new technologies in the supply of chain, etc. However textile and clothing industry is larger than fashion industry including textiles' value chain and clothing value chain, each being affected by another set of change factors. For instance new technologies are developed to improve T & C manufacturing and trade in order to ensure the efficiency of mass production, shoppers and create new products for new needs.

The current market and future growth trend on a survey of the global textile industry sector and related nanotechnology research in key market is presented in the article of nanotechnology innovation and applications in the textile industry. It is followed by an examination of the textile value chain to identify where nanotechnology has begun to play an important role. The processes by which a genetic technological revolution penetrates and diffuses across sub-segment of an existing traditional sector are discussed in the article. To this part, the casual determinants of nanotechnology based innovation and application in textile products, categories and market are examined. Emerging nanotechnology based performance improvements and categories in textiles will increasingly derive R&D and commercialization.

### **FUTURE OF TEXTILE INDUSTRY WITH IMPROVED TECHNOLOGIES**

Energy harvesting textiles are gaining momentum due to the rising demand for efficient portable energy storage solutions driven by increasing research and internet in piezoelectric /tribology and photovoltaic technologies. To fulfil this rising demand, researchers at Nan Yang technological University have successfully developed a groundbreaking fabric that converts energy from body movements into electrical power. According to the EU of the 1900 chemicals used in clothing production, 165 have been classified as hazardous to health or the environment. Consequently an increasing demand exists to explore alternatives to conventional dyeing methods.

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important one in 1747 that doubled the output of a weaver it became widely used around Lancashire after 1760 when Johnson Robert designed a method for deploying multiple shuttle, which continuously works to use of weft of more than one colour and making it easier for the weaver to produce cross striped materials.

The textile industry is extremely varied with hand spun and hand woven textile sectors at one end of the spectrum, while the capital intensive sophisticated mills sector on the other hand. The decentralized power looms/hosiery and knitting sectors form the largest components in the textile sector. The close linkage of the textile industry to agriculture and the ancient culture and traditions of the country in terms of textile making it unique in comparison to other industries in the country. India is the second largest producer of textile and garment also being the world's third largest producer of cotton after China and USA. The Indian market is also the second largest in terms of consumption of cotton after China.

## CONCLUSION

The Government of India and the Textile Industry's products manufacturing units should collaborate with each other and should create a plan for addressing the key parameter issues and promote the export of textile products from India with good strategies It is pointed out that the cost of manufacturing of products advantage can be offset to a substantial degree by improved services. It is likely that no single technology will be the best or only solution but instead a portfolio of technologies. Designing products with end of life consideration in mind remain crucial aspect of the circular economy. Traditionally textiles and clothing industry has been known for its incremental changes but the current global business transition structural change in a positive and efficient manner. The revolutionary technique drastically reduces water and energy consumption, eliminating the need for repeated soaking and heat drying fabrics. The British who greatly improved productivity and drove further technological advancements. The Government of India has taken several measures including amended technology up-gradation.

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