Role of Internet of Things (IoT) In Indian Textile (Garment) Manufacturing

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Abstract

Internet of Things, abbreviated as IoT, is the newest revolution in the world of information technology (IT) and the internet. IoT is evolving first with many facilities. It has been utilizing the advantages of prevalent computing domains and Wireless Sensors and Actuator Networks (WSAN). The textile and garment industry of India is one of the oldest industries of the country. Still, it's progressing with steadily increasing domestic consumption levels and export demands.This paper will explore the prospects of IOT in the garment industry of India. This paper will recommend ways that IoT can enable garment manufacturers to streamline production, costs and enhance competitiveness.

Keywords: Internet of Things (IoT), Garment Manufacturing.

Introduction

Internet of Things (IoT) is a comparatively new concept in the world of information technology[1]. It is found to be extremely beneficial for common people and industries as it is equipped with artificial intelligence with objects recognizable on their own, enhance intelligence with experience and communicate with the environment. Moreover, it can interpret the other things and obtain data from the surrounding. The IoT allows devices and people to connect with others anytime and anywhere through the pre-defined networks and any services[2]. This means IoT can address elements such as connectivity, computing, collections, communication, and content on its own.

The Internet of Things facilitates the interactions between the real or physical world with the virtual or digital world. In this technology, every physical entity is attributed a digital counterpart. This digital counterpart generates the virtual presentation of the physical entity[3]. It can then interacts, communicate, and exchange data with another physical entity that too has a virtual presentation. With the application of smart decision-making algorithms, the physical entities can respond quickly. The process is based on the information accumulated about those physical entities and analyzing the previous data trend. This information or data can be accumulated from the same entity in concern or from the similar types of entities. This aspect of information technology has given a new dimension to the concept of IoT. Thus, various domains of business and industry such as transportation and logistics, supply chain management (SCM), agriculture, defense, retail, and many other sectors have been immensely benefited through the use of IoT.

The aim of IoT is to apply upgraded technologies to connect the physical world with anything[4]. The concept came into being in the year 1998 and in the next year, the term was coined by Kevin Ashton[5]. Over the past few years, the development of this field is quite remarkable. Today, it is the center of study for the researchers and industry experts. Hundreds of aspects related to IoT have been reported in the literature providing meaningful definitions. IoT is a worldwide network infrastructure connecting the real world with the virtual or digital objects through the process of data capture and communication abilities[6]. The network infrastructure as mentioned above includes various modes of developments and rapidly evolving internet. The network infrastructure offers sensors, connection capabilities, and specific object identification devices which are required for the development of supportive facilities and applications. CERP (2) focuses on the concept of internetworking where the use of devices like sensors, smartphones, actuators, and computers and the use of internet-based services are important. Any IoT based application development framework needs to coordinate with these various devices[7].

According to the journal of the Internet of Things published by IEEE, an IoT is a network itself that consists of several smaller networks where an innumerable number of devices, sensors, objects, etc. are connected through a systematic or need-specific communication channel and information infrastructure to provide specific services to the users through data management. IoT is a newly evolved computing concept with immense benefits for mankind. In future, IoT will help developing an integrated environment where commonly used objects will be associated with the internet and other devices with a purpose. There is some association of IoT with RFID as far as the communication method is concerned[7]. However, IoT also includes several other wireless and sensor technologies. According to the definition of The Internet of Things European Research Cluster (IERC), IoT is a system of network infrastructure possessing utmost dynamism and designed with self-governing capabilities which are again based on standard

international protocols and where virtual world consists of "things" with unique identities, physical trends, and digital personalities.

Overview of Indian Garment Industry

Indian Garment Industry is a trillion-dollar industry. Its export market is equally big. Almost 20% of woven-garments and 33% of knitwear production are exported every year. As a whole, one-fourth of total garments produced in India are exported and three-fourth is consumed domestically. There are more than 6 million people working in more than one lakh production units in this industry. The indirect sector of this industry provides all necessary support to the direct production sector[8]. This sector manufactures multiple products like thread, buttons, zippers, buckles, packaging materials and many more. The organized sector of the garment industry is just 20% of the total industry which is mainly focused on the export sector. These are majorly partnership concern, limited liability Company, and private limited companies.

It is found that the garment productions in western and southern India are primarily focused on gents or males' garments while the northern part of the country produces most of the ladies' garments. Eastern part of India specializes in children's garments. The industry as a whole produces more than a hundred types of men, women, and children garments. These categories include raincoats, overcoats, jackets, ensembles, trousers, and shirts of different kinds, pullovers, jerseys, inner-garments, and babies' garments. There are several types of accessories as well such as gloves, shawls, scarves, and different parts of garments. The cost of product per unit is segregated in the following way: fabric 65-70%, labor or making charge 15%, and 15-20% on overhead expenses[8].

Retail sector of garment industry is equally large. It includes both organized and unorganized markets. The organized market again includes hypermarkets, departmental stores, and specialty stores. Shopping malls could be found in high numbers in every metro city. The organized retail sector is now focused on "B" and "C" categories of cities and semi-urban areas.

Liberalized economy and more flexible government policies have improved the economic condition of the large section of Indian citizens, especially women and the middle class. People have more disposable income which has increased their interest in garments. The benefits of economic reforms of the country have reached to rural areas too making the lifestyle of people almost comparable to their urban counterparts.

Today, 9-10% of the disposable income of common people is used up for garment purchase and garment-like products such as drapers, tapestries, curtains, towels, etc.

India exports garments and textile products all over the world. However, the lion's share goes to EU, the USA, and Canada (almost 70% of total export). Asia, Australia, Africa, Russia, and several countries in East Europe and the Pacific Ocean region account for the rest 30%.

The Agreement on Garments and Clothing terminated in December 2004. The agreement limited the garment export from India which hindered the expansion of garment export from this country. Just the following year, export of garments increased by 25% but it slowed down to around 10% thereafter. In recent times, several countries like Srilanka, Bangladesh, Pakistan, Cambodia, and Vietnam have emerged as tough competitors of India. Thus, Indian manufacturers and exporters have to adopt innovative practices by upgrading their supply chain management and quality of products. In the last decade, the appreciation of Indian currency (rupee) with respect to the US Dollar has downturned the export activities of India. Moreover, the economic slump of the US has further added to the agony of the garment exporters of this country. This industry is basically a labor-oriented industry [8]. As a result, many European, American, and Australian garment manufacturers have shifted their production and marketing activities to India and China.

Challenges in The Garment Industry

Manufacturers know the advantages of technology. This is the phase when traditional manufacturing processes are getting integrated with smart technology [9]. A typical manufacturing unit acquires different equipment and machines from different vendors with pre-designed ERP/MES. However, hundreds of garment factories are there in every nook and corner of the country with decades-old setups. It is really tough to integrate new technologies in these setups.

The garment industry has transformed a lot over the past two decades. The good old days of handcrafting have given place to technology and automated machinery. The garment industry is a highly labor-dependent industry but the introduction of automated machinery and IoT have made it less labor dependent. The industry has adopted automation in most of the important sections of production right from designing to finishing[10].

Garment industry needs minute details and utmost accuracy in every department. So, digitalization is beneficial for the industry as a whole since digitalization brings perfections in stock management, work coordination, human resource management, and operations. The industry also requires prompt attention to any deviation, delay, or damage in the production process or marketing. Hence, it is a perfect industry to bring IoT like technology.

The garment industry sometimes faces tough times when labor cost increases and market demand changes. Today's internet savvy customers expect international standard products. But, the changing government regulations, intensifying cost of raw materials and logistics, and increasing cost of operation are putting high pressure on costs. This has been inducing garment manufacturers to switch from mass production to small

and customized batches of production which can ensure compliance and keep up with the changing market demands[11].

Some examples of the benefits of automation are worth mentioning in this context- Parkdale Mills has reduced the operation cost with automation and Getzner Garments has been able to improve their manufacturing process and bring transparency with the adoption of maintenance operation technology. Linking garment manufacturing machinery with IoT helps in curtailing machine idle time, enhancing equipment productivity, and meeting day-to-day production targets. Moreover, technological advancement in this industry helping the companies to restructure their market competence and achieve greater strength. It is expected that IoT will help to improve sales and bring transparency in the marketing activities of the garments companies. As a whole, IoT is capable of bringing high business value in the garment industry which no one has ever expected.

IoT for Garments Manufacturing

Following are some immediate benefits of adopting IoT in the garment industry:

A. E-garments

This is also known as e-stuffs, e-clothes, or e-fabrics. These types of garments are embedded with various sensors to make the cloth suitable for the purpose for which it is manufactured or used. For example, an e-cloth designed for the road traffic applications possess sensors for calibrating the parameters like vehicle acceleration and road light. These products will enhance brand goodwill and the profitability of the companies.

B. Automated monitoring of Factory operations

The physical environment of a factory can affect the work performance of the workers. Moreover, it can also affect the quality of a fabric. Sensors and IoT can be immensely helpful in monitoring and controlling the major parameters in this realm.

C. Equipment Maintenance

Important machine operating data like maximum operational time, maximum attainable temperature, air blow speed, Vibrations, and RPM can be accumulated and synched in real time and then analyzed for machine maintenance, increasing operational efficiency, and preventive maintenance.

D. Weaving and Embroidery Machines Efficiency and Exiting loading of products

Modern machines like Dobby or Jacquards are available with PLC systems. These systems can accumulate and share data with various devices embedded with IoT. These various machinery used in garment manufacturing can preserve data related to output per hour, thread counts, maximum hours worked, etc. These data can be transferred to other devices like PCs, Tabs, and Smartphones which the management can use easily for further analysis and interpretation.

E. Product Development

Garment specific CAD tools are available that are intelligent enough to create new designs as per the operator's specification or use a readymade artwork to modify it as per the specification. A machine like dobby or Jacquard use "Virtual Sampling Tools" to convert these designs as digital samples for future applications. These digital samples can then be shared with the clients for their opinions. After finalization, the designs can be given physical structure.

If the client approves the physical samples, the collection can be stored digitally. These kinds of solutions are very secure and cost-effective. Data is managed with the help of Design Data Management systems.

F. Digital printing

With the introduction of digital printing solutions the production time and the time for bringing the products to the market have reduced drastically. IoT in digital printing has lowered the cost of production and increased operational efficiency.

G. Guided Sales Process/E commerce/Virtual Reality

Digitalized product samples and product images have been replacing the traditional mode of displaying products or physical display. Customers can use the ecommerce sites to browse different garments of their choice. Many retail stores now provide display devices to the visitors to see various products available in the shop. Various fashion garments like sarees, suits, tops, etc. can be seen on the electronic display devices and tried without undergoing any physical trial process. This is called virtual reality.

H. Streamline operations

IoT is capable of re-engineering every step in a manufacturing process. It is now possible to attain optimum production level and maintain production quality without much human intervention. Sensors attached to the machines and related software can provide real-time data regarding the performance of the machines. It is also possible to monitor fabric quality, color, and many other aspects that are important for product quality.

I. Increase up time

In a manufacturing process, failure of equipment can disturb the whole process. Integrating IoT can solve this problem altogether. Manufacturers can now ensure equipment uptime through automated conditional monitoring systems. Connected IoT device can monitor the machine health constantly. Thus, the data it supplies can help to track any aberration in the performance. Manufacturers can even develop a predictive maintenance system depending on the machine downtime indication trends.

Conclusion

Market competition is tough and profitability in the garment market is decreasing as the number of competitors is increasing with time. At the same time, customer demands are changing too quickly. In this tough situation, digital transformation is essential for manufacturers and marketers, especially small and medium levels manufacturers. Companies who will understand the appropriateness of IoT and grab this solution will be able to market attention through smooth operational processes, cost-effective operations, competitive advantage, and enhanced decision making.

Fashion is naturally transitory. What seems trendy today will fade away within a few months or years. Only, upgraded technology can help the garment manufacturers grab the latest trends or create a new one. Thus, incoming time, these two spheres, fashion, and technology, will get immense attention from the investors, designers, and end-users.

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