The purpose of this paper is to record the attempt to develop a Quality Assurance framework for small manufacturing entrepreneurs which meets the quality requirements of large manufacturing companies/retailers within the clothing industry in the Cape Metropole Area (CMA) of the Western Cape of South Africa.

A combination of qualitative and quantitative methodologies were utilised in the research. The qualitative method in the form of focus group sessions were convened to establish whether a quality problem existed as revealed by previous research in this sector. A quantitative assessment of small manufacturing companies was undertaken by means of questionnaires aimed at establishing the types of quality systems used in these small companies and the effectiveness thereof.

The research suggests that a gap indeed exists between quality assurance systems utilised in large manufacturing companies and retail companies, when compared to small manufacturing companies. Whilst a quality control system did exist in some instances, insufficient operational time was available to react to various problems that were highlighted. The research was limited to small manufacturing companies in the Western Cape of South Africa, as defined by the National Small Business Act of 1996 (102 of 1996).

This paper provides small manufacturing companies with a simple paper based quality assurance system which will assist in the transformation from quality control to quality assurance as an organisational wide intervention.

In South Africa, small companies do not have access to quality systems as utilised in large manufacturing and retail companies. The proposed quality assurance system eliminates the need for small manufacturing companies to be reliant on large manufacturing companies and retailers, thus contributing to these companies being self-sufficient and independent.

**Keywords:** quality assurance, quality control, small manufacturers, clothing industry, apparel industry
1. INTRODUCTION

Owners of small manufacturing companies consist of people that were employed by large manufacturers, who were retrenched, and now utilise the skills and knowledge acquired in these organisations to manufacture clothing garments. These small companies are housed in the garages of these owners, as they are unable to afford the rental of space in industrial and commercial areas. Many of these owners were exposed to various production and quality systems, but did not have an opportunity to manage these systems. The owners of these small companies offer their services to large manufacturers and/or retailers, to fill orders so that the orders can be delivered on time and within cost.

Clothing companies strive to produce garments that meet their customer requirements. A wide range of quality processes, are used in the clothing industry to ensure that these quality standards are met. The examination and measurement of garments are common ways of ensuring that the garments produced meet customer specifications. Quality control consists of a 100% inspection process, to ensure that garments not satisfying customer requirements are removed.

Large manufacturing and retail companies have effective quality systems that are not utilized by small manufacturing companies. The challenge is for small manufacturing companies to have a quality assurance model that would assist them to meet the quality requirements established by large manufacturers and/or retailers. This paper reports on the development of a quality assurance system that can be used by small manufacturers in order to meet customer requirements.

2. BACKGROUND

To provide the context of the study, the nature of small businesses in South Africa will be discussed and the role of quality assurance in the clothing industry.

2.1 South African Small Businesses

In South Africa, a small business is described as a company conforming to the specifications contained in the National Business Act, 1996 (102 of 1996). Small, Medium and Micro enterprises (SMME) in the manufacturing sector/sub-sector is classified in accordance with the criteria reflected below in Table 1.

Table 1: Small Business according to industry sector

<table>
<thead>
<tr>
<th>Sector/Sub-sector</th>
<th>Size or class</th>
<th>Total full time equivalent of pay employees less than</th>
<th>Annual turnover (Rm) less than</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>Medium</td>
<td>200</td>
<td>40,00</td>
</tr>
<tr>
<td></td>
<td>Small</td>
<td>50</td>
<td>10,00</td>
</tr>
<tr>
<td></td>
<td>Very small</td>
<td>20</td>
<td>0,40</td>
</tr>
<tr>
<td></td>
<td>Micro</td>
<td>5</td>
<td>0,15</td>
</tr>
</tbody>
</table>


SMME companies in the Western Cape are also known as Cut, Make and Trim (CMT) manufacturers. The customers who supply orders to CMT companies are listed hereunder:

- design houses producing for retailers;
- large manufacturers producing for retailers and export;
- wholesale retail;
- flea markets;
- tender contracts; and
A small business is defined as one that is managed and independently owned (Siropolis, 1997). Small businesses are able to perform some functions more efficiently, thereby contributing to the success and competitiveness of larger companies (Cronje, Du Toit, Marias and Motlatla, 2004). Furthermore, small businesses are of utmost importance to an economy because if they were removed from the operation, large manufacturers would have to perform these activities that could be completed more effectively elsewhere. As a result of this interdependence, the activities of small businesses are crucial to address economic growth, job creation and the alleviation of poverty in the Western Cape. According to the DTI (2004), the contribution of SMMEs to employment and production output is not nearly as much as that of many other countries.

Our past is reflected in the ‘racially skewed ownership patterns’ and the exclusion of Black South Africans in education, training and enterprise development. The foregoing is supported by Rogerson (2001) who states that the term ‘established SMMEs was referred to as businesses that were white owned and managed by white entrepreneurs. Companies owned by historically disadvantaged communities were referred to as emerging SMMEs.

According to Rogerson (2001), the CMT sector has changed and therefore the perception of an absence of black SMME entrepreneurs has changed in the Western Cape. According to Rogerson (2001) the informal economy of the Metropolitan area employs as many people as the formal industry. Naumann (2002) claims that there are in excess of 200 CMT companies in the Mitchells Plain area (suburb located on the outskirts of Cape Town) alone. According to Allie (interview, 16 January 2006) the 200 companies referred to include other areas in the Western Cape. The Provincial Development Council (2004) reiterates the findings that the SMME sector has the ability to create more jobs in the clothing industry than in the formal sector. Allie (interview, 16 January 2006) argues that the SMME sector has been playing an important role in job creation, but has not been given the opportunity in terms of market share to significantly contribute to the economy. The DTI (2004b) describes the SMME sector as the backbone of the economy with an employment figure of 50% of the workforce and contributes 35% towards the GDP.

An investigation in the SMME sector (Department of Science and Technology, 2004) revealed that the following problems existed in the CMT sub-sectors namely:

- production planning is inadequate;
- lack of quality systems result in rework; and
- strong competition in this sector resulting in reduced price levels.

The research further established a need to address the following areas in quality and productivity management systems, namely:

- a simple paper-based system allowing these companies to measure and control quality and productivity;
- the effective implementation of these systems;
- the piloting and evaluation of selected CMTs using these systems; and
- the development of short courses and mentoring.

2.2 Economic Factors

The Clothing, Textile, Footwear and Leather industry (CTFL) of South Africa is a labour intensive industry employing approximately 225 000 people with an annual turnover of R27,2 Billion. The CTFL sector represents 6% of the total output of the manufacturing sector and accounts for a total of 15% of the total formal employment (CTFL SETA, 2005). The national employment figures (metro areas only) per Regional Chamber of the council, as at 30 November, 2006, are represented in Table 1 as follows:
The Western Cape clothing industry is the second largest employer. The largest concentration of clothing companies in the Western Cape, are located in the Metropolitan area with 322 companies. The metropolitan area includes the Cape Town city area and the non-metropolitan areas of Paarl, Atlantis, Worcester and Wellington has not been included in these figures.

Employment growth in the clothing industry has been negative and volatile since 1994. Employment figures decreased from 125 181 employees in 1994 to 110 739 in mid 2004, a loss of 14 442 jobs (Barnes, 2005). The figures above are underestimated due to the large number of informal, micro and home industries that are not captured on the national database. Barnes (2005) states that it is estimated that the total clothing industry employment is 158 879. In 2005, alone, a total of 4 400 jobs were lost in the Western Cape (CCA, May 2006) due to cheap imports. These job losses have negatively impacted on the level of economic activity and growth within the Western Cape. An imbalance was verified between spending and production, as well as between imports and exports by the national Department of Trade and Industry (DTI, 2005). Even though there has been a substantial number of job losses in the Western Cape, small businesses are emerging and registering with the CCA and therefore the employer figures remain fairly stable (CCA, June 2005). The South African Clothing and Textile Union (SACTWU) subsequently, submitted an application to implement safeguard measures against imports by the government due to retrenchments in the clothing industry.

Section 6 of the International Trade Administration Act, 2002 (Act 71 of 2002) was amended with restrictions placed on 31 of the 36 textile and clothing classifications who were importing from the People’s Republic of China. The restrictions were placed on 200 product types and most garment items, so as to salvage an ailing local manufacturing industry. The notice came into operation on the 28 September 2006 and the quotas came into effect on the 31 December 2006 and will remain imposed until December 2008.

2.3 Quality in the Clothing Industry

Quality in the clothing industry is underpinned by different concepts, which include quality assurance, quality control and total quality management. Quality requirements are achieved by satisfying the specifications and sample requirements, which are used as benchmarks by these companies. Taguchi’s techniques as cited in Peace (1993) consist of in-line and off-line quality control. The two techniques are extremely important to the clothing industry as many of the concepts used in industry are based on these principles. On-line quality control refers to examiners who are responsible for ensuring that the work produced on the production floor is acceptable. Off-line quality control refers to the inspection of completed garments to ensure that the specifications set by the customer, have been met. This quality control includes aspects such as examining and measuring, to identify production problems in order to maximise product and process design.

Large manufacturers communicate details relating to specification and customer requirements and produce samples for approval. Once the samples are approved, these samples are sent to small manufacturing companies. The companies are required to manufacture two to three garments that replicate the approved samples. Large manufacturers apply the principles of quality assurance (QA) and use quality manuals and quality control systems to ensure that garments produced meet...
customer specifications. On approval of these samples, the small manufacturing company will receive the fabric, trims and order details for completion.

Glock and Kunz (2005) divide quality assurance into three phases namely in pre-production, production and post production. Planning is described as the most important element in the pre-production phase. Decision-making includes designers, work study personnel, quality personnel and the production processes. Measurement include fabric inspection, testing (sample fabric, production fabric and finished garments) fabric evaluation for quality and performance, verification of fibre content and wash care instructions, impact of storage, spreading, cutting, sewing and finishing. QA in the production process covers the use of quality manuals, specifications and samples to ensure that standards are communicated to everyone on the production floor. Quality personnel evaluate the specification sheet as well as samples received through an inspection process. Lastly, QA in post production focus largely on quality audits by analysing finished garments in the despatch area as a means of evaluating the level of defects. Finally, an analysis of returned garments assists the company to continually improve the quality processes employed (Glock and Kunz, 2005).

3. PROBLEM EXPLANATION

Research undertaken by the Department of Science and Technology (2004) supports and recommends the development of simple, paper based systems for implementation and measurement of quality and production systems for small manufacturing companies in the Western Cape. An assessment undertaken by the Clothing and Textile Centre in the Western Cape (Clotex) during 2002 revealed that there was a great need for quality improvement in the clothing sector (interview, Apollis, 2003).

Further studies undertaken by Manning (1993) in KwaZulu Natal confirmed that the quality of garments produced by small manufacturing companies did not meet expected standards. Quality was the second most important factor considered by retailers when acquiring garments from the clothing industry (Dunn, 2000). The decentralised nature of production in small manufacturing companies, make it difficult for the customers to control the quality of work, which often resulted in a high rejection rate of completed garments. Manning (2000) reported that large clothing manufacturing companies supplied small manufacturers with low quality, cheap garments as they choose not to produce these garments in their own factories. It is essential for small manufacturing companies to develop their QA process to conform to standards as specified by their customers.

In small manufacturing companies, quality control techniques consist largely of 100% inspection after the garment has been completed. The techniques in question are not effective. Consequently garments not conforming to customer specifications are removed and sent back to the line for rework or as a reject. Quality assurance provides small manufacturing companies with procedures that can be followed to ensure that the garments produced meet customer specifications ‘first time’ and are not returned for rework.

4. RESEARCH APPROACH AND METHODOLOGY

A combination of qualitative and quantitative research techniques were employed in this study, namely focus group sessions and survey questionnaires. Invitations were sent to retailers, large manufacturers utilising the database compiled by the Technology Station in Clothing and Textiles, Cape Peninsula University of Technology, Bellville campus, Cape Town, South Africa. The participants identified for the focus group discussions were responsible for quality procedures and standards in their organisations. Six focus group sessions were conducted with a total of 28 participants representing 20 companies.

The outcome of the focus group session was the development of a pilot questionnaire using both a combination of scaled as well as dichotomous response questions. Dichotomous questions referred to in this study are closed questions, which require the respondent to select either yes or no. The aim of the closed questions was to determine whether a quality system indeed existed and if so,
what type of quality system was being utilised in the small manufacturing companies. One open-ended question was included to establish whether orders were cancelled and if so, why. The pilot questionnaire was circulated to the participants of the focus group sessions for comment and critique. Feedback was received resulting in the necessary changes being made before the questionnaires were circulated to the small manufacturing companies.

Of the 72 questionnaires that were received, 63% (48 respondents) conformed to the classification of a small manufacturer according to the National Business Act, 1996 (102 of 1996). The questionnaire was divided into ten sections namely demographics and background, company size, client details, production procedure, client relationship, production processes, quality, training and willingness to participate in the research. The survey was conducted over a period of six months. The data was analysed using the Statistical Program for Social Sciences (SPSS).

5. FINDINGS

The findings collated from the focus group sessions and the questionnaire survey is presented hereunder.

5.1 Findings of Focus Group Sessions

The focus groups identified the following elements which were regarded as necessary in a quality process:

- a brief should be designed and implemented that would facilitate the manufacturing process on the production floor;
- a pre-production meeting should be held to discuss the brief supplied;
- a partnership should be formed with the customer;
- the manufacturer had to ensure that the correct schedules were received for both fabric and production; and
- the large manufacturer should take responsibility for checking of fabric and trims once it was received.

Quality was described as meeting and exceeding customer needs, which meant that the garments had to conform to the requirements and specifications, ensuring reliability and durability. The participants were of the view that the retailers were the drivers of quality and that this was greatly influenced by environmental factors, as well as the availability of raw materials meeting quality standards.

The discussion further revealed that participants had to wait for information regarding samples, re-dyes and fitting before production. The sessions also indicated that production of quality garments was often difficult, due to absenteeism and machine problems. These problems were further compounded by the bad local supply base of delivery of sub-standard raw materials and late delivery of materials.

Other needs listed by large and small manufacturers were the issues of pricing, quality checks, feedback, contractual agreements and written specifications supplied. The small manufacturers stated that they required assistance with a quality system as this would assist in the reduction of reject rates as well as the cancellation of orders.

The variables contained in the questionnaire were based on these findings. Furthermore, a significant factor for an effective quality system was knowledge of the product and controls measures in the company to ensure quality garments. The participants were of the view that a good quality system would enable the small manufacturer to trace problems timeously which would ensure that quality was maintained.
5.2. Questionnaire Survey

The questionnaire survey findings are categorised as follows:

- breakdown of company size;
- quality in production;
- pre-production process; and
- production quality process.

5.2.1 Breakdown of Company Size

Most of the respondents established their businesses after they were retrenched. Certain respondents could be classified as “home industries” which meant that the goods were manufactured on their residential premises.

Of these 48 small companies, 12.5% employed between 50 – 65 people with an annual revenue of less than R10 000 000 and therefore these respondents were included in the analysis. Further findings revealed that the annual income of the majority of the respondents fell into the ‘very small’ category with an annual revenue of less than R4 000 000. Refer to Figure 1 below:

Figure 1: Number of employees

5.2.2 Quality in Production

Quality in production as far as small manufacturing companies were concerned addressed both the pre-production quality processes and the production quality process. Large manufacturing companies were concerned all areas of pre-production, production and post-production quality processes. The quality control aspects form an integral part of the quality assurance system to ensure that the system is continuously improved. The areas of pre-production and production quality processes will be discussed hereunder, as these are relevant to small manufacturing companies.

5.2.3 Pre-production Quality Process

The clothing industry use sealed samples and specifications to ensure that the quality requirements are met. Three or four garments are made up by the manufacturer and sent to the customer for approval. The garments are examined by the customer and once approved; these samples will be
sealed, commonly known as a red seal. A red seal sample will be returned to the manufacturer and the rest of the production will be judged against this sample. On receipt of this sample, the production process commences. Figure 2 below provides an indication of the length of time taken for samples to be received back from the customer. Refer to Figure 2 below.

**SEALED SAMPLES RECEIVED BEFORE PRODUCTION**

![SEALED SAMPLES RECEIVED BEFORE PRODUCTION](image)

More than half of the respondents received samples within two days and one hour of commencing production. Arguably, these respondents would have insufficient time to react to problems that were highlighted for correction on these samples.

Furthermore, pre-production meetings were necessary to ensure that the production floor was able to cope with requirements of machinery, attachments and delivery. It was necessary to establish whether small companies had these meetings before they commenced production.

Table 3 provides an indication of the distribution of various time periods that elapsed before pre-production meetings were held.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Number of respondents</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>11</td>
<td>31.4</td>
</tr>
<tr>
<td>1 - 5 hours</td>
<td>9</td>
<td>25.7</td>
</tr>
<tr>
<td>4 days</td>
<td>9</td>
<td>25.7</td>
</tr>
<tr>
<td>2 days</td>
<td>5</td>
<td>14.3</td>
</tr>
<tr>
<td>3 days</td>
<td>1</td>
<td>2.9</td>
</tr>
</tbody>
</table>

| Total | 35 | 100 |

Table 3: Time elapsed before pre-production meetings

Respondents (71.1%) reported that pre-production meetings were held before any new style was introduced onto the production floor. Table 1 suggests that 57.1% of the respondents had pre-production meetings between one hour and one day. Arguably, pre-production meetings are not held in time to allow sufficient planning and setting up of machinery prior to the new style being introduced onto the production floor.

The production samples should be made-up using the actual fabric, trims and machinery used on the production floor. This provides the supervisor with an opportunity to make up production sample using the components (fabric and trims) used in production, before the style is introduced onto the line. Any problems encountered at this stage, could be eliminated and would avoid stoppages in production. The supervisor has an advantage of establishing the degree of difficulty associated with each operation as well as the ability to determine which operators to use on various operations.
Figure 3, reflects that 25% of the respondents received the components used in production between one to six hours before the new style commenced on the production floor. It would be extremely difficult for these respondents to make up production samples and engage in pre-production meetings within such a short time. This short lead time, therefore has a negative effect on production as it would be difficult to solve problems in ample time.

5.2.4 Production Quality Process

The production quality process involves the stages that the garments would follow to ensure that the garment conforms to customer requirements. This involves the evaluation of the garments according to the specifications and samples received. Figure 3 evaluates the quality processes used in small manufacturing companies, with the view of establishing the type of quality system employed within these organisations.

Figure 4: Inspection Process Employed

43.5% of the respondents as reflected in Figure 4 employ examiners or inspectors to ensure that garments produced, satisfied customer requirements. Supervisors were responsible for conducting in-line roving inspection as part of their work load to ensure that each operator produced garments that conformed to customer specifications. The findings revealed that 100% of the respondents informed their operators of the requirements set out by the customer. Of these respondents, a
A majority of 86.4% held their operators responsible for their own quality. Most of the respondents employed final examiners in the despatch department to ensure that garments that did not conform to customer requirements, were prevented from leaving the factory thereby confirming that a quality control system was used to evaluate quality rather than a quality assurance system.

6. PROPOSED QUALITY ASSURANCE FRAMEWORK FOR SMALL MANUFACTURERS

An analysis of the findings has revealed shortcomings as explained above in the small manufacturing companies. A quality assurance framework as presented schematically in Figure 5 could alleviate the identified shortcomings and facilitate effective quality assurance practices in small manufacturing companies.

![Flow chart of suggested quality system in small manufacturing company](image)

Figure 5: Flow chart of suggested quality system in small manufacturing company

Each component represented in the flow chart above will be explained hereunder:

6.1 Owner

The owner of the small manufacturing company is responsible for co-ordinating, planning and controlling production in line with the availability of raw materials, trims, labour and machine capacity. Decisions relating to the quality of garments are the responsibility of a quality controller. Quality control is viewed as being the responsibility of everyone in the organisation.

6.2 Samples

At least three samples must be made in accordance with the customer’s specifications. These samples are returned to the customer for a seal of approval. This seal of approval will be basis on...
which the rest of the production will be measured. Once the sealed samples are returned, production process may begin.

### 6.3 Trim Store Clerk

The small manufacturing company receives previously tested fabric and ensures that non-conforming fabrics are isolated. Any discrepancies are communicated to the owner, who liaises with the CMT co-ordinator of the large manufacturer or retailer. The trim store clerk is responsible for ensuring that all work is checked against the delivery note and that the delivery note is signed. On receipt of the sample, cut sheet and specification, the trim store clerk must ensure that:

- the quality of the trims are checked;
- the correct trims have been received;
- the trims are counted;
- the correct quantity of trim is available for the line; and
- the correct trim is supplied with the style.

Once the trims are issued to the line, the supervisor signs the issue book to accept receipt of the trims.

### 6.4 Cutting Room Supervisor

The customer supplies the small manufacturer with the patterns. The master pattern must be checked against the marker to ensure that the correct sizes and pattern pieces are included as per the sample. The lay slip should be checked and should contain information about the number of lays, the size of the lay, the ratios per size and the length of the lay. A quality check of the fabric should be conducted as the plies are spread on the cutting table. Any faults found should be removed and recorded.

### 6.5 Production Floor

A pre-production meeting must be held at least three days prior to production and should include the supervisor, quality controller and the mechanic (if the company has a mechanic). All concerns relating to the make-up of the samples should be discussed and decisions on machinery, attachments and operators skills must be finalised. Operator training can be introduced at this point. All the necessary information should accompany the sample at all times. The method of examining should be shown to the inspectors. The first ten production samples must be check to ensure that the required standards are met. Once the quality controller is satisfied that the garments are acceptable, the examiner will continue to examine the rest of the production according to the procedure used by the quality controller. Each examiner places a sticker at the back of the label which is used to assess the effectiveness of the examiner. The 100% inspection procedure should be employed to ensure that the garment meets quality specifications and standards per customer requirements. The quality controller must visit the examiner at least thrice a day to audit the examiners work and ensure that the examiner is doing her work effectively.

### 6.6 Despatch

The quality controller examiners the finished garments and once the style has been passed, the customer can be contacted.

Faults are classified as:

- critical, meaning that the garment is beyond repair or the extensive rework is required;
- serious, meaning that the garment requires repairs but could be sold as a second;
- minor, meaning that the problem is not serious; and
other, meaning that the returned garments meet the quality standards but have been accepted from the customer for goodwill.

6.7 Customer

The customer audits the goods produced by the small manufacturer in terms of the desired standards on the small company’s premises. Any faults found are recorded and a claim will be made out for damaged goods. Minor faults would not normally result in the rejection of a style but it is important that corrective action be taken to solve the problem in order to prevent it from happening in the future. Once the goods are approved, delivery instructions can be received. Once delivery instructions are received, the packaging can be completed and the destination can be attached to the goods.

7. CONCLUSION

The research confirms that quality control methods are used in small manufacturing companies to ensure that garments not meeting customer requirements are prevented from leaving the company. A quality control system is reactive compared to a quality assurance system which is pro-active. Quality assurance infer that people are committed to doing things right the first time. This implies that work must be received at the right time; people must have the right skills to do the job; the right machinery must be available and the right materials must be used. Everyone in the organisation must be aware that quality forms an integral part of the product and that quality cannot be re-inspected into the garment once it is completed. The aim must be to continually strive towards improving quality to ensure that the company remains competitive.

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