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BIG DATA ANALYTICS IN TEXTILE INDUSTRY

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Abstract
The concept of big data includes analysing capacious data to extract valuable information. In the textile world, big data is increasingly playing a part in trend estimating, analysing consumer performance, preference. The purpose of this paper is to introduce the term textile data and why it can be considered as big data. It also gives a broad classification of the types of textile data and briefly defines them. Also, the methodology and working of a system that will use this data is briefly described. Big data refers to a process that is used when traditional data mining and handling techniques cannot uncover the insights and meaning of the underlying data. Data that is unstructured or time sensitive or simply very large cannot be processed by relational database engines. This type of data requires a different processing approach called big data. This approach can be utilized for analysing the information relating to spinning, weaving and chemical processing in the manufacturing industry of towels or cheddar's sector. This segment will definitely enhance the value addition in technological development and interpretation to solve the problems of the process. Even than very negligent researches are available in this field but it's a lastly growing field and smartly utilized in the textile sector.

Keywords: *Big Data, Textile Data, Textile Industries, Digital Textile, Fashion.*

Introduction

Indian Textile Sector contributes to our economy as follows:

- 5% of GDP (at factor cost)
- 14% Industrial Production
- 9% Excise and Customs revenue collections
- 12% of total manufacturing exports
- Second largest provider of employment after agriculture

Considering the importance of this sector, Government of India has prepared a strategic plan for textiles industries and the vision, mission and objectives as stated in the strategic plan clearly focus on productivity improvement. One of the objectives as stated in strategic plan is

"To improve productivity across the entire textile value chain."

It highlights the need to improve the productivity of entire textile sector.

The textiles can be classified into yarn and power loom, hand loom, woollen, jute, sericulture and silk, handicraft, clothing and apparel, technical textile, etc. Products of power loom are towels (and allied products such as napkins), terry towels, cheddar's, etc.Modern manufacturing facilities are data-rich environments that support the transmission, sharing and analysis of information across ubiquitous networks to produce manufacturing intelligence. The potential benefits of manufacturing intelligence include improvements in operational efficiency, process innovation, and environmental impact. However, similar to other industries and domains, the current information systems that support business and manufacturing intelligence are being tasked with the responsibility of storing increasingly large data sets (i.e. Big Data), as well as associate the real-time processing of this 'Big Data' using advanced analytics. The predicted exponential growth in data production will be a result of an increase in the number of instruments that record measurements from physical environments and processes, as well as an increase in the frequency at which these devices record and persists measurements. The technologies that transmit this raw data will include legacy automation and sensor networks, in addition to new and emerging paradigms, such as the Internet of Things (IoT) and Cyber

Physical Systems (CPS) and Artificial Intelligence (AI). The low-level granular data captured by these technologies can be consumed by analytics and modelling applications to enable manufacturers to develop a better understanding of their activities and processes to derive insights that can improve existing operations. Big data, as the name suggests, is an enormous amount of data. It can be commonly referred to as the four V's:

1. Volume
2. Velocity
3. Variety
4. Veracity

The characteristics of these four V's as described below:

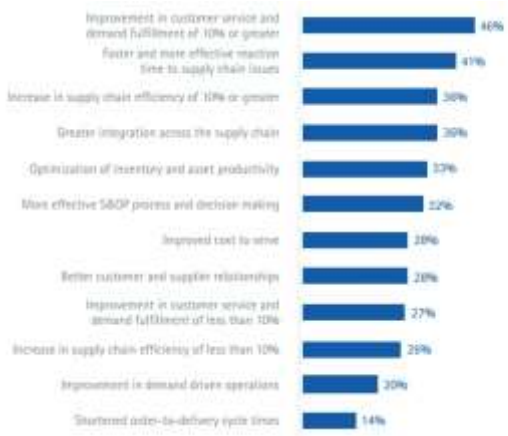
1. Volume of Big Data:
   The volume of data refers to the size of the data sets that need to be analyzed and processed, which are now frequently larger than terabytes and petabytes. The sheer volume of the data requires distinct and different processing technologies than traditional storage and processing capabilities. In other words, this means that the data sets in Big Data are too large to process with a regular laptop or desktop processor.

2. Velocity of Big Data:
   Velocity refers to the speed with which data is generated. High velocity data is generated with such a pace that it requires distinct (distributed) processing techniques.

3. Variety of Big Data:
   Variety makes Big Data really big. Big Data comes from a great variety of sources and generally is one out of three types: structured, semi structured and unstructured data. The variety in data types frequently requires distinct processing capabilities and specialist algorithms.

4. Veracity of Big Data:
   Veracity refers to the quality of the data that is being analysed. High veracity data has many records that are valuable to analyse and that contribute in a meaningful way to the overall results. Low veracity data, on the other hand, contains a high percentage of meaningless data.

Data that is high volume, high velocity and high variety must be processed with advanced tools (analytics and algorithms) for complete



functioning and analysis of data to obtain required output. The ability to analyse this enormous amount of data is known as big data analytics. The analysis of big data makes valuable conclusions by converting the data into statistics.

Production Vs Customization:

There are many technologies that help the industry in creating new ways for satisfying the ever-growing and ever-changing needs of the customer. There are, however, many challenges when it comes to adapting the production process as complexity increases with the level of customization. Another problem with mass customization is that, the customer is unaware of her/his needs and mostly lack professional design knowledge. Due to this, most mass customized products are not as desired, and hence, the customer is rendered dissatisfied. Thus, the requirement of a personal style advisor arises; to help the customer in finding a garment that satisfies her/his needs. Since, everything is going on the web, so there are virtual style advisors available. Most of them are not affordable by every customer. For this, the recommendation systems were introduced. These systems offer the customer recommendations during the process of designing. They can be based on collaborative filtering, wherein the system recommends on the basis of the preferences of a group of users; content based filtering, wherein the system uses user profile to match an item. This requires ratings given to a product directly by the user.

Big Data Analytics

Big data analytics does not revolve around how much data a company has but how a company utilises the collected data. It helps organizations harness their data and use it to identify new opportunities. That, in turn, leads to smarter business moves, more efficient operations, higher profits and happier customers. The company can take data from any source and analyse it to find answers which will enable:

1. **Cost Reduction:**
   Big data technologies such as Hadoop and cloud-based analytics bring significant cost advantages when it comes to storing large amounts of data – plus they can identify more efficient ways of doing business.

2. **Faster, better decision making:**
   With the speed of Hadoop and in-memory analytics, combined with the ability to analyse new sources of data, businesses are able to analyse information immediately – and make decisions based on what they've learned.

3. **New Products and Services:**
   With the ability to gauge customer needs and satisfaction through analytics comes the power to give customers what they want.

Textile Big Data

All the data associated with a textile product is hence called as textile data. The textile industry generates and creates several data sources. All these data are in various forms, such as words, images, etc. The era of "Fast Fashion" is making data grow and changing rapidly. Therefore, these data could be called "Fashion Big Data". The textile industry needs to analyse every last detail of market trends and demand. That is why companies in the sector must not only work with designers or sewers, but also need analysis experts. Hence, this data can be termed as "Big Fabric" it portrays all the features of big data. Following is a broad classification of the textile data:

1. Material:
   This includes the fabric that is mainly made from natural or synthetic sources. This material will be converts into the making of textile yarns and fabrics. The fabric has various characteristics like yarn type, yarn count, yarn twist, weft & warp density, weave structure etc. It may be in a form of a pliable hair like strand or as the smallest visible unit of textile production.To achieve different types of fabric, one or more of these are changed. This enormously changes the appearance and had of the fabric, which correlate to emotions, textile themes, colors etc.

2. Textile Design:
   It is the knowledge about the elements & principles of design, which combined together, gives the design of a textile product. The design of a product is mostly influenced by human emotions, textile themes, occasion of wear etc.

3. Color:
   Color preference is an important aspect that influences a gamut of human behaviour. Color image scale states that color can have three attributes – warm or cool, soft or hard, clear or grayish, which associate with hue, chroma & value. These attributes can be linked with the emotion

4. Technical / Production design:
   The technical design allows the producer to understand that how the product will be made. This makes the design of a product production friendly. It includes knowledge of pattern making, sewing etc. To extract knowledge from these data, they have to be linked together. The next section describes the proposed system that will use this data.

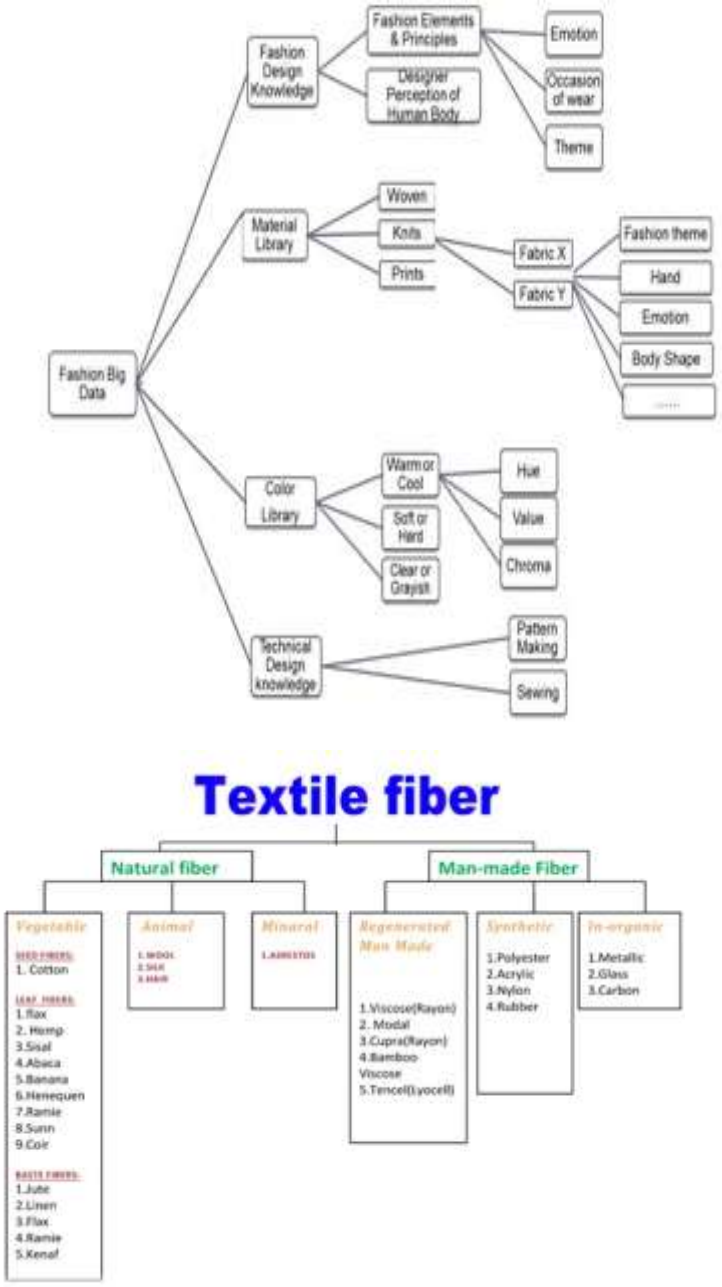


Figure 2. Data in Textile

Proposed System

The proposed system (figure 3) is a combination of the knowledge based recommender system and a search engine. It takes from engine the ability to provide the customer with an option to write her/his query and with the help of the recommender system, offer a product to the customer. The system will have the knowledge bases mentioned in section 3. These bases will help in removing the cold start problem. The working of the system will be such that the customer can select a product type and its size. Now the system will recommend a material, color, design which matches best the material type selected as well as that looks best product type (to be identified using the measurements provided by the customer). If the customer likes the recommendations she/he can choose to order the product, or else the system will improve its suggestions. The methodology to be followed to build the system is also presented in figure 3. Afterwards, a virtual designer on basis on big data applications it will show

other functionalities which are related to product design, design fabric etc. If the conditions are fulfilled the new design will create successfully. In this way methodology will work.

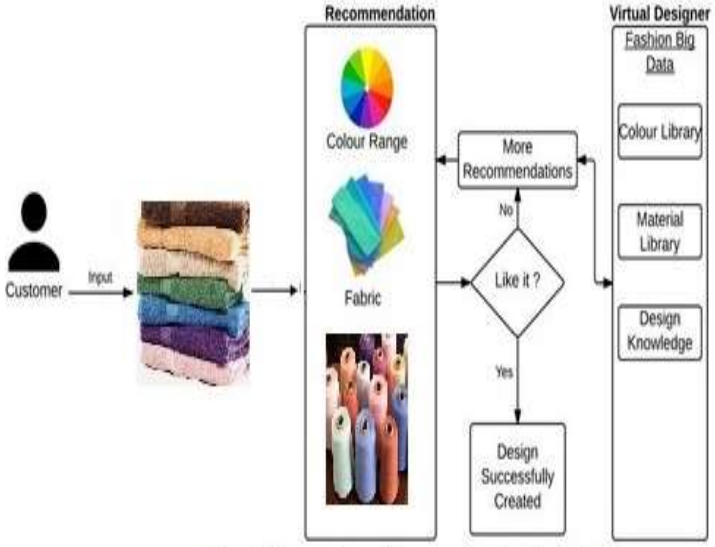


Figure 3. An overview of the proposed system for textile data

Goal of Big Data Tools:

Big Data tools are used for the analysis of the huge and complex data. Many organizations have now taken Big Data not just a buzz-word but a new technique for improving business. Organizations have to analyse mixed structured, semi structured or unstructured data. This is dons in search of useful business and market information and insights. Big data analytics helps organize this data for the organizations. Organizations have to analyse mixed structured, semi structured or unstructured data. This is dons in search of useful business and market information and insights. Big data analytics helps organize this data for the organizations. Big data analytics is the process of examining large data sets containing a variety of data types — i.e., big data to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information. The analytical findings can lead to more effective marketing, new revenue opportunities, better customer service, improved operational efficiency, competitive advantages over rival organizations and other business benefits.

Conclusion

The study introduces the term textile data and why it can be termed as big data. It also presents the classification of the data and briefly defines each one of them. In addition to this, a system is proposed that will use this data to provide the customer with a mass customization service. This methodology and working of the proposed system is briefly described. The future work involves the collection of the textile data, creating knowledge bases, establishing a link between those knowledge bases and connection it to the search engine.

Future Scope

Besides textile industry people, technology vendors are playing significant role in transforming the digital textile industry. Leaving behind popular social media forums, firms like SAP offer high-speed analytical tools which allow you to turn good volume of data into real business value, in just a blink of an eye. Big Data Analytics of textile product suppliers can also be leveraged to have good understanding on trends and ideas, which are persisting among audience, and those which are on the verge of being forgotten. Using such insights, designers make necessary adjustments in their products, change their marketing strategies, and then launch their fine collections in the market. Thus, Big Data influences key decisions related to manufacturing textile products, and helps both the industry leaders

and their targets to know each other, and jointly cooperate in taking the digital textile industry accelerati

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