IMPLEMENTATION OF MODULAR MANUFACTURING IN THE CLOTHING INDUSTRY IN KWAZULU-NATAL: A CASE STUDY

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ABSTRACT

There are many challenges facing the clothing and textile industry in countries worldwide, and South Africa is no exception. Intense competition from both the domestic and international markets is crippling both the clothing and textile industries. However, with a reservoir of experience and expertise within the industry, it could re-establish itself as a forceful industry with an ability to challenge competitors both domestically and internationally through a focus on added value, exceptional quality, and the effective application of all resources through technological innovation. One such innovation in the clothing industry in South Africa may be the use of modular manufacturing. Qualitative narrative interviews and text analysis results on the experiences of individuals through the implementation of modular manufacturing are presented and evaluated as a case study.

OPSOMMING

'n Verskeidenheid uitdagings staar die kleding- en tekstielindustrie wêreldwyd in die gesig. Suid-Afrika is ook hieraan blootgestel. Intense kompetisie in nasionale en internasionale markte het tans 'n besonder negatiewe uitwerking op die kleding- en tekstielindustrie. Daar is egter 'n goeie bron van ervaring en kennis in die bedryf wat kan meehelp om die besondere kompetisie die hoof te bied. Dit kan geskied deur te fokus op toegevoegde waarde, uitsonderlike kwaliteit, en die effektiewe aanwending van hulpbronne deur tegnologiese innovasie. Een so 'n innovasie in die Suid-Afrikaanse kledingindustrie kan die aanwending van modulêre vervaardiging wees. Kwalitatiewe narratiewe resultate van onderhoude, sowel as teks- en inhoudanalise van die ervarings van werknemers tydens die implementering van modulêre vervaardiging, word as 'n gevallestudie aangebied.

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1. INTRODUCTION AND RESEARCH METHODOLOGY

The SA clothing industry shed more than 67 000 jobs in the three years prior to 2006 [4].There is a possibility that more jobs may be shed in Durban (KwaZulu-Natal). The South African clothing industry has diminished in size to form the cut, make and trim (CMT) industries that find it difficult to negotiate wage increases as production costs escalate out of proportion. If the lay-off of workers continues in the clothing industry, it will increase the unemployment rate, thus impacting on the economy.

Issues that influence the clothing and textile industry include mechanisation and automation, research and development, the expertise and skills base, quality orientation and, above all, the eradication of import quotas. Other factors influencing the decline in the clothing industry in South Africa include:

- An inability to adjust to the changes in the industry
- Possible lack of effective performance management and leadership qualities
- Family-owned businesses that were operated conservatively with low investment and a lack of managerial qualities
- Lack of knowledge, skills, and training strategies in the industry
- Lack of strategic thinking and positioning
- A pressurised industry
- Working in 'silos'
- Lack of efficient communication
- Internal politics in organisations. [1]

The research methodology adopted in this investigation included a literature review of available documents on the industry, and interviews and discussions with organisational staff and leadership in a case study context. This methodology is similar to that recommended by Cooper and Schindler [8].

Research results are presented in an integrated format: data from the literature and other available documents are discussed, together with our own research data gathered from interviews and questionnaires used in the case study. Text and content analysis [13] are used to evaluate qualitative narrative data obtained from interview transcripts, to provide a necessary focus on interpreted narrative data from the modular manufacturing case study. The interpreted narrative results are supplied and discussed to provide a necessary context for the case study data. This narrative data tended to be vague, and may seem to be without focus to some, and especially to decision-makers. For this reason a five-point Likert scale is used to transform, for example, verbs, adverbs, nouns, and adjectives used in interview transcripts on management research questions into semi-quantitative data. If an adverb or adjective produced a very negative response in the text reader, a value of 1 was awarded and, for a largely positive response, a value of 5 was awarded. This positivist research method was derived from work presented by, for example, Alexa et al. [13] and Lacity et al. [14].

2. COMPETITIVE POSITION ANALYSIS OF THE CLOTHING INDUSTRY

The following competition context information was obtained during the clothing case study investigation:

- A competitive climate with an atmosphere of mutual dislike among clothing manufacturers
- Manufacturers were threatened by new entrants into the market
- There was a fear of new and substitute products
- The bargaining power of suppliers and buyers was extensive.

South African clothing manufacturers face market pressures from both the domestic and the international marketplace in terms of material inputs, garment costs, technology, and

machinery. New manufacturers entering the domestic markets increase the competitive pressure in the industry [4].

While these issues have an impact on the clothing manufacturing organisations, other factors such as environmental impact, socio-economic factors, and government regulations have also impacted on the industry.

2.1 A competitive climate among manufacturers

With a growing number of clothing manufacturers in the domestic markets, the shrinking of larger manufacturers, and the relocation of parts of larger organisations to non-metropolitan areas, the climate in the clothing industry in South Africa is very sensitive. The situation has worsened due to non-communication in the supply chain. Retailers and manufacturers only sub-contract orders to local manufacturers with whom they have built relationships. The CMT organisations are dependent on the main (larger) organisations for work. There is a struggle among manufacturers to obtain work from their suppliers, as price competition is the determining factor in the placement of orders for manufacture [7].

2.2 The threat of new manufacturers

The clothing industry is continually susceptible to new entrants setting up facilities. This is because the start-up capital investment is low, and a manufacturer can operate from residential premises. Although the garment production industry is easily accessible, it is not attractive because of the low rate of pay.

However, with employment and retrenchment on a regular basis, manufacturers tend to exploit the workforce by paying lower wages than those set for the industry by the National Bargaining Council. Machinists are placed in a situation where they have no choice: machining garments is the only skill they have.

The cost of production, the domination of the established larger organisations, and the demands of retailers demoralise the clothing manufacturing industry. The education level of employees in the industry is low, shown in the lack of concern for improvement in the industry.

2.3 The threat of substitute products

Garment imports are a threat to the domestic market: consumers substitute the domestic product with the imported product because it meets the consumers' needs. The lower cost of the imported product counts in its favour. The retailing industry is moving away from South African products, and thus sources the majority of its products from overseas. The South African clothing manufacturers are experiencing low production output and diminishing profit levels as they find it difficult to compete with the cost of imported garments. Previously there was an agreement between China and South Africa to prevent Chinese imports into South Africa [11]. However, the quota on Chinese imports fell away in the mean time due to interim developments in relations.

2.4 The bargaining power of buyers and suppliers

Retailers are supply chain leaders in the clothing industry. The voice of the clothing manufacturers is suppressed through the bargaining power and the multiple sourcing approaches of retailers. Christopher [7] mentions that the South African markets have changed considerably, increasing the purchasing power of customers. Retailers are focusing their attention on product quality, reliability in service delivery, and product cost as criteria to reduce the number of suppliers.

Retailers are typically using the 'play off' tactic against manufacturers to become cost competitive. Demand is volatile, and is one of the major problems faced by the clothing industry. This threatens the existence of manufacturers [1].

Retailers focus their strategy on quick response in an attempt to improve customer satisfaction. A limited number of manufacturers use process improvement strategies in order to meet the demands of the market. Clothing manufacturers and designers who differentiate themselves through the application of strategies in process improvement, cost leadership, and design development are able to stay ahead of the competition.

Textile manufacturers who supply the clothing manufacturers are inconsistent in their price, quality, and delivery. Although most textile mills are situated close to manufacturers, their fulfilling of orders is poor, which in turn causes a delay in the entire supply chain. A few manufacturers (4% of a sample taken) are sourcing their fabric and other trim materials from China, India, Pakistan, and Hong Kong, to the detriment of local textile manufacturers [2].

2.5 Uncertainty in the clothing business

There is uncertainty in the entire value chain of clothing manufacture. If a delay is encountered in one area, the entire supply chain is affected. The scheduling of production orders is a complex task, and has to be done accurately, using software technology. Understanding the complexity of clothing production enables an organisation to schedule orders accurately, thus determining the best use of capacity.

The garment manufacturer should be able to determine the complexity of the order through the application of work study principles, so that bottlenecks can be avoided. This would improve the use of resources and improve the organisation's productivity. It is therefore necessary to use the appropriate methodology for the evaluation of job complexity in clothing production in order to meet the demands of the market.

Some of the problems faced by clothing producers are:

- Throughput time per unit: the time to complete one unit of production vs the time to complete the order
- Inventory between processes: used as buffer stock, machine breakdowns, line balancing, and may extend completion time
- Critical paths: need to be arranged in parallel or in serial, and could affect the production process
- Bottleneck operations: need identification for action
- Plant utilisation: estimates effective use of resources
- Minimum order size: affects the production process's set-up costs, and has a bearing on cost per unit
- Change-over/setup: the loss of production when there is a style change
- Rejects and repairs: evaluates capacity lost through repairs and costs lost through rejects. [1]

The critical issues in clothing production scheduling are bottlenecks, line balancing, and machine set-ups during changeover, and capacity use. These factors require in-depth evaluation when scheduling the production process.

The production planner in the clothing industry is faced with the task of scheduling production, bearing in mind the complexity of styles and fashion. The clothing industry is always grappling with bottleneck operations, critical operations, and changeovers, and the work study personnel could help to correct these problems. The industry does not typically use software applications to address these issues, relying instead on experienced personnel in the organisation. Future research could evaluate this and help to develop a package that would reduce the impact on the production of garments [1].

2.6 Supply chain time reduction

Sharing information between the processes in the supply chain (fabric manufacture, fashion design and manufacture, and retailer) would help to reduce the time between processes.

Research and development in the design of fashion garments – going back into textile production and forward into the retailing industry – would simplify the projection of orders. Effective communication and information sharing within the supply chain could stimulate the entire value chain, thus addressing problems, increasing understanding of the various value-adding operations, and creating an industry that could face external competition with greater strength [10].

2.7 Throughput time compression

The application of automated machinery in laying fabric and the use of computerised cutting enable a reduction in labour, thus reducing the cost of the cutting operation and enhancing cutting room performance and productivity [10]. This must be weighed against the current cost of labour in the cutting room in calculating the cost benefit.

If there is communication through computer-aided technology between design and cutting, this would further enhance the operation in the cutting room. Automation in the cutting room could help to reduce the problems experienced with striped or checked fabric, and eliminate imperfections in the fabric [10].

One of the issues that the automation of the cutting process experiences is that the laying procedure does not identify non-conformances in the fabric. This could be addressed and corrected by the textile manufacturers during the weaving process. If this is not feasible, the remaining processes in textile manufacture – the washing/printing phase, the dyeing process, and final inspection using special machinery such as a photo-spectrometer - would help to identify and correct fabric flaws.

Process improvements could also be made in the machining and pressing departments in clothing manufacture. Advanced machine technologies are programmable, and fully automated machinery could help to reduce the time of the machining process. The latest technological developments have machinery that could perform a number of sewing operations with minimal human interference [5].

There is advanced technology in the ironing department as well: automated pressers reduce the number of operations, thus reducing the time of pressing.

Thus the entire supply chain could use machinery that would reduce the time of production of garments; but they need to apply the latest technology, without forgetting the fundamental methodology of process improvements. The improvement process addresses the quality of production, reduces the risk of accidents by reducing fatigue in operators, and focuses on the competitive position of organisations [1].

3. CONCEPT OF MODULAR MANUFACTURING

Modular manufacturing was the 'buzzword' in the early 2000s: it was the latest technology, an innovation that could improve the clothing industry's performance, especially for short production runs of fashion items. Another aspect of the methodology is that operators could sit or stand during the sewing operation, thereby enhancing teamwork, quality, and output. It is based on self-managed teams who produce garments. Production is organised in a synchronised way that eases the flow of production through the various processes. To achieve efficient performance, standard times are determined for all operations using work study principles. Workloads are distributed so that each activity has an approximate equal amount of work to balance the line of production efficiently.

The most important aspect of modular manufacturing is team members' culture and attitude, with a high focus on understanding improvement techniques applied in the industry. This allows operators to work as a 'family' to attain high performance and productivity levels [16].

The concept requires the commitment of top management and an understanding of the dynamics of the concept. Without that understanding, the project could fail. Finally, the choice of participants of the trial implementation of cellular or modular manufacturing is a critical factor that may determine the success or failure of the operation. It is advisable to start such a process with in-depth planning and with a trial run to determine the strengths and weaknesses of modular manufacturing. The concepts of team-working and cellular / modular manufacturing are used interchangeably. The concept enforces the principles of team effort, performance improvement, total quality management, and just-in-time (JIT) production. The concept further creates an atmosphere of belonging and a spirit of working together towards achieving organisational objectives. These concepts are also illustrated by Kalaoğlu et al. [16] in their simulation of productivity of modular manufacturing in the clothing industry. Elements supporting some of the discussions on modular or cellular manufacturing in the subsections below may be found in [16] [17] [18] and [19].

3.1 Prerequisites for modular manufacturing

The planning stage of modular manufacturing implementation is of the utmost importance, as it is a dynamic change from the normal line operation. The planning should be done in stages so that information is gathered on the feasibility of the change.

3.2 Selection and recruitment of team members

The recruitment of team members is a crucial stage in the development of a module or cell. Members of the team are generally recruited within the organisation from areas such as the training school, or from the production line. Management needs to select team members who work together effectively. In general this sort of recruitment is regarded as desirable once a modular system is firmly established.

3.3 How much participation should be permitted?

In modular manufacturing, teams are generally self-directed and have a degree of autonomy. For example, when a new clothing style is introduced, the company will provide the sequence of operations, but if the team suggests a better way of making the garment, they are allowed to put their ideas into practice. When suggestions are made and implemented, people take ownership and pride in their work.

3.4 Planning for modular manufacturing

Successful implementation demands careful planning. Figure 1 shows a typical layout plan of a cell for modular manufacturing with ten operations. Inputs into the process start at operation 1 (IN) and move within the cell until the garment is complete (OUT).

The matrix in Table 5 provides a typical guide plan for the allocation of tasks to the various operators, and helps to balance the content of the tasks allocated. The operations are listed horizontally and allocated to operators vertically. For example, operator A would perform operations 2 and 3. It is important that operators are multi-skilled in order to perform more than one operation in the modular manufacturing cell. This basic approach to modular manufacturing was used in a case study that is described in the next section.
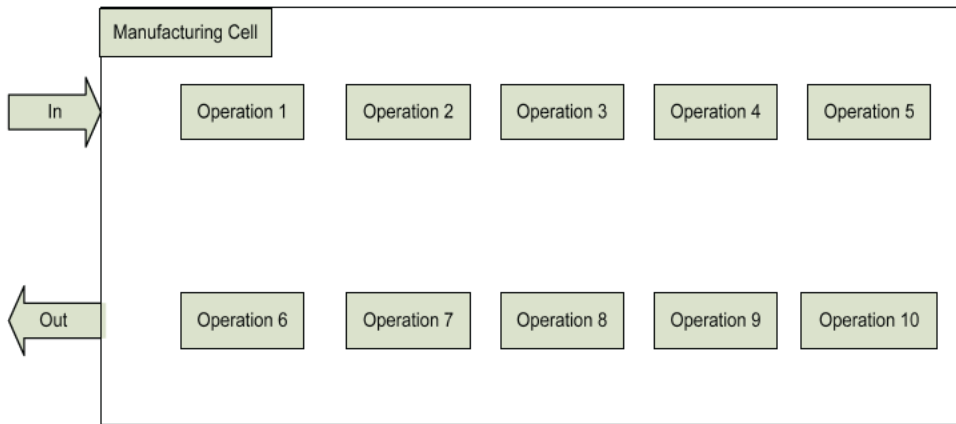
Figure 1: The layout of cellular/modular manufacturing

Operative Operation	A	B	C	D	E	F	G	H
1							■	
2	■							
3	■	■						
4		■	■	■				
5		■	■	■	■			
6			■	■	■	■		
7					■	■		
8						■		
9						■	■	■
10								■

Table 1: Skills matrix: Guide plan

4. CASE STUDY HISTORY AND CONTEXT

A qualitative case study research approach is used in the evaluation of this implementation of modular manufacturing in the clothing industry in KwaZulu-Natal. The production facility in this case study manufactures men's and ladies' fashion wear in a small town in KwaZulu-Natal. Currently approximately 300 people work in the plant. The factory opened in 1970 and implemented modern technology for that era. The facility had 16 supervisors and a plant manager.

The plant manager agreed to perform a pilot project on team-based cellular manufacturing as orders of 100 units were received. The sewing department reverted to the bundle system for larger orders. Due to inconsistency in order sizes, the organisation abandoned the Eton (overhead rail) system and reverted to the bundle system of manufacture. The plant followed conventional management practices before the 1980s, but started changing as new management came on board. There was very little interaction between employees and management, which adopted an autocratic style.

Before the year 2000 the production facility was accustomed to lot sizes of between 2,000 and 10,000 units per order. Currently lot sizes are about 100 units per order. The garments were not as complex to make in the past as those now being received. The factory was flooded with large lots of work-in-process throughout the plant. Employees who were loyal (they had been employed for the previous 30 years) said that the environment in which they worked was hostile, and they had done the same operation for several years.

5. RESULTS AND DISCUSSION

As the research methodology was exploratory [8], and aimed at making people feel comfortable with the pilot study rather than daunted by exhaustive questionnaires, this section provides a qualitative narrative discussion of the experiences of the people involved in the implementation of the current modular manufacturing. Names have been changed to protect confidentiality. This section represents the summarized interpreted narrative results of the views of 10 interviewees. They felt that management commitment and education/training are the most important aspects of any initiative in the organisation.

Results obtained with text and content analysis of transcripts represent the qualitative opinion of one analyst of the transcripts of interviewees' comments for illustrative purposes. To be more objective, one may employ the average of a number of readers of the text. Some examples of transcripts of an employee's narrative comments whose content and text have been analysed follow:

- *Any project has to have the 'blessings' of management and the buy-in from employees for it to be successful. The manufacturing and managing director of the organisation initiates the process of change as money in terms of labour is involved. Sometimes it can go into thousands of rands, but we must be able to see the benefits.*
- *It must add value to our organisation, as you know that the clothing industry is in dire straits at present and we would like to be the best.*
- *Roy was the key driver in securing management commitment.*

More detailed information on transcripts may be obtained from the doctoral thesis of Ramdass [15].

The following issues – identified as important during the implementation of modular manufacturing – were addressed during the case study interviews. Qualitative interpreted narrative results are generally provided and discussed first, and then followed by some text analysis of the narrative results.

5.1 Management commitment

Any change in the organisation stems from top management. Their commitment drives the process of change, and nothing can be achieved if management does not support the initiative. Once management give their approval, any change is possible; but employees need to understand and support the changes for them to be successful.

Management realised that, in order to counteract the threat of imports, they would try out the team-working concept, even though the employees wished for 'the good old days'. They could not afford excessive piles of inventory on the machine floor. Employees were delighted that the plant manager supported the initiative and visited frequently to find out how they were performing. An employee in the team mentioned that any project had to have the support of management and acceptance from employees for it to be successful. The managing director of the organisation initiated the process of change, as the funding of labour was involved. Support from management, especially in funding, is important for a project of this nature.

The planning, organising, leading, and controlling of the pilot project are important, as it should benefit the organisation over time. The clothing industry is in need of radical change to counteract the competition it faces. Employees were thankful that they had the commitment and the necessary expertise from the management team.

Figure 2 shows the results of a qualitative text analysis for management commitment in implementing modular manufacturing, obtained from interview transcripts such as the one mentioned above. '1' indicates acceptance with commitment, and '5' indicates excitement with commitment. A mean value of 3.5 with a standard deviation of 1.5 determined by text

analysis indicates the interviewees' relatively positive appraisal of management commitment to the implementation of modular manufacturing.
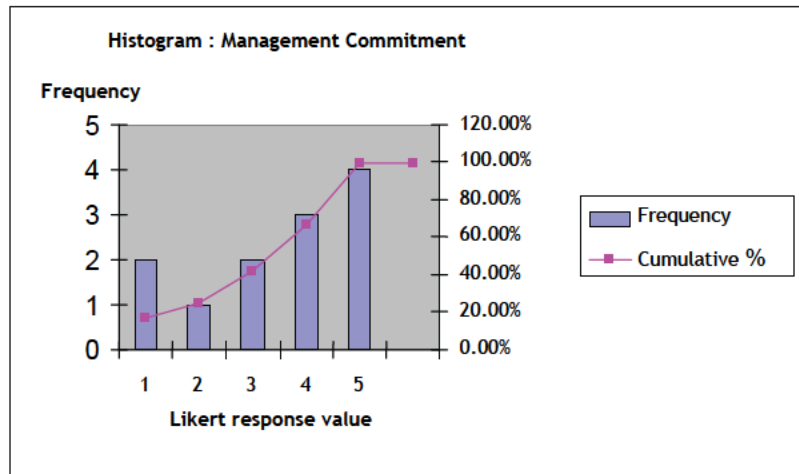

Histogram : Management Commitment

Figure 2: Qualitative text analysis – Management commitment

5.2 Education and training

A number of training sessions were held with the team of employees to provide orientation to the objectives of the pilot project. Employees held discussions about their concerns so that all understood their role in the project. The researcher explained that this was a pilot project for the purpose of adding value to the organisation, and that if it did not work, they would go back to the assembly line system using the bundle system.

The organisation invested in training and developing employees on an ongoing basis. It was mentioned that training employees in the latest developments would enhance employee skills, and workers would embrace changes in future. Another employee's experiences was that people would be willing to change if they knew what the change was all about and how it would impact on their work. Mention was made that employee involvement from the very outset would clear any negativity that might be spread through the organisational grapevine. It was said that management discussions of changes behind closed doors are unhealthy for an organisation. Open communication and the building of trust among the people are extremely important.

An employee mentioned that learning can only take place by a change in attitude and behaviour, and that training makes employees aware of the current occurrences, what employees should expect, and how barriers could be reduced. This is a great motivator for the workforce.

Employees were informed about the benefits of teamwork, and how it could change the entire organisation. An employee mentioned that training helped them to understand the current status in the clothing industry, and how they could rise above the competition; they were setting an example for the industry to follow, and they could be the best manufacturer in the clothing industry. The advantages they experienced created team spirit, and they found that they were responsible for making this project a success.

Another employee said that the concept would be ineffective, and that government intervention was the only way that the industry could be saved. The researcher interacted with the individual and convinced him of the way forward.

The employee admitted that he was sceptical and did not want change, but since there was communication with management and training of workers, he would 'go with the flow'. The comments suggest that a project such as this needs education, training, communication, and management support.

Open communication is important in a project. The sharing of information between management and employees enhances the project's success. It was mentioned, however, that the dissemination of too much information and the interpretation of the information could cause problems within the work environment. The 'grapevine' misinterprets information, and employees become despondent. It was noted that 15 years ago, operators were not allowed to speak, while now communication is encouraged in teamwork [12].

An employee said that this was quite a change for them. About 15 years earlier the floor manager had an elevated office at a centralised point on the machine floor with a clear view of all the employees. Management by walk about (MBWA) has become a prominent feature in the clothing industry. It was said that the manager should be a part of the team on the production floor, know the employees by name, and understand the problems experienced. Much could be achieved if team work is implemented throughout the organisation and if all employees strive to achieve the mission and vision of the organisation. Human assets need to be appreciated to enhance their motivational level. Working together could 'change a mountain into a molehill', as one employee put it.

It was said that employees were often ignored and that management made all the decisions. Issues such as product quality, customer expectations, and productivity were never disclosed to employees. A motivated workforce can achieve labour efficiency without pressure from management. It was explained that communication between employees and management improved quality of production, and an empowered employee could definitely add value to the organisation, no matter what problems were faced.

It was said that customer focus and expectations, together with quality and on-time delivery, are an organisational problem, and not only the responsibility of the floor managers. The team effort created a change in the working climate with information sharing that enabled employees to understand the operational aspects of an organisation better.

The implementation process outcome indicates that active employee participation with knowledge-sharing could improve the organisation's performance. Sharing information about the costs that go into production and about the financial position of the organisation helps employees to understand the importance of 'right the first time, every time'. With work study officers involved in the process, all work measurement and method study evaluations were done with the team, who shared ideas on methods and ergonomics. With the adoption of transparency in all activities, employees understood their situation and that of the organisation.

Figure 3 shows the results of a qualitative text analysis for education and training in modular manufacturing from interview transcripts. '1' indicates acceptance, and '5' indicates excitement with the concept. A mean value of 3 with a standard deviation of 1.22 determined by text analysis indicates a relatively average appraisal of education and training commitment and activities for the modular manufacturing implementation experienced by the interviewees. This is also substantiated by the qualitative discussions on the topic provided earlier in this section.
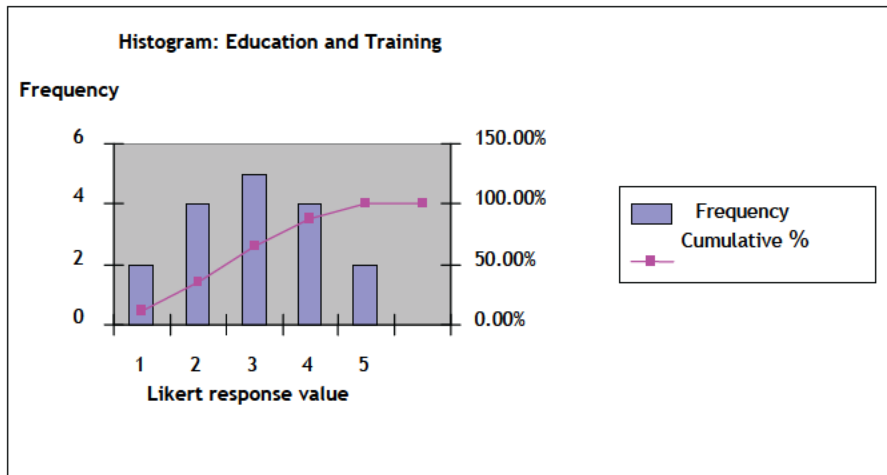
Figure 3: Qualitative text analysis: Education and training

5.3 Benefits of the new system

Encouraging results were achieved with a participative management style. On a general note, the sharing of information created a positive atmosphere. Because this research was a learning experience, some benefits did not materialise. The ability of the employees to multi-skill helped overcome the effects of absenteeism. Employees, who normally sat at their machines for the entire day with a single task, were now given the opportunity to teach and learn from others to resolve problems and become efficient team players. This was a challenging task.

The organisation benefitted overall: the productivity of the line improved by 10%, while labour efficiency improved by 15% and the morale of the employees improved with education, training, open communication, and above all, being treated with dignity. Absenteeism had a minimal effect on the cell, and employees going on a personal break were supported by the team.

The changing of jobs produced better efficiency as operators became attuned to multi-tasking; boredom was reduced, as operators normally performed the same task for many years. In a sense, a revival of energy was experienced during the project.

It was mentioned that modular manufacturing produced the garment quicker, with no work-in-progress. The visibility of tasks and operators improved, as there was minimal work-in-progress (about two units per operator). The team approach seemed to push the garments through faster. It enabled operators to respond to customer requirements more quickly. Work-in-progress was reduced from a week to a day. People were taking responsibility for their processes: there were no rejects, as the team ensured quality at each stage. Education and training improved the morale of the team and their output performance. Indirect labour was eliminated as members performed both direct and indirect operations. Supervision among team players was reduced as each member took ownership of the performance of the group.

Figure 4 shows the results of a qualitative text analysis for benefits of modular manufacturing from interview transcripts. '1' indicates few and '5' indicates many. A mean value of 3.45 with a standard deviation of 1.04 determined by text analysis indicates a relatively large number of benefits that interviewees experienced from the implementation of modular manufacturing. This corroborates the qualitative discussion on benefits experienced, provided earlier in this section.
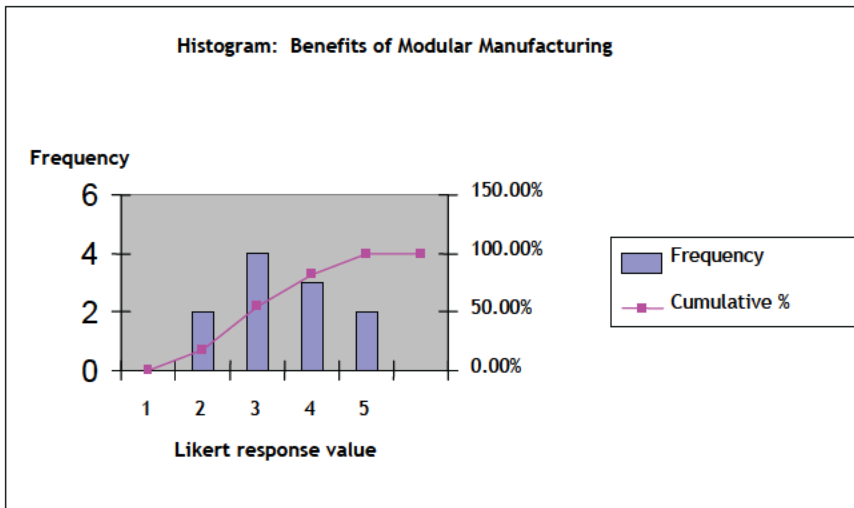
Histogram: Benefits of Modular Manufacturing

Figure 4: Qualitative text analysis: Benefits of modular manufacturing

5.4 Complaints about the new system

There were many challenges for the new system. Two employees complained and seemed to be negative about the system, saying that they did not like moving around and were used to sitting in one place and working, and did not like change. The concerns revolved around the following issues:

- multi-skills, education and training;
- team understanding and formation; and
- payment systems.

Figure 5 shows the results of a qualitative text analysis for complaints about modular manufacturing from interview transcripts. '1' indicates few and '5' indicates many. A mean value of 3.5 with a standard deviation of 1.31 determined by text analysis indicates a relatively large number of complaints from interviewees about activities in the implementation of modular manufacturing.
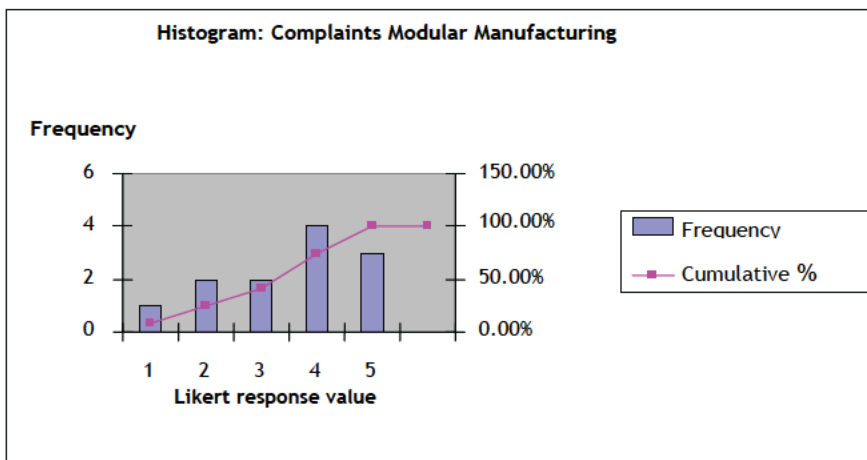

Histogram: Complaints Modular Manufacturing

Figure 5: Qualitative text analysis: Complaints about modular manufacturing

5.5 Multi-skills, education and training

The new system was a drastic change from the norm, as employees had not experienced change for a decade, and preferred remaining in their comfort zone. Ongoing training in innovative business processes is therefore imperative for an organisation. The concept of teamwork (modular/cell manufacturing) was developed more than 50 years ago, and yet operators in this plant had never been exposed to it. It was mentioned that in order for employees to accept change, there needs to be open communication among employees, with the required education and training.

5.6 Team understanding and formation

The composition of the team is of the utmost importance. Members need to understand each other, especially when there is diversity. Team members need to be thoroughly interviewed to determine whether they fit into teams. A series of education and training sessions is required to create an understanding of the dynamics of team work. Personality clashes should be avoided, and, should there be a problem, it needs to be addressed immediately [6].

5.7 Payment systems

The rate of machinists' pay is a contentious issue. Employees were willing to go through the training, but wanted a higher rate of pay. Team members felt that they were not rewarded for their input.

6. RECOMMENDATIONS

Strategic focus for manufacturing excellence

The objective of the strategy for manufacturing excellence is based on three important variables: the improvement of quality production, cost, and delivery, through the application of several elements. Waller [19] defines quality as 'the development of customer closeness where the workforce understands customer requirements and aims to fulfil these requirements'. The researcher concurs with [19], and considers this approach valuable in improving modular manufacturing for the clothing industry. The points below provide a holistic approach to the strategic focus of organisations in order to excel in the manufacturing environment.

The organisation should develop a management approach that practises an open and participative management style that supports innovation. Achievable goals need to be set and measured against industry standards. A thorough understanding of production processes and capabilities is essential for effective performance. Barriers between departments should be removed in order to achieve optimal customer satisfaction across functional boundaries. Managers and engineers need to be seen regularly on the production line, and there should be face-to-face communication on critical issues.

The organisation should institute a manufacturing strategy with a clear vision and mission – a long-term plan that is understood by everyone. There should be a philosophy of continuous improvement in manufacturing operations that embraces globalisation and the impact on the organisation. The organisation needs to create a plan of action through the involvement of stakeholders in the decision-making process, and examine strategies on a regular basis. Flatter structures would enable effective communication and the elimination of 'silos', and encourage team-work between departments.

The organisation needs to adopt quality management principles in product, delivery, and service in all operations, and create operations that are adaptable to customer needs. Operations should be engineered towards eliminating non-conformances.

In order to preserve the environment, the organisation needs to eliminate harm to the environment by determining the impact of processes. The organisation should align the performance measurement system in all contexts to the organisation's strategic objectives.

Employees should be empowered to strive for the accomplishment of the organisation's goals. A rapport should be created between management and employees by instituting coaching and mentoring, and promoting team development, team problem-solving, and team performance rewards. This would help to create an enabling environment where change is embraced, foster continuous improvement, and strategise the organisation towards technological advancement in order to improve quality, cost, and delivery.

7. CONCLUSION

The implementation of the modular manufacturing case study was seen by most of the employees interviewed in this case study as being superior to the traditional bundle system used in the clothing industry in the specific area of KwaZulu-Natal. This management approach may not work for all companies in the South African clothing industry, but for many it has proved feasible. Using the case study approach, this research provides insight into key components in the transition to a team system used in modular manufacturing. One of the keys to success in this clothing manufacturing plant was having upper level managers committed to the team system; it takes a great deal of time and financial resources in the beginning, and this does not happen without careful planning.

In addition, employees attributed the success of the transition to the plant manager. The manager not only harnessed the potential of the skills of the team, but empowered them to manage themselves. A successful organisation harnesses the potential of its workforce through open communication and breaking down barriers that prevent effective performance, according to Basdeo [3].

The results of this case study indicate some elements that made a positive qualitative contribution to the implementation of modular manufacturing in the South African clothing industry. Key elements to note are management commitment, education and training, and leadership that drive the organisation towards attaining organisational goals. The attempt at a qualitative text analysis of interview transcripts leads to statistical results that concur with the positive views on the team system expressed in this article. It is thus also concluded that text analysis may be a useful tool to analyse narrative results from interviews for decision-making purposes.

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