

# Integrating 5S Principles as a Strategy for Improving Clothing Manufacture

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## Abstract

The supply chain in the clothing is continuously influenced by internal and external competition. The industrialisation of the industry continues to impact all stakeholders throughout the world. Competition is rife in terms of value-add, quality, delivery dates and cost. Many of the manufacturers continue to operate without any kind of strategy to improve current conditions. Market share is being transferred outside the boundaries of the country. The retail industry maintained its impetus in terms of supply to the ultimate customer but the sourcing of finished products moved towards the east primarily due to cost competitiveness. In order to improve the current status, 5S principles may be implemented as a competitive strategy. This simple re-organisation of the workplace would significantly improve ergonomics in its totality, thereby creating an environment that is conducive for productive machine operation. It may be used as a competitive strategy that would cultivate strength in manufacturing capabilities. This paper evaluates current paradigms and implements 5S principles as a means of improvement through a case study in one organisation. Data regarding certain aspects were gathered from 45 clothing manufactures in the Kwa-Zulu Natal area.

**Keywords:** clothing industry, 5S principles, industrial engineering, ergonomics, continuous improvement.

## Introduction

The clothing industry in South Africa is plagued by inefficiencies. Considering it a labour intensive industry, simple organisation of work is problematic as the structures in place do not support ergonomic layouts. Organisation of labour, input, process and output are impacted through a lack of an organized systems. Clutter, dis-organisation and a lack of managerial expertise on industrial engineering

principles in a workplace reduces labour, material and machine productivity as the current labour efficiency is estimated to be in the region of 50%. Numerous organisations in the clothing and textile sector are besieged by inefficiencies throughout the manufacturing process. In order to improve the competitive position of the industry, it is imperative that simple strategies of re-organisation and re-engineering be implemented to, not only improve the efficiency, but to also contribute to the health and safety of workers (Barnes, 2005; Berry et al., 2012).

Other factors that influence the inefficiency in the industry include, but are not limited to the following:

- Inability to change with new trends
- Lack of effective leadership and management
- Poor utilisation of resources
- Inverted pyramid in terms of management
- Poor investment in technology
- Lack of managerial qualities
- Inability to implement skills development
- Poor strategy implementation
- Poor relations with labour
- Working in “silos”
- Poor communication among departments
- Poor team spirit (Esset, 2003; Ramdass, 2009)

The industry is plagued with retrenchments and employment levels over the past 30 years. The majority of the sample (73%) complained about the decline in employment levels during the 1999-2017 periods. The information elucidates that the clothing industry continues on a downward spiral. However, with assistance from government the industry is stabilising in terms of employment (Bendex, 2010).

## **Method**

The approach of the study considered a qualitative research methodology through that application of a case study. Although case studies endure criticism, they remain robust as an approach for data collection. The methodology allows exploration and understanding of complex phenomena through in-depth scrutiny. The case study methodology was performed at a number of manufacturing organisations as this provided an overview of the status of the industry. Information was gathered through direct observation and communication with supervisors and workers, focus group interviews with employees regarding their experiences and observations and the review of applicable literature from clothing related journals and applicable text. Descriptive statistics was used to explain certain phenomena (Blumberg, et al.2014).

## **Literature Review**

Several authors provided critical insight into order winning strategies. Stephenson (2015) formalised four competitive priorities which he categorised as price, quality, dependability and flexibility. These dimensions are totally appropriate for the clothing industry as organisations compete within these dimensions. Further

examination postulates that price and quality are key order winners within the industry.

Goetsch and Davis (2016) identified five different dimensions namely price; quality; dependability; product flexibility; and volume flexibility. These dimensions are similar to that of Stevenson with the addition of flexibility in terms of products and volume. Through simple manipulation and re-organisation, a clothing manufacturer can produce skirts, blouses, shirts, trousers, underwear, dresses and so forth. The supply chain determines the production of garments. In the clothing industry perspective, a pull supply chain system is used where customer orders drive the production line. Brouwer et al, (2002) added to competitive priorities by proposing plant and equipment, production planning and control, labour, product design and management. These are all appropriate as well maintained machinery and skilled labour, together with planning of production, product design and leadership enhance the efficiency and effectiveness of production management (Gapp et.al (2008).

Hill (2000) postulated that it is imperative for an organisation to critically analyse criteria that would "win orders." His "order-winning" criteria added product variety as an important variable. However, in the clothing industry which is extremely competitive, organisations are encouraged to look at niche markets. This means that they need to focus on what they are "good" at. This may mean that organisations may have variety with a particular product. He also mention performance which considers productivity, efficiency and effectiveness as imperative in a competitive environment.

Val Halen (2005) and Chan (2005) further added to the list of criteria and considered variables such as product design, cost of quality, delivery deadlines and customisation. It is imperative to note that these variables are in-exhaustive as many more variables could be added as one analyses the performance criteria of the clothing industry in particular.

In conclusion of the literature review, what separates the clothing industry in South Africa with the international industry is the resistance to change and the lack of motivation and discipline to embrace improvements within the work environment. As a simple strategy for improvement, 5S principles was chosen to improve the conditions in the working environment.

## **Results and Discussion**

### **Introduction**

The South African clothing industry has potential for the improvement of productivity in the region of 30% through the implementation of industrial engineering methodology. It may be noted that several of the larger organisations have radically reduced in size and product offerings over the last 3 decades. One such manufacturer is South African Clothing Industry who had a staff complement

of over 2000 employees in the 1980's. Currently there are approximately 300 employees. Most of their operations moved into areas such as Lesotho, Isithebe, Newcastle and Swaziland. One of the primary reasons for this is labour cost which ultimately determines product cost as a primary cost factor. As organisations became smaller and disintegrated, many industrial engineering personnel were lost and organisations deteriorated in terms of the application of simple tools that provide a conducive environment for production.

A bag manufacturer was targeted as a potential for implementation of the 5S principles. It was observed that one of the potential barriers for improvement is management. It took several discussions to persuade management about the potential for improvement and the importance of being competitive. It is important that leadership is people orientated with an insight into cultural diversity, financial management by understanding organisational costs, service delivery with quality management imperatives and last but not least, continuous improvement with the 5S principles as the basis for improvement.

The results were broken down into themes aligned to the 5S principles.

### **Theme 1 - organisation (seiri )**

Cooper (1987) and Dizaji et al (2011) mentioned that if one improves a worker's comfort level, then one improves the company's productivity level. Ergonomics is about the design of workplaces that integrates the rhythmical movements of both hands with the material and the sewing machine. The current workplace is plagued with inefficiency in terms of seating, lighting, workplace layout, disposal equipment, input material and the layout of the workplace. This inefficiency at each workplace reduces human-machine interface by approximately 50%.

The typical inefficiency currently experienced include, but are not limited to the following are:

- Poor operator efficiency
- Lost time in terms of machine and operator utilization
- Higher medical costs due to operator carpal tunnel syndrome
- Material costs - due to lost component parts
- Absenteeism due to operator frustration
- Poor quality and increased defects
- Fatigue, strains, injury
- Operator sabotage of machines
- Machine downtime
- Accidents and errors
- Labour turnover
- Poor productivity levels
- Reduced competitiveness (Jaca, et al. 2014)

The focus group mentioned that space was a major problem and concern as many operators were not visible due to bundles of panels, patterns, thread and pieces of material around them. It was observed that the ergonomic layout of the workplace in terms of work-in-progress inventory, man-machine interface, stretching out for assembly of fabrics was in disarray. Hand movements were non-rhythmic while materials for construction of garments was unorganised. This led to lost components and incomplete orders. Further, the components had to be re-cut to complete the quantity required from the order placed. Groups complained that orders were lost due to the time delay of re-cutting material for the completion of orders.

In order to address the issue operators were asked to apply the concept of stratification management. This was done through a series of mini-workshops with supervisors and workers. This meant evaluating all components within the workspace and separating them into what was required for immediate production and what needed to be removed. Therefore the importance and quantity of all was evaluated on a scale from 1 being most important to 5 being least important. The inventory of items required relocation to a storage area. Stratification management is involved with keeping only what is necessary for immediate production resulting in optimising the workplace for smooth manipulation of hand movements. Thus re-organisation of the workplace eliminates unnecessary inventory and makes everything visible. This improves visibility of the workplace which can be observed from any location within the layout of the factory. It also improves rhythmic movement of handing the components of the bag (Prabhuswamy, et al 2013); Chan (2005).

### **Theme 2 - neatness (seiton- housekeeping)**

The next theme that impacted the workplace was neatness. Due to the clutter, dust accumulated on many stagnant components that caused absenteeism and unhygienic working conditions. Staff complained that this was a health hazard which led to a number of employees suffering from allergies and related respiratory tract infections.

The clothing industry is labour intensive and predominantly female breadwinners. It is an industry that is plagued with a high rate of absenteeism. There are numerous factors that contribute to absenteeism. Some of the major factors as mentioned by supervisors and machinists are as follows:

- Poor working conditions
- Unhygienic surroundings
- Demotivation
- People behaviour

A small, medium and large organisation was sampled and provided the following results over a week.

*Table 1 Categorising absenteeism*

	Manufacturer	No of emp	No of abs	%	Direct Staff	Indirect Staff	
Monday	1	50	8	16	4	4	
Tuesday	1	50	6	12	2	1	
Wednesday	1	50	3	6	3	0	
Thursday	1	50	5	10	5	0	
Friday	1	50	1	2	1	1	
Average				9.2			
Monday	2	120	10	8	5	5	
Tuesday	2	120	12	10	4	8	
Wednesday	2	120	6	5	3	3	
Thursday	2	120	9	7.5	4	5	
Friday	2	120	11	9	5	6	
Average				7.9			
Monday	3	530	28	5.3	18	10	
Tuesday	3	530	35	6.6	22	13	
Wednesday	3	530	31	5.8	15	16	
Thursday	3	530	42	7.9	15	27	
Friday	3	530	25	4.7	13	12	
Average				6.06			

The average level of absenteeism is around 7.72% and correlates with the study by B&M Analysts which shows that the rate of absenteeism is approximately 7.2%. The predominantly female breadwinners take major strain in terms of family responsibility. One of the major concerns is that employees believe that they are entitled to their sick leave. The full quota of sick leave is taken during the course of the year and this burdens management in terms of overall productivity. An additional factor is the industrial relationship between employer and employee which seems to be irreparable. There is low morale, lack of trust, inefficiency, poor quality and increased costs (Falkowski and Kitowski, 2013).

Absenteeism can bring a production line to a standstill, especially if it is a key operation. This would result in line balancing problems where operators are reallocated to machining operations depending on their skills. This becomes the weakest link in terms of the theory of constraints and all focus is on the operation which is detrimental to the manufacturer in terms of quality, cost, delivery and profits.

The financial burden on manufacturers is huge due to absenteeism. Some organisations started an incentive to motivate people to be at work which burdens then financial status even further. Processes and procedures need to be implemented to address this problematic issue in order to improve productivity and the satisfaction of the supply chain.

Neatness encompasses the total surrounding of the employee which influences the performance of work. Discussions were held regarding all aspects of the workplace. Workstations were evaluated as to what was supposed to be there (following the principles of (JIT)) and what can be removed to ensure a smooth flow of work in process items. Obstructions to work flow were identified and removed by having a clearly defined layout. Decisions regarding the requirements of machinists was undertaken to stipulate that only what is required should be at the workstation. Such decisions were determined by the usage frequency of items. What was strongly stressed was “a place for everything and everything in its place.” In this way all obstructions were minimised for easy flow of production.

Mechanical objects that were infrequently used were stored in machine draws (example screwdrivers for the changing of needles). Jigs and fixtures were added to certain machines to enable ease of operation. Other than storage, attention was focussed on the ergonomic layout such as the chair, height of chair, the machine surface, posture of the operator, the pillows that distorted operator posture while seated and the like.

A system was developed for the identification, labelling, and work process flows that everyone understood, followed and maintained. Special attention was paid to the tidiness of notices and signs as it is a means of communication. These should be placed neatly at a convenient height so that they can be seen and yet not be an obstruction. What was also mentioned was the importance of using posters that remind operators of a healthy workplace. It was agreed that notices should also be of a proper size, and neatly typed with a clear heading.

### **Theme 3 - cleanliness (seiso)**

In view of the current experiences expressed and observed by 100% of the workforce, the workplace was in “shambles.” Untidiness of the workplace is visible to everyone, yet little is being done to improve the situation. In order to maintain a good image of cleanliness, employees were asked to clean their individual workspaces in the last 10 minutes of the day. A layout of the work environment and work spaces was charted to engage all employees individually in cleaning. No areas were left undefined or unaccounted for. Supervisors were required to make decisions in discarding items that were unnecessary to uncover areas for inspections. Discarding unwanted items made the area clear and uncluttered (Becker, 2001).

Visibility is vital in effectively identifying problems in the workplace. In addition it was suggested that machines be fitted with “robot” lights to indicate the urgency of problems that arise. The maintenance of machines, the workplace and the Daily inspection, lubrication and cleaning of equipment is part of preventive maintenance that would increase efficiency of the machinery. It was important that cleaning be done daily while inspections were scheduled to ensure that this was done religiously. Cleaning was extended beyond the work-area to all areas of the organisation even to areas not usually obvious, such as the washroom.

#### Theme 4 - standardisation (seiketsu)

"Seeing is believing"; thus emphasis must be placed on visual management. All workplaces are identical. Standardised conditions on site must be achieved so that work can be done quickly. The challenge faced by 70% of the organisations was a lack of standardisation. This is an aspect that is difficult to attain due to disagreements among staff. This should be implemented for every task in the organisation, even for the numbering of technical documents and other papers.

Although time was lost in certain instances, operators were asked to move around and observe their colleagues to create consistency among operators. This enables teams to emerge as to making the work environment as pleasant as possible for all. Standardised visual aids like indicators, labels and markers are easily recognisable and make communication simple and understandable, so that everyone can act quickly.

The following figure provides a layout that is standardised and all workstations are the same dependant on the type of machinery used. This is the process where the above three aspects of the 5S principles are put to practice at all workstations.

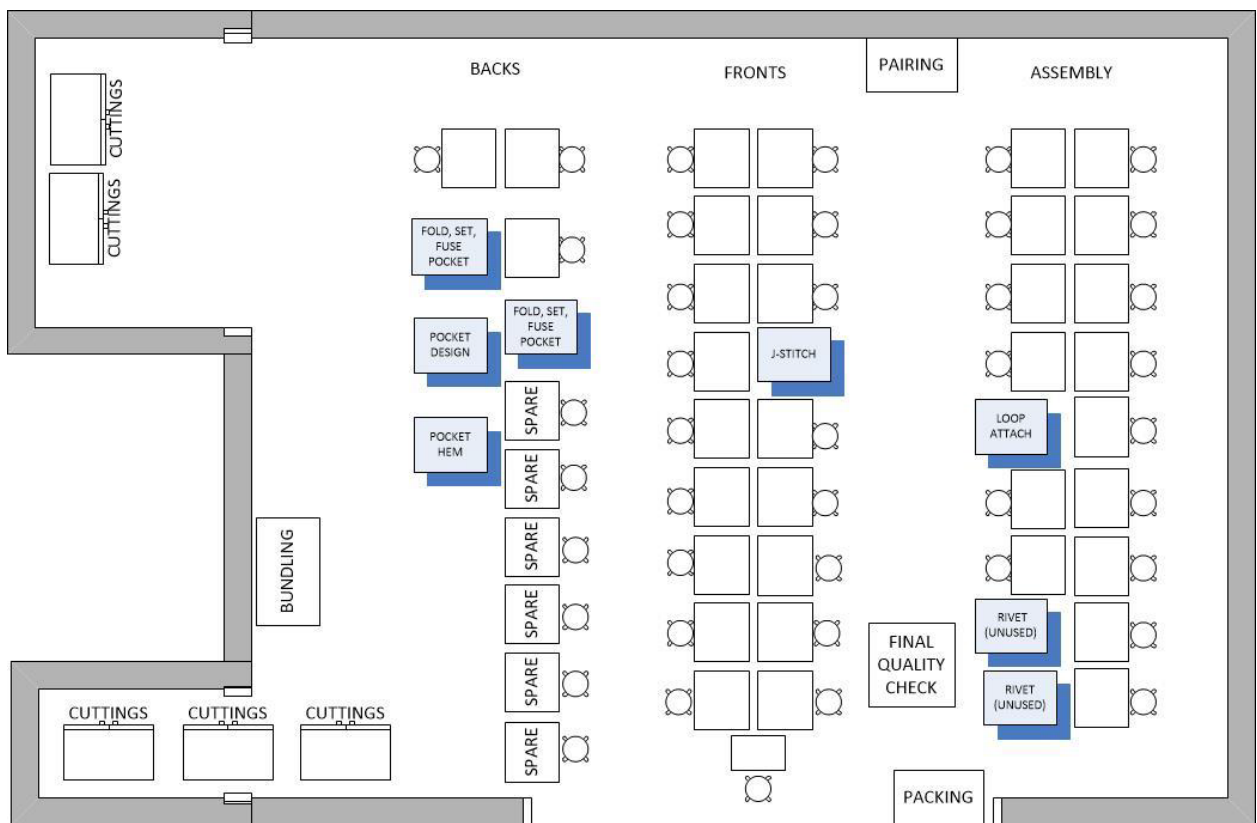


Figure 1. Typical layout of a clothing factory

### ***Theme 5 – discipline (shitsuke)***

One of the primary concerns by all respondents was the lack of discipline among machinists. Discipline among people of different cultures, age groups and languages are demanding. A decision was taken to engage staff on inculcating habits that promotes “Ubuntu”. These can be practised both at home and at work. As the final S in the 5-S, it propagates the 5-S practice. This means conscientiously engaging with the other 4 principles to ensure an orderly and efficient workplace. Continuous engagement of all operators on a regular basis would enable the 4 principles to become a habit. It also means striving for *kaizen*, which is the Japanese equivalent for continuous improvement.

### **Conclusion and Recommendations**

Formalising the system of the 5-S principles requires commitment, perseverance and leadership. Management and leadership is required to sustain the system, while teamwork and continuous engagement with staff are vital. It needs to be borne in mind that maintenance is a difficult task, but can be achieved through engagement. The introduction of the 5S principles would enable the organisation to continuously review its strategy towards attaining an environment that is conducive for the optimisation of production. This would definitely serve as a foundation upon which other improvements can be built. The recognition of the application would ensure that integration and practices are well grounded (Whitaker, 2001).

The diligent practise of the 5-S techniques enables immediate impact upon the workplace. This is not only beneficial for the organisation in terms of productivity, but also addresses the workforce environment where transformation takes. The ability to enhance working conditions impacts the following areas:

- worker
- workplace
- machine
- environment
- productivity
- cost
- delivery

The consistent maintenance of the working environment enables the organisation to improve its competitive position in a demanding environment.

### **Management commitment**

Management together with leadership qualities are imperative for the success of the implementation. To express their commitment, management are required to stand their position “and become the real owners of the organisation.” Skills development in legal, business management, human resources and industrial engineering are crucial as a point of departure. It is vital that management take their stand as the leaders of the organisation to enforce discipline.

### **Promotional campaign**

In order to achieve acceptance of the principles, a company-wide promotional campaign is recommended. Employees need to understand and take ownership through a team approach. Evaluating individual work areas would eventually encompass the entire organisation. The 5S principles must be in the “face “of all employees and it should become part of the culture of the organisation. As an example, the 5 days of the week could be lined to the 5 principles.

Monday 1st S day - organisation (e.g. throw away things you do not need).

Tuesday 2nd S day - neatness (e.g. name everything and assign locations).

Wednesday 3rd S day - cleanliness (e.g. all- together housecleaning).

Thursday 4th S day - standardisation (visual management and transparency for things).

Friday 5th S day - discipline (e.g. do your own 5-S audit).

### **Evaluation of 5-S programme**

In order to maintain the effectiveness of the programme, it is important to reward employees accordingly. The encouragement of employees to consistently engage to improve the workplace and their surrounding areas is crucial for the success of 5S principles.

### **Maintaining the system**

Inspections should be planned from time to time to evaluate the workplace. This should be known by management only. This would prevent last minute efforts to change unacceptable standards. The maintenance of 5S principles is imperative for it to be successful.

In conclusion, it is imperative to engage all employees to buy-in to the system of re-organisation, because it is the workers that would assist in this endeavour and ensure that new changes are maintained.

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