

# Grand challenges and technological developments in textile manufacturing industry

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## **Abstract**

This paper presents an industrial assessment model for textile industry and provides the result of the assessment of current technological developments. It highlights the importance of technical and intelligent textiles as well as automation systems. The paper presents the grand challenges to be faced by the industry and lists out the driving forces of the sector. It also recommends a simple road map to adapt to the technological developments.

## **Keywords**

Textile Industry assessment, Driving Forces, Grand challenges

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## **1. Introduction**

Textile is one of the sensitive industrial sector which effects the national economies. This becomes prominent especially after the Chinese effect on the market in the last decade. The recent developments indicate that there are several factors which create competitive advantages within international markets. Among them are price, quality and delivery speed. The recent study [Temiroglu, 2007] indicates that it is very difficult to sustain market share after very high competitive environment regarding these. Textile sector is seeking for alternative products which in turn require alternative manufacturing systems and production models and methods.

This paper presents a methodological analysis of textile sector which produces grand challenges and identifies driving forces which should take the attention of the industry for increasing or at least keeping the market share.

In order to develop and sustain competitive advantage and follow the change and technological progress, the study takes the attentions into a systematic assessment of the sector which can identify challenges and driving forces. Therefore a proposed assessment model is presented first and then paper concentrates the findings related to new technological developments.

## **2. Proposed assessment model**

Figure 1 illustrated the basic elements of the proposed model.

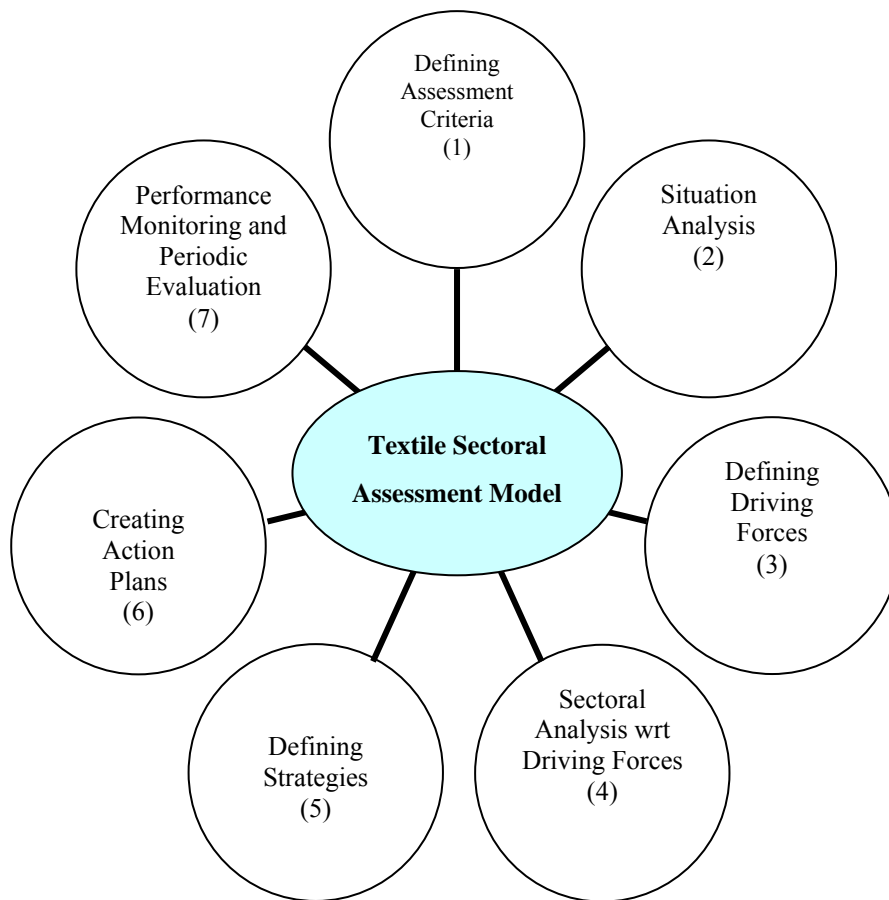


Figure 1: Proposed assessment model for textile sector

Each module of the proposed model provides an extensive analysis of sub factors which will indicate the progress and main issues of the industry. Assessment criteria employed includes

- ✓ General industrial information
- ✓ Raw material developments
- ✓ Industrial trend
- ✓ Technological developments
- ✓ Delivery channels
- ✓ Economic developments
- ✓ Financial analysis
- ✓ Human resources
- ✓ Expectations of industrial actors
- ✓ Company joint venture opportunities
- ✓ Geographic and regional developments
- ✓ Commercial scenarios

The study pointed out that the technological developments are the predominant driving forces among the others. This study therefore presents findings only related to the technological progress.

### 3. Grand Challenges in textile industry

As mentioned previously, traditional textile industries are facing a big challenge regarding the price, quality and deliver speed. However, technological developments bring some extra challenges which need to be managed properly. The study indicated the following of them.

- ✓ Rapid prototyping systems are strictly demanded. If the progress is not followed with necessary background, an important chance for competitive advantage could be lost. Textile industry requires reconfigurable machines as different textile products need to be produced as much faster as possible.
- ✓ New products may create new demand in the market. Technical (Emek, 2005) and/or intelligent textile products (Tarakcioglu, 2005) provide useful functionalities which could require extra

cost otherwise. Multi functional products may results new market share and competitive advantage. It should be noted that it will not be easy for the competitors to catch it up as the new products and systems could be created much faster than ever before.

- ✓ Implementing lean production systems (Womack et.al., 1991) and concurrent engineering methods to decrease the cost and improve the efficiency and effectiveness.
- ✓ Technical resources are becoming more dominant then human resources. The machines and methods should be taken care of and should be adapted to technological developments which do not seem to be easy.
- ✓ Autonomous decision making and decision support systems (Turban and Aronson, 1998) should be unavoidable. However, practitioners in textile industry do not familiar with computer supported decision making system. They should be spending some resources to create information infrastructures of their organization as well as equip this with related information systems.
- ✓ Textile industry creates a negative effect in the environment if not enough investment is provided for required protection.
- ✓ Integrated manufacturing functionalities should be extended to include R&D activities as well as traditional manufacturing units such as design, manufacture, storage and delivery etc.
- ✓ Technical and intelligent textile products should be supported in the market with well designed logistic systems. If the new manufacturing lines can not be supported with effective supply chains (Cooper et al., 1997) then the demand could easily be shifted to other products.

#### **4. Technological developments in textile industry**

The study clearly indicated that the trend of the technological developments in textile industry can be classified as the following.

- ✓ Automation and intelligent machines (intelligent manufacturing)
- ✓ R&D studies

- ✓ Technical textile development
- ✓ Intelligent textile development

Rational behind these are the following.

1. The price of the products are defined in the market and the organizations should develop new manufacturing technologies such as lean manufacturing to increase the efficiency of manufacturing line and decrease the cost.
2. Capacity utilization within the textile industry is decreasing due to Chinese effect and loss of demand. The improvement in the processes and production methods may create new textile systems which can be demanded in the market.
3. Raw material and production costs can be drastically reduced through automation and intelligent machining systems.
4. There is a tendency in intelligent textile products and technical textiles which can not be manufactured by every manufacturer. In the market there is not as much enough competition as traditional textile regarding with the price and quality as well as delivery speed.
5. Technologic developments in intelligent systems and machining operations makes it possible to create new approaches and products with new functionalities more easily then ever before
6. There has been various areas of applications where technical textiles and intelligent textile products is highly demanded.
7. As the speed of production and delivery is the main issue for competitive advantage, there is a tendency to implement automation and take the benefit of especially intelligent machining operations reducing costs and yielding more products with better quality.

#### **5. Technological adaptation to the progress**

As technological developments are unavoidable and adaptation process is somehow to be faced one way or another, the study is extended to define a road map for this purpose. The following is proposed. It should be noted that new products, fashions, and new opportunities in the market appear so much fast in the textile industry. For some products changes in the market appears to be

in every months even every fortnights. The road map should be considered with this fact in mind.

- ✓ **Revising grand challenges periodically:** Grand challenges are changing quite often due to the heavy technological improvements.
- ✓ **Creating a technology watch and forecasting:** Speed of the new products and new methods appearing in the market should make the practioners to continuously monitor the progress and perform technological forecasting to create strategies for investments.
- ✓ **Designing a technology inventory for textile industry:** This is very important to make profit and get benefit with the existing technologies. Due to lack of knowledge and missing information R&D activities should not be directed to provides results.
- ✓ **R&D capabilities and infrastructure:** Customer driven R&D as well as research based procurement systems seems to be more elaborated in the near future. This obviously creates new market opportunities which assure the competitive advantages.

## 6. Conclusion

Traditional textile industry is facing a very big challenge in the market and companies in developed countries are loosing market shares due to heavy competitiveness regarding price, quality and speed of delivery. This takes the attention of the actors of the industry towards new manufacturing methods, new products such as intelligent textiles as well as technical textiles.

Due to fast changes and heavy competitiveness the assessment models become more critical. This paper presented an assessment model. The

proposed analysis model is implemented in Turkey to perform the assessment and the results of the analysis regarding the technological developments are summarized in this paper. The technological assessment is performed based on situation analysis and grand challenges to be faced are identified. The evaluation process produced not only the grand challenges but also the driving forces which indicate the technological trends. Based on this analysis, a roadmap is produced.

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