International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 15, Issue 7, 2021

Innovative Woven Designs: Concepts and Development for New Entrepreneurs in the Textile Sector of Pakistan

Dr. Allah dad[1], Umber Zahid[2], Dr. Muhammad Dawood Husain[3], Syed Asad[4], [1]Assistant Professor, PIFD, Lahore Pakistan, [2]PhD Scholar, Design Studies, IIU-Malaysia, [3]Associate Professor, Textile Engineering Department; NED UET Karachi Pakistan, [4]Assistant Professor, AIFD, Karachi Pakistan

The Textile Industry of Pakistan is considered the lifeline of the country's economy. It has an overwhelming impact on the economy, contributing 60% to the country's exports. Major textile exports of Pakistan are spun yarns, greige and finished fabrics, and some degree of value-added textile articles. However, for the last decade, the industry is experiencing lots of problem in terms of getting sustained orders. This has also affected the Weaving Industry of Pakistan which is gradually losing its competitiveness with the passage of time; resulting in the loss of millions of US Dollars annually. The downfall in weaving businesses results in less motivation and encouragement for starting new businesses. In this research, by using a multi-stage sampling method where stratified random and clustered sampling approaches were selected in which 59 weaving factories considered for studying their factor of product development during years of 2015 to 2020 to address the problem for improving value-added orders in the weaving sector. The internal factor of product development is considered as most significant and important with an existing gap in its types. In this article the author suggested and formulated new types of woven fabrics such as tri-axial woven, multilayer innovative fabrics, and 3D insulated woven fabric for new entrepreneurs and entrants in the markets that can serve as a road map for them which can remain valid for a long time.

Key words: *Woven Fabrics, Tri-axial Weaving, Entrepreneurs, Competitiveness.*

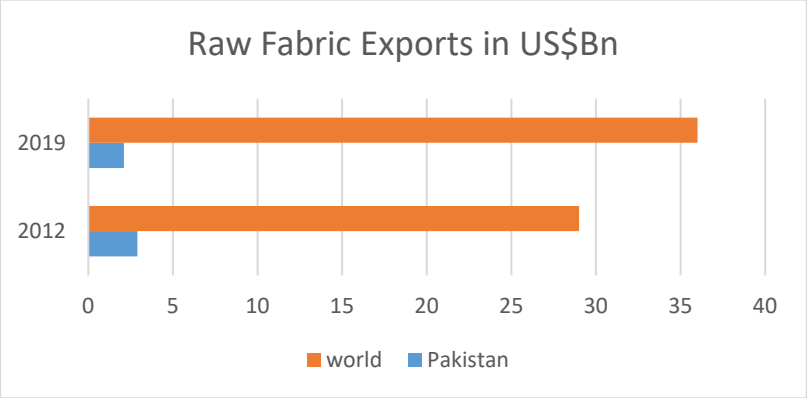
Introduction

The global textile goods market stood at $961.5 billion in 2019 (about 83% fabrics and 17% yarns) and it is estimated that the particular market would exhibit the 4.3% Compound Annual Growth Rate (CAGR) from 2020 to 2027 (World Bank Report, 2020). The high growth rate demands the textile investors to remain in the textile business by expanding their business every year. Pakistan Textile Industry has a significant positioning in the country's business arrangement. Pakistan is 5th largest cotton growing and 6th largest cotton goods exporters of the world (Ministry of Textile, Government of Pakistan, 2019). The major industry comprises of cotton and with their blends like polyester, silk, viscose material, etc.

The textile industry consists of five major sectors in manufacturing starting from ginning, spinning, fabric manufacturing through to weaving and knitting, wet processing and lastly garments or made-ups. The fabric manufacturing sector consists of two sectors: one is weaving and the second is the knitting sector in Pakistan (Sabit Adanuar, 2020). In Pakistan major fabric production is in the weaving sector which is also a dominant sector in fabric manufacturing due to high production rate (Annual Report of All Pakistan Textile Mills Association 2014, Trade Development of Pakistan). Pakistan is capable of producing fine as well as coarser fabrics and can also export them to various countries. The capacity for fabricating them is available in terms of technical support. The fine quality fabrics are used in sheeting to shirting cloth such as lawn fabrics, chiffons, silks, etc., in apparel, while coarser fabrics range from canvas cloth to denim cloth (Asim Naeem, 2015). As far as the value of the woven fabrics is concerned it could be enhanced by price reduction or by quality increment (without any change in price). The obtainability of correct class raw material is very noteworthy (Lal, 1999). Technological competence and the process of innovation is found be to significant features for gaining competitive advantage of any textile mill (Taneja, 2012)

The textile business is predominantly apprehensive with the construction of yarn, the successive plan or making of clothing and their circulation. Pakistan is one of the major manufacturers of textile goods in the world. According to the All Pakistan Textile Mills Association (APTMA) and Federal Board of Revenue, Pakistan's (2010-2015) textile industry contributes: 55% of entire exports sharing about USD$12.36 billion; 46% of total manufacturing; 40% of total labour force; and 8.5% of total GDP (Gross Domestic Product). Since Pakistan came into being the textile business has always been considered as a major means of the country's income and it plays a significant role in the betterment of the country. A sector which always played a significant role in the economic structure of any country must be increased or improved because it's able to contribute a lot at GDP, tax collection, revenues and job creations (Sarwar, 2012). The textile industry of Pakistan presently observes many problems. The industry nowadays is fronting difficulties in terms of getting new export orders and losing export share. In spite of this energetic and export-oriented textile business, there is a depressing performance of textile exports, reduced from 65% of total exports in 2007 to 55% in 2019 (Annual Report All Pakistan Textile Mills Association, 2019). Similarly the sector of

woven fabric manufacturing decreased up to a level of around USD$2.1 Billion in the year 2019. Hence enactment of this sector resulted in the loss of competitiveness in producing and exporting fabrics sector.



Source: APTMA Report (2019)

Most of the orders shifted to other countries. Due to such problems the woven fabric manufacturing sector is not flourishing or offering innovative fabric type from existing product types. There is need to identify gaps from existing product type (woven fabrics) and propose new innovative fabrics for upcoming or exiting entrepreneurs that can attract or cater to the export market as well.

Objective of the Research

- To identify gap in the existing woven fabric (type) manufacturing sector of Pakistan
- To develop and suggest new ideas/innovations in woven fabrics for entrepreneurs that can cater to the export sector.

Literature Review

Creativity is considered as one of the most important factors from competencies of a leader and it is very important too for organisational development (IBM, 2010; Merrill, 2019). It also emphasised that instead of just one department such as research and development in the company, the whole organisation needs to be creative. Research says that the primary factor of ability in Finland manufacturing companies to produce innovative products is that they take advantage of the creativity of their staff (Alasoini, 2010).

According to Fillis and Rentschler, creativity is considered as a chief factor in the growth of a firm's business, especially for their survival in the international competitive market (Fillis & Rentschler, 2010). The creative strategy of any organisation can contribute to its product value. Proper synching of creativity and strategies could result in highly effective organisation in

terms of innovation and the growth of business which ultimately leads to the better performance (Bilton et al., 2010). Innovation is a concept of accepting novel ideas in product development and process improvements (Hurley et al., 1998). For sustained success and competitive advantage, the concept of creativity with innovation is found to be the chief factor especially in order to formulate the strategy of gaining competitive advantage (Clark & Guy, 1998).

Having a capability to innovate indigenously could not be considered as a distinctly identifiable idea. The capability includes both best practices and processes within the organisation which are instrumental in stimulating, measuring and reinforcing innovative concepts. Kanter (1989) through his Kanter's model argued that organisations are most effective when management is largely autonomous and streams of innovation and capabilities are recognised.

In this competitive world, the concept of new product development becomes very necessary in order to compete or fulfil customer requirement. New product development with innovative ideas and concepts of new products in terms of physical products and service in order to respond to customer needs (Ulrich, 2004). The concept starts with the idea of new opportunities in the market. The process of new product development is comprised of: research of existing science, technology, customer buying behaviour, existing product line, and their characteristics and performance. The development of a new product has a positive impact on revenues and gives an edge over competitors. The process of development also includes its evaluation with respect to acceptance in the market, having reasonable characteristics of the product (Crawford & DiBenedetto, 2003). Most of the organisations usually put the emphasis on development rather than on research. The existence of a research and development department plays a vital role in the performance of an organisation in terms of product right properties and characteristics (Cooper, 2001).

Companies learn to produce new products with improving efficiencies, cost-effectiveness and having ability to conceptualise new product design independently (Forbes & Wield, 2000, p. 1104). New product categories include new product line and improvement of a new product (Crawford & DiBenedetto, 2003). Developing a new product is considered as rewarding however it is one of the toughest activities as the endeavours of the modern corporation. It is proved in research that the product manager must perform a strong leadership role in order to produce or manufacture a new idea according to planned business strategy (Cooper, 2001). The role of marketing and positioning in the market for a new product is very important. It can be achieved by creating the right value addition and characteristics of a product just according to right customer needs and wants. The involvement of marketing practices becomes mandatory throughout the process of new product development that creates value for the organisation. By considering the speedy pace of global market cut-throat competition, the two main organisation functions i.e. marketing and design are the primary contributor to the overall performance of the organisation (Powell & Cassill, 2006).

The textile industry invests less in new product development. According to the 1999 data, it was found that only 1.8 % of sales were spent on the Research and Development (R&D) activities (Cooper, 2001). But this one research is not fit for all, as in accordance with the variety of different end applications in textiles, the development and marketing of textiles brings several opportunities for new product development. It includes diversity in conventional textiles (home textiles, apparel) and technical textiles (medical and nonwovens based textile). This assortment brings various opportunities for organisations in generating revenue, increasing their sales, and capturing the market. The challenges for the companies in terms of role and benefits of textile products is considered (a) benefits and functionality of Product e.g from surface covering to medical delivery system (Sumanasinghe & King, 2003), (b) re-examine opportunities for products as niche/specialty products, rather than commodity products, and the inclusion of smart technology (Barnard, 2008), and (c) investigate possibilities of new finishes, technologies and applications (e.g., nanotechnology applications, such as Nanotex's use to repel and release stains (www.nanotex.com).

The concepts of complexity have a major impact on new product development processes. In the literature review various types of definitions exist for complexity: a number of parts used in the product (Murmann, 1994); and a number of different functions of products associated with the product (Griffin, 1997). Tatikonda and Rosenthal (2000) related project complexity to nature, quantity and magnitude of organisational subtasks and interaction of subtasks by a project. If the complexity as important functions, parts of products manufacturing not managed properly then it has adverse consequences on the product development process. Managing complexity is very important for companies and for these different companies uses its various technological options. Iansiti (2000) concluded that the survival of the companies depends on its capacity to monitor, asses and utilise external opportunities. In an easier way those companies who have the capacity to handle complexities are considered more effective and more successful in obtaining benefits from opportunities (Arora, Fosfuri & Gambardella, 2001).

The effective control of complexity in the process of new product development by organisations makes them more competitive. Companies who can control their processes and functions can send their new products more efficiently and also get first-mover advantage in the market. Meanwhile use of their resources, capabilities and finishing their projects on time with less stress gives better customer satisfaction (Jongbae Kim & David Wilemon, 2009).

Global textile value line is complex in terms of using various types of yarns, fibres and fabrics and their companies in terms of suppliers, manufactures is also complex in contribution to new product development due to diversification (Diamond, 2006). Depending upon the adopted strategy of the firms which are involved in the activity of developing new products could result in a more prospector outlook of the firm rather a defender outlook (Frambach et al., 2003; Miles & Snow, 1978).

The literature review has demonstrated that a clear connection between innovation and product diversity exists. Frambach et al., (2003) argued that differentiation strategies could play an important role in the practices of development of new products. According to Frohwein and Hansjürgens (2005) innovation could be achieved in the development of process or the product along with the focus of cost minimising. Qin (2007) demonstrated that innovation permits the organisation to minimise the cost by achieving economies of scale and eventually gaining the market share.

The literature review has also demonstrated that the concept of continuous improvement has been playing a huge role in sustaining the competitive advantage of the manufacturing and the services sector. A number of studies have been carried out on the implementation of the said concept. In one study, concept of buffer stocks was exploited to enhance the performance in the line transfer automation; the concept was originally presented by Buzacott (1967). In the meantime, the idea of continuous improvement touches the much higher standard. The concepts of Just-In-Time (JIT), Total Quality Management (TQM) and other various quality and productivity enhancement have been extensively applied in numerous manufacturing and service based organisations (Lascelles & Dale, 1990). Likewise in the last couple of decades, significant progression in information technology and changes in the market have created numerous prospects for innovation through the continuous improvement practices (Jingshan Li et al., 2016).

Methodology

In order to conduct this research the following steps were taken in domain of methodology:

Research Approach: Inductive and Exploratory
Research Type: Qualitative
Data Collection Strategy: Key Informant Interviews (03) and Focus Groups (03)

1	Total number of export factories (questionnaires)	59	• General Managers/Technical Directors
2	Key informant interviews	03	• Mr. Anees, General Secretary, All Pakistan Textile Mills Association • Mr. Nadeem Naz, Executive Director, Diamond Fabrics of Sapphire Fibers Pty Ltd., for the last 30 years • Mr. Munir Alam , Director Executive Denim Division and Head Fabric R&D, Azgard 9 Ltd.
3	Focus group	3	• Six members from Pakistan Institute of Fashion and Design, Lahore • Six members of Sapphire Textile Mills, Lahore • Six members of Diamond Fabrics, Faisalabad.

Data type: Primary and Secondary Reports of weaving factories
Population Size: 428 (Listed/registered as weaving factories containing Power and Modern Looms)
Sampling size: 59 (using online Sampling Calculator)
Sampling Technique: Multistage (Cluster and Stratified) (Karachi, Lahore and Faisalabad)
Tools of Data analysis: Descriptive and Thematic Analysis
Factory: Weaving Factory (Power and Advanced looms)
Woven Sample Mapping: Adobe Photoshop

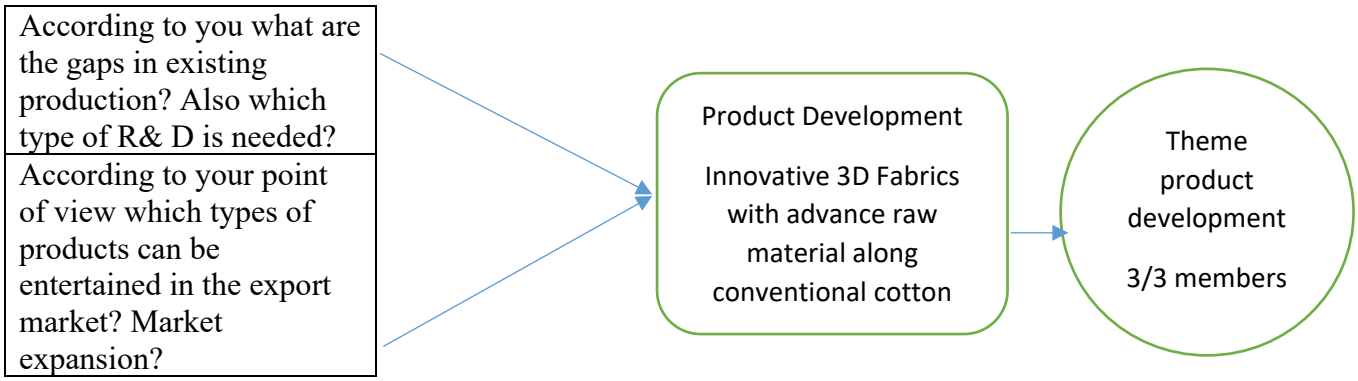
Results and Outputs

In order to get Primary source data questionnaire were sent to 59 factories according to sample size. The data was to obtain regarding type of woven fabrics and production qualities from respective factories. The details of their production/qualities are grouped together and presented below in Table 1:

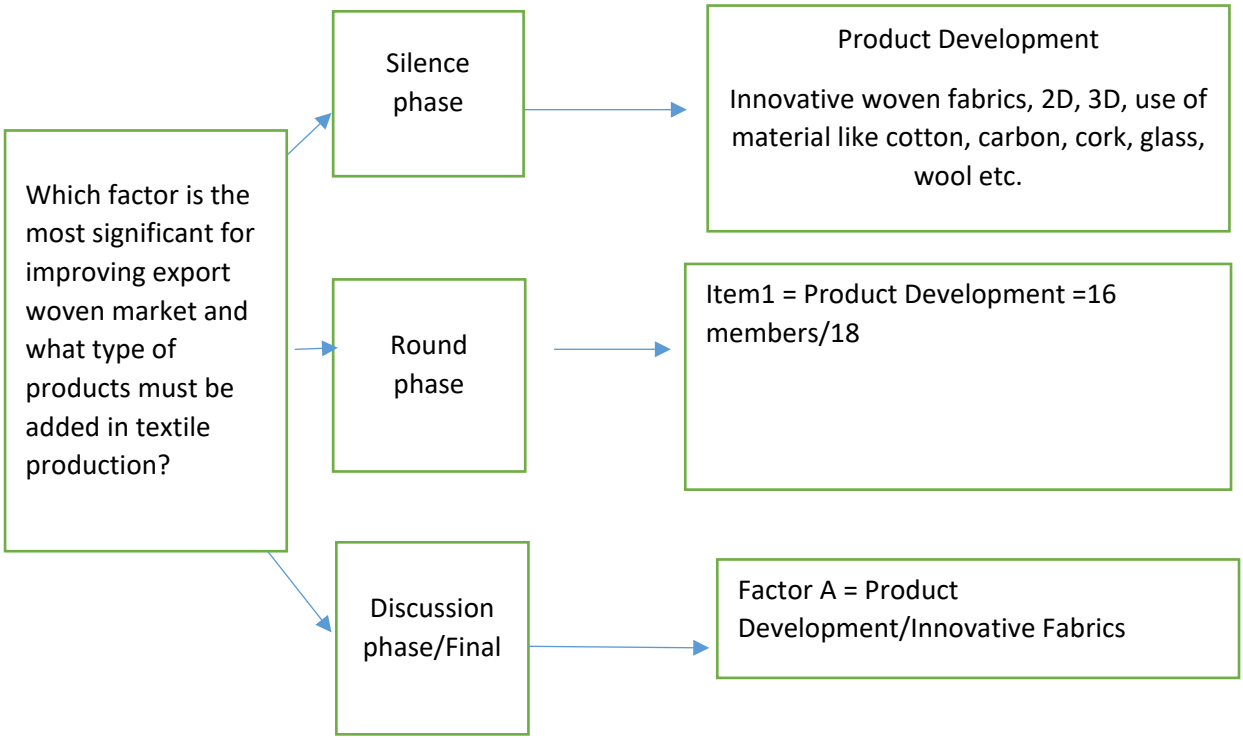
Table 1: Responses of 59 Sampled Factories

Item	Item Description	<5 %	6-10 %	11-20 %	21-40 %	41-60 %	61-80 %	81-100 %
PT -Product Type (4)								
PT2	How much woven fabrics in % of cotton, containing 85 % or more by weight of cotton, weighing not more than 200 g/m2?	0	0	0	0	27	32	0
PT3	How much woven fabrics in % of cotton, containing 85 % less by weight of cotton, weighing not more than 200 g/m2%?	5	6	24	24	0	0	0
PT4	How much woven fabrics of cotton in %, containing less than 85 % by weight of cotton, mixed mainly or solely with man-made fibres, weighing not more than 200 g/m2, 3D?	35	16	8	0	0	0	0
PT5	How much woven fabrics of cotton in %, containing less than 85 % by weight of cotton, mixed mainly or solely with man-made fibres, weighing more than 200 g/m2?), 3D	37	15	7	0	0	0	0
PI -Product Innovation (2)								
PI2	How much % of fabric production based on innovative and on a new concept of 3D?	36	12	11	0	0	0	0
PI4	How much % of order repeated/demanded from innovative and 3D fabrics from the year 2012 to 2019?	12	2	0	6	15	11	13
P15	How much fabric producing from conventional type of weaving with straight warp and weft?						9	50

Interview Results



Focus Group Results



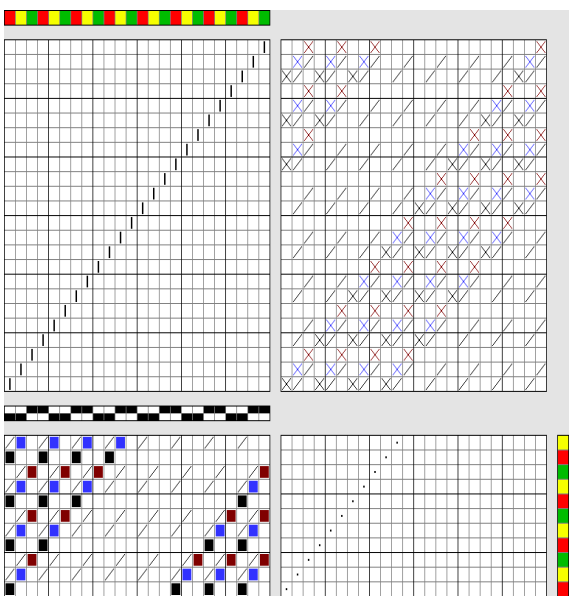
Woven Fabric Sampling Technique and Material

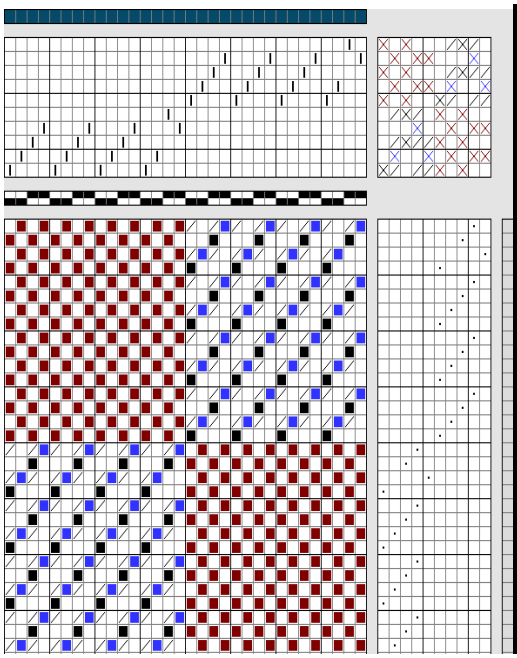
In order to fill the gap of value-added raw woven fabrics, the authors are suggesting three different types of fabrics that can be made from existing Pakistani resources such as raw material, technology and expertise. The difference between these fabric types with ordinary textile fabrics is only the addition of value by using different contextures into fabrics.

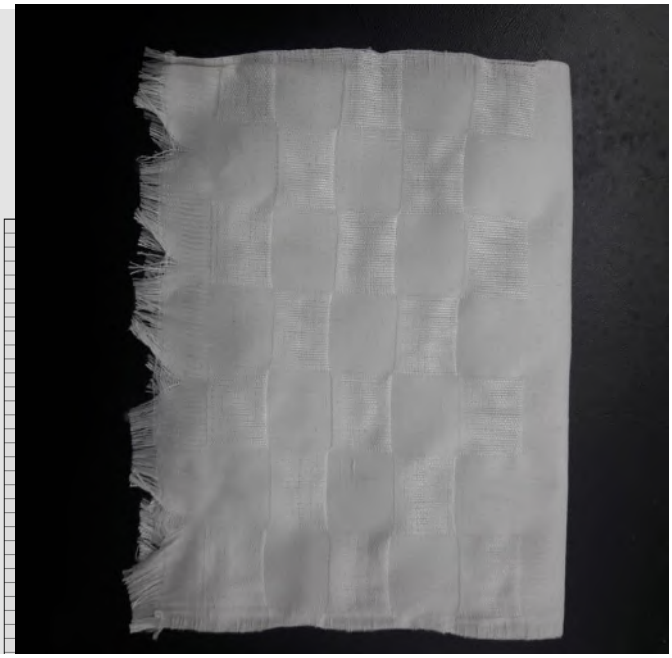
The first is a three-layer fabric which is a hollow fabric of six contextures. Each layer can be separate or can be stitched according to the requirements. Here the author is suggesting an

example of three-dimensional weaving made by using ordinary cotton yarn of the following fineness:

English system: 40/2
English system: 60/2
English system: 30/2 (cotton-polyester)
English system: 20/2 (cotton polyester for warp yarn)
Machine: Dobby Projectile Loom (Sulzer) or can also be on AVL Loom

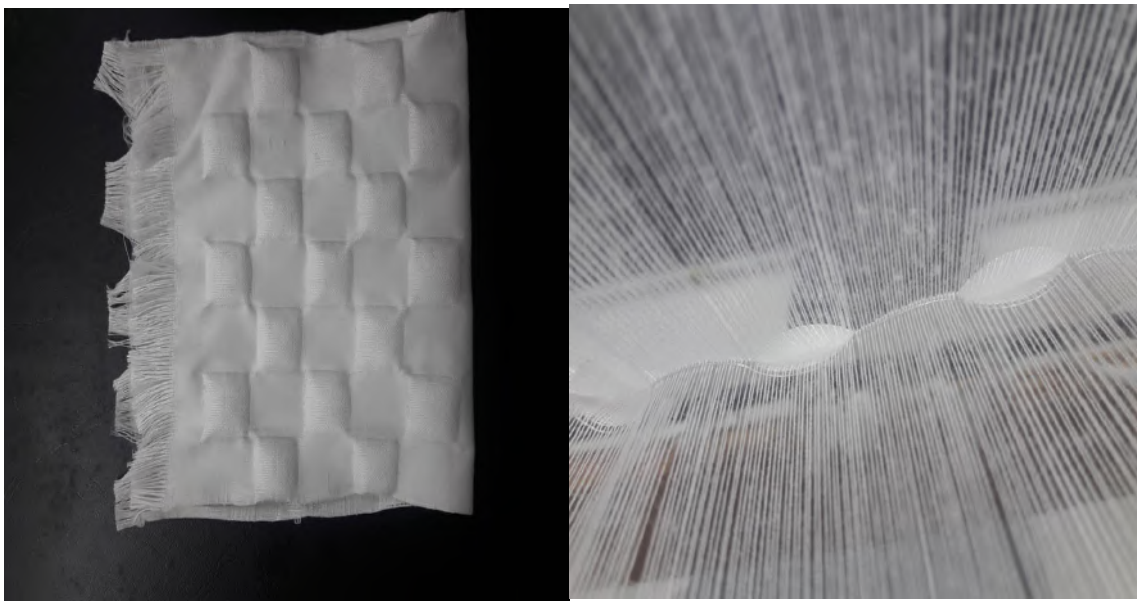






The yarn fineness range can be changed according to quality parameters. Here the end use of such type of fabric is heat insulated fabric, high strength fabric mostly use for stress bearing

fabric. The fabric that was produced on a sampling AVL Loom model, gives the direction of value-added fabrics.



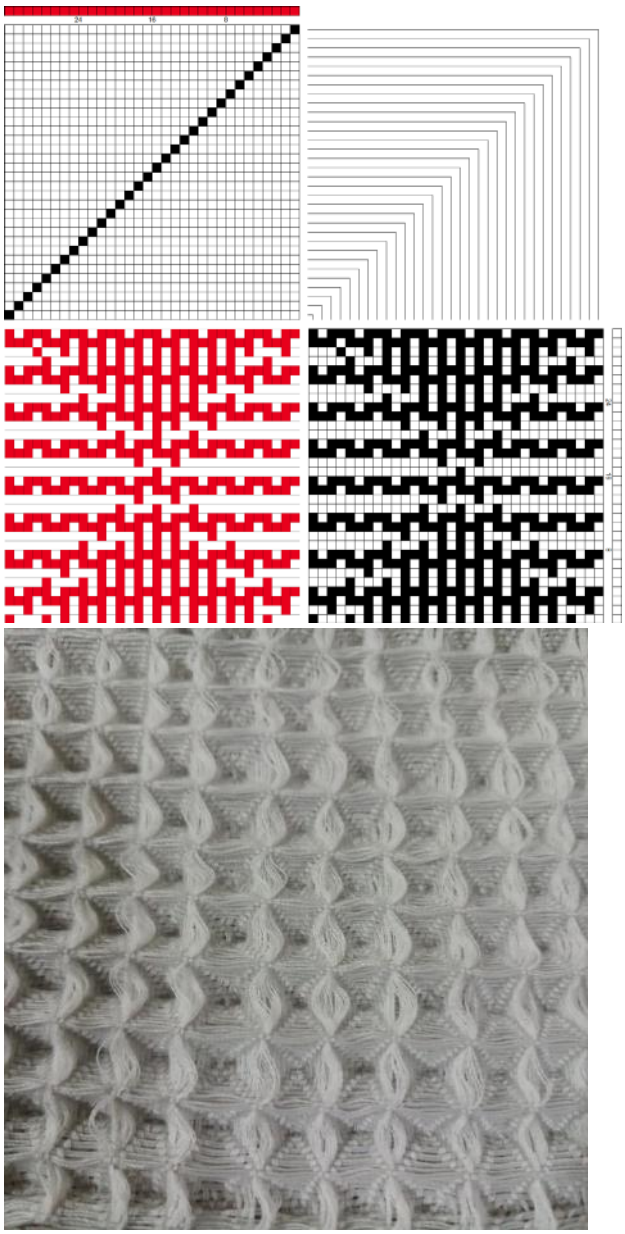
In the light of three-dimensional fabric, the author suggests two more types which are a combination of tubular and non-tubular. This type of fabric can be used as inners for better moisture management in the pockets of the tubular area also for the more thermal insulator. Materials used for making such type of fabric are 100% Pakistani which consist of 60 single cotton yarn in the warp direction and using micro polyester filament of 60 deniers.

Source: Mapping done on Photoshop on Internet image.

Another fabric was developed on the basis of existing cotton yarns which are easily available in Pakistan. The fabric gives a two face impact. One side is designed and the other is plain therefore it can be used as reversible fabric. Such type of fabric can be used for fashion articles such as tops, jackets or pants. The technical parameter of this fabric is:

Warp fineness 20/s
Weft fineness 60/2
GSM: 180 gm/m^2
Machine: Dobby AVL Loom (USA)

The fabric is made with country grown cotton and having two face fabric gives the direction of value addition in the existing range of fabrics available in Pakistani exports.



Triaxle weaving which 3-dimensional fabric is made by overlapping two war sheets at an angle of 60 degrees. This type of fabric needs a special loom which is not available in the country but it can be made by modification of existing looms. The end use of this type of woven fabric is composite fabric specially made with carbon or can be with cotton/polyester which requires more strength in its function. The advantage of this fabric is around two times the strength as compared to regular weave technique and can be an ideal option for active wear.

Source: *Mapping done on Photoshop on Internet image*

Conclusion

The concept of new product development always is an important factor in achieving competitiveness. The country product line is based on cotton fibre mostly while some of the companies are also working on their different blends. Similar to diversification in export markets, product diversification is helpful in reducing the vulnerability of the country's export portfolio to extreme volatility in export prices.

Along with cotton spun yarn, polyester and other manmade fibres are also needed to be spun and put their role in improving exports. Globally the demand for cotton-based products is still available but alongside cotton, synthetically made products are also in high demand around i.e. 40% of total demand in based on manmade fibres. So there is a need to look in this.

REFERENCES

Adanur, S. (2020). *Handbook of weaving*. CRC press.

Alasoini, T., Elise, R., Heikkilä, A., & Pekka, Y. (2010). Workplace innovation in Finland: Towards sustainable productivity growth?. *Vezetéstudomány-Budapest Management Review*, *41*(9), 2-16.

Arora, A., Fosfuri, A., & Gambardella, A. (2001). Markets for technology and their implications for corporate strategy. *Industrial and corporate change*, *10*(2), 419-451.

Barnard, K., Fan, Q., Swaminathan, R., Hoogs, A., Collins, R., Rondot, P., & Kaufhold, J. (2008). Evaluation of localized semantics: data, methodology, and experiments. *International Journal of Computer Vision*, *77*(1-3), 199-217.

Bilton, C., & Cummings, S. (2010). *Creative strategy: reconnecting business and innovation* (Vol. 3). John Wiley & Sons.

Buzacott, J. A. (1967). Automatic transfer lines with buffer stocks. *The International Journal of Production Research*, *5*(3), 183-200.

Clark, J., & Guy, K. (1998). Innovation and competitiveness: a review: Practitioners' forum. *Technology Analysis & Strategic Management*, *10*(3), 363-395.

Cooper, C. L., Cooper, C. P., Dewe, P. J., Dewe, P. J., O'Driscoll, M. P., & O'Driscoll, M. P. (2001). Organizational stress: A review and critique of theory, research, and applications.

Crawford, C. M., & DiBenedetto, C. A. (2003). New Products Management, McGraw-Hill, Boston.

Fillis, I., & Rentschler, R. (2010). The role of creativity in entrepreneurship. *Journal of enterprising culture*, *18*(01), 49-81.

Frambach, R. T., Prabhu, J., & Verhallen, T. M. (2003). The influence of business strategy on new product activity: The role of market orientation. *International journal of research in marketing*, *20*(4), 377-397.

Frohwein, T., & Hansjürgens, B. (2005). Chemicals Regulation and the Porter Hypothesis-A Critical Review of the New European Chemical Regulation. *Journal of Business Chemistry*, *2*(1).

Griffin, A. (1997). The effect of project and process characteristics on product development cycle time. *Journal of marketing research*, *34*(1), 24-35.

Hurley, R. F., & Hult, G. T. M. (1998). Innovation, market orientation, and organizational learning: an integration and empirical examination. *Journal of marketing*, *62*(3), 42-54.

Iansiti, M. (2000). How the incumbent can win: Managing technological transitions in the semiconductor industry. *Management Science*, *46*(2), 169-185.

Kanter, R. M. (1989). The new managerial work. *Harvard business review*, *89*(6), 85-92.

Kim, J., & Wilemon, D. (2009). An empirical investigation of complexity and its management in new product development. *Technology Analysis & Strategic Management*, *21*(4), 547-564.

Lascelles, D. M., & Dale, B. G. (1990). Examining the barriers to supplier development. *International Journal of Quality & Reliability Management*.

Li, J., Papadopoulos, C. T., & Zhang, L. (2016). Continuous improvement in manufacturing and service systems.

Lu, S. (2017). *WTO Reports World Textile and Apparel Trade in 2017*. Statistics, Textile industry. World Trade Organization

Merrill, P. (2019). Be ready. *Quality Progress*, *52*(10), 54-56.

Murmann, P. A. (1994). Expected development time reductions in the German mechanical engineering industry. *Journal of Product innovation management*, *11*(3), 236-252.

Powell, N. B., & Cassill, N. L. (2006). New textile product development: Processes, practices, and products. *Journal of the textile institute*, *97*(2), 155-166.

Qin, L., Wu, X., Block, M. L., Liu, Y., Breese, G. R., Hong, J. S., & Crews, F. T. (2007). Systemic LPS causes chronic neuroinflammation and progressive neurodegeneration. *Glia*, *55*(5), 453-462.

Sarwar, G. (2012). Is VIX an investor fear gauge in BRIC equity markets?. *Journal of Multinational Financial Management*, *22*(3), 55-65.

Seale Jr, J.L., Regmi, A. and Bernstein, J., 2003. *International evidence on food consumption patterns* (No. 1488-2016-123508).

Sumanasinghe, R. D., & King, M. W. (2003). New trends in biotextiles—the challenge of tissue engineering. *J Text Apparel Technol Manage*, *3*(2), 1-13.

Taneja, H., Webster, J. G., Malthouse, E. C., & Ksiazek, T. B. (2012). Media consumption across platforms: Identifying user-defined repertoires. *New media & society*, *14*(6), 951-968.

Tatikonda, M. V., & Rosenthal, S. R. (2000). Successful execution of product development projects: Balancing firmness and flexibility in the innovation process. *Journal of operations management*, *18*(4), 401-425.

Ulrich, D., & Smallwood, N. (2004). Capitalizing on capabilities. *Harvard business review*, 119-128.