

Applications of Developed Technologies in Textile Industry-Review

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Abstract

The technological innovations within the textile industry that are pushing us towards a promising future. Each stage right from yarn to textiles, the technological advancements have paved the way for cost reduction, reduce waste and increased productivity. The digital transformation has made the bridging gap between technology and textiles. The ever-evolving textile market shows immense growth and potential to exemplify human creativity. The development of 3D knit technology makes textile products faster than before. The innovative ideas and their outcome in textiles must be objective based. Digital printers are time saving, low-cost solution, resulting in richer and more vibrant imaging. Almost every industry in the world today is turning to Big Data to generate business intelligence and the apparel industry is no ore different. Digital Prototypes are used as an essential tool in modern design process. Technological advancement builds intelligent textiles to aid the interaction between connected cloth and the human body.

Keywords: Sustainable Brand, Economic Growth, Innovative Technology, Preserving Nature, aesthetically Pleasing, Fashion Sphere, Vibrant Imaging, Predictive Analytic.

INTRODUCTION

Technology is indeed changing the textile landscape in India. Therefore, it is necessary to look at the innovations, changes, upgrades that textile industry has experienced due to technology. It is now easy for the manufacturers to quantify the amount of fabric material or

chemicals that will be used in the production process. In order to produce high-quality fabrics, different testing technologies are now implemented to check how the fabric reacts in different conditions and also check its durability. We can think about the technology and simultaneously can imagine a machine that can check fabric strength by simulating how it will be used in real-time, such as how a fabric will react when it is stretched and pulled [1].

India has a rich and diverse textile tradition that trace back to the start of human civilization as we know it. Our textile industry has always been a major foreign attraction due to the rich colours and fineness of our textiles. Several new technological innovations have made the spinning process much more efficient although the quality of conventional spinning has been uncontested. Compact spinning over the traditional ring spinning is becoming the trend when it comes to spinning as it ensures the strength of the yarn, higher efficiency and great productivity. The textiles produced and what we consume today, go through a supply chain and it involves a great process flow like every other production chain. There are huge mills that have integrated process flow starting from spinning, weaving, finish and apparel production. These mills only account for 3% of the total output in the textile sector [2].

Consumers are increasingly demanding eco-friendly products, which has led to a surge in the production of sustainable textiles. Cutting edge technologies such as AI, Machine Learning and IoT are revolutionizing textile manufacturing processes. Meeting individual's needs are increasingly seeking unique, personalized products that align with their preferences and values. In response the textile industry is embracing customization and personalization trends. Integrating technology into fabrics advancements in textile technology have paved the way for the development of smart textiles also known as e-textiles. Prioritizing social responsibility is increasingly concerned about the social impact of their purchases. Embracing regional production in recent years, there has been a notable resurgence of local manufacturing driven by factors, such as supply chain disruptions, and the desire for shorten lead times [3].

Organizations and customers are more aware of sustainability now than ever, so there is an increase in demand for natural fibers. They have a quality of being lighter in weight and more substantial than other fibers. Natural fibers like cotton, silk, linen, wool, jute and cashmere help manufacturing garments, apparel, construction materials, medical purposes and interiors

for automobiles. The strategy of the industry players focuses on improving environmental performance by teaching one of the best accessible advances in fibre processing and preserving nature in the process of production. With emerging technology up gradation and innovation, the garment and textile industry can constantly match consumer needs and wants. It helps with the ecological processes and implementation of the venture [4].

Digital technologies have revolutionized the textile industry, creating a market and providing better communication with customers. Information technology has advanced processes and materials that allow garments to be designed more efficiently and quickly, reducing costs for manufacturing. Online, retail is driving further specialization in the industry. Offering customers a greater choice in personalization their apparel purposes. Additionally, digital technologies have enabled open platforms that can power virtual showrooms and give designers and manufacturers easier access to global market. As the advancements become more common place in everyday operations, it is clear why technology has become an essential part of this ever-growing segment of business [5].

The idea of metaverse is pushing virtual fashion market. Brands are embracing virtual fashion and capitalizing on it. For quite some time, gamers have buying accessories clothing and skins for their digital avatars but now the trend has caught up with fashion brands too. In fact, Ralph Lauren attributed its strong third quarter earnings to these virtual investments and younger generation shoppers it has attracted. Other global players like Nike, Adidas and Vans World are also on the same path. As the customers can dress up their avatars for virtual worlds the Horizon Worlds and Decentralized fashion industry views it as next revolutionary innovation [6].

Advancing a product from thought to reality is one of the most rewarding, yet challenging activities we can take on. Developing ground breaking products can put a company on the map or enhance an already seller reputation, but whatever the pitfall and what does it take to succeed. There is much to consider when starting this journey demanding deadlines, high project costs, internal versus external expertise, outdated technology, these are a sampling of scenarios experienced as it goes through the steps it takes to complete a project. SO, where is the best place to allocate resources for continued success? With perpetual growth in the technology sector, we see the most return from technology investments. It is proven that

digital technology across any industry, generate less time waste, cost efficient and increased ability to produce. This is no different for the textile industry. Technology enables vibrant imaging on fabrics and alterations to be done with a simultaneous click [7].

Eco-friendly brands and manufacturers in the apparel industry are welcoming 3D modelling software with opened arms because the technology enables them to contact the entire signing process with accuracy without the need to waste fabric. In addition, 3D rendering as an alteration to manual sampling saves a lot of time and effort while the scope of customize remains limitless. There is an equally growing buzz in the industry about 3D printing, which has made the production of accessories or embellishments such as buttons rather fast and easy. Latest innovations in 3D printing technology is in fact fuelling speculations that in the future it might be possible to manufacture apparels using the same [8].

Digital prototypes are used as an essential tool in modern design process. The integration can speed up design process and affect competitions between a. However, the technology will not replace the aesthetic appeal of great products, the magnetic attraction of great brands or the advantages of extended portfolio assessment because the fashion industry will continue to build good product brands and business as it has done successful in the brands and financial strategies as the key source of variety creation. Digital or virtual prototype is a process used for shortening the time to market and reducing the product cost. It allows designers to experiment easily with a variety of fabrics and patterns on 3D virtual body before the actual model garments is manufactured [9].

Garment manufacturing requires a large number of resources such as energy, water, materials and electrical arrangements. Consequently, it creates a significant environmental footprint and waste pollution, advanced apparel manufacturing develops energy-efficient and high-speed processes. They involve in base systems, computer-aided programs, fast digital printing and robotic devices. These applications deliver automation and accuracy in quality control, production and human resource management result. Emerging technologies in textile manufacturing replace unsustainable and inefficient processes to meet customers' new demands' [10].

TECHNOLOGICAL INNOVATIONS IN TEXTILE INDUSTRY

Technology is indeed changing the textile landscape in India. We can have a fine look at the innovations, changes and upgrades that textile industry has experienced due to the technology. It is now easy for manufacturers to quantify the amount of fabric materials or chemicals that will be used in the production processes. In order to produce high quality fabrics, different testing methods are now implemented to check how the fabrics react in different conditions and check its durability. With the advent of innovative technologies, new types of fabrics and materials can be used for different purposes. With genetic engineering, spider silk can be produced. With automated textile industry, almost of its processes rely on machines. Computer controlled weaving machines can produce complex patterns. Technology has enabled textile recycling in a big way and hence, helped us to achieve the goal of sustainable reusable textiles. Different technologies are now getting implemented to help active objective of sustainability [1].

Trends in the textile industry keep on changing and the production sector has to adapt accordingly. A few years back polyester was fashion however, people preferred cotton more. Now people have started to think more about sustainability in fashion. Technical textiles are a segment of textiles produce predominantly for functional purposes and not for aesthetical purposes. The demand for technical textiles has been on an upward trend in recent years due to economic conditions. Due to its versatility, cost-effectiveness, sustainability, durability, the demand for technical textiles has been an upsurge in the global market. Leather is one of the glamorous textile products that is usually associated with grandeur. However, the production of authentic leather is not so glamorous and its highly toxic nature involves huge amount of toxic materials, Indian textile conglomerate. Arvind Ltd has introduced a new technology fabric that is said to be Anti-viral for its fabrics. The technology is said to be the first in the World will be effective against corona virus that. This chemical may be applied to many fabrics including shirts and suits [2].

The rise of eco-friendly practices in response to growing environmental concerns, and sustainability has become a paramount focus for textile manufacturers. Bridging the gap between technology and textiles, the textile industry is experiencing a remarkable digital transformation. Innovative technologies such as AI, machine learning and IoT are revolutionized textile manufacturing processes. Smart factories are equipped with advanced

machinery and automation systems improving productivity, reducing waste and enhancing quality control. Integrating technology into fabrics, advancement in textile technology has paved the way for the development of smart textiles also known as e-textile. Prioritizing social responsibility, consumers are increasing concern about the social impact of their purchase. The demand of transparency regarding the origin of raw materials, fair labour practices and ethical manufacturing processes [3].

Digital Textile Printing is any inkjet-based method of printing colorant on to fabrics. The adoption of digital printing processes and dye sublimation printing in the textile sector has increased recently and it is expected that this trend will continue as technology advancement. Digital textile printing has many benefits, which help to explain why this technology is so well linked in this sector. The benefits are such as cost-effective, flexibility and sustainability. The development of digital printing technology in recent years has great-facilitated textile sector. According to a study of the textile market, they will have a significant effect on the industry in the near future [4].

TRANSFORMATION OF TEXTILE INDUSTRY BY NEW TEECHNOLOGICAL TRENDS

Digital enabled automation is making a significant impact on the way businesses operate today due to the development of smart technology and IoT system. Bu leveraging digital tools and techniques, organizations can automate mundane tasks, time saving and money while freeing up people to focus on more meaningful work. The of manual work by labour intensive processes are gone and streamlining can now achieved with simple technology such as software, robots, connected devices and intelligent machines that communicate with each other to automate the entire production line [5].

For most of the time in a year, garments are purchased keeping in mind seasonal effect with the fabrics. Although these cycles sustain continued sales of apparel market, the abundant production of garment does not help the environment. Understanding the concern, manufacturers are now improving apparel that may not only reduce the garments' quantity but also help the consumer wear them across multiple seasons. The intelligent insulation technology adapts to change in air temperature around the wearer, without the use of battery powered or wired technology. The fabric contains two separate materials that expand or

contract at different rates in response to temperature changes. The technology has been developed by sky scrape [6].

One of the pre-dominant advancements within the textile industry is digital printing. Various printers allow designers in textiles, printing, fashion and technology industry a more manageable way to bring thought to reality. Trends, such as digital dye sublimation and direct to garment technologies, make design and alterations as quick and easy the click of a mouse. Designers and product engineers can make colour selections digitally and hence the finer details of any given project. Digital printers are a time saving, low cost solution, resulting in richer and more vibrant imaging. Colour appears more powerful, blacks present at their darkest and smooth transaction and shading can be featured on the fabric [7].

Eco-conscious brands and manufacturers' apparel industry are welcoming 3D modeling software with open arms because the technology enables them to conduct the entire designing process with accuracy without the need to waste fabrics. Also 3D rendering as an alternative to manual sampling saving a lot of time and cost while the scope to customize remains limitless. This is an equally growing buzz in the industry about 3D printing which has made the production of accessories or embellishment such as buttons rather than fast and easy. Latest innovation in 3D printing technology is in fact fuelling speculations that in the future it might be possible to manufacture apparels using the same [8].

TEXTILE INNOVATIONS AND TRENDS IN 2024

In the field of textiles innovations resulted in a wide range natural and synthetic fabrics that are lighter, smart multi-functional and with a wider range of engineering properties. Research on smart and intelligent textiles began at the end of 20th century and has made quantum leap in the 21st century. Wearable technology involves integration of electronics in clothing, watches and even bodies. The adoption of new generation of smart textiles and wearable technologies opened up new possibilities for the developers and gives the potential enhance functions like heat regulation, impact protection, communication, antimicrobials and fire protection, etc. Some researchers in clothing and textile designs have asserted the importance of multi-disciplinary collaboration and suggested that development processes for smart clothing products. Some researchers believed that the available technology in the conceptual and design phases of fashion product development is proving that digital prototype is feasible

and can be used for some specific goals and applications [9].

The advancement and novel technologies in material science have been steadily growing towards ethical practices. Clothes with characteristics such as hydrophobic cotton, plant based textiles, antimicrobial fabrics, shape memory polymers, etc, show versatility in textile innovations. U. S based start up Refiner products recycled textiles made of pure consume waste. Sweden start up Vividye develops reversible textile colouring using efficient printing technology. Technological advancement builds intelligent technology to aid interaction between connector and human body. Hungarian start up Alpha Fentech creates smart clothing to ease period pain. German start up Moto Skins offers robotic fabrics with embedded improve circulation in the human body. U.S based startup Coats Digital advance manufacturing management through Tech-driven Solutions. German start up Sews brings robotics to apparel manufacturing applying machine learning and computer vision technology. To meet the growing demand for low-cost clothing, brands have developed supply-chain for high-volume synthetic petroleum-based garments. Canadian start up the Fitting Room offers personalized through impressive shopping experiences [10].

CONCLUSION

In the automated textile industries, almost all of its processes rely on machines. To bring the vision for growth in the future, technology will play a vital role. Smart Textiles find applications in various sectors, including healthcare, sports and fashion, with potential uses ranging from biometric monitoring to temperature regulation. Digital textile printing is any ink jet based method of printing colorants onto fabric. Digital technologies have revolutionized the textile industry, creating a wider market and providing better communication with customers. The idea of Meta verse pushing virtual fashion market. PLM and ERP software have been making their way into the apparel industry for a while now, playing to streamline the supply-chain and improve production. The product development process is a cycle, which is related to large group of people. The availability of 3D technology is driving the efficiency of textile manufacturing and design.

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