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Latest Technology Solutions Trends in Apparel Industry and Tools used for Production Management

Debraj Sarkar, Md Bakash Ahamed

Assistant Professor, Department of Textile Technology

Government College of Engineering & Textile Technology, Berhampore, Murshidabad, West Bengal, India.

Assistant Professor, Department of Computer Science & Engineering

Government College of Engineering & Textile Technology, Berhampore, Murshidabad, West Bengal, India.

Abstract: Advanced and robust Universal network connectivity, the latest and greatest inventions, Advances in tools, technology, systems and adoption strategy are shifting the tactic nearly all business functions As business, corporate, manufacturers look to stay competitive in the marketplace, they are constantly searching.. New development and productions trends are seeing that balance flip recently. Essentially, technology and manufacturing advancements can now be tailor-made to production management, without the cost of a fully custom solution. The modern Textile Industry as well as apparel industry is fronting boundless alterations. Technology trends compromise fascinating prospects, if one knows how to use them to progress the business. AI, Big data, combined with production automation and product technology innovation, 3D design and printing.ERP,CAD/CAM, application of RFID technology, IoT technologies , Block chain technology has the immense potential to make development more specific, also more native and practical. Potential benefits include E-Marketing, advanced electric payment gateway, higher processing speed, very fast logistics, faster delivery times and lower input cost than currently, as a result of reduced delivery times and inferior stocks. In this article, some of the Modern Technology Solutions Trends in Apparel Industry and Tools used for Production Management using the latest digital resolutions have been discussed.

Keywords: AI, Bigdata,E-Marketing, 3D design,ERP, RFID, production management, IoT technologies, Blockchain technology

I. INTRODUCTION

World fashion retail marketplace is set to grow to every year. Apparel production is the central juncture in the apparel supply chain. Refining the global apparel productivity level, technologies have an important role. With the help of digital technology, now consumers can review and track the deliveries remotely. With the use of recent technology, providers can submit digital trials of the new collections to their consumers and can take the design endorsement on digital samples. The adopted technology is serving the businesses in dropping product development costs and abolishing the trial enlargement time. There are numerous discovery progresses completed in the apparel business by consuming advanced software systems and IoT technologies. Prognostic Maintenance Made potential by the IoT, AI and machine learning, prognostic care is serving producers avoid interruption by contagious questions previously they ascend. Calculation prognostic maintenance expertise to a industrial process can save on both the maintenance costs and interruption while spreading the predictable life of apparatus. McKinsey & Company schemes that prognostic maintenance programs will decrease costs by around 20% for maintenance and cut unplanned machine outage by 50%.Rendering to Management Study HQ, there are 3 main explanations for managing production. Serving an apparel producer to complete its purposes, Enhancing manufacturing business standing and friendliness, Decreases the charge of

manufacture. These are countless details of considering production management is an important area of business growth. As one can attain the subsequent goal by dealing the workshop floor. Refining factory performance through exploiting resources accumulative product superiority for applying the correct systems. Healthier the superiority one yield on the floor (such that from sewing machines) upgraded will be business. Reducing the delivery time. Improving the production KPIsControlling material consumption, controlling the manufacturing cost, and executing orders as per plan. If somebody can't control the production workshop teams and can't emphasis on the industry – their teams would constantly be hostile with each other for work-related disputes. Some working teams will be burdened with labour, and some of them will relish their free time. In an apparel manufacturing unit, if somebody is working as a director or roughly handling the workshop or handling the plant floor, he is hypothetical to do one and many of the ensuing actions. Handling apparel manufacture can be done resulting ways.

- Handling 5Ms (Man, Machine, Material, Method, and Money)
- Manufacture planning, scheduling, and control
- Organizing and running the production floor efficiently at the anticipated level of performance
- Get-together with the manufacture demand and delivery related issue
- Meet the various problems and issues raised by an apparel production team, as early as possible
- Determining the workshop floor issues as early as possible
- Handling plant floor workers and making them pleased in terms of making work obtainable, disbursing reasonable salaries, seeing performance pluses, providing all essential tools that can aid worker doing their work well.
- Getting things completed noticeably by the shop-floor team.
- Captivating database conclusions and building a scheme based on the own factory procedures and resource obtainability.

The apparel industry accounts to 10% of global carbon productions. More sustainable apparel manufacture can therefore meaningfully contribute to more justifiable economies. Once it comes to refining sustainability in the modern apparel sector, the data science and recycling technologies have the solidest capacities. Numerous technologies previously exist to make the apparel supply chain more workable. Though, maximum talented skills require wide exertion, money, teamwork and collaboration to produce real noticeable marks. Taking the correct people, in the correct spaces, making the precise conclusions, remains one of the main contests for corporations that are ready to start the cause of sustainability. Attention in domestic skills is quite high but climbing up such machineries takes a lot of stint and money. the transfer to sustainability must originate from makers, administrations and customers. The biggest alteration in sustainability for the apparel industry might come from ever-changing to a round or closed loop supply chain, connecting a recycling model wherever unexploited or superfluous substances are fed back into the chain to reduce the wastage. To realize that, creators have to alter the way, the apparel /garments are planned ,designed and shaped, transported, bought, used and recycled. Invention may aid stimulate the start of the move to a circular economy. Supplementary examples of recycling and waste use in industrial include:

- vegan leather, made of wine leftovers; garment waste as a resource, such as recycled yarns;
- food waste-to-yarn solutions;electrospinning of recycled materials.

Food wastage combined with the excessive amount of garments and textiles waste has risen to a new sustainable resolution: the use of food and farming waste to generate new materials. Waste from citrus peels, milk, pineapples and coffee grounds are now being used to produce new resources for the apparel industry.

Additional inventions that subsidise to a more workable supply chain include:

- finishing ozone, which substantively eases the use of water, energy, chemicals substances, enzymes and pebbles, by means of the ordinary bleaching abilities of ozone gas for whole and specialty bleach effects;
- fabric; low-impact fabrics; chrome-free tanning of leather;
- chemical and water-free dyeing solutions for textile synthetics;
- fungus-based materials grown from mycelium and other agricultural by-products offer a sustainable alternative to leather, plastic foams and other materials that have poor environmental performance;
- big data solutions can also improve the sustainability of the apparel supply chain.

Clients and productions prerequisite clearer meanings to be able to rank products and brands and liken how they perform on sustainability criteria. Presenting a recycling grading scheme, for instance, would aid shoppers control the sustainable performance of a product. Native and regional initiatives such as Rank a Brand already exist, but the introduction of a global recycling grading scheme can be a major step towards making the apparel industry more sustainable. The issue of Traceability is important in the growth of such a grading scheme. Newest technologies such as, big data also block chain would make application

of a transparent maintainable grading scheme easier. Nevertheless, any such exertion would still necessitate commitment from industry and administrations worldwide. Social media is a big driver of this recent trend, giving clients a platform to show what they think is vital, while intensifying the effects of appraisals and sentiments collective online.

As an apparel manufacturer, one can usage message and storytelling to advance the image and product's sustainability record. Decent, well-grounded storytelling can boost more aware procurement behaviour. Considering the collaborating with social influencers to endorse the product. Using crowd funding platforms such as Kick-starter may help not only to raise money, but also to get consumer feedback on your designs. Getting early consumer input and cash can be decisive for a new business, especially in fashion, where there are a lot of upfront costs before making the first sales.

II. ADVANCED TECHNOLOGY TREND IN MANAGING APPAREL PRODUCTION/ MANUFACTURING

Several advanced Technology solutions that are accessible for handling a production workshop floor in a better way. Managing production using a real-time production management system (PMS)In the digital age, data is playing an important for managing shop floors in the garment industry. There are several data capturing relevant technologies and automation in data gathering and preparing intelligent reports for managers. To name a few -

The technology has been used in managing the apparel production-If ones' are already working in the apparel development sector, he/she might be already shrewd the common technology solutions that are trending in the current century. If one is a newbie, then he/she might find some lists somewhat new inventions. All these are the available solutions for apparel manufacturing units. The query is how one can use such technical solutions.

Digitalization – Digitalization of the shop floor data. Making use of the shop floor data in refining factory performance.

Internet of Things (IoT) - A way of linking each sewing machine and equipment through the internet (wi-fi) and being intelligent to spread each other and share data.

Artificial Intelligence (AI tool) - Using the collected data through digital solutions and using AI for getting projections in various production areas.

Business Intelligence - A tool that helps in preparing customized reports, KPI dashboards from the data you have gathered in your system and database.

Smart sewing machines – This is not a new thing to those who are already using smart sewing machines and IoT-based sewing machines. But the application of smart sewing machines is still less.

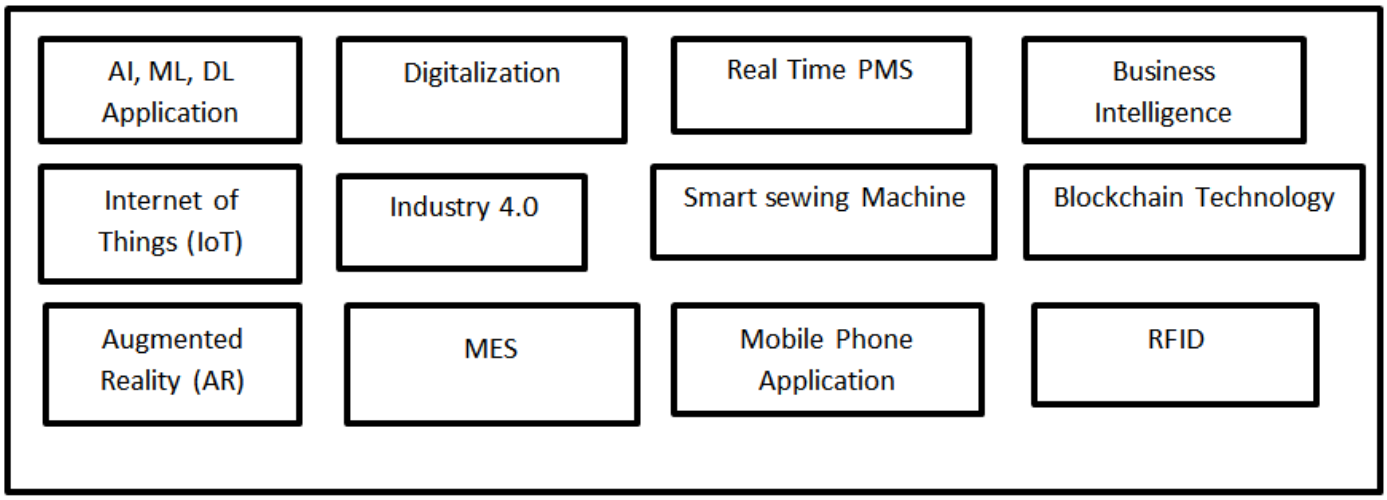

Fig. 1: Advanced Technology Solutions for Modern Apparel Industry

New manufacturing technologies allow the apparel industry to move from labour-intensive production to capital-intensive manufacture. Other consequences of new manufacturing technology include earlier production, less waste, reshoring and localisation of manufacture nearer to market and lower carbon footprints. Though these consequences are usually positive, localisation of production can potentially lead to job losses in emerging countries which produce apparel for the European market. New industrial technology solutions include: innovations to sewing machines, such as laser-cutting machines, fusing machines, button hole machines, and seam bonding machines; sewing robots; stitch-free clothing;3D printing, which has more potential for apparel production than current applications, especially for garments involving multiple layers; digital textile printing, which

gives companies and consumers the ability to customise and produce specific consumers' designs and ideas quickly and relatively cheap.

3D Design and 3D printing technology-Many current developments in apparel design technology can help you design and sell your product. European buyers may expect you to deliver more digital data and presentation material along with your product. As a supplier, you are expected to shift from being a contractor or sub-contractor to become a partner.3D design-Designing a new garment style includes finding the best fit. For example, should it have a looser or tighter fit, long or short sleeves, and a pointed or curved collar? This process can be significantly improved by 3D rendering. Flat sketches and technical patterns can be morphed into simulated 3D renderings, allowing you to adjust the design and create the best fit in real time.3D Printing-Chakraborty &Biswas defined 3D printing (3DP) as "a computer assisted design (CAD)/computer assisted manufacturing (CAM) technology where a component or the whole substance is manufactured in a layer-by-layer fashion based on a 3D digital model utilizing liquid or rigid materials". 3DP is referred to as an additive manufacturing method that facilitates a cost effective, sustainable and new fashion design based production technique.

Specimens of technology used in wearables comprise:

- RFID (Radio Frequency Identification) — In a digital dressing trial room, sensors can detect RFID tags or threads in the clothing substances that the client is trying on, while linking with a smart mirror. The customer is then able to peruse choices, demand changed sizes and even order matching items from inside the dressing trial room. This confirms the customer gets the right size and aids make well-informed consumptions;
- Electronic rechargeable batteries and built-in solar cells can make wearable's a mobile power basis for portable devices;
- NFC (Near-Field Communication Technology) — This wearable machinery lets clients to co-operate with their clothing and get info about the apparel, including materials used, its cost and producer. A NFC chip can personalize each apparel with any preferred info;
- Bluetooth Low Energy lets wearable devices to interconnect with the smartphones while by means of much less battery power than earlier Bluetooth technology.

The Virtual and augmented reality (VR) Technology-both the physical and online domains of retail has been one of Virtual Reality's most thrilling presentations.it is positively true in the apparel industry: one extensive use of VR is allowing clients to virtually attempt on wears. This stretches greater exactness, cheers to modified measurement functionality, and also pays augmented reality technology where clients might be extra likely to purchase products they impressed, that they're tried on.

III. PRODUCTION PROCESS FLOW AND TECHNOLOGY SOLUTIONS

In the subsequent chart apparel production procedure flow and technology used by all process are shown.

Fig. 4: Managing apparel production using technology and software systems

For managing the apparel production in a apparel workshop, one need to identify the ensuing things with meaningfulness of the technology obtainability. This will provide an knowledge of what digital tools and technology are cooperative and early.

Activities of the shop floor team are common actions within a production team desires to achieve in a apparel workshop to succeed the workshop healthier way. Most of these responsibilities are operated by the manufacturing engineering team. Most of the apparel workshops track the old-style method of execution the subsequent tasks. But these tasks can be achieved faster with correctness by using technology solutions (advanced Software systems, smart phone applications).

- Establishing garment operation SAM, Defining workflow (OB and Line layout)
- Building operators' Skill Matrix,Ongoing line balancing (with live production data)
- WIP management, Capturing Non-productive time (making it part of a process)
- Incentive calculation (automation in incentive calculation)
- Data collection and report preparation, Method Improvement
- Measuring operation cycle time, Displaying production KPI data
- Piece rate payment calculation, Garment quality checking and inspection
- Operator training, Explaining an operator using mock-up of an operation

One must understand how many diverse things need to be operated by manufacturing engineers and the manufacture team to accomplish the manufacture floor. All these develop part of the manufacture system for plummeting the fault in creation apparels, supervisory the manufacture cost, manufactures a apparel in the smallest likely time. Additional subject is human management. One can construct trust with labours through message, presenting the potentials over data and instances, and systems. For that reason, all these actions are there. For handling the manufacture and manufacture plant, apparel workshops rent a team of people. The shop floor superintendents and chiefs are allotted the followings type of shapes. Each of the following individuals has an significant role in implementing the guidelines.

- Line Leaders, Line Supervisors
- Industrial Engineers, Production coordinators
- Floor in-charge, Production manager
- Production GM,Quality team

Whatsoever profile individual has, they require a tool for dealing the manufacture floor. Need a arrangement for supervising the manpower and supervisimh5Ms of management.Tools and technology used for handling production lines

- Line balancing tools, Loss time tracking (non-productive time)
- KPI data displays on the floor (Production performance and quality performance)
- Handling machine breakdown, Machine maintenance application
- Reporting tools, Mobile applications

Real-time production management system (PMS)-this is the most detailed and extensive system that can capture individual employees' working data and can help to perform the above activities in a better way. This system is very smart. Data is collected from one place (sewing workstation, cutting workstation, and from other shop floor workstations) and develop a detailed database. With less workers now apparel workshops are capable to do numerous actions and accomplish the manufacture line in a healthier way. The top management of the companies is getting real-time production status and helps the factory team to manage it very well.

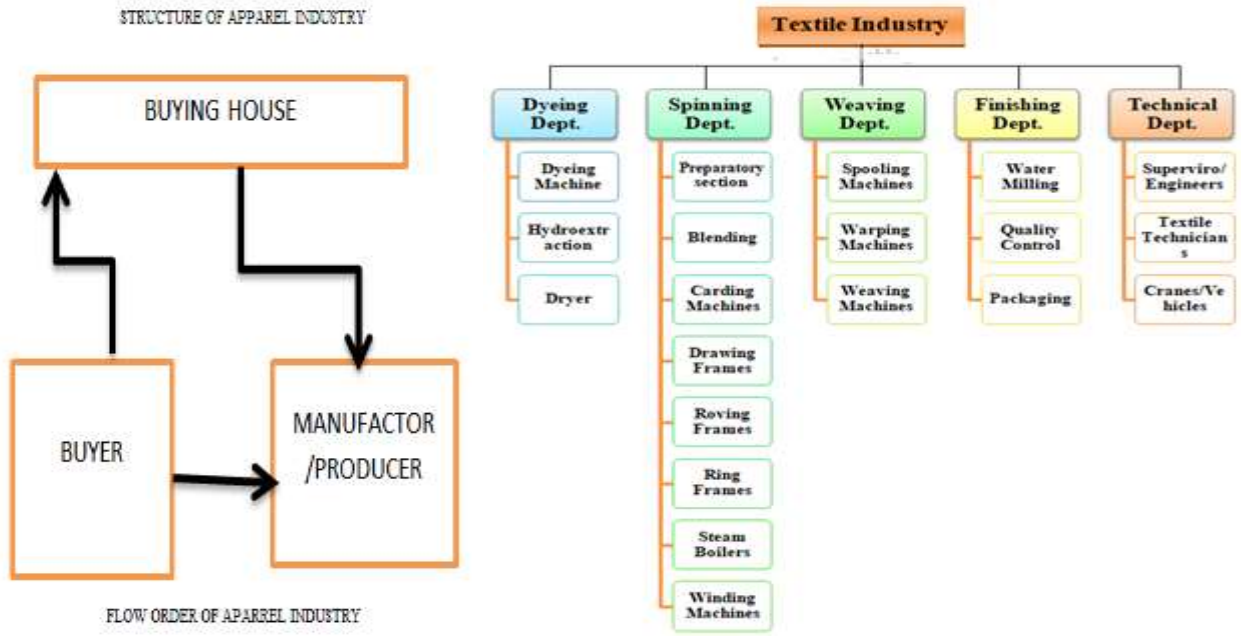

Fig 5 Structure of Apparel and Textile Industry

IV. LIST OF THE TECHNOLOGY SOLUTIONS FOR THE MODERN APPAREL MANUFACTURING INDUSTRY

- **Enterprise resource solution (ERP)** – it comes with several modules and delivers customer-specific resolutions. Making PO, Challans, Bills, Fabric indent, inventory management, apparel appraisal, and production expansion doings can be digitalized by using a solitary ERP system.
- **CAD Systems** – Computer aided design (CAD), a technology that eases the pattern making task for apparel products. With the CAD implements, apparel patterns are developed in computer. Digital pattern can be easily modified. Additional than pattern manufacture these actions can be achieved using a CAD resolution - design making, digitization of paper design (manual pattern) design grading, nesting, marker making, fabric consumption.
- **3D Simulation, 3D body Scanner** – Using the 3D simulation you can develop 3D garment on the digital platform. One can see how the design fit to a dress form. 3D body scanner is used for gauging the human body. This technology aids in getting first and precise 3D model and full body dimension.
- **Virtual fitting room and sample approval** – here a virtual dress form or virtual human is used to test the apparel fit. Even the drop of the fabric can be seen with the apparel fit. Using this technology apparel producer can take trial endorsement online.
- **Automatic cutting machine (CAM) Automatic single ply cutting machine** – CAM systems are very common in the apparel manufacturing industry. For creation tradition finished apparels, single ply of fabric essential to cut. In order oo speed up the cutting procedures and mechanize the cutting procedure automatic cutting machines are very valuable. In custom-made apparel (Made to quantity) manufacturing, single ply cutter is extensively used
- **Fabric cut planning Software (Fabric), Fabric inspection machine and fabric quality report** – Fabric utilization in cutting can be improved by using the latest technology solution available for this purpose. Intellocut is one such kind of arrangement for fabric redeemable and material cut planning. toay fabric review machine comes with digital data entry for measuring fabric defects and 4-point system data analysis and report
- **Product SAM estimation** – To establish an accurate standard time (SAM) of a garment, PMTS based software is very common. GSD, Sew.Easy, Pro,SMV and timeSSD are few answers, used for SAM guesstimate.
- **Real-time Production tracking system** – A production factory can track their shop floor production status real time and improve the visibility. Data as well as info received from the real time system, can be used for line complementary, output upgrading and WIP administration.
- **QC / SQC related Application** – For delivery scrutiny, many purchasers use inspection app. The quality inspection unswervingly enters inspection data in the application (tablet) and uploads Inspection report to their PLM. For application like inline, end-of-line inspections SQC are offered. BlueCherry has such creation.
- **Machine maintenance software** – For maintaining all machines, and equipment record. Keeping the machine usage record. Additionally, machine breakdown maintenance records.
- **Production planning tool** – it is used for end to end production development and procedures scheduling software. Fast React provides such solutions.

- **Computerized Embroidery and quilting machine** – In high fashion apparel engineering, embroidery designs are generally found which includes hand embroidery apart from machine embroidery. For the first making, a varied range of design collection and rapid design change computerized, embroidery machine, play a key role.
- **Technology Advancement in sewing machine** – Sewing machine with computer panel and display are common now. Sewing machine handler can easily choice stitch type, stitch number afore sewing. A machine will halt spontaneously when a number of stitches are finished. There are many progresses completed in sewing machines.
- **Template stitching /Profile stitching/ automatic workstation** – these are a semi-automatic machine, works like computerized embroidery machines. After loading the work into frame, operators don't requisite to handle the substantial. An operator can join more than workplace at a time.
- **Overhead hanger system** – An overhead material handling system, in which all components of a garment hanged in hangers. The hanger moves on the overhead rail. This type of systems decreases the material handling of the machinist. Secondly, the single piece flow abridged the throughput times. Eton, INA, SmartMRT and Eurotex are zxample of solution providers.
- **Product lifecycle management (PLM)** – it is an information management system of an enterprise, can assimilate data, procedures, business systems and, eventually, people in an lengthy enterprise. This lets end-user to manage this info throughout the entire lifecycle of a product efficiently and cost-effectively, from invention, proposal, and production, through commercialization and disposal.
- **Digital Measuring Tape** – By using digital tapes, measurement can be unswervingly transferred to the computer (Excel sheet) wirelessly. Example, Datapro. Mobile applications are also obtainable for digital measuring.
- **Thread selection and ordering application** – Coats has launched an application for online thread selection and ordering.
- **Barcode printing machine** – Barcode printing machine is required for printing carton sticker.
- **Digital garment and textile printing** – For the fast printing and giving the finest print quality without restrictive the number colors in a design digital printing solution is here. Trial approval lead time for the printed design decreases by using digital printing technology. Moreover, In the age fast fashion, customers like custom prints in their t-shirts and seller prerequisite to print a single garment for a design. The digital textile print resolution comes into play. Kornit, Textjet, Colorjet etc Examples -.
- **Direct to Garment Printing (DTG)** – DTG printers are used for printing directly to the readymade garment. Solution providers - Brother, Epson
- **SewBot** - it is a robot that sews garments without human involvement. An Atlanta-based company called SoftWear Automation has shaped the Sewbot. Sewbot is already fitted in t-shirt manufacturing. This might be the future of readymade apparel manufacturing for principal products.
- **Web ticketing system Email solution** – In a running business to fix issues, all staffs of one section want backing from the other sections, Usually by means of email ,chatting, video conference etc. Verbal communication and mailing system are enough good but Web ticketing system is the among best technique for raising issues and enquiring for the resolutions. The web Support team easily track the list of pending stuffs and trail up of an old ticket can be done. For small like Boss who wants emailing solution and endorse their business name/brand. There are numerous small-scale domestic readymade apparel producers and domestic brands who needs extra IT technology resolutions for retailing RMG products
- **Apparel-Commerce website** – one can sell the products through manifold sales channels. For selling the products unswervingly to client or resellers; and handling own business by means of e-commerce business resolutions like Unicommerce and Shopify.
- **Payment gateway** - If one likes to expand his market and select multiple channels for selling his products, he needs a digital payment receiving decision. Where without sharing company's bank account details, he can accept payment from his clients. One can sell digital products apart from physical properties by assimilating payment gateway in his website. Instamojo (affiliate link) and Paypal (international payment) are some example for selling products online. So, There are various other tradition software /technology solutions for apparel producers and apparel business proprietors.

V. CONCLUSION

There are many problems exist in the production factories. Where the number of procedures is more in order execution, there will be higher problems. Without the right technology and utilization of the installed system, one can't manage the factory the way someone wants. Application of digital technologies in textile manufacturing and apparel industry is escalating day-by-day. Producers must need to accept these technologies to make their supply chain more effectual than earlier. Application of these technologies in export based Asian countries will help to produce high quality fabric in short lead-time. There will be new job opportunities in the textile and apparel manufacturing industry as well. These technologies eliminate too much reliance on manual labour, which will reduce the production cost. At the similar time, the current manpower can be skilled with required technical skills, which will make new job chances in the market. The application of these tools and technologies will also guarantee justifiable textile manufacturing procedures by plummeting fabric consumption and increasing superiority. These technologies

would also benefit textile, apparel and fashion manufacturers by modifying the existing supply chain models. In this article, I have tried to show how modern apparel industry plants can manage their production house, order, production processes with the help of the modern technology resolutions.

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