

Improving Company throughput at a South African Company

Makhala Mpho Motebele, Charles Mbohwa

Abstract—Research has largely concentrated on customer responses to the products they have received from tiger brands. The present study sheds light on the determinants of customer loyalty to a content-based service, improving company business processes and optimum productivity in a manufacturing company. General fundamentals of productivity must build a loyal customer base in order to attract repeat business and have a competitive advantage over competitors. Need fulfillment, responsiveness, security and technical functionality of the company are shown to influence productivity. Managerial implications are provided.

Keywords—Capacity planning, Process Capability, Operations Strategy, Human Capital.

I. INTRODUCTION

PIONEER food has contributed to South Africa's rich agriculture heritage. Our core business is the production, distribution, marketing and selling of a diverse range of food, beverages and related product for both Human and animal consumption. The present day company was formed in 1997, and is building on the foundation laid by two pioneering farming co-operatives, namely Bokomo and Sacco. Operating in the food and beverages business sectors, Pioneer Foods' core business is the production and distribution of a diverse range of food, beverages and related products. Focused on products for both human and animal consumption, Pioneer Foods is a significant player in these industries in southern Africa. Employing more than 11 000 permanent employees, the Group has a leadership position in the staple foods segment with value-added quality products, and a diversified and expanding portfolio of premium household brands, across all market segments of the LSM categories. The Group's sophisticated research and development infrastructure and wide distribution network, enable it to pass cost benefits on to the consumer, achieved through efficiently managed economies of scale, and are comparable to the best in the southern African food industry. Underpinning the quest to produce affordable products of a consistently high quality is a serious commitment to food safety and nutritional ethics. The division of Pioneer Foods on which the assignment is based is Bokomo Foods. Particularly the unit of Bokomo Foods named Moirs Biscuits. The Factory has moved from the former

Kwality Biscuits brand which based at an old decrepit factory in Bronkhorstpruit just outside Cullinan. The Moirs biscuit plant is a newly built factory nested in the vibrant industrial Economic hub of Gauteng in Olifantsfontein Midrand. The plant has 102 permanent employees and 78 contract employees across three shifts which cover a 24-hour shift pattern. Moirs Biscuits produces an assortment of biscuit delicacies, some of the biscuits that people may be familiar with are the popular Tea lovers and Lemon Cream brand of biscuits. These products are now produced under new and improved recipes under the most elaborate and strictest quality conditions available for production. Given that Moirs Biscuits is a new factory there are several operational challenges that face the company from process issues right down to the Human Resource problems.

In order to get the facility back on track, it essential that we critically look at improvement opportunities across business processes across all functions and establish way on how we can improve / build on them to deliver organizational objectives and shareholder value. This paper follows a structured approach looking at methodologies, tools and techniques that are utilized in the area of Operations Management. The Operations Strategy is reviewed in detail to ensure total clarity and transparency in crafting the strategic direction of the organization, in simple terms: "what we want to achieve and how do we get there". This is followed by a quick review and analysis of the products and product mix that are produced. The paper seeks to establish if the consumer expectations are being realized. A review of the process in terms of design was done with a view to optimize the manufacture the products. A detailed analysis of the facility layout was done with a view to optimize it. Process flow from a quality and food safety risk perspective was discussed and reviewed. Operational Risk Management, Health and Safety are highlighted as important facets of factory lay-outs. The assessment of the factory's ability to meet the market requirements in terms of volume and mix (capacity planning) was done. Here optimum shift patterns, hours of work and plant capacity were looked at. Simultaneously, the actual ability of the process to manufacture the product according to customer or consumer expectations was assessed (Process Capability). Scientific tools and the use and application for the Moirs' Biscuit were established. The last, but certainly not the least important part, of any organization, its people, or Human Capital is also discussed.

Makhala MphoMotebele; phone: 082 845 5113; P.O Box 1347 Geldenhuys Street Protea North 1515, (email:makhalamotebele@ymail.com).

Charles Mbohwa is the professor of the University of Johannesburg, P. O. Box 524; Johannesburg 2006; Tel: 011 5591202; Fax: +27-11-5591347; email: cmbohwa@uj.ac.za).

II. LITERATURE REVIEW

Operations strategy: An organization's operations function is concerned with getting things done; producing goods and/or services for customers. However, many people think that operations management is only concerned with short-term, day-to-day, tactical issues. All business organizations are concerned with how they will survive and prosper in the future. A business strategy is often thought of as a plan or set of intentions that will set the long-term direction of the actions that are needed to ensure future organizational success. However, no matter how grand the plan or how noble the intention, an organization's strategy can only become a meaningful reality, in practice, if it is operationally enacted. An organization's operations are strategically important precisely because most organizational activity comprises the day-to-day activities within the operations function. The relationship between an organization's strategy and its operations is a key determinant of its ability to achieve long-term success or even survival. Organizational success is only likely to result if short-term operation activities are consistent with long-term strategic intentions and make a contribution to competitive advantage. The relationship between operations and the other business functions is similarly important. The objective of the operations function is to produce the goods and services required by customers whilst managing resources as efficiently as possible. This can lead to conflicts within an organization. [1]

Conflicts between the operations and the Marketing functions are likely to centre on the desire of marketing to ensure that operations concentrate on satisfying customers. Whilst this may seem desirable, marketing will usually want operations to be able to meet customer needs under any circumstances. This is likely to lead to demands to produce greater volumes, more variety, higher quality, a faster response, and so on, all of which are likely to lead to less efficient operations. Conflicts between the operations and the accounting and finance functions, on the other hand, are likely to centre on the desire of accounting and finance to want operations to manage resources as efficiently as possible. This will tend to pull operations in exactly the opposite direction of that desired by marketing. Conflicts between operations and the human resource management function are likely to centre on issues of recruitment, selection, training, management and the reward of those employed within operations. The operations function lies at the heart of any organization and interacts with all the other functions. As such, achieving agreement about what decision areas lie within the purview of operations, and what should be the basis of decision-making within operations is an essential part of ensuring the consistency of action over time necessary for a successful organizational strategy [1], [2].

Management of quality: The responsibility for the management of quality extends throughout the entire organisation and thus must be orchestrated by the top

individual in the organisation. Not only must the current quality activities be stabilised and coordinated but continuous improvement must be sought. That improvement can be obtained by focusing on three factors, the organisation, business and manufacturing processes within the organisation and individuals [2]. Measuring quality is deciding whether quality has been achieved depends upon the perceptions of customers or users. This is because the driver of quality is the needs of customers or users. Measuring quality prior to delivery is very critical in the product design phase that the customers need one properly reflected in the specifications and drawings. Laboratory and field tests prior to production can verify whether needs will be met by the proposed designs. Once an effective design is found, quality measures can be specified to determine that the product will perform to the design. In this way the measures can help predict how well the customers' needs are met during production prior to distribution. If customers' perceptions can be predicted before the product is delivered, needed corrections may be possible before the customer receives it.

Quality measures in production can be a dimensional measurement, performance test data or durability test data. The first two quality measures tend to confirm early in the product's life testing, can help predict satisfaction with the product later in its life cycle, durability tests are growing in importance. After the product has been distributed actual perceptions about meeting needs can be sought. Perceptions are found by companies through direct contact as well as surveys. The surveys may be conducted by mail or telephonically. Results furnish valuable feedback for the continuous improvement of business and manufacturing processes surveys may be conducted outside the firm so that the competitor's products are evaluated at the same time. Comparison to a product of a competitor gives useful information as to how well the customer expectations are being met in the market place. The importance of basic quality information is that it must be understood and developed by the personnel in the organisation who also have the ability to make improvements. For that reason, the data should also be represented in an easy way to read format – pie charts and bar graphs that show visual trends as well as irregular patterns. Quality basics require that procurement personnel, as well as production and engineering professional be comfortable with daily measures of product and process goodness [2].

The control of manpower: The control of manpower requires measuring, monitoring, comparing it with the manpower plan. Just as the sales demand will vary around the manpower plan, so will production vary around the manpower plan [3]. A certain amount of variation is considered normal, so it is wise to establish tolerances, or plus and minus ranges within which no change in manpower planning would be required. Any deviation from the predetermined ranges would trigger re planning via overtime, layoffs and so on. Inherent in planning is the necessity to predict and prepare a manpower plan under the conditions of great uncertainty. Successful control requires corrective actions to be taken as soon as

possible when actual conditions falls outside the tolerances of the manpower plan [3]. As part of an overall management information system reports should be developed showing the number of employees, number of absentees, frequency of absenteeism, layoffs, new hires, types of skills, and skills levels. Measures of productivity efficiency indicate output per unit of manpower. Measurements might be in units per man-hours, direct labour man-hours to unused man-hours, direct labour man-hour to machine- hours, overtime-hours to straight time hours, piece-rate workers to day workers. Each ratio measures actual performance against the plan, to trigger corrective action and bring results back to the planned norms. Without this type of comparison there would be no knowledge of either efficient or inefficient use of manpower.

When deciding on employee mix, operations managers must weigh considerations like skill levels, the extent of any cross-training and the ratio of part time to full time employees. These issues affect the overall flexibility of the firm's labor pool and the investment that it must make to develop the employees that it needs. Managers must make important tradeoffs to determine an appropriate employee mix. To make employees more flexible, they could invest in cross-training [4] after comparing benefits against the costs of justifying the investment.

Principles of productivity: The following principles of productivity should be considered by companies that want to improve throughput and operational performance:

1. Time is the most precious resource - it cannot be stored, reused or slowed. This demands intolerance of delays and time cushions, concentration on speeding up all needed activities, and eliminating unneeded ones.
2. Well run operations do not normally require complex systems, technology and unnecessary computerisation- Focus attention on eliminating problems not coping with their effects.
3. Any manufacturing problem can be minimized, most can be eliminated - Chaos is not normal in manufacturing. One problem solved may produce much better results than any system enhancement to handle its effects.
4. Plans impossible to execute are worse than useless - the final result will be poor throughput and performance. Realistic planning is important.
5. Plan capacity over a long horizons schedule specifics in the near term - Detailed plans should cover only very short horizon.
6. Planning defines resources needed to make what is planned; execution applies available resources to make what customers want now. This highlights the difference between planning and execution.
7. Educate all employees continuously- manufacturing is a living activity, constantly changing to meet market needs. Next to time, people are a company's most important resource.

Manpower capacity: The term capacity by itself can be misleading. In fact calculations of both available capacity and required capacity must be made in manpower planning.

Available capacity indicates the current availability of such resources as manpower, equipment and facilities under normal operating conditions. Required capacity refers to the capacity needed to meet company goals of optimum customer service, inventory levels, and manufacturing efficiency in the light of customer order or forecast requirements. Required capacity should be compared to available capacity to determine whether the latter should be and can be adjusted to meet the forecasted demand. Available manpower capacity is somewhat flexible because new hires assigned to open work stations or equipment can increase capacity while layoffs of departmental transfers can decrease capacity. Manpower capacity can be adjusted by: working overtime, adding a second or third shift, hiring new employees, laying-off employees, reducing the work week, increasing sub contracting, reducing subcontracting and improving production methods [5]. Planning and controlling of manpower - a key factor in the success or failure of the manufacturing operation is the planning and control of manpower.

Strategy in an organization can exist at three levels: Corporate level strategy is the highest level of strategy. It sets the long-term direction and scope for the whole organization. It is concerned with what the business should be, how resources (e.g. cash) will be allocated and how relationships between the various business units and between the corporate centre and the business units should be managed. Organizations often express their strategy in the form of a corporate mission or vision statement. Business level strategy is primarily concerned with how a business unit should compete within its industry, and what its strategic aims and objectives should be. In single business organizations, business level strategy is synonymous with corporate level strategy. The bottom level of strategy is that of the individual functions (operations, marketing, finance, etc.), the functional strategies. These strategies are concerned with how each function contributes to the business strategy, what their strategic objectives should be and how they should manage their resources in pursuit of these objectives.

Organisations can adopt a cost strategy based on the ability to produce at low cost. A quality strategy is centred on the ability to produce in accordance with specification and without error. Speed focuses on the ability to do things quickly in response to customer demands and thereby offer short lead times between when a customer orders a product or service and when they receive it. Dependability is the ability to deliver products and services in accordance with promises made to customers (e.g. in a quotation or other published information). Flexibility is the ability to change operations. Flexibility can comprise up to four aspects:

- i. The ability to change the volume of production.
- ii. The ability to change the time taken to produce.
- iii. The ability to change the mix of different products or services produced.
- iv. The ability to innovate and introduce new products and services.

Excelling at one or more of these operations performance objectives can enable the organization to pursue a business strategy based on a corresponding competitive factor. However, it is important to note that the success of any particular business strategy depends not only on the ability of operations to achieve excellence in the appropriate performance objectives, but crucially on customers valuing the chosen competitive factors on which the business strategy is based. Matching operations excellence to customer requirements lies at the heart of any operations based strategy. The structural decision areas to be considered are: **Facilities**: the location, size and focus of operational resources. These decisions are concerned with where to locate production facilities, how large each facility should be, what goods or services should be produced at each location and what markets each facility should serve. **Capacity**: The capacity of operations and their ability to respond to changes in customer demand, for example through shift patterns, working hours and staffing levels. **Process technology**: like the degree of automation used and the configuration of equipment. **Supply network**: the extent to which operations are conducted in-house or are outsourced. Decisions about vertical integration, choice of suppliers, their location, the extent of dependence on particular suppliers, and how relationships with suppliers are managed [6].

Structural decisions often involve major capital investment decisions, which once made will set the direction of operations for many years to come. They invariably impact the resources and capabilities of an organization, determining its potential future output. It may be prohibitively expensive to change such decisions once implemented, and hence these must be considered to be truly strategic decisions for the organization. It may be much easier to change the organization's marketing strategy (e.g. its target markets, or its promotional activities) than it is to change its operations strategy with respect to the structural decision areas [6].

Product planning is a process that begins with the company's product development strategy and ends with a design specification for a new product as shown in Fig. 1.

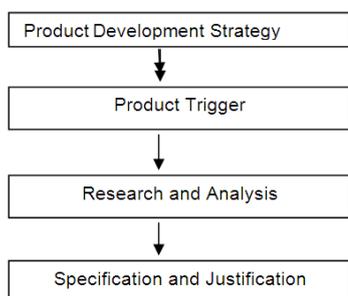


Fig. 1 The stages of the product development strategy

Product development strategy proposes how the company wants to turn that innovation into business success. It describes the position of the company's products in the market

and thereby determines the sort of new products the company seeks to develop. It sets the ground rules for product innovation.

Product Development Strategy involves the development of the actual product. It is usually necessary to integrate the skills of designers, engineers, engineers, production, finance and marketing specialist so that product development is quicker, less costly and result in a high-quality product that delights customers [6]

Product triggers are stimulus to start the development of a particular product. In this case our product has reached its maturity stage and the company wants to maintain the sales of the product to their maximum level as possible. It is therefore important to know what exactly to do in this stage to retain the customers. Our product can be triggered by the new products that are been launched in the market, given the fact that consumers are always looking forward for something new [7]. In the research and analysis stage the opportunities and constraints are researched and finally the proposed new product is specified and justified. When the company decides to make an update or sort of a supplement of existing product it will benefit in terms of retaining its existing customers, maintaining its brand, catch the eyes of the new customers. In doing so our company will get the opportunity to further continue gaining revenues from the product while designing or planning the new ones in order to stay in business [7]. Justification of new product development is done and specifications are set.

Product stork is the process of determining how often this product that is been planned will be needed. This goes on about creating market predictions to determine the buying power of the planned product. After the predictions have been made that determine how often the product will be purchased, we will be able to know how much raw-material will be needed to make that particular product and forecast the capacity to accommodate future demands. In order to be accurate on the previous mentioned, a thorough scanning of the environment needs to be made, this will help us monitor and analyze the company's marketing environment. We can be almost accurate about the future projections when we clearly understand what is going on in the market. [7]

Environmental Scanning is the practice of monitoring and analyzing a company's marketing environment. To key decisions that management need to make are what to scan and how to organize the activity. The first task in the environmental scanning is to define the feasible range of forces that require monitoring. These are the potentially relevant environmental forces that have the most likelihood of affecting future business prospects. The second prerequisite for an effective scanning system is to design a system that provides a fast response to events that are only partially predictable, emerge as surprise and grow very rapidly. It provides the essential informational input to create strategic fit between strategy, organization and environment [8].

Process design is important for company throughput and performance effectiveness and efficiency. In the just-in-time

(JIT) philosophy, the ideal batch size is one unit, a quantity that may not always be realistic owing to practical considerations requiring minimum batch sizes (e.g. machines that processes multiple items simultaneously, heat-treating equipment that processes and machines with very high long set-up times). Nevertheless, the goal is still to reduce the batch size as much as possible. Small batch sizes in both the production process and deliveries from suppliers yield a number of benefits: in-process inventory is considerably less than it is with large batches. This reduces the carrying costs, space requirements, and clutter in the workplace. Inspection and rework costs are less when problems with quality occur because there are fewer items in the batches to inspect and rework; permit greater flexibility in scheduling; good for repetitive systems, which typically produce a small variety of products. This flexibility enables JIT systems to respond more quickly to changing customer demands for output: [8]. Small batches and changing products mixes require frequent setups. Unless these are quick and relatively inexpensive, the time and cost to accomplish them can be prohibitive. There is need to train workers to do own setups, reduce setup time and cost and to have set up tools and equipment and setup procedures that are simple and standardized. Multipurpose or attachments help to reduce setup time. For instance machines with multiple spindles, parts that are easily rotated into place for different job requirements can drastically reduce job change over time [9].

Manufacturing cells: The cells contain the machines and tools needed to process families of parts having similar processing requirements. In essence, the cells are highly specialized and efficient production centers. Among the important benefits of manufacturing cells are reduced changeover times, high utilization of equipment, and ease of cross-training operations. The combination of high cell efficiency and small batches sizes results in little work-in-process inventory and can be considered by companies that want to improve performance and throughput.

Quality improvement: Defects during processing can disrupt the orderly flow of work. Consequently, problem solving is important when defects occur and these can be reduced through the use of automation, involving automatic detection of defects during production and stopping production as necessary. [10].

Production flexibility: Process design can increase production flexibility and reduce bottlenecks in a variety of ways. Computer aided design (CAD) can be used to enhance productivity and flexibility. It can include computer aided process planning (CAPP). Sophisticated CAD systems can also be able to do on-screen test, replacing the early phases of prototype testing and modification. A rough estimate is that CAD increases productivity of designers between 3 to 19 times. [11].

Process Capability: During the design phase of the products & process or a review of the current products being produced, it is essential that the ability of the process to deliver products that conform to specification be determined.

This is called process capability. It is a statistical process control technique that helps an organization establish the variation in a process, determine the cause of the variation and ultimately plan on reducing the variation to acceptable limits or in some rare instances, eliminate them. [11].

Factory and production layout: Layout can utilize computerized layout techniques, which have been developed since the 1970s to help design and implement good process layouts. [12]. Systematic layout planning is done for layout problems where numeric flow of items between departments either is impractical to obtain or does not reveal the quantitative factors that may be crucial to the placement decision. Assembly line balancing – this would occur when, for balance purpose, workstation size or the number used would have to be physically modified. Step in balancing an assembly line [12].

1. Specify the sequential relationships among tasks using a precedence diagram.
2. Determine the required workstation cycle time
3. Select a primary rule by which tasks are to be assigned to workstations and a secondary rule to break ties.
4. Assign tasks one at a time, to the first workstation until the sum of task times is equal to the workstation cycle time, or no other tasks are feasible because of time or sequence restrictions.
5. Evaluate the efficiency of the balance
6. If efficiency is unsatisfactory, rebalance again using a different decision rule.

The trend of office layout is toward more open office with personal workspaces separated by only low divider walls. Companies have removed fixed walls to foster greater communication and teamwork. Size and orientation of desks can indicate the importance of professionalism of the people behind them. [13], [14].

The Utilization of Group technology/Cellular layout has the following benefits:

1. Better human relations. Cells consist of a few workers who form a small work team; a team turns out complete units of work.
2. Improved operator expertise. Workers see only a limited number of different parts in finite production cycle, so repetition means quick learning.
3. Less – in process inventory and material handling. A cell combines several production stages, so fewer parts travel through the shop.
4. Faster production set up. Few jobs mean reduced tooling and hence faster tooling changed.

Capacity planning is the process of determining the production capacity needed by an organization to meet changing demands for its product. Capacity is the maximum rate of output of a process or a system. A discrepancy between the capacity of an organization and the demands of its customers results in an inefficiency, either in under-utilized resources or unfulfilled customers. The goal of capacity planning is to minimize this discrepancy. Demand for an organization's capacity varies based on changes in production

output, such as increasing or decreasing the production quantity of an existing product, or producing new products. [13]. Capacity decisions are very important. They have a real impact on the ability of the organisation to meet future demands for products; affect operating costs- the greater the capacity of a productive unit, the greater its cost. The three steps for capacity planning are:

- Determine Service Level Requirements
 - ✓ The first step in the capacity planning process is to categorize the work done by systems and to quantify users' expectations for how that work gets done.
- Analyze Current Capacity
 - ✓ The current capacity of the system must be analyzed to determine how it is meeting the needs of the users.
- Planning for the future
 - ✓ Using forecasts of future business activity, future system requirements are determined. Implementing the required changes in system configuration will ensure that sufficient capacity will be available to maintain service levels, even as circumstances change in the future.

III. FINDINGS

A. Manpower and Production

Having visited some factories within the group, one does not fail to see the low level of skilled manpower available at the production floor. With such manpower, no production planning will be successful at the level expected by the organization even with the most sophisticated production plan and technology. The group is incurring large labour costs. A situation of low productivity at the expense of quality and quantity can be comfortably generalized. An Analysis of one branch indicated that its operations were occurring at a financial loss.

Production is directly linked to the availability of the right kind of personnel. More personnel in most instances do not improve productivity. This was found to be the case at the company. There were too many employees and productivity was very low.

Centralization of decision making was found to be one of Moirs Biscuits Group's greatest dilemmas. The different levels of managers and supervisors are not appropriately empowered and involved in decisions,

B. Machinery and Technology Use and Impact

There is scope for introducing new machines at Moirs. Since in the industrial revolution, the introduction of machines in the manufacturing sector has been for the purpose of making work easier and improving productivity. Machines are to serve man and compliment for those inadequacies of man in a factory environment. This will improve the company's throughput and performance in the following areas: quality goods, precision, replicability, speed, volume and most importantly offering the it the possibility to make more profit. Some advantages of new confectionery machinery and technology are:

1. Increased productivity – This is due to faster processing, optimization of baking conditions, faster handling of work activities and improved online marketing and sales.
2. Complexity of production – best suited for complex productivity due to increasing demand for variety of biscuits and confectioneries.
3. Cost saving and manufacturing reliability due to improved productivity and consistent production conditions.
4. Advantages over competitors – superior engineering comparison to others.
5. Quality products – finished products that are professionally packaged and modern.
6. Best service and maintenance systems and technologies. New machinery and equipment is designed for service and for maintenance
7. Robust technology – solid background in the baking and confectionery industries which is available and is improving all the time.
8. Shortest payback period on investment – due to money saved on waste, increased turnover and competitive advantage.
9. Modern technology and machinery in the industry can result in 60-70% labor saving costs.
10. Better reliability that is in-built in the machinery and the technology.
11. Organization of production – input – throughput – output through software.

When a large number of employees were moved from the old factory to the new facility, consultation did not take place with all stakeholders (union and employees) to inform / brief them on the new changes and strategic direction of the organization. One of the main cause of the poor performance one unit studied was found to be the very low competency levels of staff. There should have been employee development so that the workers would be competent enough and capacitated to deal with the new equipment, technology and machinery in the new facility. This was compounded by the challenge of having an ageing workforce that is required to make the transition to the new facility with minimum effort and delays, learning new skills in the process. The change management was in the case of this unit not done properly. There was need to at all times involve employees and to harness support from people within the company and its environment. There was need for the organization to make the employees understand where they should be, when, why, and what measures will be needed to get there; plan development towards that and to communicate, involve, enable and facilitate involvement by all people, as early and openly and as fully as is possible. Other change management theories and principles available in literature could have been used to better effect. [15]. This should have been accompanied by an HR Strategy that would have defined how the company can attract the best staff and to ensure their expertise, talent and contribution are maximized [16].

IV. CONCLUSION

This paper has looked at the literature on how Moirs Biscuits company can improved its performance and throughput. There is need for a clearly defined strategy. All employees in the organization must know: What the business intends doing (products to manufacture and sell); How it will be manufacturing these products; What are the specifications of the products (like quality, cost); Resources available to the company; and What part do the employees play in ensuring the organization achieves its goals? Thereafter, it becomes a case of execution of the necessary strategies and refining of the processes.

Key to the success of the organization is time management and effective human resources. In addition technology and machinery will also play an important part. HR Strategy must be crafted with the following Key Strategic Thrusts underpinning the overall strategy: Attract and recruit the best; training & development; performance management; appropriate rewards and recognition and staff engagement.

V. RECOMMENDATIONS

1. JIT SYSTEMS - use of some of the philosophies of just-in-time systems can be of great importance in the biscuit manufacturing company and can help eliminate defects. Moirs must work by these objectives:

- Deliver products on schedule in the quantities that customers need, focusing on the big retail outlets in the country.
- Deliver perfect quality through improved quality management systems that are certified to ISO 9001.
- Reduction of lead times through better planning and implementation systems
- Eliminate waste: So that rejects and breakages are reduced or eliminated
- Develop worker productivity through training and continuous improvement systems
- Continue the quest for improvements

2. Management must use time-phased planning for a company to fulfil these objectives. Planning plays a very important role in making the materials resource available in the near future for the processing..

3. Exposure to the world glass technologies, factories and methods of production should be enlarged. Those workers who are trainable must be helped to acquire innovative attitudes as the organization undergoes a transition from a monopoly to a liberal competitive organization. Process designers and production operations personnel can visit similar factories in industrialised countries with a view to benchmarking with the best in the sector.

4. It is important to empower branch managers to become proactive, lack of authority result in the inability of branch managers to make decisions. In production planning the key issue is to determine the smooth linkage between input - throughput and output. It is most important to organize the throughput to meet the demand of the market in the fastest,

cheapest, most qualitative, effective and efficient manner.

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