AN INVESTIGATION INTO TECHNOLOGY MANAGEMENT TO CREATE SUSTAINABLE COMPETITIVE ADVANTAGE WITHIN THE FAST MOVING CONSUMER GOODS (FMCG) BEVERAGE INDUSTRY

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ABSTRACT

Technologies are evolving rapidly, making it difficult for organisations to manage to keep abreast with the latest technologies. This research study examines the influence of technology management to create a sustainable competitive advantage within Gauteng's beverage organisations. Fast-Moving Consumer Goods (FMCG) organisations today are exposed to innovative and advanced technologies that are aimed at improving overall organisational efficiency and production. Management's support structures and approaches are essential in ensuring that technologies, either old or new, are maintained and accepted by employees. Beverage industries are facing great difficulty when old technologies have to be maintained, leading to increased maintenance cost, inexperienced technical staff members, and the inability by management to implement efficient technology management procedure and practices. Although beverage organisations still persist with legacy systems, which have definite functionalities, these systems are limiting organisational growth to comply with emerging technologies and new business requirements. Additionally, new technology integration into existing business systems are proving difficult due to improper technology management and lack of positive acceptance by employees. The quantitative research study examined the ability of beverage organisations to manage technologies according to predefined technological principles and activities, in order to create a sustainable competitive advantage. Recommendations to the research study includes up-skilling of staff, utilisation of well-defined technology management frameworks, two-way communication, change-management processes and intelligent manufacturing systems. The conclusions definitely highlight the importance for beverage organisations' management to follow a technology management framework that supports and facilitates technical staff to implement new technologies and migrate legacy systems effectively. New technologies must be seen by employees as a positive change for beverage organisations to increase efficiency.

Keywords: Beverage organisations; manufacturing; fast-moving consuming goods; technology management.

1.1 INTRODUCTION

Innovative and diverse technologies are changing the way Fast Moving Consumer Goods (FMCG) companies function today, due to the readily availability of information. These companies are able to use technologies to their advantage, by giving rise to new product variations, developing new markets, and improving overall quality, through their entire production processes. However, due to the changing nature of technology, beverage companies in particular, need to use the principles and procedures of technology management

programs in order to maintain and create competitive advantages, either by cost or differentiation.

1.2 Background to the study

Fast-Moving Consumer Goods (FMCG) refers to the consumption of packed goods, which include beverages, food, and over-the-counter drugs (Nagarajan & Sheriff, 2013:43). Furthermore, Nagarajan and Sheriff (2013:43) highlight that these goods are often retailed at consistent periods. FMCG prices are moderately less and profits are made up through the volume of sales. In the move towards world-class manufacturing, many beverage companies find it difficult to keep up with the advancement of technology in the efforts to attain improved efficiencies and productivity. Thus, managers have the unenviable task of maintaining and ensuring that their engineers and employees are skilled enough to keep up with technological advancements. Technology Management refers to the predefined management guidelines that enable organisations to manage their technological first principles in order to create sustainable competitive advantages (Amalnik, 2014:711). This encompasses the upgrading and maintaining of legacy systems within beverage companies, which need to be planned due to capital expenditure limitations, and additionally coordinated, to confirm plant availability. A legacy system is any computer system that significantly resists modification, but is business critical, and hence, their failure can have a serious impact on the business (Batlajery, Khadka, Saeidi, Jansen & Hage, 2014:3). These legacy systems require that managers do plan ahead to ensure that their engineers and employees are constantly equipped to deal with regular crisis situations beverage companies should be enduring. Whether it is implementing or optimising technologies, beverage companies need to think proactively, which requires continuous planning and adaptation by top management to ensure that they stay competitive.

1.3 Problem statement

The beverage industry experiences great difficulties and challenges in maintaining legacy systems, as well as migrating to more advanced, efficient systems, while keeping their functionality and processes intact. Additionally, the cost of maintaining equipment becomes an ever-increasing concern due to the growing costs of replacement parts and not achieving business targets as a result of delays caused by the plants' unplanned maintenance. The problem is further exacerbated by inadequate and incompetent junior maintenance employees, as many of the competent technical and experienced employees are frequently leaving the beverage companies. Improper technology management reduces the capability of beverage companies to produce products of high quality and at a productivity level that keeps production cost under control. Large scale beverage manufacturers are finding it more difficult today to manage technology due to small scale beverage manufacturers using efficient and compact technologies in production. Thus, a major challenge is for all beverage manufacturers to manage their technologies well enough to be able to deliver a constant revenue stream and profitability, in order to stay competitive.

1.4 Aim of the study

The aim of this study is to establish the importance of technology management in the FMCG beverage industry so that companies in this industry can attain a competitive advantage.

1.5 Research Questions

The research questions are aligned to the objectives of the research study, namely:

What are the management's approaches and methods being used in technology management?

How does technology management influence the company's competitive advantage?
In what ways can effective technology management transform productivity performance of beverage industries in Gauteng?

1.6 Significance of the study

The contributions of this study will be beneficial to both management and technical staff of beverage companies as in how competitive advantages can be attained through the effective management and development of technology. Unsal and Cetindamar (2015: 182) highlight that creating and sustaining a competitive advantage requires more than operational efficiency and cost minimization. For technology intensive companies, creating sustainable competitive advantage is related to the capability of managing technological assets. Furthermore, this research study will provide information on wide-ranging legacy system migration strategies that are currently being implemented, as well as the best practice maintenance procedures. This information will thus enhance the knowledge of beverage producers about the appropriate ways of maintaining plants, as well as understanding how the upgrading of older technologies can improve productivity and performance. Moreover, this study will provide areas of training and development that are needed for improving engineers and technical staffers' competencies. For future researchers, this study can provide an insight into technological advancements that are specific to the beverage industry and have assisted in improved product quality.

2. LITERATURE REVIEW

Globalisation has brought about rapid technological changes, which brings up innovative ways of doing business. New technologies are continuously being introduced into the market, which provides more efficient methods for organisations to improve internal business processes. Ultimately, technological changes are occurring so rapidly for organizations that the ability to adopt new technologies is becoming an important mechanism. Technology is the design and manufacture of innovative and inventive products to satisfy consumer needs (Rettinger, 2014:1). Amalnik (2014: 705) argues that technology is an accepted plan to diminish the certainty in cause-effect relations involved in attaining a certain objective. This description recognises that information processing actions are able to create advantages which can be attributed to the strategic management of technology. Companies that are part of FMCG industry, such as beverage organisations, need to be at the forefront of modern-day technology in order to stay competitive. However, many of these beverage organisations are experiencing difficulties due to their limited information technology infrastructures and manufacturing technologies. Therefore, it is essential for these organisations to invest in modern technologies such as cloud computing, intelligent manufacturing systems and efficient automation systems. These modern technologies will assist beverage organisations to collate data from both primary and secondary activities of their value chains in order to create data visibility and take advantage of technological opportunities, so as to attain a competitive advantage.

2.1 Trends in manufacturing technologies

The progression of technology into the modern age, reduces the need for manual labour and other forms of waste. The swift pace of technological change demands a multi-disciplined, strategic approach from all forms of management levels if development is to occur in an effective and efficient manner, to take advantage of technological opportunities. White and Bruton (2011:17) postulates that product life cycles have been shortened due to the rapid pace of technological development and the increasing sophistication of individually-designed products. Subsequently Berthold and Imkamp (2013: 1) accentuates that under the impact of

global megatrends, manufacturing technology is faced with a number of different challenges; from the speed of product development, to the accuracy of data. Trends in manufacturing, represent a gradual change in resource efficiency, process capability, increasing flexibility and transparency – all of which have a special significance in production today. Advancements and trends in manufacturing technologies are driving organisations to reconsider their approaches to the manufacturing of products. Adopting these technologies creates a future in which value chains are shorter, more localised and more cooperative, and creates sustainability benefits (Despeisse & Ford, 2015: 1). Despeisse and Ford (2015: 2) asserts that new technology trends such as Additive Manufacturing (AM), known as Three Dimensional (3D) printing, allows objects to be developed more efficiently, and is progressively being implemented as a direct manufacturing approach in sectors such as motorsports, aerospace, toys, jewellery, along with a number of medical applications where personalisation is key (e.g. hearing aids). AM could make, or support future needs into becoming more sustainable in manufacturing, which includes improvements to resource efficiency, effective manufacturing, and introducing new manufacturing processes (Despeisse & Ford, 2015: 2). Robots today have revolutionized current processes by making production more efficient and effective. For many years, industrial robots were large, expensive, operated from static positions – mostly indoors, and commonly used to perform repetitive tasks (OECD, 2016). But, a conjunction of digital technologies have made robots smaller, more self-directed and more flexible, which can be programmed and used by average workers, thus enhancing processes and production (OECD, 2016). Robots are also able to learn able to learn and adapt to numerous processes rapidly in today's age of digitalisation. Consumer taste and uniqueness currently force manufacturing organisations to create and instil flexibility in their production processes as brands and taste are constantly being introduced in to the market.

2.2 Legacy systems

According to Batlajery et al. (2013:13), a legacy system is a significant and large system that individuals within an organisation are unable to deal with. Subsequently, Conteh (2015:120) defines a legacy systems as outdated software or hardware systems that are not upgradeable to the latest versions. Due to legacy systems having lengthy presence in an organisation, these legacy systems impact heavily on the way organisations think and the way work is managed. Legacy systems, due to their historical presence in the organisations, become intensely entrenched in an institution's thinking about how work should be organised (Alexandrova, Rapanotti & Horrocks, 2015:1). For more than two decades, Siemens' legacy systems were used for many forms of process automation within the organisation's industry sectors (Automate, 2016). These legacy systems – known as the SIMATIC S5 controller – were responsible for a range of controlling tasks. Although many of these legacy controllers are still in existence today, advancements in technology has increased the demand to migrate these S5 systems to the new S7 systems (Automate, 2016).

2.3 Business value of legacy systems

Although legacy systems are considered obsolete technologies, these systems are still being utilized in businesses today due to a portion of value they contribute towards business (Mingus, 2015:1). However, some employees within the affected business sector (in this case, the FMCG industry) consider legacy technologies as a hindrance towards acquiring and developing new skills and knowledge. According to Mingus (2015:3), there are associated financial and business reasons for legacy systems to continue which include:

- The time taken is very costly for redesigning a system that currently still functions and serves the necessary product or process requirements. Companies prefer investing

in money-making or saving opportunities, as long as these old systems perform a specific task or function.

- Legacy systems are designed and custom-made to meet specifically the business requirements and procedures. These legacy systems fit within the organisation so perfectly and are almost universally made, thus deterring organisations from changing procedures so that system can be upgraded.
- The migration of old systems to new technologies can be expensive when software redesign is needed, as well as the acquisition of new hardware. Additionally, existing staff do not have the essential skills to migrate to new technologies, thus additional consultants and extensive training become compulsory, leaving organisations in a migration dilemma.
- Many legacy systems often involved efficient automated functionality which contained business personnel, financial and product information. Thus companies maintain that redrafting these systems could potentially endanger data confidentiality and data integrity and, for this reason, opt to keep their legacy systems.

2.4 Legacy system assessment

One of the central aspects that forces an organisation to sustain its legacy system in business is the extremely customisable functionality provided by the system, which cannot be simply implemented in many new enterprise solutions (Alkazemi, 2014:111). Therefore, businesses must be able to conduct the necessary assessments of their legacy systems in order to evaluate optimal strategies for the upgrading of these systems. According to Alkazemi (2014:112), there are four strategic options:

1. Scrapping the system completely when the system is not effectively contributing to business processes.
2. Continue maintaining the system, which occurs if the system is still needed and users do not require any system changes.
3. Changing of the system in an effective way so as to optimise system maintenance, and often occurring where and when regular changes are needed.
4. Migrating of old technologies to new systems when the old system cannot continue to be in operation.

It is of paramount importance for the organisation's management to ascertain where their legacy system is and then apply the best strategy, against the business value to be derived out of the legacy system.

2.5 New technologies in beverage manufacturing industries

According to Batlajery et al. (2013:17), the first signs of legacy modernisation is when legacy systems present difficulties in communicating with new or current technologies and the maintenance of these legacy systems becomes increasingly complicated. Today's businesses functions require effective scalability, rigidity, manageability and efficient processing, most of which legacy systems cannot deliver. In order for manufacturers to succeed in industry, execution strategies must be formed to take advantage of technological innovations (Bono, 2015). New technologies have enabled manufacturing firms to increase system uptime by improving performance, efficiencies and productivity. New production technologies are faster and precise, smaller, cost-effective, and are consistent than the technologies they succeed (OECD, 2016:7). In addition, OECD (2016:8) accentuates that new technologies are able to produce and deliver large amounts of information that optimises the functionalities within machines. These increased functionalities serve as substitutes for many previously renowned functions that were hitherto occupied by humans.

2.6 Management of resources and decision making

Many decisions are made by managers based on the resources available and some of these decisions are strategic and operational. Decision-making is a massive responsibility for everyone involved, which includes employees. Information is needed across all levels of the organisation in order for managers to make appropriate decisions that will increase productivity and performance. However, there exist differentiation in the types of information at each level. Lower level is where managers or supervisors need accurate, measureable and organisational information. Managers at the top levels need undefined, summarized, future-oriented, and mostly external information (Karaman & Ghaffarzadeh, 2014:130). Resources can be in the form of technological information from different levels of the organisation which can enable management to effectively understand the status of current technologies and thus make appropriate decisions to either improve or maintain current technologies. Upward communication from the lower levels of the organisation provides feedback and information on how well the organization is functioning, and conveys operational problems and performances (Boundless, 2016). Through the upward sharing of information, managers are able to gather information about employee's feelings towards their jobs, technological difficulties, working conditions and the organization's health or well-being in general. Decisions are made at each level of the organisation, however agreement between the levels are not always reached.

2.6.1 Technology management in manufacturing industries

Technology management is concerned with the linking of all interconnected areas of science and management, and engineering to generate and implement technological competencies (Roy and Singh, 2015:113). Roy and Singh further asserts that these capabilities shape and achieve the operational and strategic aims of an organisation. According to Schuh and Kramer (2015: 439), technology management can be referred to as the effective identification, choice, acquisition, advancement, exploitation and protection of technologies required to preserve a set of products and services to the market or industry.

2.6.2 Technology management frameworks

A framework can be defined as an interconnected set of concepts that help to determine how a specific phenomenon functions (Svinicki, 2013:5). The main aim of the technological management framework, is to provide an understanding on how strategy, innovation and operational processes can be supported with the technological and commercial knowledge within the internal and external environments of the organisation or firm (Zadhi & Othman, 2011:45). The understanding of technology being motivators of innovation has come to be known as the technology-push approach to innovation, wherein organisations create marketable products, mainly in the recognition and acknowledgement of scientific discoveries (Li et al., 2012:3). Contrastingly, Li et al. (2012:6) highlights that market pull innovations are primarily the development of direct attempts to satisfy market needs, provided that innovation is predominantly the product of scientific development, then it can be considered a technology-push innovation. Cetindamar, Phaal & Probert (2009:241) assert that stability among market 'pull' (i.e. requirements), and technology 'push' (i.e. capabilities) must occur. Mechanisms such as communication channels, teams, management tools training, business processes can support the link of the technical and commercial perspectives (Cetindamar et al., 2009:241). Market pull and technology push refer to sources of innovation and motivations for innovators.

2.7 SWOT analysis and organisational competitiveness

SWOT Analysis, which stands for Strengths, Weaknesses, Opportunities and Threats analysis, is referred to a system that considers both internal and external factors affecting the performance of an organisation, relative to competitors or market conditions (Abubakar & Bello, 2013:84). Thus, the SWOT analysis technique is an aid for managers in developing a strategy that creates a strategic fit between the company's capabilities, resources, and competencies and its industry structure.

2.8 Manufacturing management best practices in industry

There are numerous forms of best management practices in manufacturing operations the management area, and these include Six Sigma and Lean Manufacturing (Munizu, 2013:1).

2.8.1 Lean manufacturing

Lean manufacturing has been regarded as a necessity to meet the needs of customers and continue to remain profitable in a progressively competitive environment. Marshall (2015:7) emphasizes that - due to the widespread success of the Toyota's system of production (the basis for lean systems) in the automotive industry - lean production has transformed into one of the prominent research paths in the area of Operations Management (OM). Lean productions are standard practices in the manufacturing industry (Marshall, 2015:71).

2.8.2 Six Sigma

The Six Sigma program attempts to improve the processes within an organisation, with the focus on reducing variability in organizational processes and routines (Parast, 2011:50). Madhi and Almsafir, 2012: 95) defines Six Sigma as a type of management strategy under the direction of senior management to create total customer satisfaction and quality innovation. It provides the means of: "doing things right, the first time!" – And, to work smarter, by using data information. A popular framework for Six Sigma is DMAIC which encompasses: Define, Measure, Analyse, Improve, and Control phases (Shing, Nadarajan & Chandren, 2014:123). These phases are described below:

Define: In this stage, senior to top management identifies the scope and goals of the company, in accordance with customer feedback and the company's mission and strategy (Hung & Sung, 2011:581).

Measure: This stage involves a measurement that is reliable, to support in the control of the goals and scope that is previously defined in the first stage (Hung & Sung, 2011:581).

Analyse: In this stage, analysis tools and techniques are used to identify and confirm the root causes of a defined problem (Hung & Sung, 2011:581).

I**mprove:** The improve stage aims to eliminate the causes of problems, process variations or prevent the reoccurrence of problems, by finding workable solutions (Hung & Sung, 2011:581).

Control: After improvements are completed, continuous measurements are needed on the processes, to ensure stability and control (Hung & Sung, 2011:581).

2.9 Competitive advantage within beverage industries

Organisations today have to find ways of become quicker than their competitors. The aim of organisations is to beat their competition as well as generate new customers. Individuals who possess knowledge signify a tool for creating innovations. With individual's knowledge, personal creativity, skills and abilities, it is likely to generate new innovative ideas that will assist organisations to attain a sustainable competitive advantage (Hana, 2013:82). Unsal and Cetindamar (2015:182) asserts that creating sustainable a competitive advantage is the only

way for firms to make sustainable profit and – therefore - to survive. Companies these days are facing ever-changing environmental conditions, swift technological developments and progressively growing competitive requirements. However, companies that have a competitive advantage through differentiation and product variation strategies must take cognisance of competitors' duplicating its business procedures and drawing in its customers. Many years may pass before a company realises a strong brand image that sets it apart from its competitors. During that time, the company faces the risk of changing consumer tastes or preferences (Leger, 2016). Intense competition and heightened customer requirements require a greater need from FMCG firms, in particular beverage companies, to differentiate themselves through the management of technological innovations, in order to secure a competitive edge as many smaller beverage manufacturers can now rival larger manufacturers through advancements in technologies. There exist intense competition within the food and beverage sector and resultant profits are very small.

2.10 Value chain and competitive advantage

Value chain strategies have a significant impact on the organisations' ability to reduce costs and increase their competitive advantage within the market arena.

2.10.1 Value chain

Companies that are able to determine and structure suitable positions in the value chain through distinct strategies and specific actions are able to generate or create value (Sahlman & Haapasalo, 2012:61). According to Jung (2014:134), the value chain has two distinct sets of activities that an organisation undertakes. The first set is the primary activities, which is directly related to the products or services that an organisation sells to a customer, whereas the second set includes the support activities which relate to functions that are contained within an organisation's infrastructure that assist in the performing of the organisation's primary activities. Kirli and Gumus, (2011:308) asserts that the value chain is an instrument with which to confirm and analyse an organisation's competitive advantage. Organisations have numerous resources, capability and a competitive advantages, such as the human resources advantage, management advantage, technological advantage, and or the innovative advantage. The Value Chain analysis aids management by providing a comparison between the critical success factors - such as product cost, product quality, and innovation and delivery time to that of competitors - and selecting the appropriate strategy (Alnawaiseh, Rawashdi & Alnawaiseh 2014:179).

2.10.2 Competitive advantage

Customer satisfaction is considered as the number one priority for organisations in an extremely competitive environment (Kirli & Gumus, 2011: 307). These competitive environments have driven companies today to adopt innovative management methodologies, change manufacturing systems and capitalise on the latest technologies. Alnawaiseh et al., (2014:180) proclaims that in order for a competitive advantage to take place, companies must acquire the necessary technologies, resources and abilities than can make changes to products and services to satisfy customers' needs, as well as respond speedily to the variations in the competitive environment (Alnawaiseh et al., 2014: 180). Organisations employ differentiation in their products and services as a strategy to create uniqueness, and is directed towards customers that are not price-conscious (Bowen, 2011:12). Product uniqueness is often represented in the technological supremacy, quality, design, and the difficulty for competitors to imitate (Bowen, 2011:12). With the utilization of a differentiation strategy, it is possible for organisations to produce exceptional profits and outperform competitors through excess revenues.

2.10.3 Technology as a strategic competitive factor

According to (Philbin, 2013:35) technology can be a strategic factor in executing an organisation's strategy. Technology is a valued resource for numerous organisations, both in the not-for-profit and commercial or industrial sectors. In order for organisations to remain competitive - especially in knowledge-intensive industries - these organisations need to have access to leading technologies (Philbin, 2013:35). According to Liao, Fei and Chen (2007:9), there are two types of knowledge-intensive industries; with the first being high-tech industrial organisations or companies in the manufacturing sector, which includes the aerospace and electronics industries; while the second type is referred to as being the knowledge-intensive services, which include the education and information service industries. As reported by Noorani (2014:14), technology enables companies to present innovativeness at an extraordinarily fast pace, providing solutions that assist companies to perform better in relation to their competitors, because the short-cycle times and innovative products enable companies to achieve the niche in almost every market.

3. RESEARCH AND DESIGN METHODOLOGY

Fonseca, Costa, Lencastre and Tavares (2013:1) acknowledge that while case-study approaches are predominantly fitting for detailed studies, survey-based methodologies can provide substantial amounts of data that are generally easier to process and suitable for forecasting and generalization. This is a quantitative study which used methods to highlight objective measurements, statistical, mathematical, or numerical analysis of data collected through a self-administered questionnaires. The quantitative approach is appropriate for this study because the data collected from participants are based on their physical, technical and management experiences within beverage companies that directly relate to efficiencies and productivity.

3.1 Research philosophy

According to Creswell (2009:231) philosophy/paradigms is referred to as a worldview. This research study will be using a positivistic approach as a research philosophy in order to study the effect of technology management introducing a competitive advantage within the beverage industries. The foremost reason for choosing this approach is that the study will be using a deductive approach. To ensure validity, the research study focused on a scientific and statistical approach which relates to a positivist philosophy. A positivist approach quantifies and processes the noticeable into scientific evidence. The use of scientific methods are consistent, reliable and valid. Objectivity during the study was the foremost priority when generalising findings from a specific to the whole population. Results were obtained quantitatively while being objective. Survey research provides a quantitative description of trends, attitudes, or opinions of a population by studying a sample of that population (Creswell, 2009:12). A survey includes cross-sectional and longitudinal studies, using questionnaires or structured interviews for data collection, with the intent of generalizing from a sample of the population.

3.2 Rational for selecting a quantitative approach

This study focused on a quantitative approach, more precisely a survey type of research study; because a statistical analysis of reordered data from different views of people (management and technical level) could be performed within the beverage manufacturing industry. As per the research study topic, both variables of technology management and competitive advantage cannot be controlled or manipulated to obtain a desired outcome, thus – due to this limitation – surveys were sent to participants who were, and are still exposed to the real conditions within the beverage industries. Additionally, a quantitative approach is

much more of a structured approach than a qualitative approach. Due to the large sample size of the beverage industry, a quantitative research study was appropriate and especially useful in carrying out the large scale survey throughout the beverage industry to analyse both managerial and technical views and trends. The quantitative research study was additionally utilised to quantify both managerial and technical employee attitudes, opinions, behavioural patterns and other distinct variables, all of which yielded generalised findings from the large sample population. The results of statistical data was used to support the relationship between the two variables (Technology Management and Competitive Advantage). Comparisons of these two variables, based on the statistical outcomes, determined whether or not technology management influences competitive advantage. A self-administered survey was used, as it was relatively easy to survey people, thereby allowing a conclusion based on the gathering of data and findings. These findings were then generalised across the beverage industry.

3.3 Target population

This research study involved people from management and technical staff members from three Gauteng beverage companies. These staff members were subdivided amongst the two companies, which included: Amalgamated Beverage Industries (ABI), consisting of 450 members; and Coca Cola Canners South Africa, consisting of 350 members. The total target population was 800 employees from the two beverage companies in Gauteng.

3.4 Sampling strategy

There are two types of sample designs which are probability sampling and non-probability sampling. Due to selecting a quantitative research study approach, the findings was piloted across the beverage industries. Therefore, the sampling method was non-probability judgemental sampling, whereby the people chosen within the sample came as a result of their present and prior knowledge and professional judgement within the beverage industries. These people included technical and management staff.

3.4.1 Source of data

Primary data is the data the researcher collects to address the specific problem at hand, and regarding the research question; whereas secondary data becomes the results of studies done by others, and for different purposes than the one for which the data are being reviewed (Cooper & Schindler, 2014:663). Primary data was used in the study, rather than secondary data, because secondary data transpires over time and is not a true reflection of a current study.

3.4.2 Pilot study

Pilot study is defined as a small scale experiment of the techniques and procedures to be used on a much larger scale (Hazzi & Maldaon, 2015:53). A pilot was conducted and issues addressed. The least difficult sections where technology management as the majority of the technical and managerial staff faced these issues on a regular basis. The questionnaire was sent via email to six plant technicians, two engineers and two technical managers in the same environmental parameters as the actual research study. All the questionnaires where returned via email within a fifteen day period. The pilot study also determined the estimated timeframe needed to complete the questionnaires.

3.5 Data analysis

Data analysis is a deductive process whereby data are organised, scrutinised through and read (Castellan, 2010:7). A quantitative approach was taken to analyse the data of two variables (technology management and competitive advantage). According to Creswell (2014:84), a

variable refers to a quality of an individual or an organisation that can be measured and that fluctuates among the people or organisation being studied. The main aim of utilizing a quantitative approach was to test the predetermined hypotheses of whether the effect of technology management is a tool to gain a competitive advantage and produce generalizable results. Due to our sample size (beverage industry) being a collectively a large sample, a quantitative analysis approach was deemed appropriate. The advantage of applying quantitative data analysis in the study is that the data from the gathered questionnaires was easily comparable between different communities within different locations. With the use of statistical methods, the results of quantitative analysis assisted in proving the hypotheses about the effect of technology management on a competitive advantage within beverage industries. The results of the respondent's feedback via the generated questionnaires were recorded in spreadsheets and transferred to SPSS for statistical analysis. Descriptive statistics and data relationships were calculated. The statistical software program, SPSS (Statistical Package for Social Sciences) was used for in-depth data analyses. Excel, tables, graphs were used in the data analysis to tabulate findings and graphical representations.

3.5.1 Validity and reliability

Validity is defined as the degree to which a theory is precisely measured in a quantitative study (Heale & Twycross, 2015:66). Validity also refers to conclusions derived from research study. Reliability is related to the constancy of measurement whereby participants completing an instrument(s) over a period should have the same responses each time the test is completed (Heale & Twycross, 2015:66). To ensure that the results from the self-administered questionnaires were consistent, follow up meetings as well as telephonic support were conducted and provided respectively to ensure that participants understood all aspects of the questionnaires. Thus, this level of support and clarity to the participants instilled confidence and reliability in the resulting feedback from the questionnaires.

3.6 Limitations of the study

This study has a few limitations which have to be highlighted. The study focused on the beverage industry which in its entirety is extremely large. Thus, a small sample of the beverage companies were selected for the research study in order to obtain a more realistic research study approach. Although many telephonic conversations took place to explain and improve clarity on the questionnaires to both technical and managerial staff, a huge parentage of time was spent on gaining access to plants to explain questionnaires physically. Most plant technical staff times and availability is limited due to breakdown situations and plant commitments. Additionally, safety inductions and procedures limited access times to plant. Furthermore, some plant technicians were hesitant in providing accurate views of management's ability and support, thus they opted not to. In doing so, questionnaires had to be redirected to other technical staff.

3.7 Ethical considerations

Ethics is defined as norms for conduct that distinguish between acceptable and unacceptable behaviour (Resnik, 2015:1). Resnik (2015:1) highlights that norms promote the aims of research, such as knowledge, truth, and avoidance of error.

3.7.1 Ensuring participants have given informed consent

Informed consent is more than a form. It means that a person knowingly, voluntarily and intelligently gives his consent (Fouka & Mantzorou, 2011:3). Participants will be made aware of the information prior to taking the questionnaire as the information will enable participants to voluntarily decide whether or not to participate as a research study subject.

3.7.2 Ensuring no harm comes to participants

According to Resnik (2015:1), it is imperative when conducting research that participants are protected from harm and risk. Furthermore, Resnik (2015:1) asserts that respecting human dignity, privacy, and autonomy are key aspects of quality research.

3.7.3 Ensuring confidentiality and anonymity

According to Saunders, Kitzinger and Kitzinger (2015:617), anonymity is one form of confidentiality – that of keeping participants' identities secret. Saunders et al. (2015:617) elaborates that confidentiality includes keeping private what is said by the participants and this is only achievable through researchers choosing not to share information. This research study ensured that participants were not identifiable as the participants were referred to simply as being subject A, B, C, or D and so on. Furthermore, the names of participants were not disclosed or shared.

3.7.4 Ensuring that permission is obtained

The permission to carry out the research study was granted from the management of the beverage companies either via a letter or e-mail from within the said or above-mentioned beverage companies, which enabled the researcher to conduct the study.

4. RESULTS, DISCUSSION AND INTERPRETATION OF FINDINGS

A quantity of 110 questionnaires were received, of which 92 were accurately completed and feasible to be utilized in the study. The remaining 18 questionnaires were unworkable as a majority of these questionnaires were incomplete, with some technicians and engineers' double ticking for same question as well as omitting questions. Mainly hand delivered and e-mailed questionnaires were received and feasible to use.

4.1 Participant demographics analysis

Males represent 85% of the beverage organisations combined technical and managerial staff whereas females reflect a remaining 15%. The technical and managerial staff is represented with whites accounting for 33%, blacks and Indians represented 28% and 22% respectively whilst coloureds and other races reflect the least amounts with 16% and 1% respectively. The results above shows that the industry is dominated by white male technicians, engineers and high-end managerial staff members to the detrimental impact of the larger black population of South Africa. This could be attributed to the level legacy knowledge that still remains in the hands of white males for which beverage companies have to retain this knowledge. Diplomas represent the highest amount of educational qualifications at 67%. However, degrees an honours degrees are the closely matched educational qualifications representing 13% and 9% respectively. Matric qualifications which account for 11% could indicate that beverage companies are encouraging work experience placements and internships for final year students. These placements could assist students when applying for graduate programmes after qualifying in their specific degree. Additionally, part of the 11% of the matric qualified staff members could represent an older generation whom entered the firms decades ago and moved up ranks without increasing their formal educational background. Artisans and Electricians represent 15% and 9% respectively. These artisans are predominantly responsible for specific related task such as electrical foreman. However, Technicians represent the majority of positions with 52%. The major percentage of technicians can be attributed to high degree of complex systems and automation within beverage plants which require constant maintenance. Engineers and Managers have a small representation with only 16% and 8% respectively. 59% of staff members are the longest serving with a years of service greater than 15 years. Years of service between 6-10 and 11-15 represent 8% and 13% respectively. The overall low percentages of years of service between 6-15 years indicate potential movement out of the organisation. Years of service between 0-5 years which represent a combined 20%, are periods where graduates, developing technicians and engineers are practicing their qualifications, additionally these staff members are also trying to further their careers in and out of the organisations. Staff whose years of service exceed 15 years are typically the personal responsible for servicing legacy systems due to experience and knowledge gained over years. Additionally, staff members with only

matric qualifications are able to work on these legacy systems due to their expertise and forward movement within the organisation. Beverage organisations will potentially retain these employees at high cost so as ensure the business value of legacy systems is contained.

4.2 Section B: View of employees analysis

This objective of this section is to gather the employee's views on the difficulty of new technologies, management approaches and support from management in dealing with technologies.

4.2.1 Employee's perspectives:

Table 4.2.1: Employee Perspectives

		Agree		Neutral		Disagree		
B 1.1	**Employee's Perspective**	*(f)*	%	*(f)*	%	*(f)*	%	Total Response
B 1.1.1	Management provides adequate support to system maintenance.	70	76%	4	4%	18	20%	92
B 1.1.2	Preventive maintenance is done on a regular basis.	72	78%	5	5%	15	16%	92
B 1.1.3	There is enough external technical assistance to support legacy systems or old technologies.	79	86%	8	9%	5	5%	92
B 1.1.4	New technologies is sometimes reluctantly accepted by personal.	80	87%	2	2%	10	11%	92
B 1.1.5	New technologies has improved employee's efficiencies and capabilities.	85	92%	3	3%	4	4%	92
	MEAN	**77**		**4**		**10**		
	Standard Deviation	**5,14**		**2,3**		**6,11**		

As denoted in Table 4.2.1, the *mean* value of 77 emphasises that the large portion of the respondents agreed with the general perspective of employees towards new technologies efficiencies, maintenance scheduling and technical support. The *standard deviation* of 2.3 from the mean highlighted that there is relatively small difference of deviation, thus there exists a commonality within employees of not understanding the perspectives. Based on the responses above, employees have an overall positive agreement on the technology implementations and the support needed to maintain these technologies. Beverage industries have planned schedules or intervals in order to perform and conduct preventative maintenance procedures and practices need to ensure plant availability. However, the introduction of new technologies is often met by resistance as employees are hesitant in accepting and this can be attributed to the poor implementation of change management processes and procedures. These changes normally potentially affect the current way employees perform their duties, and thus creates apprehensiveness and uneasiness within employees as their comfort zones are now disrupted. Due to the complex nature of beverage processes and legacy system architectures, system integrators are preferred as external support arms as they have prior knowledge of beverage systems, as well as exuding a high degree of competence within the areas of process technologies.

4.2.2 Management approaches:

Table 4.2.2: Management Approaches

		Agree		Neutral		Disagree		
B 1.2	Management Approaches	(f)	%	(f)	%	(f)	%	Total Response
B 1.2.1	A reactive type attitude is used to deal with repairs, maintenance and adopting technologies.	84	91%	1	1%	7	8%	92
B 1.2.2	A proactive methodology is used to deal with repairs, maintenance and adopting technologies.	6	7%	4	4%	82	89%	92
B 1.2.3	A leadership with strategic decision making abilities are displayed when technological concerns are raised.	44	48%	8	9%	40	43%	92
	MEAN	**45**		**4**		**43**		
	Standard Deviation	**31,84**		**2,87**		**30,7**		

As denoted in Table 4.2.2, the *mean* values of 45 and 43 for "agreed" and "disagreed" responses accentuates that employees have a high degree of variability in agreement and disagreement of management approaches, as well as strategic decision-making abilities. Furthermore, this variability of responses from employees is confirmed through a *standard deviation* values of 31.84 and 30.7 respectively.

4.2.3 Management approaches to technology

Table 4.1: Management Approaches to Technology

		Agree		Neutral		Disagree		
B 1.3	Management Approaches to Technology	(f)	%	(f)	%	(f)	%	Total Response
B 1.3.1	Management willingness to accept and adopt new technologies is present throughout all departments.	65	71%	4	4%	23	25%	92
B 1.3.2	Collaboration between employees is encouraged by management throughout the organisation to ensure acceptance of new technologies.	62	67%	3	3%	27	29%	92
B 1.3.3	Technology is used strategically to make a positive impact on how business is conducted.	71	77%	6	7%	15	16%	92
B 1.3.4	Special and niche skills are sourced to ensure the adaptation and integration of innovative technologies.	48	52%	10	11%	34	37%	92
B 1.3.5	Proactive change management approaches are implemented to ensure acceptance of technologies.	39	42%	9	10%	44	48%	92
	MEAN	**57**		**6**		**29**		
	Standard Deviation	**13,13**		**3,05**		**11,01**		

4.3 Section C: Technology management analysis

Table 4.3.2: Technology Management

		Agree		Neutral		Disagree		
C 1.1	Technology Management	*(f)*	%	*(f)*	%	*(f)*	%	Total Response
C 1.1.1	Procedures and practices are readily available when selecting and implementing new technologies.	72	78%	7	8%	13	14%	92
C 1.1.2	Adequate management support is available on hand when managing new technologies.	55	60%	10	11%	27	29%	92
C 1.1.3	Migration of legacy systems to new technologies are done strategically and systematically to improve efficiencies.	40	43%	6	7%	46	50%	92
C 1.1.4	Adequate support is available to support legacy systems or old technologies.	39	42%	12	13%	41	45%	92
C 1.1.5	Research and Development in innovative technologies is encourage by leadership.	30	33%	8	9%	54	59%	92
C 1.1.6	Consultation between all staff members occurs before technological changes are implemented.	77	84%	5	5%	10	11%	92
C 1.1.7	Establishing of a change management process that would engage the employees so that they can identify opportunities to realize the responsiveness and efficiencies of the new technology solutions.	27	29%	4	4%	61	66%	92
C 1.1.8	Provision of employee training on the newly developed business processes and technologies	47	51%	10	11%	35	38%	92
	MEAN	**48**		**8**		**36**		
	Standard Deviation	**18,42**		**2,76**		**18,36**		

According to the above responses, it can be deduced that there exist an above average response rate that measures and procedures are available when implementing new technologies as well as support from management in new technology implementation. However, a large portion of the respondents disagreed with the availability of technology management procedures and support in legacy system migration and support to new technologies. Additionally, a majority of employees disagreed with change management processes having a positive impact on technological opportunities as change often creates resistance within employees due to insecurities.

4.4 Section D: Competiveness of the organisation analysis

Table 4.4.1: Competiveness of the organisation

		Agree		Neutral		Disagree		
D 1.1	Competiveness of the Organisation	(f)	%	(f)	%	(f)	%	Total Response
D 1.1.1	Customer's preference to the brand is in demand.	85	92%	5	5%	2	2%	92
D 1.1.2	Customer feedback on average is very positive.	82	89%	4	4%	6	7%	92
D 1.1.3	Product taste is unique which heightens customer demand and expectations.	85	92%	4	4%	3	3%	92
D 1.1.4	Product quality is able to meet or exceed customer expectations.	89	97%	2	2%	1	1%	92
D 1.1.5	Long term relationships exist between customer and suppliers.	91	99%	1	1%	0	0%	92
D 1.1.6	Product prices are aligned to market.	77	84%	7	8%	8	9%	92
D 1.1.7	The presence of an effective culture that focuses the energies and abilities to produce meaningful results.	65	71%	5	5%	22	24%	92
D 1.1.8	Staff motivation is increased as improved technologies reduces the complexities of working conditions.	72	78%	2	2%	18	20%	92
D 1.1.9	System breakdowns are reduced due to technological advancements.	84	91%	3	3%	5	5%	92
D 1.1.10	Technologies have increased time to market products.	82	89%	5	5%	5	5%	92
D 1.1.11	New technologies have the ability to increase the rate of production and efficiencies as well as reducing waste and cost.	90	98%	2	2%	0	0%	92
D 1.1.12	Innovative activities are tied or linked to customer taste and preferences.	92	100%	0	0%	0	0%	92
	MEAN	**83**		**3**		**6**		
	Standard Deviation	**8,1**		**1,93**		**7,16**		

According to the responses above, this section emphasises that competiveness within the organisations can be attributed through many factors, such information sharing, competitive pricing, product quality and ability for organisations to use technologies in an effective manner to innovate and create uniqueness within their products. Organisational culture is recognised as one of the key factors that help determine employee's efficiencies and productivity. Technological advancements within processes are shaping organisations to produce and improve time to market products, thus rivalling competitors and increasing competitiveness. Additionally, new technologies are aiding employees to perform more effectively and reduce system breakdowns through conditioning and monitoring systems that are able to perform predictive maintenance – thereby reducing potential system breakdowns. Ultimately, new technologies are positioning organisations to become leaders in their own market segments through effectively leveraging of technological changes, whilst

organisations that struggle to keep up with the technology curve or fail to adapt to new technologies will lose potential share and competitiveness in the market.

4.5 Section E: Manufacturing processes analysis

Table 4.5.1: Manufacturing processes

		Agree		Neutral		Disagree		
E 1.1	Manufacturing Processes	(f)	%	(f)	%	(f)	%	Total Response
E 1.1.1	Manufacturing best practices and tools (e.g. Lean Systems, Six Sigma, TQM) are being used within organisation.	82	89%	0	0%	10	11%	92
E 1.1.2	Maintenance on legacy systems is done on a more regular basis as opposed to new technologies.	84	91%	3	3%	5	5%	92
E 1.1.3	Processes are in accordance to ensure plant availability when migrating legacy systems.	85	92%	2	2%	5	5%	92
E 1.1.4	There is clearly and defined preventative maintenance schedules to ensure maximum production and maximum plant availability.	75	82%	6	7%	11	12%	92
E 1.1.5	Process and Procedures are available to mitigate risk during production breakdowns.	69	75%	3	3%	20	22%	92
E 1.1.6	New technologies have enhanced manufacturing processes through increasing the rate producing of varied products and delivering effective ways of removing waste.	84	91%	8	9%	0	0%	92
E 1.1.7	New technologies such as Manufacturing Execution Systems (MES) is able to simplify and track manufacturing processes and business related tasks.	79	86%	4	4%	9	10%	92
E 1.1.8	Technological advancements in manufacturing processes and procedures instils confidence in employees to conduct their work effectively and improves working conditions.	81	88%	8	9%	3	3%	92
E 1.1.9	Legacy systems are difficult to integrate in today's modern manufacturing processes.	83	90%	5	5%	4	4%	92
E 1.1.10	Manufacturing related R&D is widely used by the organisation to create improvements in existing methods or processes, or wholly new processes, machines or systems.	58	63%	20	22%	14	15%	92
E 1.1.11	Manufacturing with the use of legacy material request programs create problems when integrating with suppliers and vendors.	51	55%	38	41%	3	3%	92
	MEAN	**76**		**9**		**8**		
	Standard Deviation	**11,51**		**11,03**		**5,84**		

The popularity of the responses from this section indicated the new advancements in technologies and innovation have aided manufacturing processes in positive and efficient manner. Tools such six sigma are effectively utilized within these organisations to remove waste. Despite the continued maintenance and upkeep of legacy systems, these systems are proving difficult to be integrated into modern manufacturing systems and processes due to their old and customized functions. Processes and procedures are an integral part of beverage organisation maintenance strategies in order to ensure plant availability and a reduction in downtime. New technological development in manufacturing execution systems are aiding beverage organisations to perform better track and traceability functions on processes and products. Global trends and technological advancements in manufacturing processes are accelerating employee's skills to better perform their task and duties.

4.6 Conclusion

Results indicated that the dominant gender with technical qualifications within beverage industries are males, with females exuding a very small percentage. A major percentage of participants agreed that new technology implementation procedures and practices as well as maintenance schedules are prevalent in beverage industries. Although responses from participants highlighted that a high degree of legacy migration procedures are available, the maintaining of legacy systems with the dedicated support from management and external networks are in moderate supply. The overall results of new technology implementation from participants emphasizes that indeed advancements within technologies have assisted technical and managerial staff to better perform at job profiles and assist these individuals in improving productivity and thus the overall efficiency of the organisation.

4. CONCLUSIONS AND RECOMMENDATIONS

The primary research study included findings from the areas of demographics, views of employees, technology management, competitiveness of the organisation and manufacturing processes. These findings are described below.

5.1 Demographics

The findings from the study reveals that, demographically, beverage industries still display a large percentage of technical staff members who serve these industries for long periods thus a high degree of participants exhibit greater than 15 years of service. The majority of the long serving technical staff members have diplomas, with their education qualifications highlighting that education progression is not seen as a priority by the organisation for technicians. A high percentage of technical staff members are still serving the beverage industry for the greater part of 15 years, highlighting that beverage industries tend to retain experienced staff members so as to utilize their legacy knowledge.

5.2 View of employees

Results from the findings emphasise that the beverage management are committed to providing technical support to ensure that both new technologies and maintenance procedures are implemented so as to reduce downtime and increase uptime. Additionally, legacy systems are often dealt through external support structures such as system integrators whom have in depth knowledge of the system due to prior beverage process expertise and experience. New technology implementation is regarded as a strategic driver towards improving both plant and employees' efficiencies and productivity, however these technologies are often faced with resistance from employees. The findings also reveal that there are some pockets of employee resistance in the organisations. Resistance to changing technologies is a result of management failing to implement or the absence of appropriate change management processes. Furthermore, beverage industries radiate a reactive type of approach to crisis situations due to the unpredictability of plant breakdowns and variability in manufacturing processes rather than proactively planning.

5.3 Technology management

The findings indicate that technology management within beverage organisations are initiated by management which involves numerous procedures and practices in ensuring that new technologies are implemented correctly and efficiently. However, majority of legacy system migrations within beverage organisations are not conducted in a systematic way so as to elevate waiting time or downtime. Additionally, there exists a reduced amount of support from within beverage organisations to maintain legacy systems, highlighting the continuous movement of experienced technical staff in and out of the organisations. Although beverage organisations regularly inform their technical staff members about technological changes before these changes are initiated, employees reluctantly believe that change management processes provide ample assistance and opportunities to realise the effectiveness of the

change. Findings also indicate that beverage organisations provide a fair amount of training on new technologies to technical staff members once these technologies are applied.

5.4 Competitiveness of the organisation

The findings indicate that employees of beverage organisations have the ability to identify competitiveness of their organisation through product uniqueness, product quality, customer satisfaction and meeting demand. An effective organisational culture is viewed by employees of beverage organisations as a contributing factor towards performance and productivity. In addition, findings have revealed that new technologies have supported beverage organisations to manufacture their products at a faster rate than with older technologies. The research study results revealed that new technologies have the advanced capabilities that enable beverage manufacturers to increase production rates as well as intuitive features and functionalities that assist employees to make fault-finding processes easier.

5.5 Manufacturing processes

Findings from the research study have revealed that manufacturing tools such as six sigma and lean manufacturing are being implemented within beverage organisations as a form of best practices to eradicate waste, such as over production and downtime. Although beverage organisations have predefined procedures and practices when maintaining and migrating legacy technologies, these legacy systems are constantly drawing much attention by technical and managerial staff due to irregular maintenance and failures. Irregular maintenance and failures signify loses in production times and ultimately decreased revenue streams for beverage organisations. Additionally, the findings highlighted that technology advancements in beverage organisations have influenced the rate of production and variants which legacy technologies are unable to replicate. Legacy systems are proving very difficult to integrate into modern manufacturing technologies due to their limited functionalities, irrespective of whether or not the systems have significant business value for the organisation. However, new advancements in manufacturing technologies are assisting beverage organisations to further track and trace materials and products so as to reduce over production and ensure that processes utilize more of just-in-time systems.

5.6 Conclusions

The research study concluded that there exists a common pattern of long service attributes by technical and managerial staff members within beverage industries, with the majority of these staff members having educational qualifications, such as diplomas. Despite efforts through black economic empowerment policies and systems by the South African government, a large number the technical staff is still dominated by white males within the beverage organisations. The results highlight that a reduction in plant and machine breakdowns is achieved through a strong commitment by management in areas of new technology implementation, legacy system migrations and preventative maintenance planning. If management provides inadequate or no support at all, the resulting consequences for beverage organisations is loss of revenues and production. Results conclude that management's approach to new technologies resides in the form of procedures and practices. However, legacy system migrations are not done systematically and beverage organisations rely heavily on external system integrators for support. System integrators have wider access to the latest technologies and expertise which gives them the ability to design and commission specialised beverage processes. However, organisations relying heavily on system integrator support poses disadvantages for beverage organisations as majority of their intellectual beverage processes knowledge resides with the system integrators. Additionally, training to internal technical staff can be limited due to the external assistance provided by system integrators. The change management approach that management's provide are not effective in instilling confidence within employees of beverage organisations, thus lack of training, communication, as they assist to boost and to improve confidence and effectiveness

within employees in order to maintain new technologies. Results indicate that beverage organisations' competitiveness is directly affected by the uniqueness in products being produce and product quality, which has the ability to increase the rate of customer demand. Effective and committed organisational cultures are accelerating the rate of new technology acceptance by employees. These new technologies are aiding beverage organisations to produce products at exceptional rates which surpasses their competitors. Management is committed to improving manufacturing efficiencies through best practice tools as indicated by the results. New technologies in conjunction with best practice tools are assisting beverage organisations through advanced material traceability and accelerated production rates. However, legacy systems negatively impact manufacturing processes despite the use of best practice tools, as these systems have limited integration capabilities and continuous system maintenance is needed. As denoted from above, beverage organisations rely mainly on experienced technical staff and external resources to facilitate and maintain legacy systems. It is essential for management to provide support and change processes to technical employees if they intend to successfully implement and manage technologies in an effective manner. Beverage organisation's culture has direct effect on whether or not employees are motivated enough to accept new technologies and perform at an optimum level, thus leadership is regarded as an integral part of build self-confidence for employees. New technologies are proving significant for beverage organisations due to their advancements in manufacturing processes. These advancements are enabling beverage organisations to differentiate their products and increase production, while utilizing the same resources in order to achieve a sustainable competitive advantage.

5.7 Recommendations

Recommendations to the beverage industry include up-skilling employees, using technology management frameworks, communication, change management process and intelligent manufacturing systems. These recommendations are described below.

5.7.1 Up-skilling employees

Up-skilling of employees within beverage organisations through training and further education can benefit staff members tremendously in achieving productivity, improving staff morale and overall confidence in carry out duties or task. Beverage organisations should implement mandatory learnerships, and mentorship programs at a trainee level and when new technical employees are hired. These programs will ensure that experienced technical staff transfers their legacy system knowledge and niche skills onto lesser experienced staff members, thereby ensuring that skills are not lost to the organisation. The better, to best-trained technical staff members are, the fewer chance of errors being committed during technology implementation and maintenance. Up-skilling technical staff is more than just improving productivity but ensuring success and survival of an organisation.

5.7.2 Using technology management frameworks

Technology management frameworks are instrumental in ensuring the success of organisations through a series of activities and processes. These frameworks together with managements support structures, are extremely effective in organising technological resources in a systematic manner so as to outpace competition. Organisations that adopt this systematic approach will go through a series of processes, which includes the identification, selection, acquisition, exploitation and protection of technologies. Beverage organisations in particular that utilized these frameworks will be far more effective in new technology implementation as technologies are initially selected in accordance to business strategy and goals. Thereafter, these technologies are exploited in manner so as to improve productivity by optimising business and manufacturing processes. Management of technological activities are considered to be characteristically extremely effective success factors for businesses. With all the advantages presented by technologies, these technologies will only be effective if

managed in an appropriate manner in order achieve a sustainable competitive advantage. Following a technology management framework religiously, beverage organisations will then comply with an appropriate maintenance schedule, preserve life of machinery and improve the overall efficiency and competitiveness of the organisation.

5.7.3 Communication

Communication consists of an exchange of ideas or messages between employees so as to express themselves. Managers at different organisational levels have the ability and authority to deliberate on various matters pertaining to the organisation, which include problems and issues. Two way communication can assist beverage organisations to improve the understanding of messages and bridge gaps between managers and employees. A key component of beverage organisations is to maintain job satisfaction within employees. Two-way communication can facilitate job satisfaction among employees, as employees feel a sense of satisfaction when there is an open channel between employee and their managers. These open channels allow for employees to clearly express ways and suggestions to improve job roles and performance, as well as refining relationships. Two-way communication is a strategic factor for beverage organisations in ensuring that employees are able to rationalise business objectives and the reasons for technological change. Communication assists in employee empowerment and engagement, which are critical success factors for internal operations within the organisation.

5.7.4 Change management process

Change is always faced with employee resistance. Therefore, it is vital for employees to participate prior to the change implementation phase or stage rather than later on. Early involvement of employees in the change process ensures that employees feel part of change and the sense of empowerment by being able to contribute to the change process. Beverage organisations operate in a turbulent environments in which change is constantly being introduced due to technological advancements, changing manufacturing processes and globalisation. Change models will play a significant part in facilitating change through a series of stages and processes. Change models are not entirely perfect but vital to achieving change with organisations.

5.7.5 Intelligent manufacturing technologies

Although maintenance is an integral part of ensuring technologies and manufacturing machinery performs effectively through its lifecycle, intelligent manufacturing technologies such as Manufacturing Execution Systems (MES) can assist in proactively determining maintenance schedules and failure of components. Installing MES will assist beverage organisations to monitor real time data on wastages and downtime within the production environment. This data is important in assisting management to highlight unprofitable business areas thereby introducing counter measures to eradicate these unprofitable areas and increase productivity. MES gives beverage organisations the opportunity to track and trace raw materials thus eliminating wastages in production schedules. Efficient and accurate production schedules will further assist beverage organisations to effectively allocate employees and staff per production run. MES has additional inventory benefits for beverage organisation by accurately recording product material, spares and production runs. Procurement departments have the added benefit of then knowing accurately the type of products as per each facility thus reducing the potential to over stock and purchase. Ultimately MES is beneficial to beverage organisations to increase efficiency by clearly identifying production schedules, product usage and employee allocation times.

5.8 Further study

This study highlighted the importance of technology management in attaining a sustainable competitive within beverage industries. It is of importance that this study be re-established

into food industries within the remainder of provinces in South Africa so as to complete the research study into the FMCG sector.

5.9 Conclusion

In order for FMCG organisations to stay competitive within their designated industry, these organisations must be able to innovate and manage their technologies in effective ways so as to achieve the overall organisational goal and strategies. Beverage organisations with technology management capabilities that are able to respond to rapidly changing conditions and processes effectively, will ensure that they stay ahead or in line of their competitors. Managers are key decision makers in ensuring that technologies are managed and accepted by employees. It is vital for beverage organisations to ensure that the information and feedback received from employees at the different hierarchical levels is accurate and appropriate in order for management to decide on the appropriate technologies and change management processes needed. Beverage organisations require technology to clearly understand customer requirements, modernise operations, obtain new customers and discover innovative opportunities. Old systems such as legacy technologies have the potential to negatively impact these organisations through inefficiencies and breakdowns whereas new technologies have added advantages in terms of cost reduction and increasing productivity. Thus, deciding on whether to retain, migrate or completely change over legacy systems to new technologies must be done in accordance to the business value in order to maintain efficiencies in the organisation. Technology advancements within the value chain activities are proving beneficial for beverage organisations as the majority of wastages can occur through their primary activities. These technology advancements are changing current processes and reducing the amount of resources being utilised, thus a reduction in cost and wastage are easily achieved. Furthermore, optimising within value chain not only assist in reducing cost but also provides beverage organisations with the ability to differentiate their products through innovative technologies and processes. A combination of cost reduction and differentiation presents an effective strategy for beverage organisations to sustain their competitive advantage within their industry. Employee engagement and empowerment are essential processes for beverage organisations in decision-making at technical levels. These processes are proving to be self-motivators due to level of autonomy given to both technical and managerial staff. Employee engagement associated with decisions concerning the selection of technologies and maintenance of these technologies are imperative for beverage organisations to get the buy-in from employees on new technologies. Thus, beverage employees that are empowered through factors such as a high degree of autonomy, training, resources and encouragement can produce a more productive and efficient workforce which ultimately creates a competitive advantage for the organisation. The research study has indicated that if beverage organisations apply technology management principles and practices, these organisations can achieve a sustainable competitive advantage.

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