AN ANALYSIS OF THE CURRENT STATUS OF THE FOOTWEAR INDUSTRY IN SRI LANKA

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ABSTRACT

Footwear industry in Sri Lanka has survived for a long period of time and this industry has successfully catered the local market till the early 90's, but in the recent past, this industry has been seriously affected by dumping of footwear products from East Asian countries, especially from China. Another reason for this is lack of proper planning. It is believed that the local footwear industry is capable of even exploring an international market. It might have a huge potential especially in the western countries as fashion oriented designer-wear, but this industry has not acquired enough attention of the relevant parties. It should be noted that the involvement of engineering know-how in the footwear industry is minimal. Although, there is some minute engineering involvement, the technology transfer to the footwear industry is negligible compared with the global arena. Firstly, no proper research has been carried out focussing on the problems related to the footwear industry in recent years in Sri Lanka. Secondly, the present situation with respect to the footwear industry has not been systematically evaluated by any organization or individual. Finally, most of the footwear manufacturing firms are carrying out their businesses individually, thinking that this prowess is unique to individual businesses. This was identified during the data collection phase of this research. Therefore, there is a necessity for comprehensive research, which is highly demanded by the industry and, that would be beneficial to all stakeholders of this industry at large. This work focuses on the issues discussed above and proposes a classification as well as general recommendations for the future advancement of the industry.

Keywords: Footwear, Manufacturing, Technology.

INTRODUCTION

The human foot combines mechanical complexity and structural strength. The foot can sustain enormous pressures and provides flexibility and resiliency (Salathe and Arangio, 2002; podiatry channel, 2005). The foot contains 26 bones; 33 joints; more than 100 muscles, tendons (fibrous tissues that connect muscles to bones), and ligaments (fibrous tissues that connect bones to other bones); and a network of blood vessels, nerves, skin, and soft tissue (Morton, 1935; podiatry channel, 2005; Bata, 2005). These components work together to provide the body with support, balance, and mobility (Salathe and Arangio, 2002). This combination also gives the structure to the foot, but no two feet could be observed with similar proportions because of anatomical variations present in feet within and among individuals. The human foot is extremely sensitive to changes in other organs and external conditions. On one hand, a structural flaw or malfunction in any one part of the feet can result in the development of problems elsewhere in the body. On the other hand, abnormalities in other parts of the body can lead to problems in the feet (podiatry channel, 2005).

Therefore, correct design and manufacturing procedures are essential for the footwear industry to ensure comfort and foot safety, which are the primary objectives of wearing shoes. This is one of the prime reasons for changing shoe designs frequently. This fact is evident from the continuous improvement of foot and last measurement equipment and techniques (Bidegain, Bidegain, Georges, Baumann and Baumann, 1983; Gumbert, 1998; Dorsey and Irene, 2000; Tadin, 2002). As a result, research is being carried out in different parts of the world to provide the best features possible to protect different foot types from discomfort and injury (Goonetilleke and Luximon, 2001; Kos and Duhovnik, 2002). At the same time, designer footwear focusing on trends and style are also developed and tested all over the world. In order to cater for the above mentioned main and auxiliary requirements of footwear, different shoe lasts are produced. Lasts with different features are produced to accommodate different types of feet (orthopaedic sportsmed, 2005). Figure 1 depicts some major features and measurements of a last. The fit of a shoe depends on the design, shape and volume of the last. The lasts must represent the anatomical information of the feet; at the same time, give the finished shoe a pleasing and fashionable appearance.

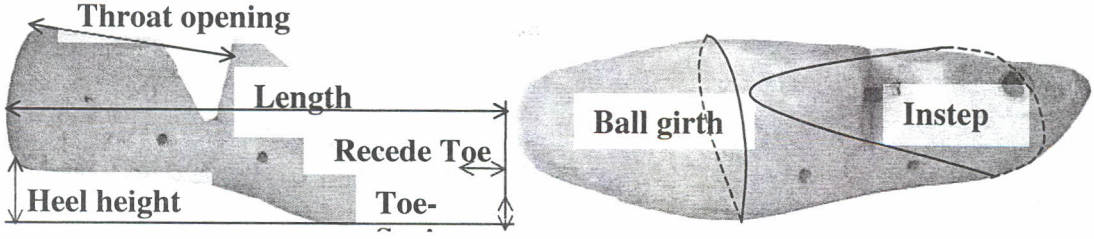

Figure 1. Major Features of a Last

In order to design a last, several measurements have to be considered. The majority of measurements are volume based rather than the traditional length and width associated with shoe fit. Although in Sri Lanka, footwear industry uses basic measuring methods, according to latest concepts, feet are scanned to obtain an accurate shape of lasts. For this, 3D digitisers, 3D laser scanners and 3D imaging technology are widely used (Cheuk, 1998; Luximon, 2001; Mochimaru, Kouchi and Dohi, 2000). These measurements require careful assessment of the foot, which cannot be accomplished with the same precision as linear measurements. The modern last makers use precision instruments to determine girth measurements, whereas old shoemakers used the hand span to this same effect. Aspects of the foot were measured against the shoemaker's hand; the ball of the foot was compared to the girth between the thumb and the middle finger. The instep was measured between the thumb and the little finger. This method was subject to enormous variations depending upon the size of the shoemaker's hand. This signifies the importance of modern techniques of measuring.

Footwear manufacturers in developed countries use the above mentioned technology and are trying to optimise the products that go into the hands of customers. In the Asian context, China, India, Thailand, Vietnam, and Malaysia are found to be the major shoe manufacturers. According to literature, all these countries use cutting edge technology for footwear manufacturing. They are in a position where they could produce high quality footwear at low cost. They also have their own strong research base (CLFI, 2005; FDDI, 2005; CLRI, 2005). With respect to the usage of technology, Sri Lanka is far away lagging behind the rest of the Asian countries. This is evident from the survey and analysis discussed in detail under following

sections of this paper. Literature available regarding this industry is minimal and no proper research has been undertaken to uplift the footwear industry in Sri Lanka. Some literature pertinent to the footwear industry is available at the Industrial Development Board (IDB), Export development Board (EDB) and the Industrial Development Authority (IDA). A master thesis by Nakandala (2004) is evidence for one of such rare research related to technological aspects of the leather industry that has been carried out by academics in Sri Lanka.

OBJECTIVES

Thinking in line with the above introduction, this research has focused on the local footwear industry with an emphasis on the technological aspects. This research is intended to provide an input for the development of the local footwear industry through an investigation of the present status of the footwear sector with respect to political, economic, social, and technological (PEST) considerations. Final objective was to recommend in-depth solutions for the above identified technological problems. This work is an initial attempt towards introducing new technology and techniques to the footwear industry in Sri Lanka.

METHODOLOGY

This research was carried out in several phases. During the initial phase, to assess the level of technology used in the footwear industry in other countries, a literature survey was carried out. Information was sought from theses, journal papers, articles, patents, conference proceedings, and from websites related to technology providers. This phase provided the basic information related to the footwear industry too. Then a literature survey was carried out along with a series of factory visits to collect data on existing practices and technology in the Sri Lankan footwear industry. In addition, to acquire knowledge on the current technological and operational practices, footwear manufacturing plants, footwear production machinery manufacturing plants and other associated organisations were visited. Expert knowledge in footwear industry was elicited through interviews. For this purpose, a questionnaire was formulated with both open and close ended questions.

ANALYSIS

A comprehensive analysis of the data elicited throughout the first and the second phase was carried out. Initially, it was a SWOT analysis to investigate the present status of the footwear industry in general and pros and cons of the industry were identified according to PEST considerations. A comparison between the Sri Lankan footwear industry and other countries where the footwear industry is advanced was done with respect to the footwear industry. A cluster analysis was carried out according to a hierarchical clustering algorithm to classify the industry (Jain, Murty and Flynn, 1999). All manufacturing processes were analysed with an emphasis on technology, number of employees and production capacity. Through a proper study of the present operational level, recommendations for improvement were suggested depending

on the scale of industry. After carrying out an in-depth analysis on them, viable and suitable recommendations have been offered.

RESULTS AND DISCUSSION

Following were the major findings of this research project with respect to the SWOT analysis mentioned in the methodology.

Strengths

1.The literacy level of the Sri Lanka (92%) is in par with developed Asian nations (Infoplease, 2005). Most of the children in Sri Lanka get benefited from free education system and most of them go to school at least till grade eight. In year 2003 there had been 434,131 ordinary level registrants and 213,201 advanced level registrants, which bear testimony for the level of education the labour force (Dept. of census and statistics, 2004). As a result, Sri Lankan labour force can be easily trained.

2.The footwear industry is facilitated by many supporting industries which are well established such as the leather and last manufacturing, but these industries have not developed over time.

3.Sri Lanka holds a name for craftsmanship in the global market. This excellence has come from agricultural products (e.g. Tea) to finished apparel products. This image can be a bonus for even footwear products, to compete in the international market. Quality may be promoted to gain the competitive advantage over other footwear producing countries.

4.Labour laws prevalent in Sri Lanka are conducive to workers and most of them are in compliance with international labour laws (Silva, 1997). The government carefully monitors the well-being of the working sector. Child labour is not used in manufacturing processes like in other South Asian countries (e.g. Bangladesh). This makes Sri Lanka an ethical manufacturer.

5.Sri Lanka is strategically located in close proximity to major sea and air tracks. As a result, time consumed for logistics will be less compared to other Asian countries like Vietnam and Thailand. Since the competition is tough for fashion oriented products in American and European markets, Sri Lanka might have an advantage over the other East Asian countries due to this reason.

6.The footwear industry is supported by established footwear manufacturing machine industry. This industry caters for the needs of the footwear manufacturing plants in Sri Lanka. This industry can be considered as fully complementing the local footwear industry making the whole industry self sufficient at present level of technology.

Weaknesses

1. Sri Lankan footwear manufacturers are lagging behind in application of standard techniques for maintenance, quality control, process planning and testing etc. because of the competition of prices. Even the large scale manufacturers in the local context have not implemented these procedures. Considering global trends, effective maintenance procedures such as TPM (Total Productive Maintenance) and quality procedures such as TQM (Total Quality Management) are common.

2. Product development in footwear industry is virtually nonexistent compared to the international footwear companies. SME sector cannot focus much on this aspect because of financial constraints. Even though, product development is important for continuous improvement, even the large scale manufacturers are reluctant to focus on product development.

3. Local manufacturers are not interested in getting feedback from the customers for products they put into the market. The communication between the marketing and production departments is poor. This may lead to failure in identifying customer preferences. Hence, local footwear has not been able to achieve customer satisfaction. As a consequence, local customers have gradually accepted imported footwear. Also, a lot of designs have failed to achieve the target marketing bench marks.

4. The facilities for training in the footwear industry are minimal. This is because of lack of training institutions. There is only one training centre, which is under the IDB. Due to lack of facilities and awareness on available resources, the number of participants for the offered training courses is low.

5. In order to get the best output from the production process, the raw material should be good in quality. Due to lack of laboratory facilities for footwear industry, especially for raw material testing, quality testing and for research and development, Sri Lankan manufacturers find it difficult to keep up with the global quality standards.

6. Institutions that are established for the development of footwear industry are not independent. Legal, institutional and financial barriers are encountered when carrying out activities for the betterment of the industry. There are stringent government rules and regulations that have to be followed most of the time delaying development projects. Sometimes these even result in abandonment of such projects.

7. Financial institutions are not flexible enough to assist the local industries to find necessary finances to initiate businesses or to expand. The interest rates and the bank guarantees are beyond the reach of the local manufacturer. The SME sector finds it difficult to keep up with the ever improving technology because of lack of financial assistance from banks even if they are capable of using the technology.

8. Sri Lankan footwear industry suffers from negative attitude of the public towards locally manufactured products. Machinery manufacturers also face this problem. Even though level of quality is matched with international standards, the local customers reject these products because it is under "Made in Sri Lanka" label.

9. Technological knowledge present in the footwear industry is minimal in the local footwear industry. It has made this industry backward that uses primitive machinery and production techniques.

Opportunities

1. There is a good potential market for export for both footwear and footwear manufacturing machinery. Sri Lanka at present is exporting canvas shoes to several countries and it was found that there is an increasing demand for fashion oriented hand made footwear from European countries. One remarkable fact is that, Sri Lankan footwear manufacturing machinery have just ventured into the export market and is about to export to India.

2. Latest trend for footwear is not only in large scale manufacturing, but also in SME sector manufacturing that can go for high quality footwear. There is a huge demand for 100% leather products especially in European Union countries. There are niche markets that the SME sector can venture outside Sri Lanka and also within Sri Lanka.

3. Sri Lanka being a country based on agriculture, quality leather may be easily obtained. This will benefit both cattle farming and leather industries. At the moment, footwear industry depends on the Indian supply of leather as well.

4. Technological knowledge and expertise of our academia may be harnessed for the betterment of the industry. Universities and footwear industry may complement each other in this exercise. If knowledge transfer from the universities to a footwear industry is properly managed, this industry may also be developed as the apparel industry.

Threats

1. Dumping of low priced footwear from countries such as China, Thailand, Vietnam and Hong Kong has severely affected the local footwear industry. Their production costs are much lower than that of the Sri Lankan industry due to the usage of latest technology and economies of scale.
2. Environmental regulations have been barriers for the development of this industry. Tanning process is associated with environmental impact and the Sri Lankan environmental regulations are unfavourable for the development of the leather industry.

3. Sri Lanka is a country with a majority of Buddhists. Therefore, religious reasoning has affected the raw material processing industry especially the tanning and related processes.

4. Governmental laws and regulations are unfavourable for the local enterprises most of the time. The taxes imposed on the local manufacturers are unbearable for the SME sector. For the well being of the industry, the manufacturers should be guided and assisted more by the government.

5. At present, Sri Lanka is facing a huge power crisis. All the industries suffer from high overheads from the increasing tariffs of the national power supply. Footwear industry is no exception. It also has to add this high overhead to the production cost. This factor has a considerable influence on large scale manufactures.

After the above analysis, the following spider charts were obtained for strengths (Figure 2a), weaknesses (Figure 2b), opportunities (Figure 2c) and threats (Figure 2d). These figures clearly represent the positioning of the Sri Lankan footwear industry in the global context. Italy and China were selected for comparison because Italy is considered as a quality footwear producing country with an average production volume, and China is considered a country that is mass producing footwear. All strengths, weaknesses, opportunities and strengths were represented in scales in order to make visualisation easy.

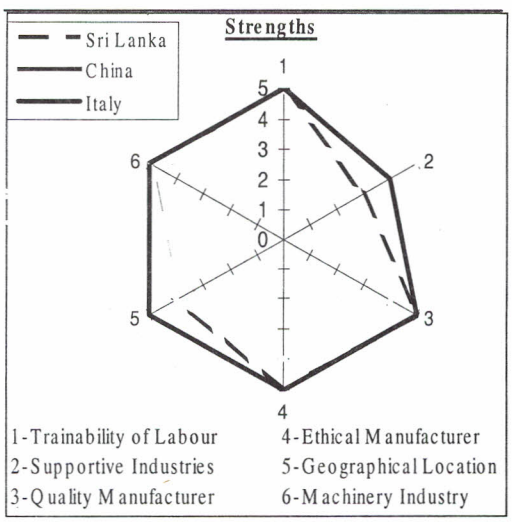

Figure 2a. Strengths

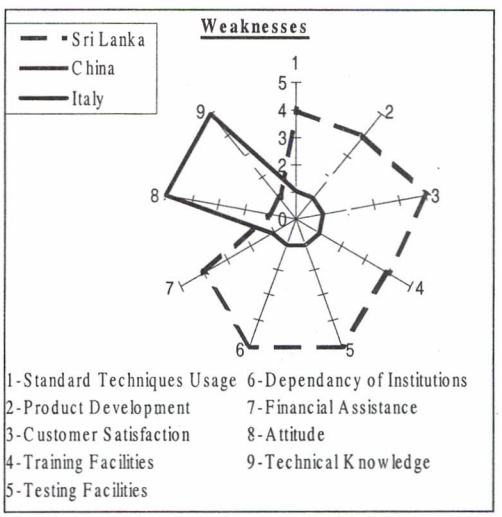

Figure 2b. Weaknesses

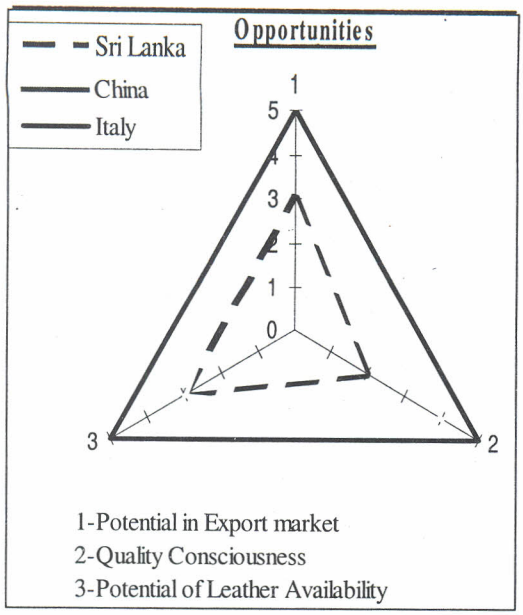

Figure 2c. Opportunities

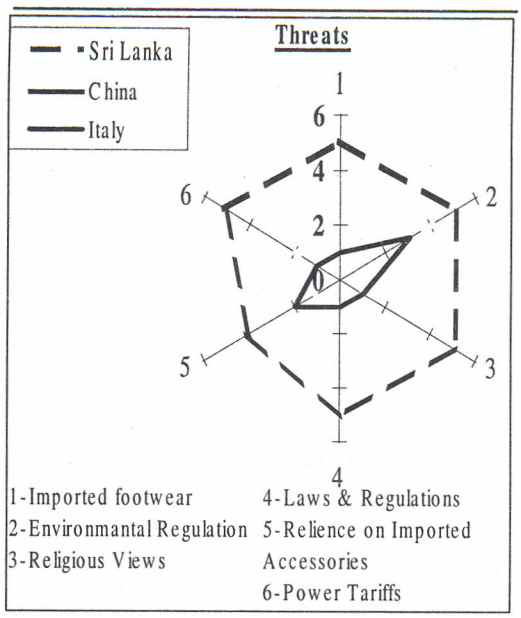

Figure 2d. Threats

CLASSIFICATION OF THE INDUSTRY

After the SWOT analysis, a clusterisation of the footwear industry was performed using a hierarchical clusterisation method (Figure 3) to derive a taxonomy of the footwear industry of Sri Lanka. For this analysis, data from a representative sample of fourteen different footwear manufacturing organisations were considered. Clusterisation with respect to the production output was not performed because the production output data included rubber slippers, which makes the result bias. Although a large number of slippers are produced, for which the technology requirement is also low, the number of workers needed to manufacture slippers is low. As an example, an industry that produces only rubber slippers had only 3 workers and the production was 12,000 pairs per year. As a result, the number of employees in the organisation was considered more representative of the capacity of the industry from observation. There was a correlation (R^2 = 0.67) between the number of workers and the production variety of industries. Production variety is also evidence for the capability of the organisation. At a level of 350 employees, two distinct clusters could be identified. As a result, two clusters from footwear manufacturing organisations could be made. Along with a cluster of cottage industries, altogether three clusters in the footwear manufacturing sector could be recognised with common features.

After the above general analysis, technological issues were studied and analysed in detail to identify the technological issues related to the footwear industry where the engineering input may be required. Advanced machinery and technology are virtually nonexistent in both SME and large scale footwear manufacturing sector. The machinery used in SME sector is comparatively primitive. Manufacturing and maintenance of the machinery is simple, but the capacity of these machines minimal. In large scale industries, some high capacity machines such as injection moulding machines, material processing machines are being used, but footwear

design and product development aspects don't acquire proper attention from the local manufacturers. Each of these problems were separately analysed and solutions are suggested to overcome them.

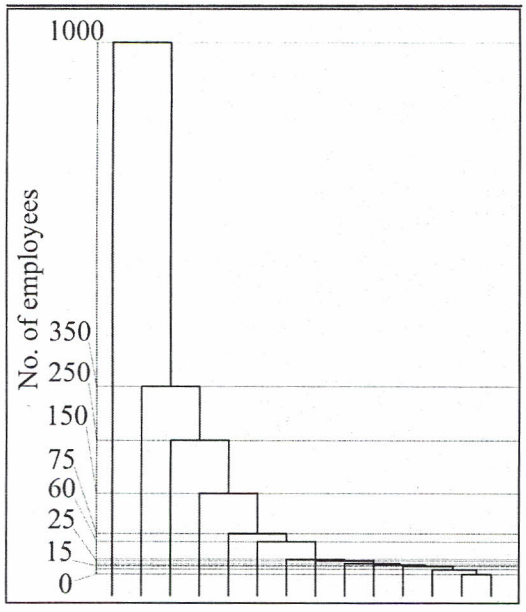

Figure 3. Hierarchical Clustering of the Footwear Manufacturing Industries According to the Number of Employees

Pattern cutting is one of the important functions in footwear manufacturing. Overhead hydraulic presses and die sets are being used for pattern cutting at present. By this method, a lot of raw material gets wasted. According to manufacturers, about 30% of the raw material gets wasted as off cut. This involves in an additional overhead cost and a disposal cost. The off cut creates environmental problems as well. Large and medium level manufacturers are affected by this problem since they do not use any optimisation technique to get the most out of the raw material. In order to get the most out of the available raw material, in the pattern designing stage, interlocking parts may be designed. Similar designing is done in ready made garment industry using CAD/CAM machinery. There are dedicated software to design patterns for footwear. Raw material can be utilised optimally by using these software. This will lead to high production rate as well. Large scale manufacturers may be able to bear the cost of moving in to CAD/CAM. Almost all footwear manufacturing industries will get benefited if a common service centre with CAD/CAM facilities is established. It may be possible to bring down the cost of production if a nominal fee is involved. Universities can provide necessary technical assistance to overcome the technology gap.

Another shortcoming is seen in last manufacturing. The last may change from design to design. In today's fashion world, fashion trends change rapidly. Most of the time, large scale manufacturers get their lasts designed and manufactured abroad. The charges are high and also the time taken to get a set of lasts is considerably high. This leads to high production costs and most of the time fashion trends get obsolete when the last arrives with a lead time. To go for an

export oriented market this is a barrier. Sri Lankan last manufacturers use manual methods to manufacture lasts and get copies from mechanical copying machines. There are software specially developed for last design and grading. Using CAD/CAM facilities, accurate shoe lasts can be manufactured. Since the cost for this sophisticated equipment is high, these services can be provided through a government funded common centre at subsidised rates. Universities can provide technical expertise for using CAD/CAM and also utilise the existing CAD/CAM facilities. The mechanical copying machines may also be re-engineered to have high accuracy and yield.

Quality of the locally manufactured footwear is not of a satisfactory level. Quality can be evaluated according to the fit, finishing and durability. In general most of the manufacturers are not aware of the quality factor. This is especially so in the SME sector. Large scale manufacturers also do not practise standard quality checking. In order to venture into the global market, quality of a product is vital. In order to get benefited from the image as a quality producer, quality of products should be maintained at a high level. Large scale manufacturers should focus more on this aspect. There should be quality checking throughout the production process. Implementing TQM may be feasible. Putting up quality assurance laboratories and employing a dedicated quality staff to monitor and measure quality may improve the quality levels. In order to achieve high quality, large scale manufacturers can go for specially developed software for shoe testing. Small and medium scale manufacturers are not keen about the quality factor. There should be awareness campaigns to orient them towards improvement of quality. Human involvement in the production process is high in many SME factories. The quality may be low or may vary due to this reason. Implementation of simple techniques such as quality control charts may help maintain and improve quality.

The level of productivity of the local footwear manufacturers is relatively low. Most of the facilities are underutilised. Especially in the large scale sector there should be increased production rates in order to compete in the local market as well as in the international market. Idling machines and labour increases the production cost. The cost of a pair of shoes may be reduced, giving a huge boost to compete with foreign footwear producers by achieving a high production rate. Methods to monitor the levels of productivity and clearly set targets may have to be implemented. Work study teams may be trained to monitor the production processes and implement necessary steps to overcome bottlenecks, time delays etc.

There are many operations management practices that the local footwear manufacturers can follow in order to get a streamlined production process. This is a must in order to be export oriented. SME sector can also follow these steps to upgrade their levels of production. Large scale manufacturers can go for proper material handling techniques. They can implement bin systems in order to get smooth flow of material. There is a clear need to go for MRP or ERP systems since the market competition in the footwear industry is high. SME sector does not give operations management practises due regard. At least the SME sector can go for 5S methods in their factories. There should be proper inventory control systems to monitor material usage and for production planning. There should be awareness campaigns to focus them more into this aspect. Universities and relevant government institutions (e.g. IDB, IDA, and EDB etc.) may take part in actions to improve.

Most of the machines used in the SME sector of the footwear industry are simple and primitive machines. These machines may be manufactured in Sri Lanka. More sophisticated machines may be designed and manufactured for the benefit of the local manufacturers. Existing machines may be upgraded using techniques of reengineering. In large scale manufacturing plants, there are processes that may be easily automated. Level of productivity of the processes, the capacity and the quality may also be increased by implementing automated systems. Universities and research centres may cater for the relevant needs. More simple machines may be designed and manufactured using the technical know how in the universities and industry.

CONCLUSIONS

The deep rooted Sri Lankan footwear industry has the potential to compete with other footwear producers in the world by venturing into niche markets with a high demand for designer footwear. In order to explore the possibilities of such a venture, the industry needs to be empowered by providing correct support. The experts in the industry and technical know how within the country may be harnessed to transfer technology to the footwear industry. Sri Lankan footwear sector can be classified into three distinct categories. The industrial organisations can be clustered into two with respect to the number of employees in the organisations and there is also a cottage industry for footwear manufacturing. For these sectors, separate strategies may have to be used to train personnel and transfer technology. Footwear manufacturers, suppliers of accessories, leather manufacturers, footwear manufacturing machinery producers, universities and other research and development institutions and the rubber industry were identified as the main stakeholders of the footwear manufacturing sector in Sri Lanka. Improvement of all the above mentioned stakeholders is required to develop this sector. For further development of the industry, research and development suitable for Sri Lanka is seen as a must.

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