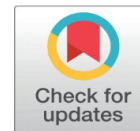


NEW PRODUCT DEVELOPMENT IN TEXTILES AND APPAREL INDUSTRY



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ABSTRACT

Product development is key to survival of any industry with change of time. This article discusses about the process of new product development in textile and apparel industry. Major points considered during this process are demand of customers, availability of new raw materials, sustainability, economic viability and responsibility towards nature. Engineering of products is a complicated issue here due to natural variability of textile materials, limitations of fibres available and use of old conventional machineries in many cases.

Keywords: Textile and Apparel Industry, Spinning, Weaving, Knitting, Nonwoven, Artificial Neural Network

Received 05 September 2021

Accepted 20 September 2021

Published 20 October 2021

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DOI [10.29121/IJOEST.v5.i5.2021.227](https://doi.org/10.29121/IJOEST.v5.i5.2021.227)

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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1. INTRODUCTION

It is a common practice for any industry to develop new products continuously for its improvement in market share and sometimes due to question of survival. Textiles and apparel (T&A) industry is no different from them hence they need to develop new products involving innovation. The complication about T&A industry is the components are produced largely in different companies. For example yarns are the products of spinning industry, fabrics are the products of weaving, knitting or non-woven factories, fabrics are dyed, finished in another factory and garments/ finished products are made in different factories. There are a limited number of companies where all these processes are performed under one shed or under the control of same management. This makes innovation more difficult as one cannot innovate only one part of the products without knowing the properties required/ achieved in the final products which go to the customers.

2. MARKET RESEARCH

Many find market research a tool for guidance for new product development. In traditional market research, one asks the customers about their wishes and needs and what they think about a specific product. With these kinds of direct questions, traditional market research methods such as customer surveys often yield disappointing results when it comes to the search for innovation. One often hears a quote attributed to Henry Ford: "If I had asked

people what they wanted, they would have said faster horses.”

Christensen [Christensen \(1997\)](#) called changes that seep into market as continual product and process renewal as ‘incremental change’, such as the introduction of new fibres, yarns and fabrics using spandex to lycra or elastane. Disruptive technology creates a new value proposition in the consumer’s mind that overturn the perceived value of existing products. One such example is the introduction of man-made fibre in the last century. It led to a completely new generation of fibres and applications as well as entirely new set of textile companies in the market. The concept of disruptive innovation has changed the basic concepts of strategy [Frumkin et al. \(2012\)](#). Strategy is traditionally rooted in supply and demand conditions, and in concepts such as market share and competitiveness against existing rivals in market place. This is not applicable when disruptive innovation makes both an existing company and its competitors irrelevant. Traditional concepts need to be replaced by a concept such as “Blue ocean” strategy [Kim and Mauborgne \(2005\)](#). This suggests that companies can create a space that did not previously exist, a blue ocean, in contrast to more traditional companies operating in an established market, the red ocean. The red ocean is everything that currently is in existence.

3. PRODUCT DEVELOPMENT

In conventional industry like textiles and apparel industry the product development can be broadly classified into four categories:

- The first and most common is to develop fabrics or apparels based on a sample supplied by the customer;
- The products designed by fashion designers or professionals using their own imagination and predicted market trend;
- Replacement products using newly developed raw materials which give better performance or lower the cost of production
- The fourth one is development of products using latest raw materials, technology and knowledge, which market has not seen earlier.

It is very common that customer provides a sample, which he/ she might have collected from market, or from one more supplier, to the manufacturer. Sometime marketing team of a company collects some products from market, which he feels has got good demand. Once it is supplied to the factory the R&D team analyses various physical and chemical properties such as ends per inch or wales/courses per inch, yarn count, blend components and percentage, yarn twist, tensile properties, shade etc. Based on those values yarns and fabrics are being produced, dyed or printed, finished and again compared with the original one. The cost is calculated and finally a decision is taken regarding supplying of the desired product to the customer and pricing of the same. In the case of technical textiles and performance textiles the performance properties are also assessed before reproducing the desired product. For example Company X wants to develop on fire retardant textile product which has got demand from an agency. It will procure samples of similar product either from market or the customer. It will test fire retardant properties, tensile properties, heat conduction and fuming properties before going for the conventional required fabric and yarn quality parameters. Then it will be ascertained whether the FR properties has been inducted by chemical finishes or using inherent FR fibres during spinning of yarn. In case of chemical finishes the FR properties after a number of washes will be assessed to see its durability. Then the layers of fabrics will be separated if the final product is made of

multiple layers, which is very popular, will be analysed separately for reproduction. In this type of product development innovation has not big role.

The second group of product development needs inventions. The inventions can be subdivided into low level inventions, with low risk or high level inventions, with high risk. With both options the commitment to develop the innovation comes down to market knowledge, technical experience and gut feeling [Starbuch \(2012\)](#). As a part of innovation process, protection of intellectual property should be considered. A good and proven route is to use a lab book at commencement of invention, recording the idea, time and place with any witnesses present, and then following the patent protection process.

Generally for selecting a solution following points are considered:

- **Feasibility** – to check whether the idea is feasible
- **Fit (Strategic and cultural)** – the idea must fit the vision, strategy and culture of the company.
- **Desirability** – the idea must have a customer benefit
- **Business viability** – an idea with business viability is one where the income is higher than the expenses.
- Scalability
- **Sustainability** – the idea must be successful in long run, it must have a long lasting economic, social and ecological benefit
- **Adaptability** – in a dynamic changing environment, one's idea must be adaptable.

A key principle in the product development is empathy i.e. putting oneself in the position of the customer or user so that one can explore the person's feelings, emotions, thoughts, intentions and actions. With empathy one not only establishes distance to oneself but also build up proximity to the potential customers. Quickly one should learn from mistakes and establish a culture of experimentation in the company. Teflon was discovered because a chemist experimented with refrigerants and stored them for too long [Muller-Roterberg \(2021\)](#). Customers will view a new potentially innovative offering in the context of the available products and determine if the given counter has under-satisfied or unsatisfied needs that are better fulfilled by the new product. Each consumer will evaluate new offerings in terms of whether or not it outperforms the currently available products and is consistent with the value proposition expected from the given brand [Bowonder et al. \(2010\)](#). If the answer is yes the new offerings will have greater perceived value to the customer. The fire fighter's suit used to be made from fire retardant fabrics earlier but understanding the problems faced by the fire fighters during operation such as heat, sweat the new products have been developed using tri-layer material. The top layer or outside layer is made of flame retardant fabric which will protect the fire fighters from catching fire, the middle layer is made of heat resistant fibres which will not allow heat from fire to go inside and the bottom layer is made of moisture absorbent fibres which will absorb the sweat which in actual life increases due to heat and excitement. Some companies have moved one step ahead. According to them why fire fighter's suit should be boring and only consider about functionality. They introduced fashion element without compromising the ergonomics aspect. Innovation in textiles and product development has resulted in significant growth in the 'shapewear' segment of the apparel market. Shapewear products utilise textiles that contain a percentage of elastane or latex for compression. Shapewear builds on the historic costume of waist cinchers and bustlers.

Given the increased market demand for environmental consideration, using green technologies, reducing carbon footprints and employing sustainable practices the textile industries continues to advance technologies toward the goal. Use of recycled polyester, recycled cotton yarn, organic cotton as components in the existing products are popular now.

In the case of fashion designing the designers study the choice of stars, if they are making the garment for a specific star. Also they study the trend and gather knowledge about the properties of fabrics made of different materials so that they can choose the material depending on his/her requirement. It is known that the environment issue has taken a front seat now considering the damage already done to the nature by human being. The fashion designers consider them also while designing their products. The main value addition factor is their creativity and artistic outlook which depends on their guts. One need not to explain how much value is added in their products as compared to conventional products.

4. ENGINEERING OF TEXTILE FABRICS

Developing a textile product as per the required properties is a complicated issue. Chemical finish and fabric properties play most important role in deciding the final product quality. Again the fabric quality is affected by the yarn quality and yarn quality in turn depends on the fibre quality and process parameters. Hence engineering fabric as per the required quality needs to consider all the properties and process parameters of raw materials i.e. yarn and fibre. With progress in science, new fibres, technology and finishing techniques traditional design knowledge has become inadequate to fulfil the need of the consumers. A methodical approach to designing has become necessary [Chattopadhyay \(2008\)](#). A large number of researchers worked on finding the scientific methods for engineering of fabrics and yarns [Basu et al. \(2002\)](#), [Behera \(2011\)](#), [Basu \(2011\)](#), [Das and Ghosh \(2015\)](#), [Chattopadhyay et al. \(2004\)](#). [Basu et al. \(2002\)](#) engineered fabric properties using artificial neural network. The ANN allowed them to predict the fibre properties and spinning process parameters while using air-jet spinning process. With globalization there is increased need to reduce product lead times. Activities must be performed in parallel to ensure sufficient attention is paid to market needs and manufacturing technologies during the design process for successful product development [Behera \(2011\)](#). Designing of textile products is still based on traditional techniques, experience and intuition. Compared to modelling from first principle and other techniques, computational methods can be a powerful tool to model the nonlinearities and complexities involved in prediction of fabric properties. Others [Basu \(2011\)](#), [Das and Ghosh \(2015\)](#), [Chattopadhyay et al. \(2004\)](#) have utilised ANN and other latest mathematical tools to engineer yarn qualities or predict the fibre properties and spinning parameters required. It is very clear that development of these models needed knowledge on the textile processes and fibre properties. A large volume of database has to be created to improve the accuracy of the models. The models involve Artificial Neural Network, Fuzzy Logic and/or hybrid modelling. For development of technical textiles where performance is the main criteria scientific method need to be followed. For achieving the desired properties one has to decide the raw materials, technology of production etc. For certain products nonwoven fabrics give better result considering the required properties such as filters, absorbing materials etc. And in some other cases where high strength is required woven or warp knitted fabrics are preferred. Kothari et al used artificial network modelling for prediction of thermal transmission properties of woven fabrics [Kothari and Bhattacharjee \(2011\)](#). It is claimed that the feed forward back propagation ANN can predict the thermal insulation of the fabrics

based on fabric construction parameters like weave, yarn count, thread density, weight and thickness as input. The network can be used to predict the thermal insulation of woven textile fabrics based on these parameters before they are manufactured.

The success factors for creating new products are the following:

- Simplifying products and processes
- Starting where others left off
- This quote is from Thomas Edison: “Most of my ideas belonged to other people who never bothered to develop them”. Innovations are not created in vacuum; they are based on experience, insights, knowledge and the approaches of the other people.
- Observing everything and everyone in every possible place
- Experimenting with ideas
- Networking
- Overcoming obstacles to creativity

One should be able to think keeping most of the obstacles away from his/her mind. The whole thinking of others and set up will be changed if a successful idea brings a good product. Many times people start thinking about product development keeping the existing set up in mind, which is non starter.

5. REPLACEMENT OF NON TEXTILE PRODUCTS WITH TEXTILE PRODUCTS

While broadening the use of textile materials the technologists have developed various products to replace some of the non textile products. Here also the conditions remain same that is the new product should match with the replaced product as far as the properties are concerned or may be better or they should be cheaper with similar properties. Also there may be social reasons which force people to change the habits. Due to awareness and constant appeal by the animal lovers the use of fur has reduced drastically and those are replaced by fur produced from textile fibres. Similarly in many places use of leather has been replaced by synthetic textile products One more example is use of Astroturf in grounds, replacing natural grass. Many of the sign posts presently are made of warp knitted fabric, which is much lighter than metal, the quality of printing is much better and don't rust in rain. The bullet proof vests/ jackets are much lighter due to use of Kevlar or other para-aramid fabrics in it without affecting the performance. In building construction technical textiles have penetrated deeply because of its various advantages such as light weight, high strength and resilience etc. They have resistance to chemicals, sunlight and pollutants. Designers have become successful in designing technical textiles which have replaced other materials such as steel, wood etc such as use of awnings in airport and stadium, blades of wind power turbines etc. So designing these products need the knowledge on the fibres characteristics, technologies available and main purpose of the structures which these materials need to perform. These are the products where textiles were not used earlier.

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