Kaizen Practices and Performance Improvement in Zambian Manufacturing Companies

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ABSTRACT
There is strong evidence that Zambian manufacturing organizations are increasingly implementing Kaizen programs to help them improve productivity and enhance delivery performance. The aim of this study is therefore to investigate the relationship between Kaizen practices and improvement in performance in Zambian manufacturing companies. This study argues that an understanding of knowledge transfer should play a central role in understanding improvements in performance resulting from Kaizen activities. The study also sought to determine the challenges faced by manufacturing companies in implementing Kaizen practices. Building on the extant Kaizen literature, and the knowledge-based theory, this study investigates key Kaizen practices and performance outcomes of knowledge transfer in Kaizen programs. The study employed a cross-sectional descriptive research design with the target population being manufacturing companies in Lusaka Province and the Copperbelt Province being the two highly industrialised regions in Zambia. The unit of analysis was a manufacturing company and a key informant was identified for each company. Thirty-three questionnaires were distributed, and 31 companies responded. Based on the conceptual framework developed, hypotheses were formulated and tested using ordinary least squares regression modelling approach.

The results show that the 5Ss were the most popular activities implemented while the Suggestion System was the least implemented. The implementation of Kaizen practices leads to significant operations performance improvements in manufacturing companies in the form of productivity, quality and overall equipment effectiveness. The results also show that employee attitude is the major challenge in implementing Kaizen while management support or leadership is the last hurdle. This research is original work as it has never been done before in Zambia. Kaizen implementation is a new phenomenon in Zambia. Firstly, the value of this research was to inform management, the Kaizen Institute of Zambia and the government policymakers on the successes of the implementation of Kaizen practices in manufacturing companies in Zambia. Secondly, the value of this research was to highlight the challenges faced by manufacturing companies in Zambia in implementing Kaizen practices so that more resources could be directed at reducing these challenges so that companies can enjoy the benefits of Kaizen practices.

Keywords: Kaizen practices, employee attitudes, performance improvement, Zambia, manufacturing companies

1. Introduction and Study Background

In the early 1990s, Zambia adopted a liberalized economic policy framework to avert the economic decline and poor industrial performance from the mid-1970s (GRZ, 2014). Following the liberalization of the economy and trade policies, the government concentrated on creating an enabling business environment for private players. This saw a significant improvement in macroeconomic indicators with the GDP growth rate averaging 3.9 by 1998. In 2000, the aspiration of Zambia as a nation was to become

a prosperous middle-income nation by the year 2030. Hence, the government developed a long-term planning instrument known as the vision 2030. In aspiring for this vision, the nation should build a strong and dynamic middle-income industrial nation that provides opportunities for improving the well-being of all, which among others has led to the creation of the Kaizen Institute of Zambia (GRZ, 2014). To build an industrial nation that sees the aforementioned scenario, there is a great need for productivity and quality improvement in the products and services produced; and enhanced efficiency and effectiveness which lowers the costs of operations in the industries (KIZ, 2015). Zambian manufacturing companies have also embraced Kaizen practices with a view to contributing to achieving the aspirations of becoming a prosperous middle-income nation through improved operations' performance. This study explores the relationship between the Kaizen implementation and improvement of operations' performance in the Zambian manufacturing companies.

1.1 Zambian Manufacturing Sector

Following the economic liberalization in the 1990s, the Zambian industrial sector underwent significant economic reforms to structurally adjust the economy to ensure dynamism, efficiency and competitiveness by the private sector (GRZ, 2014). There was a policy shift away from import substitution, protectionism, and heavy public-sector involvement towards the promotion of a private sector-led market-oriented economy. Consequently, most state enterprises were privatised.

Since the mid-1990s, the performance of the manufacturing sector has been positive albeit fluctuations (ZDA, 2014). The manufacturing activities in the country are undertaken by the private sector players with the government providing a conducive business environment through policy guidance. Further, the government has put in place interventions to support the manufacturing sector, such as the establishment of Multi-Facility Economic Zones (MFEZs) and Industrial Parks and provision of sector-specific investment incentives (ZDA, 2014). The government also promotes small and medium enterprises (SMEs) in labour-intensive light manufacturing activities to promote the growth of the industry.

The manufacturing sector in Zambia now accounts for about 11 percent of the country's Gross Domestic Product (GDP) and has been growing at an average annual growth rate of three (3) percent in the last five years. Growth in the sector is mainly powered by the agro-processing (food and beverages), textiles and leather subsectors. Secondary processing of metals is one other major activity in the sector, particularly the smelting and refining of copper, and this has contributed to the manufacturing of metal products. Construction materials such as cement as well as Fertilizers, chemicals and explosives are also produced in the sector. Other activities include wood products and paper products.

This paper is arranged as follows: the next section provides an introduction to the Kaizen Concept in Zambia and the research objectives, followed by the literature review and conceptual framework. The methods used are then presented, followed by research findings, discussion and conclusion.

1.2 Introduction to Kaizen Concept in Zambia

Several techniques for improving productivity and indeed performance in manufacturing organisations have been developed over the years such as lean manufacturing, Kaizen, Business Process Re-engineering, Statistical Quality control, Total Quality Management and many others (Nderi, 2012). The Kaizen concept developed in the 1950s is one of the all-encompassing concepts of many Japanese business practices. Kaizen is a compound word involving two Japanese concepts: Kai (change) and Zen (for the better) (Liker, 2004, p.41; Palmer, 2001). The concept indicates a process of continuous improvement of the standard way of work (Singh and Singh, 2012). Kaizen has become very popular in many parts of the world although Nderi (2012) argues that much as Kaizen transformed many Japanese companies into world-class companies, its success outside Japan is highly contestable.

According to the Ministry of Commerce, Trade and Industry, hereafter (MCTI), the need for continuous improvement in the Zambian manufacturing industries cannot be overemphasized in the wake of increasing competition which has rapidly become the major problem for Zambian manufacturing industries.

Owing to the significant contribution of the manufacturing sector to the Zambian economy, it is imperative to study the effectiveness of the improvement techniques such as Kaizen being implemented in the sector. The Kaizen concept is a relatively new concept in Africa and Southern Africa in particular. In Zambia, only thirty-three (33) companies had adopted the philosophy by the end of 2015 and most of

these had less than 4 years' experience with the concept (KIZ, 2015). These companies adopted Kaizen through participating in workshops and lessons offered by experts in Kaizen. Studies of the relationships between Kaizen implementation and organizational performance in some countries outside Japan have shown a relatively strong link in countries such as Kenya (Nderi, 2012), Tunisia (Kikuchi, 2008), Bangladesh (JICA and Unico International Corporation, 2009) and Desta et al (2014) also confirms similar findings in Ethiopia.

However, no similar research yet has been conducted in Zambia. Therefore, being a relatively new concept in the Zambian context, research to ascertain the extent of to which Kaizen activities have been understood and improved the operations' performance is needed. This research will, therefore, study the relationship between Kaizen implementation and improvement in operations performance in Zambian manufacturing companies. The specific objectives of the study are as follows: To ascertain the extent to which Kaizen practices are being implemented by Zambian Manufacturing companies; to establish the challenges being faced by the Zambian Manufacturing companies in implementing Kaizen, and to determine the relationship between Kaizen implementation and improvement in operations' performance in Zambian manufacturing companies.

2. Literature Review

2.1 The Kaizen Concept

The Kaizen philosophy originated in Japan where it was dedicated to the improvement of productivity, efficiency, quality and business excellence. Kaizen is an internationally acknowledged method for continuous improvement involving small improvements in key processes in an organisation (Titu et al., 2010; Venkatesh, 2007; Wittenberg, 1994). Unlike a lot of the Japanese philosophies, Kaizen forms an umbrella concept that covers different techniques including Kanban, total productive maintenance, six sigma, automation, just-in-time, suggestion system and productivity improvement and many others (Singh and Singh, 2009). The Kaizen philosophy sits on three pillars for successful implementation; these are housekeeping, waste elimination and standardization (Thessaloniki, 2006).

In manufacturing, Kaizen is associated with locating and eliminating waste in machinery, labour or production procedures. Doolen et al. (2008) further added that Kaizen is a process of focused and sustained innovation throughout the organization that is in the form of small logical incremental projects known as Kaizen events. It means a systematic way of small incremental changes toward betterment in each workplace and each department (Cheser, 1998). Although many firms have achieved process improvement through implementation of continuous improvement programmes, the initial improvement is easily eroded back to the pre-improvement level, especially if the three pillars are not adhered to (Mano et al., 2014). It is important to note that Kaizen is not only restricted to manufacturing, but the philosophy is also a way of life which can be applied to the service and not-for-profit organisations (Thessaloniki, 2006).

A firm can acquire team-based capabilities, by participating in a series of knowledge acquisition programs such as Kaizen (i.e., constant improvement techniques) (Mesquita et al., 2008). In this regard, "participation" is defined as attending workshops, lessons etc., conducted by experts. The New United Motors Manufacturing (NUMMI) joint venture between General Motors and Toyota, transferred many Japanese techniques such as Jikoda (problem prevention), Heijunka (consistency in operations), and Kaizen (continuous improvement) to American suppliers (Newman and Rhee, 1990).

This research invokes the knowledge-based view to help provide an explanation of the relationship between Kaizen activities and operational performance. First, a firm participating in programs such as Kaizen can acquire knowledge which can help them create capabilities that can be used to continuously improve productivity, quality of products produced, speed and flexibility of operations and overall equipment effectiveness. The knowledge-based view (Grant, 1996; Nonaka, 1994) draws attention to how knowledge is created in organizations through knowledge management process of socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit), as well as internalization (explicit to tacit). The knowledge-based perspective (Grant, 1996) equally supports a knowledge development performance relationship. Building upon the resource-based perspective's notions of value, inimitability, and rarity, the knowledge-based perspective centers on the notion that distinctive

capabilities to create and also exploit wisdom, enhance outcomes and thereby create competitive advantages (e.g., Hult et al., 2004).

2.2 Kaizen Systems

Kaizen is implemented through systems which must work in a coordinated manner. There are a number of systems and practices that fall under the umbrella of Kaizen philosophy. These include 5S, Kaizen events, 5 Why's, Total Preventive Maintenance (TPM), Just-In-Time (JIT) System (Doolen et. al., 2008); others are Suggestion System, Kaizen costing, Quality Circle (QC), Total Quality Management (TQM), Toyota Production System (TPS), Kanban system, elimination of the Ohno's seven wastes (Liker, 2004; Hines and Rich, 1997) and poka-yoke (error proofing) (Liker, 2004).

This study, however, focused on 5S, Kaizen events, 5 Why's, Total Productive Maintenance (TPM), Just-In-Time (JIT) Systems, Suggestion System and Total Quality Management (TQM), as they are considered the major distinct practices in operational performance improvement (Titu et al., 2010). These systems if well-coordinated and implemented can lead to improvement in the efficiency and productivity of an organisation, while ensuring a conducive organisational climate for continuous improvement and innovations (Titu et al., 2010).

2.3 Kaizen and Manufacturing Operations Performance Improvement

The link between Kaizen practices, teamwork and superior organisation performance is indismissable (Thessaloniki, 2006). Most of the studies that have focused on Japanese manufacturing have illustrated the importance of Kaizen in the improvement of organizational performance (Liker, 2004; Womack and Jones, 1996). Research shows that Kaizen can be used as a strategic instrument for achieving organisation objectives (Titu et al., 2010). Further, Thessaloniki (2006) also found a strong link between Kaizen practices and improvement in performance in the agriculture sector.

2.4 Studies from Selected Countries

The findings of a study done in Tunisia on the effect of Kaizen in some selected manufacturing firms found that, a number of companies that implemented Kaizen were able to achieve numerically expressible quality or productivity improvement using existing machinery and equipment were 9 out of 14 companies (64%) in the electrical and electronics sector, and 4 out of 13 (31%) in the food processing sector. For example, 8 companies achieved at least 20% higher productivity, 3 of which raised productivity by at least 50%; another company cut its nonconformity rate from around 20% to 0%, while another company reduced die replacement times from 110 minutes to 70 minutes (Kikuchi, 2008).
In Bangladesh, Kaizen was piloted for the jute sector in "The Study on Potential Sub-Sector Growth for Export Diversification." After six months, four model companies achieved an average of 11% production growth in their spinning sections and machine stoppage reduced by 45.7%. In their weaving sections, the result was a 13.4% increase in production and a 23.5% reduction in machine stoppage (JICA & Unico International Corporation, 2009).

Nderi (2012), in a study on Kaizen implementation in Kenyan manufacturing firms, showed that there is a strong positive relationship between Kaizen implementation and operations performance improvement. The Reports from the Kenya Association of Manufacturers also indicated that Kaizen interventions have often resulted in 50-70% reductions in throughput time, 50-100% increases in productivity, 20-40% savings in manufacturing costs, 40- 60% reductions in quality errors, and 50% releases of space, as well as significant improvements in team spirit and morale (Kenya Association of Manufacturers, 2012).
Desta et al., (2014) conducted a study on the effects of the newly introduced Kaizen techniques in three pilot companies in northern Ethiopia (an engineering company, a textile factory, and a leather tanning company). The study found that the three pilot companies had reduced the costs of production, improved quality, reduced lead time, improved customers' satisfaction and had partially achieved three out of five (5S) Kaizen steps: sorting, setting, and shining, but they had not yet achieved how to standardize and sustain self-discipline.

2.5 Key Performance Indicators

Manufacturing operations performance management is characterized by four key distinct performance dimensions, these are; cost/productivity, time/speed, operations flexibility and quality. Others include creativity, innovation and customer satisfaction (Singh and Singh, 2009). These four distinct classes of performance dimension coincide with the four basic components of cost, quality, speed and flexibility by which the manufacturing strategy of a firm is generally expressed (Doolen et al., 2008). Some of the purported human resource outcomes of Kaizen event are increased employee knowledge of the need for improvement in the organization (Singh and Singh, 2009; Butterworth, 2001), increased employee knowledge of the principles, tools, techniques of continuous improvement, development of problem solving skills (Nderi, 2012), and that it promotes teamwork in an organization and proficiency in lean manufacturing tools (Mika, 2002).

2.6 Challenges of Kaizen implementation

To successfully implement Kaizen means that all employees need to be proactive and set aside time to make improvements, and should be more than willing to contribute in any way possible (Anthony, 2006). This philosophy of continuous improvement can prove challenging. Numerous studies mention that, both in Japan and abroad, particularly in the cases of American and European companies, leadership is the single most significant aspect for effective implementation of Kaizen (Kaplinsky, 1995; Imai, 1986). This suggests that it is plausible to apply Kaizen in countries with a variety of socio-cultural contexts however that application must be executed under the proper leadership and with changes that replicate the uniqueness of the targeted society.

On transferability of Kaizen across cultures, there are views that question the general applicability of Kaizen to developing countries. They assert that most of the developing countries have to deal with the issue of weak human resources. Continuous improvement calls for a seamless extension of training and skills development towards the entire labor force. Then again, in a region with low literacy, it is problematic for businesses to put into action such a training system for the whole workforce (Kaplinsky, 1995). Ebrahimpour and Schonberger (1984) argue that a lower skilled workforce represents the only obstacle to successful JIT implementation in developing countries and that this could be overcome through employee training.

Short-terminism, the lack of upward mobility, and inattention to details of the workers, in general, may also add to difficulties in the implementation of Kaizen. Moreover, in nations where the hierarchical framework is seriously rooted, it might not be easy to establish a participatory mechanism on which nearly all workers are inspired to contribute actively to process and product improvements. Gapp et al., (2008) showed empirically that an environment of worker participation is required if the benefits of 5S are to be reaped. In addition, managers' misconceptions about continuous improvement are common sources of difficulty in Kaizen implementation, since they often expect instant results, whereas, in reality, it takes time before the benefits of Kaizen become visible (Karsten and Pennink, 2007). In such circumstances, even if managers know the concept and tools, translating these ideas into practices and internalizing Kaizen as a company-wide movement remains a very complex task.

Aoki (2008) found out that lack of organizational capabilities that facilitate an incremental organization-wide innovation greatly hindered implementation of Kaizen in Chinese firms. These capabilities include capabilities that facilitate cross-functional communication, that which encourages worker's self-initiative and those that discipline workers (shop- floor based) so that they conform to Kaizen standards. Researchers who recognize the effectiveness of Japanese work practices state that Japanese companies have developed capabilities that make their workers or work teams learn and improve their work processes independently (Kenney and Florida, 1993; Koike,1994). On-the-job training (OJT) plays a critical role in creating such capabilities. Employees in Japanese companies experience various kinds of jobs through the OJT, which helps to reduce social distance between different categories of the workforce (Lam, 2000). In this perspective, it is organizational capabilities which facilitate communication among diverse people that allow Japanese companies to implement incremental organization-wide innovation successfully. This affirms the view that successful implementation of Kaizen is largely influenced by an organization's ability to develop these capabilities (Aoki, 2008). Other capabilities are also important. Shah and Ward (2003) argue that larger firms enjoy larger financial and human resources, as well as

economies of scale hence, have better conditions for implementation of new techniques in their firms as compared to small or medium-sized firms.

2.7 Conceptual Framework

Based on the review of the literature, the following conceptual framework about the Japanese management system, Kaizen, is developed. This conceptual framework is developed as indicated in **Figure-1**. When the manufacturing companies undertake Kaizen activities or practices in terms of 5S, Kaizen Events, 5Whys, Total Productive Maintenance, Just-In-Time, Suggestion System and Total Quality Management; these practices lead to improved operations' performance in terms of Quality, Productivity, Speed, Flexibility and Overall Equipment Effectiveness.

Figure-1

2.8 Research Hypotheses

Based on the literature and conceptual framework in Figure 1, the proposed hypotheses of the study were as follows:

- Hypothesis 1a-e: Kaizen practices (5S) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 2a-e: Kaizen practices (5 Whys) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 3a-e: Kaizen practices (Kaizen Events) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 4a-e: Kaizen practices (TPM) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 5a-e: Kaizen practices (JIT) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 6a-e: Kaizen practices (Suggestion Systems) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.
- Hypothesis 7a-e: Kaizen practices (TQM) have a positive relationship with operations performance (Productivity, Quality, Speed, Flexibility and Overall Equipment Effectiveness) in Zambian manufacturing companies.

2.9 Operationalisation of the Concepts in the Hypotheses

The concepts were operationalised as follows:

2.9.1 Kaizen Practices

This study measured seven practices of Kaizen: 5S, Kaizen events, 5 whys, total productive maintenance, Just-In-Time, systems, suggestion system and total quality management. Respondents were asked to rate the extent to which the company had implemented the Kaizen practices. This was measured by using a 5-point Likert Scale, from 1- Minimal to 5- a great extent. **5S**- A way to visualize the working place, assuming the care of the workplace, on the basis of: selection, systematic, cleaning, standardization and self-discipline. **Total Productive Maintenance (TPM)-**Actions improving the continuous maintenance of machinery, by preventing accidents and downtime. An indirect measure of the effectiveness of total production maintenance is the Overall Equipment Efficiency (OEE) which is the degree of effective use

of equipment, measured as a percentage. **Suggestion System-** is an approach by which the suggestions and ideas of the employees are conveyed upwards all the way through the management hierarchy. **Just-In-Time (JIT)**- is producing and supplying goods at the time they are needed. The company holds the minimum amount of raw materials and just enough finished product to meet demand. **Kaizen Events-** are a focused, short-term project to improve a process. It includes training followed by an analysis, design, and, often, re-arrangement of a product line or area; or are short duration improvement projects with a specific aim for improvement; typically, they are weeklong events led by a facilitator with the implementation team being predominantly members of the area in which the kaizen event is being conducted plus a few additional people from support areas and even management. **5 Why's**- the practice of asking, five times, why the failure has occurred in order to get to the root cause or causes of the problem; and can be a lot more than one particular cause to a problem as well. **Total Quality Management (TQM)**- a set of systematic activities carried out by the entire organization to effectively and efficiently achieve company objectives to provide products and services with a measure of quality that meets customers, at the ideal time and price.

2.9.2 Operations Performance

This study measured operations' performance in terms of quality, cost or productivity, speed and flexibility. The respondents were asked to rate the improvement in the performance dimensions. Measurement of improved operations' performance consisted of a 5-point scale, where 1(Minimal) (1) and 5 (Great Extent). **Productivity** - an index that measures output (product) relative to the input (labour, materials, or energy used to produce the output). This is also the overall measure of the ability to produce a product. **Quality -** a real measure of excellence or a condition of being relieved from flaws, inadequacies and extensive variations. Having strict and consistent commitment to certain standards that achieve uniformity of a product to satisfy the specific customer or user requirements. **Speed** – is the rate at which production flows. This reduces inventory, increases liquidity, reduces risk (uncertainty about the future); and creates a competitive advantage. **Flexibility -** the capacity to produce a product in a variety of ways. This saves time and costs; maintains dependability and speeds-up response to customer needs. **Overall Equipment Effectiveness -** is a measure of the entire (complete, whole, inclusive) equipment performance- the extent to which the tool is carrying out what it is intended to do.

3. Methodology

3.1 Research Design

The study employed a cross-sectional research design to determine the relationship between the variables-Kaizen practices and operations' performance. The sampling design was the census. This was influenced by the relatively few companies that had implemented Kaizen in manufacturing industries in Zambia.

3.2 Population and Sampling

In 2002, the government of the Republic of Zambia conducted a manufacturing survey which established that a high concentration (about 67%) of manufacturing companies were in Lusaka Province and Copperbelt Province (GRZ, 2014). Hence, the targeted population was the manufacturing companies in Lusaka Province and Copperbelt Province that had adopted and implemented Kaizen philosophy or concept. The Zambia Association of Manufacturers (ZAM) and Kaizen Institute in Zambia (KIZ) listed 33 companies that had implemented Kaizen in Zambia (ZAM, 2014; KIZ, 2015). This formed the target population for the study. Questionnaires were distributed to all thirty-three (33) but only thirty-one (31) companies returned the fully answered questionnaires.

3.3 The Questionnaire

The primary data for the study was collected towards the end of 2015 using structured questionnaires which were administered to managers, operational managers or equivalent managers of manufacturing companies practicing Kaizen in Lusaka Province and Copperbelt Province. The questionnaire was developed based on inputs from the literature. The questionnaire comprised of a five-point Likert scale that collected the respondents' responses to both operational performance items as well as for Kaizen practices quantitatively through closed-ended questions. Also, the questionnaire consisted of four sections. Section 1 explored the respondents' company profile. Section 2 assessed respondents' responses

on the extent of Kaizen practices implementation. Section 3 investigated the respondents' evaluation of manufacturing companies improved operational performance dimensions. Section 4 talked about Kaizen implementation challenges faced by companies.

Prior to collecting the data, the items on the questionnaire were pretested with two academicians (from the operations and supply chain management discipline) and two executives at the Kaizen Institute of Zambia. Also, a pilot study was conducted with 6 executives from the manufacturing companies that have implemented Kaizen on the Copperbelt Province to assess the research instrument's quality. These steps resulted in some changes being made, mainly to improve the clarity of the questions. The questionnaires were physically distributed to the thirty-three participating companies and after one week a follow up were made to collect completed questionnaires.

4. Data Analysis and Findings

4.1 Response Rate and Demographic data

The study distributed questionnaires to Managers and Operational Managers. From thirty-three (33) questionnaires distributed, thirty-one (31) were completed by the respondents and collected while two were not returned. This represented a response rate of 93.9 % which was a very good rate.
The data revealed that the respondent companies with less than 50 employees were 9 (29%), between 51 and 100 employees were 8 (25.8%), between 101 and 150 employees were 5 (16.1%), between 151 and 200 employees were 3 (9.7%); and more than 200 employees were 6 (19.4%). The sectoral representation of thirty-one manufacturing companies was roughly evenly spread among 6 sectors. The data revealed that 9 (29%) were in food and beverages, 3 (9.7%) come from the textiles, and leather and industries, 5 (16.1%) were in chemical, rubber and plastics products, another 5 (16.1%) were in basic metal products, 4 (12.9%) came from the fabricated metal products sector and 5 (16.1%) came from other sectors.

4.2 Challenges faced by companies in Kaizen Implementation

Respondents were asked to give their perceptions on the extent to which they felt their firms experienced challenges on nine mostly experienced challenges by companies implementing Kaizen using a 1-5 scale with 1 (Not at all) and 5 (To a great extent). Table 1 below shows that employee attitude was the most challenging the companies were facing with the mean of 3.19. This was followed by financial constraints and insufficient participation by workers with the mean of 2.71 respectively. Ineffective training was third with the mean of 2.55 and misconceptions about Kaizen had a mean of 2.52. Ineffective Kaizen Performance measures had a mean of 2.43, Organisation Structure had mean of 2.42 and Ineffective Communication Systems had a mean of 2.26. The least was Lack of Management Support or Leadership with a mean of 2.16.

[Insert Table 1]see appendix 1

The results indicate that the companies could do better if employee attitude was to change as management support or leadership did not seem to be a serious challenge. These results are consistent with findings by Aoki (2008) on organizational capabilities that facilitate Kaizen implementation; Karsten and Pennik (2007) on the difficulties of misconceptions about Kaizen in its implementation as well as Kaplisky (1995) on the importance of training and skills development in the implementation of continuous improvement methodologies such as Kaizen. The financial constraints also posing a lesser challenge to Kaizen implementation are consistent with arguments that Kaizen is a low-cost approach to process improvements and it involves the employees or workers (Imai, 1986).
The results reveal that employees' attitude was the most serious challenge the companies were facing, followed by financial constraints, insufficient participation by workers, ineffective training, and misconceptions about Kaizen, ineffective Kaizen performance measures, organisation structure and ineffective communication systems. The least was lack of management support or leadership and other unspecified areas.

5. Measurement reliability and validity

The study addresses twelve primary constructs related to 5S, Kaizen events, 5 Why's, Total Productive Maintenance (TPM), Just-In-Time (JIT) Systems, Suggestion System and Total Quality Management (TQM), quality, productivity, speed of operations (Speed), flexibility of operations (Flexibility) and Overall Equipment Effectiveness. Existing scales from the literature were used for all the constructs. Descriptive statistics, factor analysis, and scale reliabilities are provided in Table 2. The scale reliability for the Flexibility factor was 0.538 which was poor according to the rule of thumb of 0.700 suggested by George and Mallery (2003). Thus, the Flexibility factor was not included in subsequent analysis.

Table 2: Scale items: Descriptive statistics, factor analysis and Chronbach's (coefficient) alpha

Construct (Coefficient α)	Factor	Mean	Standard Deviation	Factor Loading
5S α = .859	5S1: Sorting 5S2: Order 5S3: Cleanliness 5S4: Standardisation 5S5: Self- Discipline	3.96 4.09 4.19 3.93 3.90	.94 .87 .70 1.09 .94	.891 .917 .625 .867 .686
Kaizen Events α = .781	KaizenEvent1: Short terms interventions KaizenEvent2: Improving existing processes KaizenEvent3: Target work area by the team	3.58 4.00 4.03	.95 .77 .94	.826 .888 .805
5 Whys α = .835	5Whys1: Problem identified 5Whys2: Asking five times on problem 5Whys3: Problem root cause found	3.83 3.41 3.80	1.12 1.33 1.10	.899 .796 .923
Suggestion System α = .800	Suggestion1: Specific system used e.g. box Suggestion2: Employees know hierarchy Suggestion3: Immediate feedback provided	3.51 3.80 3.64	1.45 1.04 1.17	.801 .848 .914
Total Productive Maintenance (TPM) α = .808	TPM1: Routine maintenance done TPM2: Self-equipment maintenance TPM3: Effective equipment use	3.87 3.64 3.84	1.15 1.14 .93	.896 .786 .879
Total Quality Management (TQM) α = .793	TQM1: Uses number of practices TQM2: Interacts with customers TQM3: Involves all employees	3.68 4.13 4.06	1.04 .88 .81	.818 .831 .892
Just-In-Time (JIT) α = .755	JIT1: Products delivered on time JIT2: Holds enough raw material JIT3: Holds enough products	3.77 3.84 3.87	1.17 1.13 1.15	.665 .818 .871
Productivity α = .793	Productivity1: reduced idle time Productivity2: ensured the health and safety Productivity3: Reduced costs	3.61 4.16 3.71	.84 .82 .86	.896 .815 .813
Quality α = .851	Quality1: Free from defects Quality2: Reduced customer complaints Quality3: Sticking to set standards	3.90 4.03 4.35	.83 .795 .84	.850 .751 .835
Speed α = .836	Speed1: Improved productions flow Speed2: Reduced inventory Speed3: Reduced future uncertainty	3.90 3.58 3.55	1.01 .92 .92	.886 .885 .832
Flexibility α = .538	Flexibility1: Product produced in different ways Flexibility2: speeded-up response to customer needs Flexibility3: Customers dependability on company product	3.26 4.03 4.26	1.26 .875 .815	.564 .930 .712
Overall Equipment Effectiveness α = .825	OEffectiveness1: Equipment availability OEffectiveness2: Improved performance efficiency OEffectiveness3: Improved quality of product	4.06 3.84 4.26	.93 .90 .68	.889 .893 .804

In addition, a test of discriminant validity is reported in Table 3. Here, as suggested by Gaski and Nevin (1985), the shared variance between multi-item scales is compared to the reliability for each scale. In all cases, the reliability estimates for the one-dimensional constructs were greater than the shared variances of the pairs, verifying discriminant validity for the constructs.

Table 3: Tests for construct discriminant validity

	1	2	3	4	5	6	7	8	9	10	11
Scale Reliability	.859	.781	.835	.800	.808	.793	.755	.793	.851	.836	.825
Construct shared variance											
1. 5S	1										
2. Kaizen Events	.595	1									
3. 5 Whys	.616	.643	1								
4. Suggestion System	.683	.620	.729	1							
5. Total Productive Maintenance (TPM)	.742	.563	.618	.732	1						
6. Total Quality Management (TQM)	.759	.560	.723	.712	.727	1					
7. Just-In-Time (JIT)	.607	.439	.601	.437	.561	.677	1				
8. Productivity	.468	.583	.612	.484	.454	.627	.598	1			
9. Quality	.511	.596	.577	.469	.533	.433	.420	.569	1		
10. Speed	.536	.361	.487	.484	.641	.595	.683	.500	.459	1	
11. Overall Equipment Effectiveness	.542	.566	.544	.599	.535	.423	.456	.527	.681	.590	1

6. Analysis and results

6.1 Extent of Kaizen Practices Implementation

Seven summated indexes of the Kaizen practices were created based on the items on each practice with each item being evenly weighted. Descriptive statistics of these summated Kaizen practices were used to assess the extent to which the thirty-one companies had implemented the seven Kaizen practices (see Table 4 below). The results showed that 5S had the highest extent of implementation with the mean of 4.01, Total Quality Management second with 3.96 and Kaizen Events third with 3.90, Just-in-time fourth with 3.78, Total Productive Maintenance fifth with 3.72 and 5 Whys sixth with 3.70. The Suggestion System was least in the extent of implementation with a mean of 3.60. The results are displayed in Table 4 below.

Table 4: Mean of Responses on Extent of Kaizen Practices Implementation

Kaizen Practice	Mean	Std Dev
5S	4.01	0.74
Kaizen Events	3.90	0.75
5Whys	3.70	1.04
Suggestions Systems	3.62	1.04
Total Productive Maintenance	3.72	0.92
Total Quality Management	3.96	0.77
Just –In-Time	3.78	0.94

The hypotheses were tested using multiple linear regressions using four models. Due to the small sample size (31), only three independent variables were used (the three that had the highest extent of implementation). Thus, the independent variables for the four models were the following factors: 5S; Kaizen Events and Total Quality Management. The first model had Productivity as the dependent variable and models 2, 3, and 4 had Quality, Speed, and Overall Equipment Effectiveness as dependent variables respectively. The study included firm size as a control variable because firm size has become a routine control variable in empirical studies (Kurshev and Strebulaev, 2015). Larger firms tend to have more resources than smaller firms which may influence the implementation of Kaizen in a firm. The number of employees in a firm was used as a proxy for firm size.

As a first step in testing the hypotheses, the study used hierarchical regression. All variables were standardized to reduce the potential effects of multicollinearity (Cohen et al., 2003). The technique of least squares was used with the control variable Firm Size entered as a block in step 1, followed by the main effects in step 2 (5S, Kaizen Events and Total Quality Management). Specifically, the following regression equation was analyzed in two hierarchical steps for each of the four models:

$$Y_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X + \beta_4 X_4 + \varepsilon_i$$

Table 5: Examination of direct effects

Independent Variable	Hypothesis (Result)	Productivity		Quality		Speed		Overall Equipment Effectiveness	
		Std β	t	Std β	t	Std β	t	Std β	t
Step 1: Control variables									
Firm size (SIZE)		0.329	1.877*	0.234	1.298	0.320	1.818	0.073	0.396
R^2		0.11		0.06		0.10		0.01	
Model Fit		F =3.524		F = 1.686		F = 3.306*		F = 0.157	
Step 2: Main Effects									
Firm size (SIZE)		0.107	0.716	0.083	0.509	0.172	1.062	-0.083	-0.509
5S		-0.151	-0.663	0.264	1.065	0.238	0.957	0.349	1.402
Kaizen Event	3a 3b 3e (Support)	0.360	1.999*	0.438	2.235**	-0.042	-0.215	0.405	2.058**
Total Quality Management	7a (Support)	0.509	2.259**	-0.037	-0.151	0.386	1.571	-0.044	-1.78
R^2		0.49		0.40		0.40		0.39	
Model Fit		F = 6.320***		F = 4.316***		F = 4.276***		F = 4.22***	

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.

Table 5 presents the results of the testing of Hypotheses 1a-e, 3 a-e and 7 a-e. The first column in the table shows the relevant independent variables while the corresponding right-side columns display effect size (standardized b) and significance (t-value) of each direct relationship. As shown in row two at step 2 of the table, Hypothesis 1a, 1b, 1c, and 1e related to 5S are not supported. 5S activities are not significantly associated with Productivity (b=-0.151; t=-0.663); Quality (b=0.264; t=1.065); Speed (b=0.238; t=0.957) and Overall Equipment Effectiveness (b=0.349; t=1.402). Three hypotheses H 3a, H 3b, and H 3e related to Kaizen Events have been supported. Kaizen Events are significantly associated with Productivity (b=0.360; t=1.999); Quality (b=0.438; t=2.235); and Overall Equipment Effectiveness (b=0.405; t=2.058). However, hypothesis H 3c was not supported. Kaizen Events are not significantly associated with Speed (b=-0.042; t=-0.215). As for Total Quality Management only one hypothesis, H 7a, was supported whilst hypotheses H 7b, H 7c and H 3e were not supported. Total Quality Management is significantly associated with Productivity (b=0.509; t=2.259) but not significantly associated with Quality (b=-0.037; t=-0.151); Speed (b=0.386; t=1.571) and Overall Equipment Effectiveness (b=-0.044; t=-0.178). These results imply that Total Quality Management has more influence on Productivity than Kaizen Events and 5S. The results also indicate that Kaizen Event has more influence on Quality than 5S and Total Quality Management. Furthermore, the results indicate that Kaizen Event has more influence on Overall Equipment Effectiveness than 5S and Total Quality Management. None of the three variables was significantly associated with the speed of operations (Speed).
Regarding the control variable, the results showed that Firm Size did not have statistically significant effects on Quality, Speed and Overall Equipment Effectiveness. However, it did have a significant effect albeit a weak one ($p < 0.10$) with Productivity.

7. Discussion

7.1 Productivity

Kaizen Events and Total Quality Management were significantly related to Productivity. These results are consistent with findings from the literature. Thessaloniki (2006), also found a strong link between Kaizen practices and improvement performance in the agriculture sector. In addition, studies conducted in Tunisia by Kikuchi (2008) and Bangledesh by JICA and UIC (2009), found that manufacturing companies that implemented Kaizen practices were able to improve productivity using existing machinery and equipment. However, Kaizen and 5s showed no significant relationship to Productivity which is inconsistent with the findings from the literature.

7.2 Quality

Kaizen events were significantly related to quality. The result is consistent with the findings from the literature. A study conducted in the agriculture sector showed that there is a link between kaizen practices and improvement in performance (Thessaloniki, 2006). Furthermore, studies conducted by Kikuchi (2008) in Tunisia; Nderi (2012) in Kenya and Desta et al, (2014) in Ethiopia all showed that Kaizen techniques when implemented improved quality. However, kaizen 5S and total quality management were not significantly related to quality. These results are not consistent with the findings from the literature.

7.3 Speed

Kaizen 5S, Kaizen events and total quality management showed no significant relationship to speed. These findings are not consistent with the results from the literature. For example, studies done in India on manufacturing firms shows that most manufacturing industries are currently encountering a necessity to quickly respond to rapidly changing customers' needs, tastes and desires through continuous improvements (Singh J and Singh H, 2009). Additionally, studies by Ahmed et al (2005) on a casting based manufacturing plant showed an increase in production output as elimination of waste on equipment resulted in speedy of operations.

7.4 Overall equipment effectiveness

Kaizen Events were found to have a significant relationship to overall equipment effectiveness. The result is consistent with findings from the literature. Thessaloniki (2006), also found a strong link between kaizen practices and improvement performance in the agriculture sector. In addition, Kikuchi (2008), conducted a study in Tunisia, where the results showed that kaizen techniques resulted into increased production and productivity due to increased overall equipment effectiveness. Besides that, JICA and UIC (2009), conducted a study in Bangledesh were the results showed that kaizen implementation reduced machine stoppages by 45.7%. However, Kaizen 5S and total quality management showed no significant relationship to overall equipment effectiveness.

Kaizen Events and 5s showed no significant relationship to productivity, quality, speed and overall equipment effectiveness. Furthermore, Kaizen events showed no significant relationship to speed and in addition, total quality management showed no significant relationship to quality and speed. These results mentioned, are not consistent with the findings from the literature reviewed. This could be because of employees' attitude as the most serious challenge the companies were facing, followed by financial constraints, insufficient participation by workers, ineffective training, and misconceptions about Kaizen, ineffective Kaizen performance measures, organization structure and ineffective communication systems. The least was lack of management support or leadership and other unspecified areas as shown in table 1. The challenges found were consistent with findings by other researcher (see for example Aoki, 2008; Imai 1986, 2000 and Kaplisky, 1995).

8. Conclusion

In view of the findings of the research, there is a need for more manufacturing companies to adopt and implement the Kaizen practices with a view to improving the operations performance as evidenced by those that adopted and implemented the concept. The Kaizen Institute of Zambia (KIZ) need to do more sensitisation on least implemented common practices to have a holistic approach to continuous improvement and should intensify registration, monitoring and evaluation of concept implementation and progress reports be shared with relevant stakeholders timely. The government of the Republic of Zambia (GRZ) should consider implement promotional activities on Kaizen philosophy in all economic sectors whether private or public and involve all concerned partners such as ZAM, ZDA and line Ministries. There is a need to institutionalise the Kaizen concept in all sectors.

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