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Article *in* Asian Textile Journal · March 2022

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Textile 4.0
Digital revolution in textile industry

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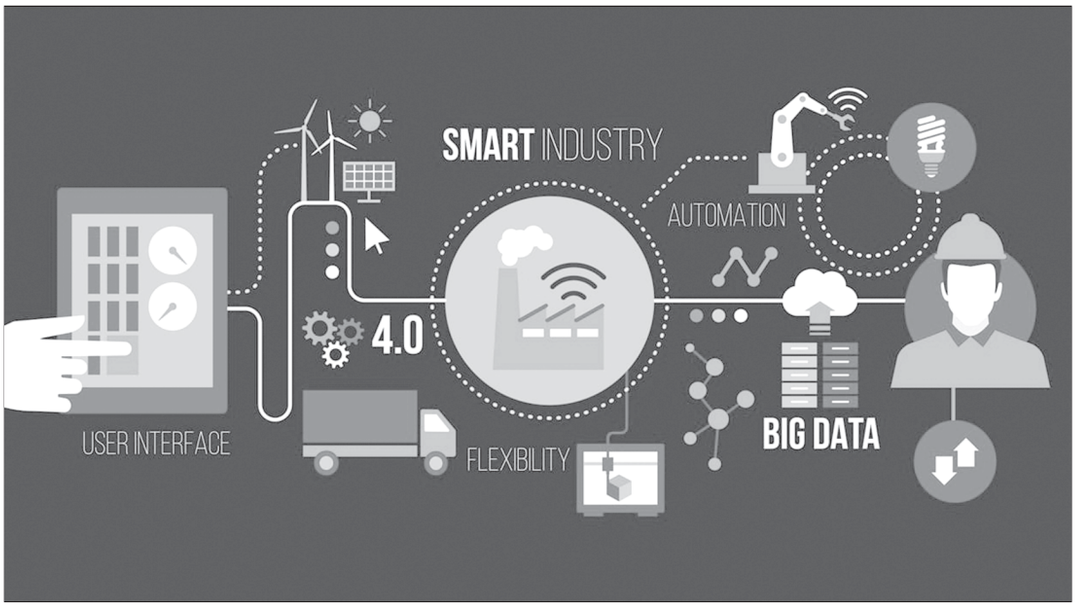


The world of manufacturing is changing. Digitalization is transforming manufacturing industry. Every organization today is unique and they all confront the same challenge i.e. the need for connectivity and real-time information across operations, clients, products, and people. In order to survive and thrive in the future, businesses must be willing to invest in new digital industrial technology. Industry 4.0, or the advent of new digital industrial technology, is a transition that enables for the collection and analysis of data across machines, resulting in quicker, more flexible, and efficient processes that generate higher-quality goods at lower costs. Industry 4.0 (I4.0) refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data. Industry 4.0 (I4.0) transforms the business functions and growth by not only investing in new technology and tools to boost industrial efficiency It also emphasizes on interconnectivity, automation, machine learning, and real-time data that are the parts of a new phase in the Industrial Revolution.

Industry 4.0 (I4.0) is a new industrial revolution is combines modern production processes with the Internet of Things (IoT) in production manufacturing systems that are connected. It communicates, analyzes, and uses the data to drive more intelligent action in the physical world. Digital solutions have made it possible to have more flexible production, higher productivity, and the development of new business models. Operations are been easily optimized by implementing Industry 4.0 (I4.0) technology and a standard operating process aligned with Industry 4.0, that has realized the digital transformation by providing numerous alternatives for optimizing business operations and drastically reducing resources and lead times[1,2].

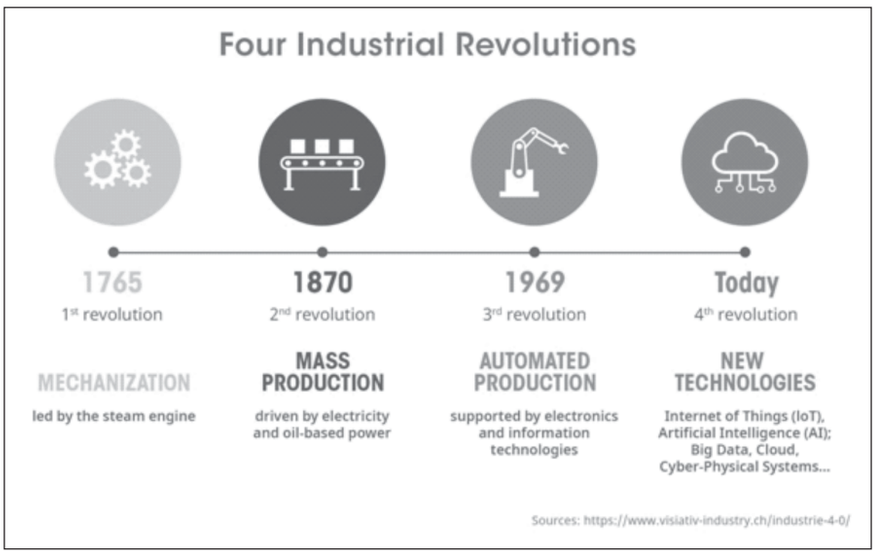
This paper highlights the current prospects of digital revolution and its application in textile sector.

Evolution of Industries 1.0 to 4.0

Inception of the industrial revolution in the 18th century, contemporary industry has made significant breakthroughs. For centuries, the majority of products such as weapons, tools, food, clothing, and housing, were been made by hand or with the help of labour animals. With the development of manufacturing technologies around the end of the 18th century, this began to change. The transition from Industry 1.0 to the forthcoming industrial era - Industry 4.0 was a steep uphill journey.

Industry 1.0

The First Industrial Revolution took place in 1765 (from the eighteenth to nineteenth centuries). The central idea in Industry 1.0 came from the economics of Adam Smith's Wealth of Nations that occurs at the same time as the discovery and widespread exploitation of coal. For the first time, production was mechanized. Steam power and its industrial



applications resulted in the most substantial increase in human productivity ever seen.

Industry 2.0

Industry 2.0 (from the late 1800s to the 1980s) was a period in which the number and variety of industrial products increased dramatically. Frederick Taylor's The Principle of Scientific Management, which was the first book on modern management theory, was a turning point in Industry 2.0.

Industry 3.0

The Third Industrial Revolution began in 1969. It marked technological advancements such as the shift from analogue to digital, which had a significant impact, particularly on the electronics industry. This was the very beginning of the application of computer technology to boost factory productivity.

Industry 4.0

In the year 2000, the Fourth Industrial Revolution, popularly known as Industry 4.0, began. The internet of things (IoT), big data, electric vehicles (EVs), 3D printing, cloud computing, artificial intelligence, and cyber-physical systems are all emphasizing factors driving the industry 4.0.

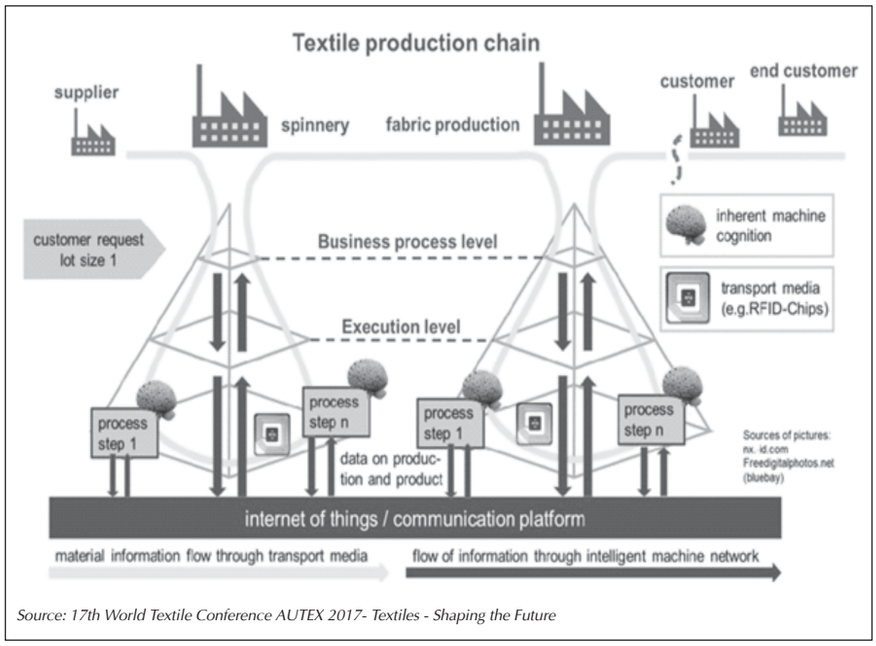
Textile industry

Apparel has retained an important place in human life starting from historical era to today's modern world. In today's economy, the apparel business is a worldwide industry. Clothing manufacture dates back to the year 2000 BC. Apparel production became one of the large scale economic activities providing significant employment, next to agriculture. The textile sector is currently seeing the consequences of digitization, with rising individualization, device and person networking, and advancing automation of manufacturing and logistics operations all becoming more prominent. In the sphere of fashion, technology is the most important factor in achieving excellence in manufacturing.

Globalization dynamics, innovation and the relentless advancement of technology progress, require proactive strategies. The possibility and effectiveness of the integration of new digital technologies to support fashion companies comprise an important opportunity to combine advanced manufacturing systems and traditional processes and bring back the traditional quality and the special value of crafts within the framework of industrial production[3].

Application of Industry 4.0

Industry 4.0 was a German government programme launched in 2012[4] to sustain its manufacturing industry's outstanding competitiveness. Many government bodies are working to foster the creation of new sectors and services that provide jobs, wealth, and human development. To support the survival of garment makers, digitization has enabled an equal order allocation mechanism (sharing or dividing) among SMEs. As a result, a production management system is required to facilitate evaluation and application of Industry Revolution 4.0 in the Textiles Technology and Textile Manufacturing sectors across the supply chain in Spinning, Weaving, Finishing and Garmenting[5]. Artificial intelligence, the Internet of Things, next-gene-



Source: 17th World Textile Conference AUTEX 2017- Textiles - Shaping the Future

ration robotics, 3D printing, wearables, gentle engineering, nanotechnology, improved materials, biotechnology, and other technologies are all elements of the new industrial revolution. The introduction of smart factories and smart clothing in Industry 4.0 (I4.0) is marked by extensive developed digitization and automation with the application of information technologies (IT) and electronic devices in services and manufacturing[6]. One such example is an increase in textile labour productivity as robots, AI, and IoT aim to improve the efficiency and production capacity of the Indian textiles industry[7].

Textile Industry 4.0 (I4.0) has made smart connected products a technological foundation for adopting new business models in textiles.

Industries 4.0 provide a new degree of value chain organisation and control that encompasses a product's whole life cycle. The complete cycle includes the order, subsequent development and manufacturing, and product delivery to the customer. In addition, the product life cycle takes into account recycling and product-related services.

IoT

The Internet of Things (IoT) is one of the nine pillars that make up the Industry 4.0 (I4.0) revolution, according to Boston Consulting Group (BCG)[8]. IoT and Industry 4.0 (I4.0) solutions to increase awareness into textile manufacturing[9]. Communication between product process flow to improve performance and minimise risk, improve quality, continuous worker involvement, product defect traceability, increased supply chain visibility, and customer reliability and trust-ability are just a few of the advantages of an IoT-based system[10].

ERP

For a long time, the Apparel and Textile industry has relied on Enterprise Resource Planning, or ERP. The ERP solution provides a solid platform for textile companies to assess, benchmark, and optimise their business operations in accordance with their corporate business plan, making it easier to make the best business decisions. Raw materials, stock, finance, quality, and plant management are just a few of the important aspects of textile manufacturing that the technology helps with.

Robotics

Clothing needs to be modified according to season, purpose and consumer demand, large-scale production is especially labor-intensive[11]. Robot-based sewing systems have already been developed in special applications[12]. Textile-based wearable robots have been developed through research efforts in fields including robotics, biomedical engineering, and human-computer interaction. By compiling this research, it is apparent that several classes of wearable robots are emerging, including locomotion assistance, grasping and reaching, shape-change for dressing[13].

Artificial Intelligence

Adopting AI technologies offers the potential for increasing sales or optimizing processes[14]. AI-based industrial applications, technologies and functions, the term Industrial Artificial Intelligence is used frequently[15]. Pattern inspection, flaw identification, and colour matching are some of the most often used AI applications in textile manufacturing.

Conclusion

The fundamental drivers of industry transformation are technological innovation and human capital. One of the most commonly used terms in the fashion business nowadays is 'digital transformation.' In recent years, there is a dramatically shift in customer's wants and expectations. The demand for digital transformation covering from 3D-printed gowns to smart factories has risen as a result by integrating smart factories; industry is ushering in a new technological era.

The fourth industrial revolution is a watershed moment in human history. Textile Industry 4.0 (I4.0) has made smart connected products a technological foundation for adopting new business models or data-driven business models in textiles. The possibility of technology convergence holds the key to the future of truly smart textiles. All industrial buildings were changed into smart factories, and all physical production systems received more intelligent qualities when sophisticated technologies such as big data, intelligent robotics, and virtual personal assistants were considered. This manufacturing revolution will undoubtedly aid in increasing productivity, improving economics, encouraging expansion, and changing organisational efficiency.

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Brookfield picks up minority stake in Jindal Poly Films' packaging films business

Jindal Poly Films Ltd (JPFL) has signed an agreement for the sale of a minority stake in its packaging films business to Canada's Brookfield Asset Management, which, through its Special Investments programme (BSI), and together with institutional partners (collectively Brookfield), has agreed to make an Rs 2,000-crore investment in the company.

With this transaction, JPFL will spin off its packaging films business, which generates approximately 85% of its total revenue, into a wholly-owned subsidiary in which BSI will hold a minority stake. JPFL will continue to own its non-woven business unit and other corporate assets.

The structured equity investment in JPFL comprises compulsory convertible preference shares and equity shares of the new subsidiary, giving BSI a 25% stake and downside protection through a ratcheted equity structure tied to financial performance, the company said in an official release. BSI has also entered into an investor rights agreement. This strategic investment will enable JPFL 'to accelerate its diversification into new businesses, while increasing profitability and growth prospects for its packaging business unit,' it said.

'We are proud to enter a strategic partnership with a large global investor such as Brookfield. Having access to their international network greatly broadens our horizons. The transaction is a testament to JPFL's leadership position and growth potential,' said Mr Vinod Kumar Gupta, Chief Executive Officer of JPFL.

'We are pleased to partner with JPFL, India's leading manufacturer of flexible plastic films for the packaging industry, which plays an essential role in the preservation and hygiene of products in different sectors such as food and healthcare. In partnership with Jindal, we aim to help the company maintain its strong track record of growth," said Mr Dev Santani, managing director of BSI.

'BSI is sector agnostic and invests in large-scale, non-control (minority) investments where we can provide capital and be a strategic partner to leading companies. We intend to continue to scale our BSI investments in India and be a partner of choice,' he added.

Gujarat Fluorochemicals to expand capacities at Dahej

Gujarat Fluorochemicals Ltd. (GFL), a manufacturer of fluoropolymers, fluoro-specialities and speciality chemicals, has announced fresh investments into expansion of polytetrafluoroethylene (PTFE) and polyvinylidene fluoride (PVDF) capacities at its integrated manufacturing facility at Dahej, Gujarat.

The rapid growth of electric and hybrid vehicles is driving unprecedented demand for PVDF, a thermoplastic fluoropolymer used both as a binder and a separator coating in lithium-ion batteries, which is essential for the creation of safer and longer-range performance. PTFE has also emerged as an ideal medium for insulating the insides of lithium-ion batteries. GFL has been looking to tap opportunities in futuristic technology, like electric vehicles (EVs), solar panels and 5G, by supplying raw materials and components to these verticals. The company said its expansion plan will see additional emulsion PTFE capacity to be operational in 2023 and an approximate 10,000-tpa of battery grade PVDF capacity during the next 2-3 years. 'Through this investment, Gujarat Fluorochemicals is focusing on servicing future requirements of PVDF and PTFE in EV battery and fuel cell electric vehicles (FCEVs) technologies for combating climate change,' the company said in a statement.