Working paper

International Growth Centre

Management quality, productivity, and profitability in Zambia

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September 2016

When citing this paper, please use the title and the following reference number:
F-41303-ZMB-1

DIRECTED BY
LSE
UNIVERSITY OF OXFORD

FUNDED BY
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ABSTRACT

This paper investigates how quality management practices may affect productivity and profitability in Zambian manufacturing industry. The study attempted to fill the research gap by examining relationships between quality management (QM) practices, productivity and profitability in the manufacturing industry in Zambia using principal components analysis, correlation, multiple regression and mediation analyses. In doing so, relationships between QM, productivity and profitability constructs were assessed and described. The results reveal that benchmarking, customer focus, people management, process management and leadership appear to be of primary importance and exhibit significant impact on productivity. Benchmarking, people management and leadership further exhibit significant impact on profitability. In addition, the findings also suggested that productivity mediates the link between QM and profitability. Findings of the study provides a striking demonstration of the importance of quality management practices for the manufacturing industry in Zambia in enhancing its productivity and profitability and in leveraging the international competitiveness of the Zambian economy.

Keywords: Quality Management, Productivity, Profitability, Manufacturing Industry, Principal Components Analysis, Correlation, Multiple Regression and Mediation Analysis.

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1. Introduction

1.1 Background and Rationale

Manufacturing companies in Zambia have, since 1975, never had it easy. After having to contend with the economic crises of the 1970s to the 1990s, they are now faced with severe electricity shortages arising from climate change and corporate governance challenges in Zambia's national electricity utility company (ZESCO); escalating costs of raw materials and other supplies as a direct consequent of a volatile exchange rate of the local currency (kwacha) against major currencies; high interest rates; competition from high-quality and relatively cheaper imported goods; and a demanding clientele that expect high quality manufactured products. Given these competitive pressures and deteriorating business environment, many manufacturing companies have closed shop and those that remain operational have been forced to continuously seek ways to innovate and improve quality for them to remain viable.

Adopting and implementing quality management practices may have helped some manufacturing firms to remain viable in the face of a very difficult operational environment. This is because the ability of a company to demonstrate that it has quality management systems in place to assure its clients and regulatory bodies can determine whether it gets the business or loose it to a competitor. It is for this reason that at the regional level, the Common Market for Eastern and Southern Africa (COMESA) initiated the Regional Integration Support Mechanism (RISM) project to enable businesses in the region to establish and implement Quality Management Systems based on ISO 9001:2008[1]. In Zambia, this project is implemented through the partnership of Zambia Bureau of Standards (ZABS) and Zambia Association of Manufactures (ZAM) in conjunction with the Ministry of Commerce, Trade and Industry. Companies whose quality management system conform to ISO 9001:2008 make an application to the Zambia Bureau of Standards for certification. If the company is compliant, ZABS grants the certification which is a Quality Management System mark of conformity denoting that an organisation's Quality Management System complies with ISO 9001:2008 Quality Management System standard. ISO certification in Zambia, however, comes with the cost of training borne by the company. For this reason, a number of companies adopting and implementing quality management practices are yet to attain the ZABS quality management system mark nor fully invest in quality management systems training. However, they remain alive to the need to ensure that quality becomes a company's basis for improvement in overall performance, employee motivation and greater credibility with customers.

[1] ISO 9001:2008 is the international language of business. It is based on eight quality management principles. These include: customer focus; leadership; involvement of people; process approach; systematic approach to management; continual improvement; factual approach to decision making, and mutually beneficial supplier relationships.

Quality of a product or service is the degree to which the product or service meets specifications and needs of customers. Quality management (QM) is “an integrated management approach that aims to continuously improve the performance of products, processes and services to achieve and surpass customer expectations” (Talib, et al 2010, 155; Dean and Bowen, 1994; Agus et al, 2009). It is a team activity, demands a new culture, emphasis and it calls for discipline and quality knowledge (Manz and Stewart, 1997). Quality advocates have identified several crucial principles for successful QM practices which among others are: leadership, customer focus, benchmarking, people management, process management and evidence based-decision making and relationship management (Saraph et al, 1989).

Top leadership acts as the main driver for QM implementation, creating values, goals and systems to satisfy customer expectations and to improve an organization’s performance (Ahire et al., 1996). A customer focus keeps the business aware of the changes taking place in its environment and provides the knowledge needed to change the product. Likewise, benchmarking is another process in which an organization continuously compares and measures itself against business leaders anywhere in the world to gain information and provide a guideline for rational performance goals (Boone and Wilkins, 1995). As of late, it has been widely accepted that the most valuable resource within a company is the people that work within it (people management). In this regard, as Agus et al., (2009) notes, people in the organization should be continually given adequate training and education on prescriptions, methods and the concept of quality, which usually includes QM principles, team skills, and problem solving (quality related training). Processing management (such as setting a goal of zero defects) and continuing to renew one’s commitment to moving ever closer toward that goal, will lead to improvements that continue to approach absolute perfection over time (Richman and Zachary, 1993). Simultaneously, process management requires everyone in an organization to work towards doing things right the first time, every time (i.e., the concept of total quality management or TQM). This requires process ownership, process documentation, defined customer and supplier requirements, indicators and measurement criteria, an improvement methodology and the necessary statistical methods (Anonymous, 1995). Lastly, quality management is a goal-orientation with constant performance measurement, often with the use of statistical analysis. The analysis process ensures that all deviations are appropriately considered, measured and responded to consistently (Shores, 1992).

In this regard, it was important to study how the adoption of quality management practices affect productivity and profitability in the Zambian manufacturing industry. Further, it is imperative to discern public policy implications of how such quality management practices can be accelerated at the various levels of the manufacturing process to ensure that the country’s total factor productivity is further raised and, thereby, improve income levels for both entrepreneurs and their employees. This paper explores whether quality management practices could help enhance the productivity and profitability of Zambian manufacturing industry. The main question explored was how quality management practices affects productivity and profitability in the Zambian manufacturing industry. The underlying motivation was to enhance both the managerial and policy maker's understanding of the relationship between quality management practices, productivity and profitability and thus, inform public policy design and practices for leveraging the international competitiveness of Zambian manufacturing industry.

More specifically, the main objectives of the study were:

- To empirically investigate correlates between QM, productivity and profitability.
- To empirically assess the importance of each QM indicator on productivity and profitability.
- To empirically determine whether productivity mediates the link between QM and profitability.

The paper is organised into five main sections. Section one has introduced the paper, setting out the rationale. Section two reviews relevant literature while section three provides the research methodology. Section four reports the results of the statistical analysis conducted while section five makes a conclusion and draws out implication for management practice and policy.

1.2 Brief Context of Zambian Manufacturing Industry

The nature and structure of Zambia's manufacturing industry should be understood in a historical context. Under colonial rule, Zambia was a source of raw materials (copper) and a market for manufactured goods. Soon after independence in 1964, Southern Rhodesia's Unilateral Declaration of Independence in 1965 resulted in the closure of Zambia's southern route to the sea and consequent haste to establish import-substitution manufacturing industries under a highly protected trade regime. Besides, at the time of independence, the country lacked skilled human resources and technical knowhow. It relied on expatriates to decide on manufacturing technologies to adopt. The nationalization of the manufacturing industries in the late 1960s also resulted in increased inefficiency as operational decisions were being made by politicians and not stemming from business imperatives.

More fundamentally, the manufacturing sector was conditioned to rely on foreign exchange receipts generated by copper exports to import machinery, spares and other inputs. This dependency on copper earnings effectively tied the performance of some manufacturing sub-sectors (chemicals, rubber and plastic; metal products/fabrication; non-metal mineral products; and paper and paper products) to the boom and bust cycle of the international prices of copper (World Bank, 1996). According to the World Bank (2004:51) “there was a strong forward linkage from the manufacturing to the mining sector but very little forward linkage from the mining to the manufacturing sector” – a situation that undermined the role of manufacturing in the national economy. The above factors, especially before the sector was privatized in the early 1990s, contributed to declining levels of productivity and profitability in the manufacturing sector on account of shortages of foreign exchange to import spares, raw materials and intermediate goods to keep the sector viable.

Given Zambia’s high rate of urbanization and high rate of population growth, the food and beverages sub-sectors has thrived the most even during the period of “creative destructive” of the early 1990s when Zambia embarked upon trade liberalization as an integral part of the structural adjustment programme.

In general, the manufacturing industry in Zambia has had a chequered trajectory, beginning with its location as a driver of the import-substitution industrialisation thrust of the 1960s to the late 1980s through to the creative destruction of the privatisation of the 1990s that weaned it off from state dependency to the current scenario (post 1990s) of a largely private sector driven industry where government only provides an enabling environment for its operation.

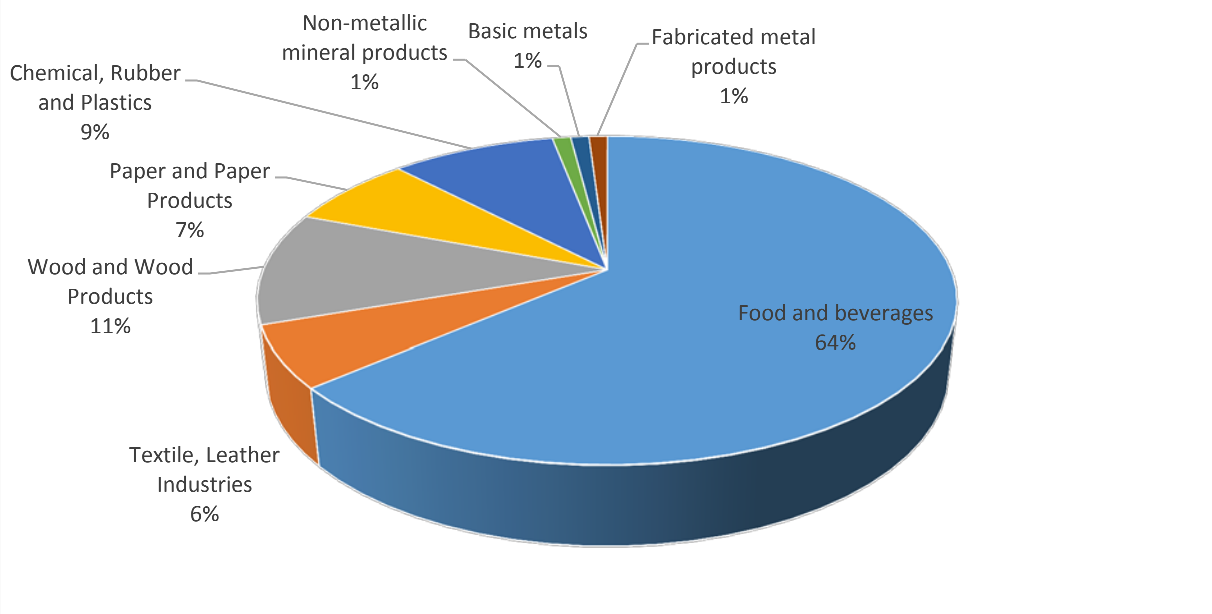
Its role in national development has remained significant, however. Currently, the manufacturing sector in Zambia accounts for about 11 percent of the country’s Gross Domestic Product (GDP) and has been growing at an average annual growth rate of three (3) percent in the last five years. Growth in the sector is largely driven by the agro processing (food and beverages), textiles and leather subsectors. Secondary processing of metals is another main activity in the sector, including the smelting and refining of copper, and this has led to the manufacturing of metal products. Fertilizers, chemicals, explosives and construction materials such as cement are also produced in the sector. Other activities include wood products and paper products.

The sector is of vital importance in relation to the country’s macroeconomic strategy for encouraging broad-based economic growth. In this regard, the Government has put in place measures to support manufacturing activities, such as the establishment of Multi-Facility

Economic Zones (MFEZs) and Industrial Parks (these are industrial areas for both export orientated and domestic orientated industries, with the necessary support infrastructure installed), and provision of sector-specific investment incentives. Government also promotes small and medium enterprises in rural and urban areas so as to enhance labour intensive light manufacturing activities in these areas. The sector has attracted significant investment in recent years (foreign direct investment stocks in the sector totalled about US$ 805.7 million as of 2011), and other than producing many different products, manufacturing also absorbs much of the output from other sectors such as agriculture, and also supplies inputs into the other sectors such as mining and construction.

Manufactured goods contribute an average of 25 percent to the country’s total exports (ZDA, 2014). The main exports of manufactured goods are; engineering products, processed and refined foods, chemical and pharmaceutical products, scrap metal and leather products. The main destinations of Zambia’s manufactured products are the Common Market for Eastern and Southern Africa (COMESA) and the Southern African Development Community (SADC) trade blocs, with the Democratic Republic of Congo and the Republic of South Africa being the largest markets. Other significant export markets outside Africa are China, Belgium, the Netherlands and Switzerland. The growth of the food and beverage sub-sector has been consistent compared to the boom and bust sub-sectors and has resulted in a marked shift in the structure of the manufacturing sector. Figure 1(a) summarises the composition of Zambian manufacturing industry.

Figure 1(a): Composition of Zambian Manufacturing Industry, 2015



Source: Zambia Development Agency, 2015

In terms of concentration of manufacturing firms, a 2014 study by the Ministry of Commerce, Trade and Industry showed that from the 3,811 manufacturing establishments that operated in Zambia in 2010, 42 percent of them were located in Lusaka Province. Copperbelt Province was the second most populated province with 25 percent of establishments followed by Northern and Southern Provinces. Central Province was in fourth position. By contrast, North-Western and Luapula Provinces had the least concentration of manufacturing enterprises accounting for only 6 per cent (MCTI, 2014).

It is in this context of Zambian manufacturing that the study was situated to investigate how quality management practices may affect their productivity and profitability.

2. Literature Review

The development of Total Quality Management (TQM) practices has been one of the major changes in management practice. TQM was introduced around 1980, primarily in response to severe competitive challenges from Japanese companies. The recognition of TQM as a competitive advantage is widespread around the world, especially in western countries, and today very few (especially manufacturing) companies can afford to ignore the term TQM (Dean and Bowen, 1994).

This section reviews literature on TQM practices and the relationship which these practices have with productivity and profitability of a firm.

Definition and Measurement of Quality Management Practices

Quality management has been defined as an approach to management made up of a ‘‘set of mutually reinforcing principles, each of which is supported by a set of practices and techniques’’ (Dean and Bowen, 1994), which has achieved discriminant validity with respect to other strategies for improving the organization’s performance (Hackman and Wageman, 1995). TQM is a systematic quality improvement approach for firm-wide management for the purpose of improving performance in terms of quality, productivity, customer satisfaction, and profitability (Sadikoglu and Zehir, 2010 – TQM 9). Quality management Principles (QMP) are a set of fundamental beliefs, norms, rules and values that are accepted as true and can be used as a basis for quality management. These principles can be used as a foundation to guide an organization’s performance improvement.

From the pioneering works of Saraph et al. (1989), many studies have drawn on the quality management literature to identify the key practices of QM and have developed measurement instruments to analyse its implementation in the firm. The studies by Haynak (2003) and by Sousa and Voss (2002) show that QM includes practices for improvement that affect both the firm’s internal environment and its relationship with its environment.

One of the main ideas of QM is the assumption that the firm acts as an integrated system (Hackman and Wageman, 1995). However, this idea of the system is not limited only to the relationships established within the organization. It can also be generalized to the relationships that the firm establishes in its relationship with the outside world. The full product value chain is thus seen as a system, which for its optimization must be considered as such, and the final quality of the products to be achieved is that which satisfies the customers (Dean and Evans, 1994). Schonberger (1990) asserts that QM sees the firm as part of a chain of consumers and suppliers. In the strictly internal arena, QM includes practices highly focused on the social component of the firm, on areas such as capability of groups or individuals to be self-regulating in relatively complete tasks and teamwork as well as on others of technical nature, such as process control. Process control focuses on making the organization’s processes comprehensible to the people who carry them out (Saraph et al., 1989), as well as on the search for the sources of involuntary errors (Ahire and Dreyfus, 2000). Manz and Stewart (1997) maintain that one of QM’s strong points lies in the fact that it is a management system that takes into account the sociotechnical system of the organization.

Measurement of Quality Management Practices

Several studies have developed an instrument for measuring quality management, assessing its reliability and validity, applicable to industrial firms (Flynn et al., 1994; Ahire et al., 1996) or to both industrial and service sectors (Saraph et al., 1989; Badri et al., 1995; Black and Porter, 1995, 1996; Grandzol and Gershon, 1998; Quazi and Padibjo, 1998; Quazi et al., 1998; Rao et al., 1999). Alongside these, mention must be made of the action-research based instrument by Prybutok and Ramasesh (2005) developed as a context-specific single-site empirical research.

Saraph et. al. (1989) identified management leadership, role of the quality department, training, employee relations, quality data and reporting, supplier quality management, product/service design and process management as the key constructs when measuring QMP. Other studies have adapted Saraph et al.'s (1989) survey instrument to assess the implementation of TQM (e.g. Anderson et. al, 1995; Grandzol and Gershon (1997); Rungtusanatham et al. (1998); Dow et al. (1999), Samson and Terziovski (1999); Wilson and Collier (2000)). From these studies, it can be inferred that the most common practices of measuring QMP are leadership, quality planning, human resource management, customer focus, process management, supplier management and continuous improvement.

Elements of QMP

There are seven quality management principles as promoted by the International Standardisation Organisation which address various components of quality management. In 1990, the International Standardisation Organisation issued standards for the design of quality assurance systems. These so-called ISO 9000 standards and were originally designed for manufacturing of products, but they are now used in a variety of organisations and industries.

These principles can form a basis for performance improvement and organizational excellence when implemented by a firm. A brief description of these principles, as outlined by ISO (9000) is provided in Table 1(a):

Table 1(a): Quality Management Principles

Management Practice	Description	Benefit to firm	Modes of implementing management practice
Customer focus	Meet customer requirements and strive to exceed customer expectations	Increased customer value, increased customer satisfaction, Improved customer loyalty, enhanced reputation of the organization, expanded customer base and Increased revenue and market share.	Recognize direct and indirect customers as those who receive value from the organization. • Understand customers' current and future needs and expectations. • Link the organization's objectives to customer needs and expectations. • Communicate customer needs and expectations throughout the organization. • Plan, design, develop, produce, deliver and support goods and services to meet customer needs and expectations. • Measure and monitor customer satisfaction and take appropriate actions. • Determine and take actions on interested parties' needs and expectations that can affect customer satisfaction. • Actively manage relationships with customers to achieve sustained success.
Leadership	Management task of maintaining and practicing a vision of the organization with respect to customer requirements.	• Increased effectiveness and efficiency in meeting the organization's quality objectives • Better coordination of the organization's processes • Improved communication between levels and functions of the organization • Development and improvement of the capability of the organization and its people to deliver desired results	• Communicate the organization's mission, vision, strategy, policies and processes throughout the organization. • Create and sustain shared values, fairness and ethical models for behaviour at all levels of the organization. • Establish a culture of trust and integrity. • Encourage an organization-wide commitment to quality. • Ensure that leaders at all levels are positive examples to people in the organization. • Provide people with the required resources, training and authority to act with accountability. • Inspire, encourage and recognize people's contribution.
Engagement of people	Competent, empowered and engaged people at all levels throughout the organization are essential to enhance its capability to create and deliver value.	• Improved understanding of the organization's quality objectives by people in the organization and increased motivation to achieve them • Enhanced involvement of people in improvement activities • Enhanced personal development, initiatives and creativity • Enhanced people satisfaction • Enhanced trust and collaboration throughout the organization • Increased attention to shared values and culture throughout the organization	-Communicate with people to promote understanding of the importance of their individual contribution. • Promote collaboration throughout the organization. • Facilitate open discussion and sharing of knowledge and experience. • Empower people to determine constraints to performance and to take initiatives without fear. • Recognize and acknowledge people's contribution, learning and improvement. • Enable self-evaluation of performance against personal objectives. • Conduct surveys to assess people's satisfaction, communicate the results, and take appropriate actions.
Process approach	Consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system.	• Enhanced ability to focus effort on key processes and opportunities for improvement • Consistent and predictable outcomes through a system of aligned processes • Optimized performance through effective process management, efficient use of resources, and reduced cross-functional barriers • Enabling the organization to provide confidence to interested parties as to its consistency, effectiveness and efficiency	• Define objectives of the system and processes necessary to achieve them. • Establish authority, responsibility and accountability for managing processes. • Understand the organization's capabilities and determine resource constraints prior to action. • Determine process interdependencies and analyse the effect of modifications to individual processes on the system as a whole. • Manage processes and their interrelations as a system to achieve the organization's quality objectives effectively and efficiently. • Ensure the necessary information is available to operate and improve the processes and to monitor, analyse and evaluate the performance of the overall system. • Manage risks that can affect outputs of the processes and overall outcomes of the quality management system.

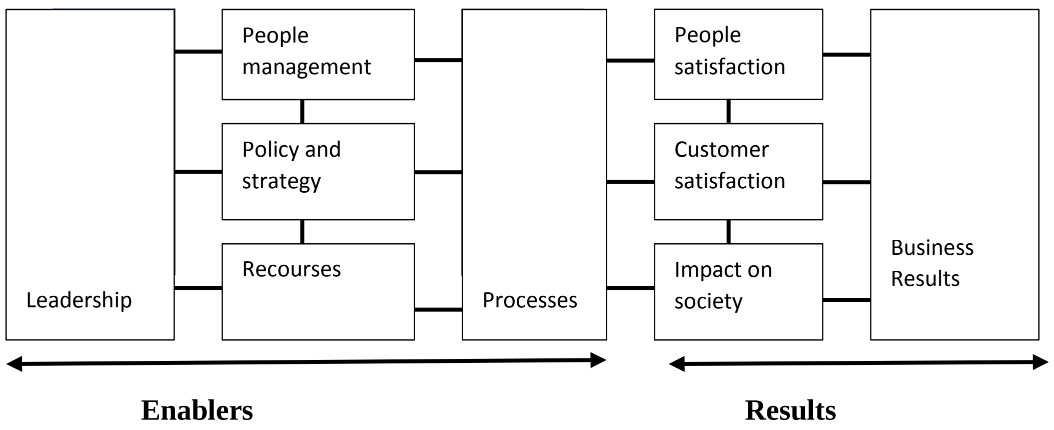
Improvement	Successful organizations have an ongoing focus on improvement.	Improved process performance, organizational capabilities and customer satisfaction • Enhanced focus on root-cause investigation and determination, followed by prevention and corrective actions • Enhanced ability to anticipate and react to internal and external risks and opportunities • Enhanced consideration of both incremental and breakthrough improvement • Improved use of learning for improvement • Enhanced drive for innovation	• Promote establishment of improvement objectives at all levels of the organization. • Educate and train people at all levels on how to apply basic tools and methodologies to achieve improvement objectives. • Ensure people are competent to successfully promote and complete improvement projects. • Develop and deploy processes to implement improvement projects throughout the organization. • Track, review and audit the planning, implementation, completion and results of improvement projects. • Integrate improvement considerations into the development of new or modified goods, services and processes. • Recognize and acknowledge improvement.
Evidence-based decision making	Decisions based on the analysis and evaluation of data and information are more likely to produce desired results.	Key benefits • Improved decision-making processes • Improved assessment of process performance and ability to achieve objectives • Improved operational effectiveness and efficiency • Increased ability to review, challenge and change opinions and decisions • Increased ability to demonstrate the effectiveness of past decisions	• Determine, measure and monitor key indicators to demonstrate the organization's performance. • Make all data needed available to the relevant people. • Ensure that data and information are sufficiently accurate, reliable and secure. • Analyse and evaluate data and information using suitable methods. • Ensure people are competent to analyse and evaluate data as needed. • Make decisions and take actions based on evidence, balanced with experience and intuition.
Relationship management	For sustained success, an organization manages its relationships with interested parties, such as suppliers	• Enhanced performance of the organization and its interested parties through responding to the opportunities and constraints related to each interested party • Common understanding of goals and values among interested parties • Increased capability to create value for interested parties by sharing resources and competence and managing quality-related risks • A well-managed supply chain that provides a stable flow of goods and services	• Determine relevant interested parties (such as suppliers, partners, customers, investors, employees, and society as a whole) and their relationship with the organization. • Determine and prioritize interested party relationships that need to be managed. • Establish relationships that balance short-term gains with long-term considerations. • Pool and share information, expertise and resources with relevant interested parties. • Measure performance and provide performance feedback to interested parties, as appropriate, to enhance improvement initiatives. • Establish collaborative development and improvement activities with suppliers, partners and other interested parties. • Encourage and recognize improvements and achievements by suppliers and partners.

Working with an ISO9000 system has a number of benefits for the firms namely ensuring transparent and audited processes in the firm, strict document control procedures which make it feasible to create relevant procedures and protocols within the organisation and the ISO 9000 system is also suited for seeking continuous improvement by means of performance indicators (Geraedts et. al, 2001).

A more comprehensive representation of the elements involved in QMP is provided by the European Foundation for Quality Management (EFQM) which defines TQM as: All manners in which an organisation meets the needs and expectations of its customers, personnel, financial stakeholders and society in general' (Foley, 1994). The EFQM Model for Business Excellence consists of nine distinctive areas, each representing a different aspect of the organisation. These nine areas are subdivided into areas concerned with what results have been achieved (Results) and areas concerned with how these results have been achieved (Enablers) and are shown is Figure 1(b). The Model for

Business Excellence serves as a useful framework within which to structure quality improvement efforts because of its integrated cycle for continuous improvement. The cycle begins by carrying out a self-assessment to see what Results are achieved at a given moment. Based on these findings, organisations can decide what improving actions must be taken to strengthen one or several Enablers, in order to achieve better results next time. For example: if an organisation wants to improve People (employee) satisfaction, it has to strengthen People Management and also perhaps Leadership, and Policy and Strategy. This can be realised by improvement actions in these particular areas (Geraedts et. al, 2001).

Figure 1(b): EFQM Model for Business Excellence



Source: Geraedts et. al, 2001

After such improvement actions have been implemented, the organisation again carries out a self-assessment in order to see if the improvement actions have resulted in a better overall performance. Based on this second assessment, new Result areas can be selected for improvement, and so the cycle begins again.

Empirical Studies on Quality Management Practices and Firm Performance

The links between TQM and performance have been investigated by numerous scholars. While examining the relationship between TQM and performance scholars have used different performance types such as financial, innovative, operational and quality performance. Although the effects of TQM on various performance types are inconsistent, quality performance generally indicated strong and positive relations. TQM practices help to promote quality performance. The indicators for quality performance are product/service quality, productivity, cost of scrap and rework, delivery lead-time of purchased materials, and delivery lead-time of finished products to customers.

Various empirical studies have been undertaken to see the link between QMP and productivity and profitability. These studies have produced varying results (e.g. ., Kaynak, 2003; Nair, 2006; York and Miree, 2004; Sadikoglu, 2004; Prajogo and Sohal, 2001; Hung, 2007; Terzionski, 2007; Agus et al., 2009) and so the relationship still needs further examination. An updated summary of empirical studies undertaken on the topic, as presented by Tari et. al. (2007) is provided in Table 1(b):

Table 1(b): Summary of Firm Quality –Performance Empirical Studies

Study	Sample	Quality variables	Performance variables	Main analysis	Major findings
Anderson et al. (1995)	41 electronic, machinery and transportation components plants in the USA	7 constructs	1 perceptual variable	Path analysis	Employee fulfilment has a significant direct effect on customer satisfaction. There is no link between continuous improvement and customer satisfaction
Flynn et al. (1995)	45 manufacturing plants in the United States (US)	8 constructs	2 perceptual constructs and 1 objective construct	Path analysis	A relationship exists between TQM and perceived quality market outcomes and the percentage of items that pass final inspection without requiring rework
Powell (1995)	54 US manufacturing and service firms	12 factors	2 variables (perceptual)	Correlation analysis	TQM-performance correlation. However, TQM success critically depends on soft aspects
Dow et al. (1999)	698 manufacturing firms in Australia and New Zealand	9 factors	1 construct (perceptual)	Structural equation model	Three of the nine TQM factors have a significant positive correlation. These are the so-called 'soft factors'
Samson and Terziovski (1999)	1024 manufacturing firms in Australia and New Zealand	6 factors	1 construct (perceptual)	Regression analysis	The relationship exists. The categories leadership, staff management and customer focus were the strongest significant performance predictors
Curkovic et al. (2000)	57 firms (suppliers to General Motors, Ford and Chrysler)	10 factors	8 quality performance measures (perceptual) and 6 firm performance measures (objective)	Correlation analysis	TQM affects quality performance. Quality management may also have impacts on firm performance
Agus and Sagir (2001)	30 Malaysian manufacturing companies	1 construct	1 latent endogenous construct (objective)	Structural equation model	TQM has an indirect impact on financial performance mediated by competitive advantage
Escrig et al. (2001)	231 Spanish industrial and service firms	1 construct	1 construct	Structural equation model	TQM impact on firm financial performance
Rahman (2001)	49 firms in Australia, with and without the ISO 9000 certification	9 factors	1 construct (perceptual)	t-Test	No significant differences between the impacts of TQM on performance for firms with and without the ISO 9000 certification
Singels et al. (2001)	192 industrial and services firms in the North of Holland	ISO 9000 certification/no ISO 9000 certification	5 performance measures (perceptual)	t-Test	ISO 9000 certified firms did not outperform those without such a certification

Tsekouras et al. (2002)	143 Greek firms (with and without the ISO 9000 certification)	ISO 9000 certification/no ISO 9000 certification	4 financial measures (objective)	t-Test	ISO 9000 adoption has no effects on firm performance
Wayhan et al. (2002)	48 ISO 9000-certified companies in North America	ISO 9000 certification	2 measures (objective)	MANOVA	The relationship between ISO and financial growth does not exist, except for the ROA variable
Kaynak (2003)	214 industrial and service firms in the US	7 constructs	3 dimensions (perceptual)	Structural equation model	TQM has positive effects on firm performance
Merino-Dı´az (2003)	965 Spanish manufacturing firms	5 constructs	1 factor (perceptual)	Regression analysis	A relation between TQM and performance does exist. However, human resources variables contribute the most to performance
Terziovski et al. (2003)	400 certified firms in Australia	5 constructs	2 factors (perceptual)	Regression analysis	Quality culture has an effect on business performance. The individual factor found to contribute the most to this was customer focus
Tari et. al. (2007)	106 ISO-certified firms in Spain	9 constructs		Path Analysis	leaders play a critical role as drivers of TQM; process management influences continuous improvement and continuous improvement can Impact on quality outcomes; a firm could transfer the organizational forms and behaviours underlying quality management to other countries with similar cultures.

Relationship between Quality Management and Firm Profitability

The literature pertaining to relationships among QM practices such as customer satisfaction, customer loyalty, and profitability can be divided into two groups. The first, service management literature, proposes that customer satisfaction influences customer loyalty, which in turn affects profitability. Proponents of this theory include researchers such as Anderson and Fornell (1994); Gummesson (1993); Heskett *et al.*(1990); Heskett *et al.* (1994); Reicheld and Sasser (1990); Rust, *et al.* (1995); Schneider and Bowen (1995); Storbacka *et al.* (1994); and Zeithaml *et al.* (1990). These researchers discuss the links between satisfaction, loyalty, and profitability. Statistically-driven examination of these links has been initiated by Nelson *et al.* (1992), who demonstrated the relationship of customer satisfaction to profitability among hospitals, and Rust and Zahorik (1991), who examine the relationship of customer satisfaction to customer retention in retail banking.

Literature shows that customer satisfaction is the result of a customer's perception of the value received in a transaction or relationship - where value equals perceived service quality relative to price and customer acquisition costs (see Blanchard and Galloway, 1994; Heskett *et al.*, 1990) - relative to the value expected from transactions or relationships with competing vendors (Zeithaml *et al.*, 1990). Loyalty behaviours, including relationship continuance, increased scale or scope of relationship, and recommendation (word of mouth advertising) result from customers' beliefs that the quantity of value received from one supplier is greater than that available from other suppliers. Loyalty, in one or more of the forms noted above, creates increased profit through enhanced revenues, reduced costs to acquire customers, lower customer-price sensitivity, and decreased costs to serve customers familiar with a firm's service delivery system (see Reicheld and Sasser, 1990).

Synthesis of Literature Review

The research literature on QM has identified numerous studies across the world. It is said that QM has the potential to not only increase competitiveness and organizational effectiveness but also improve product quality, organizational performance and in turn profitability (Ahire et al., 1996; Opara, 1996; Bayazit & Karpak, 2007; Ortiz et al., 2006; Terziovski, 2006; Agus et al., 2009; Sadikoglu and Olcay, 2014).

In addition, several studies have succeeded in providing evidence that TQM has a positive impact on financial performance and/or overall performance (Schaffer & Thompson, 1992; Opara, 1996; Cherkasky, 1992; Agus & Hassan; 2000; Bayazit & Karpak, 2007; Kaynak, 2003; Ortiz et al., 2006). Agus (2001) found that training and top management commitment play very important roles in TQM implementations in public listed manufacturing companies. The overall findings of that study point to the significant and positive impact of QM on competitive advantage and customer satisfaction, which, in turn, significantly improves the financial performance of these companies. On the other hand, Deming (1986) argued that improvements in quality do create corresponding improvements in productivity by reducing costs, errors, rework, and delays.

The present study aims to produce empirical evidence regarding the relationships among QM, productivity, and profitability, which earlier researchers may have known about but described only implicitly with regard to Zambian manufacturing. While some studies have suggested that QM helps to improve performance, few have used statistical evidence to back up such claims. The present study is one of only a few that attempts to estimate empirically the impact of QM on productivity and profitability in Zambian manufacturing firms.

3. Research Methodology

3.1 Measurement Instrument

Given that the primary objective of the study was to measure firm management's (i.e. senior quality managers or production managers) perceptions of quality management practices and level of productivity and profitability in the manufacturing industry, a set of elements for measuring quality management practice had to be well developed. This was achieved through a thorough review of quality management literature. Productivity and profitability measures were also developed following along the line of Sadikoglu and Olcay (2014), and Terziovski et al. (2006). To figure out respondent bias and carefulness, various elements were repeated in each construct throughout the questionnaire.. The main questionnaire had thirty-three QM elements and eleven productivity and six profitability elements. The elements included a five-point Likert-type scale anchored from (1) strongly disagree to (5) strongly agree, which indicated respondents' disagreement or agreement with each item, respectively.

3.2 Population and Sample

A cross-section survey methodology was used in the study, and the unit of the sample was at the firm level. The target population for the study were small, medium and large scale manufacturing firms in Zambia. The sample of this study consisted of 200 manufacturing firms in the Lusaka and Copperbelt provinces, which were selected at random through simple random sampling. The reasons for leaving out micro-enterprises but rather focusing on small, medium and large scale firms were twofold. First, these were the firms likely to have adopted quality management practices driven primarily by competitive rather than regulatory forces. Second, at this level the industry was likely to be heterogeneous in terms of sub-sectors and product/process complexity. Sample companies were then randomly chosen from a list of manufacturing firms obtained from the Zambian Central Statistical Office and the Zambia Association of Manufacturers.

3.3 Measurement and Operationalisation of Variables

An empirical examination of the proposed model of quality management in this study required the operationalisation of the theoretical constructs suggested by the literature review. Elements of quality management constructs were identified from previous studies (e.g., Sarah et al., 1989, Ahire et al., 1996; Powel, 1995; Flyn et al., 1994, 1995; Terziovski, 2006) and adapted to the Zambian context. Constructs of quality management practices from these studies were operationalised using six main dimensions, namely; leadership, people management, customer focus, strategic planning, information and analysis (benchmarking), and process management.

3.4 Statistical Analysis

As the initial data analysis, the data from the sample was subjected to validity and reliability tests to ensure that the data collected could actually be analysed using principal components analysis (PCA). According to Laundau and Everitt (2004), it is only appropriate to use PCA if the data fulfills four assumptions that are required for PCA to give valid results, namely; 1) multiple variables measured either at continuous or ordinal levels, 2) linear relationship between all variables, 3) sampling adequacy and 4) no significant outliers. The data from the sample was, therefore, checked and fulfilled all the four assumptions, allowing for principal components analysis.

Churchhill (1979) also cautions that, “in order to obtain reliable measures, a reliability test must be conducted to determine the item analysis and internal consistency and stability of the measurements”. The reliability analysis was conducted by calculating the Cronbach alpha for each scale reference with a threshold point of 0.70 suggested by Nunnally (1978). The results showed that the Cronbach alpha measure for the instrument and each scale measure were in an acceptable range. On the basis of the validity and reliability tests, PCA was used. This enabled the identification, extraction and computation of composite scores for factors underlying each construct in the study’s conceptual model. The composite scores (transformed from ordinal to continuous variables) where then used as correlation and regression factor scores.

Before undertaking multiple linear regression analysis, the transformed data was subjected to further tests to check for any violations in assumptions underlying multiple linear regression analysis. This was done by; 1) checking that the dependent variable was measured on a continuous scale and examining descriptive statistics of the transformed continuous variables, 2) ensuring that the model had at least two independent variables and checking the normality assumption by examining their respective histograms superimposed with a normal curve, 3) checking the linearity assumption by examining correlations between continuous variables and scatter diagrams of the dependent versus independent variables, 4) examining collinearity diagnostics to check for multicollinearity, 5) examining residual plots to check for error variance assumptions (i.e. normality and homogeneity of variance), 6) checking for independence of observations using the Durbin-Watson statistic, and 7) examining influence diagnostics (residuals, Dfbetas, Mahalanobis and Cook distance) to check for outliers. The data from the sample fulfilled these assumptions of multiple linear regression allowing for the specification, estimation and hypothesis testing of the multiple linear regression model developed.

Results

4.1 Sample Demographics

Table 1(c) shows that the agro-processing, food and beverages sub-sector was the most dominant of the 200 firms surveyed (i.e. 27% of the sample) in both Lusaka and Copperbelt provinces. The dominance of the agro processing, food and beverages is reflective of the composition of manufacturing in Zambia where the sub-sector accounts for about 63 percent of manufacturing activity in the national economy.

Table 1 (c): Provincial Distribution of the Manufacturing Firms Surveyed.

Sub-Sector	Name of Province		Total
	Lusaka	Copperbelt	
Agro Processing, Food and beverages	39	15	54
Textile, Apparel and Leather	6	9	15
Wood and wood products	2	3	5
Paper and Paper products	4	2	6
Chemicals/ Pharmaceuticals	8	9	17
Plastics and Rubber	9	2	11
Base Metals	0	2	2
Fabricated Metal products	13	8	21
Energy, Electrical and electronics	3	6	9
Machinery and Equipment	2	6	8
Other please specify	34	18	52
	120	**80**	**200**

Table 1(d) Years in Operation of Sampled Firms

Age of Firm	Frequency	Percent	Cumulative Percent
Less than 3 years	11	5.5	5.5
4 to 6 years	28	14.0	19.5
7 to 10 years	26	13.0	32.5
10 to 15 years	30	15.0	47.5
16 years or more	105	52.5	100.0
Total	200	100.0	

Table 1(d) shows that the majority of firms surveyed were quite established and had been in existence for more than 16 years (i.e., 53 percent of the sample). On the other hand, about 63 percent of the sample employed only up to 100 employees – a fact that demonstrates high capital intensity in an economy with high rates of decent work deficits and surplus unskilled and semi-skilled labour. The agro-processing, food and beverages sector had the highest number of firms that employed more than 100 employees in the sample (i.e. about half the firms in this sub-sector) as shown in table 1(e).

Table 1 (e). Range of Firm Size in Terms of Employment by Manufacturing Sub-sector

Sub-sector	**Employees**					**Row Total**
	Less than 50	51-100	101-150	151-200	Above 200	
Agro processing, food and beverages	12	15	5	4	18	**54**
Textile, Apparel and Leather	8	2	2	2	1	**15**
Wood and wood products	2	2	0	0	1	**5**
Paper and Paper products	1	2	0	2	1	**6**
Chemicals/ Pharmaceuticals	8	4	0	2	3	**17**
Plastics and Rubber	2	4	2	1	2	**11**
Base Metals	1	0	1	0	0	**2**
Fabricated Metal products	9	6	0	2	4	**21**
Energy, Electrical and electronics	4	2	1	0	2	**9**
Machinery and Equipment	7	0	1	0	0	**8**
Other please specify	23	12	3	2	12	**52**
Column Total	**77**	**49**	**15**	**15**	**44**	**200**

4.2 Results of Validity and Reliability Tests

The sample data was first screened for univariate outliers to ensure that there were no such variables that could have disproportionate influence on the results. All component scores were less than three standard deviations away from the mean, confirming that there were no significant outliers. In addition, there were no values identified nor recorded as missing data. The minimum amount of data for principal components analysis was satisfied, with a sample size of 200 cases (using listwise deletion). A minimum of 150 cases has been recommended as a minimum sample size to undertake principal components analysis (Neil, 2008).

The factorability of the 50 items in the measurement instrument was examined. Several well-recognised criteria for the factorability of a correlation were used. Firstly, it was observed that the 50 items correlated at least .3 with at least one other item, suggesting reasonable factorability. Secondly, the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.89, above the commonly recommended value of 0.6. The Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequancy is a statistic that indicates the proportion of variance in the variables that might be caused by underlying factors. Third, the Bartlett's test of sphericity was significant ($\chi 2$ (528) = 2720.16, $p < .05$) – Table 1(f). The Bartlett's test of sphericity tests the hypothesis that the correlation matrix is an identity matrix, which would indicate that the variables are unrelated and therefore unsuitable for structure detection. The diagonals of the anti-image correlation matrix were also all over 0.3. Finally, the communalities were all above 0.3, further confirming that each item shared some common variance with other items. Given these overall indicators, principal components analysis was deemed to be suitable with all 50 items.

Table 1(f): Kaiser-Meyer-Olkin and Barlett's Test result

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.89
Bartlett's Test of Sphericity	Approx. Chi-Square	2720.16
	Degrees of freedom	528
	Significance.	.000

In order to obtain reliable measures, a reliability test was conducted to determine the item analysis and internal consistency and stability of the measurements (Churchill, 1979). The reliability analysis was conducted by calculating the Cronbach's alpha for each scale. The scale of Cronbach's coefficient alpha value is the most widely used statistic to determine the reliability of the measurement. The result showed that the Cronbach's alpha measure for the instrument exceeded the acceptance threshold point of 0.70 suggested by Nunnally (1978). Alpha coefficients for the instruments' scales ranged between 0.77 and 0.81 after the alpha maximisation process were carried out. The alpha coefficient for the quality management practices (QMP) scales was 0.81 while that of the productivity scales was 0.77. The alpha coefficient for profitability scales was 0.77. All the three Cronbach alpha coefficients were in an acceptable range. The overall value of Cronbach was 0.87 which was also in an acceptable range (Table 2). This means that the instrument used for data collection was reliable.

Table 2: Cronbach Alpha Test Results

Item	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Overall	.87	.94	50
Quality management practices scales	.81	.92	33
Productivity scales	.77	.83	11
Profitability scales	.77	.87	6

4.3 Results of Principal Components Analysis

This section reports and analyses results of the principal components analysis conducted to identify, extract and compute composite scores for the factors underlying each construct in the study's conceptual model.

4.3.1 Results of Principal Components Analysis of Quality Management Practices

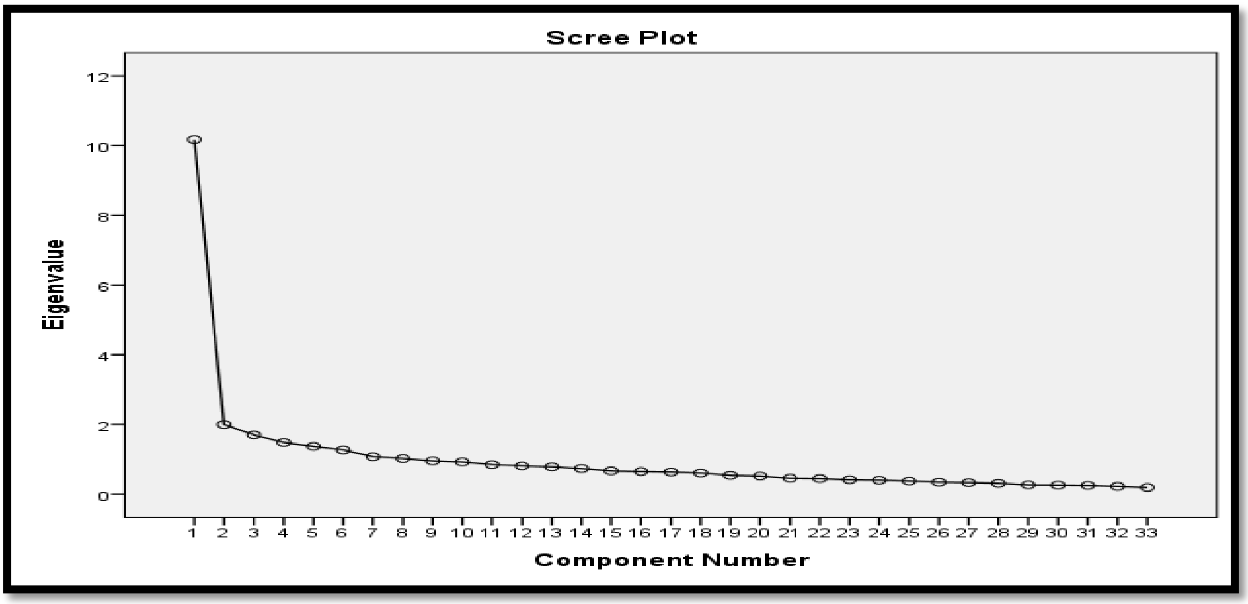
Varimax was the rotation method chosen since the goal of the variable reduction was to achieve a simple structure with a readily explainable division of variables onto separate components. As per Kaiser Criterion, only factors with eigenvalues greater than 1 were retained. As can be seen in Table 3, initial eigenvalues indicated that the first eight factors explained 30.8 percent, 6.0 percent, 5.1 percent, 4.4 percent, 4.1 percent, 3.8 percent, 3.2 percent and 3.0 percent of the variance, respectively. Thus, an eight factor solution, which explained 60.8 percent of the variance was obtained. The eight factor solution for quality management practices is consistent with previous empirical findings. For instance, empirical work by Terziovski (2006) supports a factor solution of seven principal components in regard to quality management practices while that of Agus et al. (2009) supports a nine factor solution. Besides, the 'leveling off' of eigenvalues on the scree plot after eight factors (Figure 1(c)) supports an eight principal component quality management solution in the current study.

Table 3: Total Variance Explained Output Table (Quality Management Practices)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.172	30.825	30.825	10.172	30.825	30.825	3.717	11.262	11.262
2	1.997	6.052	36.877	1.997	6.052	36.877	3.052	9.249	20.512
3	1.701	5.156	42.033	1.701	5.156	42.033	3.018	9.146	29.658
4	1.482	4.492	46.525	1.482	4.492	46.525	2.728	8.268	37.925
5	1.368	4.147	50.671	1.368	4.147	50.671	2.654	8.043	45.968
6	1.268	3.841	54.513	1.268	3.841	54.513	1.972	5.977	51.945
7	1.074	3.255	57.768	1.074	3.255	57.768	1.855	5.621	57.566
8	1.022	3.097	60.865	1.022	3.097	60.865	1.089	3.299	60.865
9	.953	2.888	63.752						
10	.924	2.799	66.551						
11	.848	2.570	69.121						
12	.810	2.454	71.575						
13	.783	2.374	73.949						
14	.734	2.223	76.172						
15	.666	2.019	78.191						
16	.648	1.963	80.155						
17	.635	1.923	82.078						
18	.605	1.833	83.911						
19	.541	1.638	85.550						
20	.519	1.574	87.123						
21	.455	1.380	88.504						
22	.445	1.348	89.852						
23	.413	1.252	91.104						
24	.399	1.210	92.314						
25	.375	1.135	93.449						
26	.344	1.041	94.490						
27	.329	.997	95.487						
28	.310	.940	96.427						
29	.264	.799	97.226						
30	.255	.773	97.999						
31	.249	.754	98.753						
32	.222	.673	99.426						
33	.190	.574	100.000						

Extraction Method: Principal Component Analysis.

Figure 1(c): Scree Plot (Quality Management Practices)



The rotated component matrix in Table 4 shows the factor loadings for each variable. The first set of seven elements (benchmarking of technology; benchmarking of quality procedures; benchmarking of other firm's product quality and procedures; benchmarking of customer service; focus on achievement of best practice; strategy covering all manufacturing operations and benchmarking of operating process) loaded strongly on component 1, which will be called "Benchmarking". The second set of four elements (customer complaints used as a method to initiative improvement; consideration of customer requirements when designing new products and services; effective process for resolving customer complaints and, employees believe quality is their responsibility) all loaded strongly on component 2 which will be called "Customer Focus". The third set of six elements (champions of change are effectively used; proactively pursue continuous improvement; ideas from production operators are actively used; the concept of internal customer is well understood; employee satisfaction is formally and, regularly measured and occupation and safety practices are excellent) loaded strongly on component 3, which will be called "People Management". The fourth set of four elements (suppliers work closely with us in product development; we work closely with our suppliers to improve each other's processes; our suppliers have an effective system for measuring the quality of the materials, and we have methods to measure the quality of our products and services) all loaded strongly on component 4, which will be called "Process Management". The fifth set of five elements (effective top-down and bottom-up communication; organisation-wide training and development; senior managers actively encourage change; the mission statement is communicated throughout the company and, employee flexibility, multi-skilling and training are actively used) all loaded strongly on component 5, which will be called "Leadership." The sixth set of two elements (knowledge of customer's current and future requirements and dissemination and understanding of customer requirements) loaded strongly on component 6, which will be called "Knowledge of Customer's Changing Needs." The seventh set of three elements (incorporation of customer requirement in company plans and policies; comprehensive and structured planning process and, alignment of company operations with the mission statement) loaded strongly on component 7, which will be called "Leadership". The last single element (benchmarking of other firms product quality and procedures) stood out of the benchmarking component and loaded strongly on component 8, which will be called "Information and Analysis". The component labels proposed by Terziovski (2006) suited the extracted components and were to a large extent retained.

Table 4: Rotated Component Matrix[a] (Quality Management Practices)

	Component							
	1	2	3	4	5	6	7	8
Benchmarking Technology	.753							
Benchmarking of quality procedures	.709							
Benchmarking of other firms' product quality and procedures	.705							
Benchmarking of customer service	.623			.392				
Plans focus on achievement of best practice	.507		.369			.357	.377	
Written statement of strategy covering all manufacturing operations	.482						.398	
Benchmarking of operating process	.332							-.323
Customer complaints are used as a method to initiate improvements		.727						
Focus on customer requirements in designing new products and services		.662				.332		
We have effective process for resolving customer complaints		.650						
All employees believe quality is their responsibility		.475		.315	.345			
'Champions of Change' are effectively used			.724					
We proactively pursue continuous improvement			.667			.312		
Ideas from production operators are actively used		.385	.571					
The Concept of Internal Customer is well understood		.341	.469					
Employee satisfaction is formally and regularly measured			.454		.318			
Occupation health and safety practices are excellent	.391		.395			.330		
Suppliers work closely with us in product development				.842				
We work closely with our suppliers to improve each other's processes				.812				
Suppliers have an effective system for measuring quality of the materials				.687				
Methods to measure the quality products and services exist	.309	.432	.327	.453				
Effective 'top down' and 'bottom up' communication			.371		.636			
Organisational-wide training and development		.432			.636			
Senior Managers actively encourage change			.444		.588			
The Mission Statement is communicated throughout the company					.556		.408	
Employee flexibility, multi-skilling and training are actively used		.409			.473			
We know our customers current and future requirements						.762		
Customer requirements are disserminated and understood		.304				.690		
There is high degree of unity of purpose throughout the firm							-.655	
When we develop our plans, policies and objectives, we always incorperate customer requirements	.408	.343					.441	
We have a comprehensive and structured planning process which regularly reviews short and long term goals	.303				.402		.429	
All operations of the company are aligned with the mission statement	.393		.323				.421	
Benchmarking of other firm's product quality and procedures								.788

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 21 iterations.

Composite scores were created for each of the eight principal components, based on the mean of the elements which had their primary loadings on each principal component. The principal components composite scores were then used in correlation and regression analysis, thus enabling testing of the study's hypotheses using parametric methods.

4.3.2 Results of Principal Components Analysis of Productivity Measures

Principal components analysis was further used to reduce the complexity of the productivity data by decreasing the number of productivity elements. As Laudau and Everitt (2004:281) writes, " principal components is essentially a method of data reduction that aims to produce a small number of derived variables that can be used in place of the larger number of original variables to simplify subsequent analysis of data". A correlation matrix of the productivity data shows that there existed substantial correlations between different original elements of the 11 item productivity construct, suggesting that some simplification of the data using principal components analysis would be possible.

As was the case in the quality management construct, the varimax rotation procedure was preferred since it sets outs to achieve a simple structure with a readily explainable division of variables onto separate components. The communalities indicating the amount of variance in each variable that is accountable for are displayed in Table 5. These were produced on the basis of the eigenvalue-one criterion and a minimum criteria of having a primary factor loading of 0.3 or above.

Table 5: Communality Values of the Productivity Measures

	Initial	Extraction
Our employees' morale is high	1.000	.685
Our employees' commitment to the organisation is high	1.000	.720
Our employees' job perfomance is high	1.000	.583
Our employees' absenteeism is low	1.000	.566
There is an accurate and faster data flow in the company	1.000	.812
Our work design is continually improved	1.000	.391
Our work environment is pleasant	1.000	.546
Our defect rate on our products is low	1.000	.713
Warranty claims on our products is low	1.000	.678
We deliver in full on time to our customers	1.000	.446
Our employees' productivity is high	1.000	.611

Extraction Method: Principal Component Analysis.

As per Kaiser Criterion, only factors with eigenvalues greater than 1 were retained. Table 6 below, labelled “Total Variances Explained,” shows how much of the total variance of the observed variables is explained by each of the principal components. The first principal component (scaled eigenvector), by definition the one that explains the largest part of the total variance, had a variance (eigenvalue) of 4.3; this amounted to 39.9 percent of the total variance. The second principal component had a variance of 1.3 and accounted for a further 12.0 percent of the total variance. The third principal component had a variance of 1.0 and accounted for a further 9.3 percent of the total variance. As seen in Table 6, initial eigenvalues indicated that the first three factors explained 61.3 percent of the variance obtained. Thus, on the basis of the eigenvalue-one criterion, a three principal’s components solution, which explained 61.3 percent of the variance was preferred.

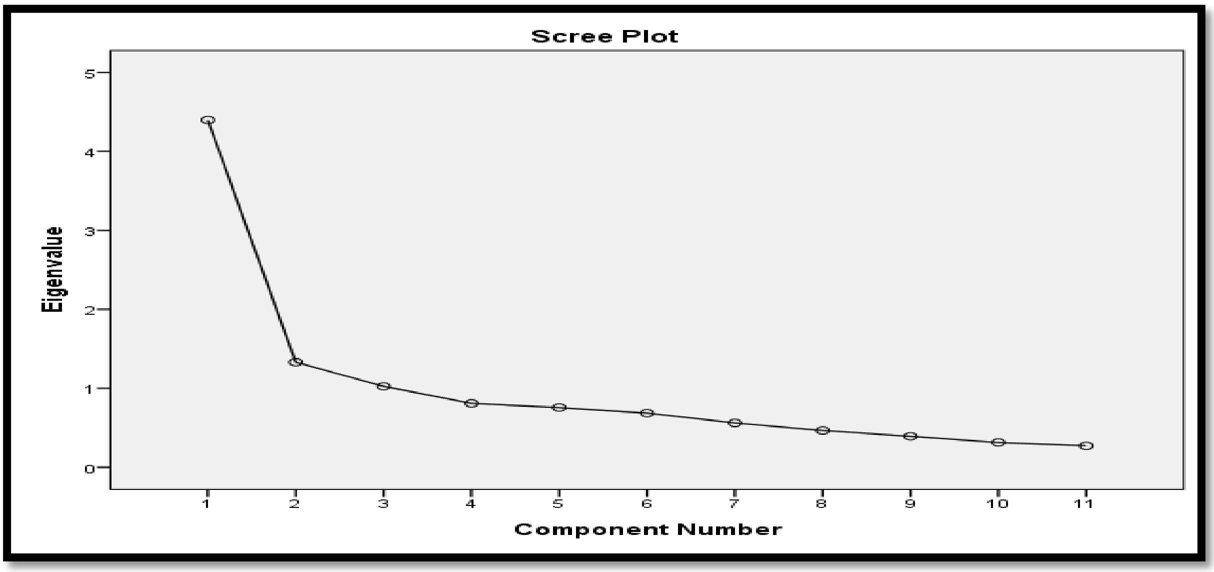
Table 6: Total Variance Explained (Productivity)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.396	39.961	39.961	4.396	39.961	39.961	3.598	32.710	32.710
2	1.330	12.087	52.048	1.330	12.087	52.048	1.980	18.001	50.711
3	1.025	9.317	61.365	1.025	9.317	61.365	1.172	10.654	61.365
4	.809	7.350	68.715						
5	.755	6.866	75.581						
6	.685	6.231	81.812						
7	.560	5.095	86.907						
8	.465	4.227	91.134						
9	.391	3.551	94.685						
10	.313	2.843	97.528						
11	.272	2.472	100.000						

Extraction Method: Principal Component Analysis.

In addition, the 'leveling off' of eigenvalues on the scree plot after three components (Figure 2) supports a three factor solution in the current study. Evidently, the curve shows an "elbow" at principal component number three, indicating that higher order principal components contributed a decreasing amount of additional variance and so were not needed. Thus, the 11 variable items in the measuring instrument were summarised by the first three principal components. It was assumed that the three-component solution for the productivity construct was adequate.

Figure 2: Scree Plot on Productivity Measures



The rotated component matrix in Table 7 shows the factor loadings for each variable. The first set of seven elements (employee morale; employee commitment; employee's job performance; work environment; timely delivery to customers; employee productivity and, work design) loaded strongly on component 1, which will be called "Productivity 1 (Employee)". The second set of three elements (low defect rate on products; low warrant claims on products and, low absenteeism) all loaded strongly on component 2 which will be called "Productivity 2 (Defect Rate)". The third component had a single variable (accurate and factor data flow) loaded strongly on it, which will be called "Productivity 3 (Data Flow)".

Table 7: Rotated Component Matrix[a] (Productivity Measures)

	Component		
	1	2	3
Our employees' morale is high	.822		
Our employees' commitment to the organisation is high	.797		
Our employees' job perfomance is high	.727		
Our work environment is pleasant	.686		
We deliver in full on time to our customers	.650		
Our employees' productivity is high	.646	.431	
Our work design is continually improved	.583		
Our defect rate on our products is low		.815	
Warranty claims on our products is low		.808	
Our employees' absenteeism is low		.558	.499
There is an accurate and faster data flow in the company			.884

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]
a. Rotation converged in 5 iterations.

Composite scores were created for each of the three principal components, based on the mean of the items which had their primary loadings on each factor. Overall, principal component analysis indicated that three distinct components were underlying the productivity construct and that these were strongly internally consistent. Thus, to simplify matters it was assumed that a three-component solution for productivity measures was adequate. The composite score data for each of these three components was, thus considered well suited for parametric statistical analyses. The principal composite scores were then used in correlation and regression analysis, thus enabling testing of the study's hypotheses using parametric methods.

4.3.3 Results of Principal Components Analysis of Profitability Indicators

To reduce the complexity of the profitability data, principal component analysis was again used. A correlation matrix of the profitability data (Appendix Table A3) showed that there existed substantial correlations between different original elements of the 6 item profitability construct, suggesting that some simplification of the data using principal components analysis would be possible. Consistent with the procedures in the previous two sections, the varimax rotation method was preferred in order to achieve a simple structure with a readily explainable division of variables onto separate components. The communalities indicating the amount of variance in each variable accountable for are displayed in Table 8. These were produced on the basis of the eigenvalue-one criterion and a minimum criteria of having a primary factor loading of 0.3 or above.

Table 8: Communality Values of the Profitability Indicators

	Initial	Extraction
Return on assets of our company has increased	1.000	.705
Market share of our company has improved	1.000	.633
Profits of our company have grown	1.000	.797
Sales of our company have grown	1.000	.727
Returns on equity of our company has increased	1.000	.741
Returns on investment of our company has increased	1.000	.227

Extraction Method: Principal Component Analysis.

As per Kaiser Criterion, only factors with eigenvalues greater than 1 were retained. Table 9 below, labelled "Total Variances Explained," shows how much of the total variance of the observed variables is explained by each of the principal components. The data was reduced to one principal component. As seen in Table 9 below, initial eigenvalues indicated that the single component explained 63.8 percent of the variance obtained. Thus, on the basis of the eigenvalue-one criterion, a one factor solution for profitability indicators, which explained 63.8 percent of the variance was preferred.

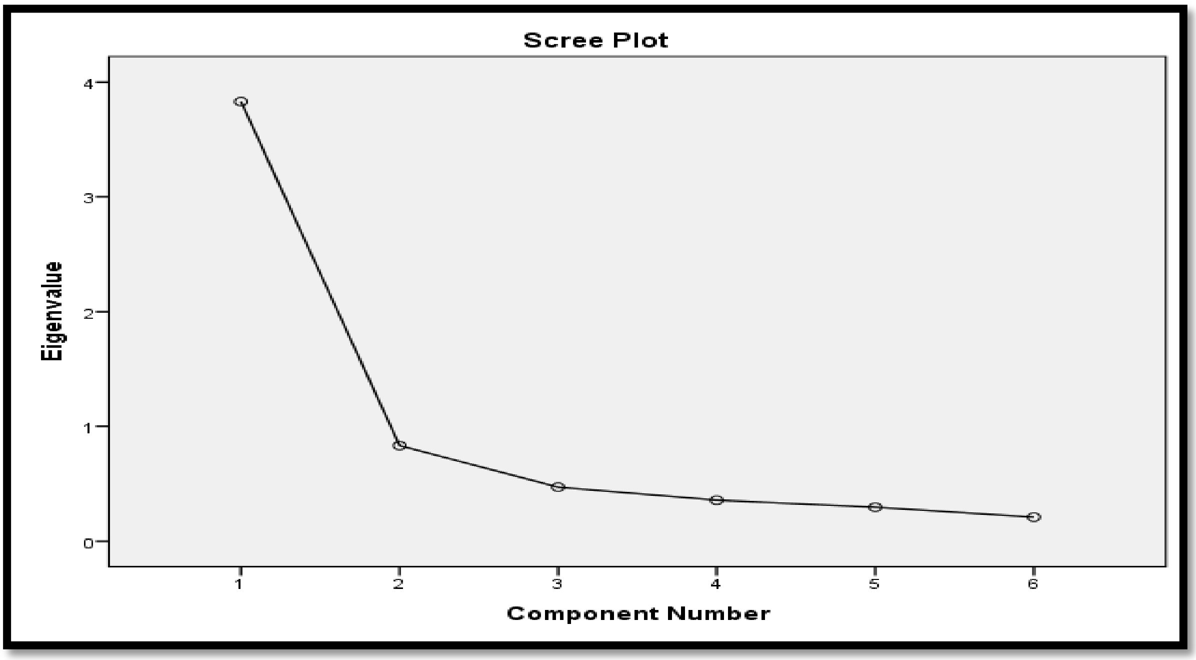
Table 9: Total Variance Explained (Profitability Indicators)

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.830	63.838	63.838	3.830	63.838	63.838
2	.834	13.895	77.734			
3	.471	7.843	85.577			
4	.358	5.959	91.536			
5	.297	4.954	96.489			
6	.211	3.511	100.000			

Extraction Method: Principal Component Analysis.

In addition, the 'leveling off' of eigenvalues on the scree plot after one component (Figure 3) supports a one factor solution in the current study. Evidently, the curve shows an "elbow" at principal component number one, indicating that higher order principal components contributed a decreasing amount of additional variance and so were not needed. Thus, the 6 variable items capturing profitability in the measuring instrument were summarised by the first principal component. As such, in the study it was assumed that a one-component solution for the profitability construct called "Profitability" was adequate. The principal components composite score for profitability was, thus considered well suited for parametric statistical analyses. This was then used in correlation and regression analysis, thus enabling testing of the study's hypotheses using parametric methods.

Figure 3: Scree Plot



4.4 Results of Correlations

The main purpose of the study was to investigate how quality management (QM) practices, affect productivity and profitability in the Zambian manufacturing industry. The objective was to enhance managerial understanding of quality management practices, productivity and profitability and thus, leverage the industry's international competitiveness. The main objectives of this paper are:

- To empirically investigate correlates between QM, productivity and profitability.
- To empirically assess the importance of each QM indicator on productivity and profitability.
- To empirically determine whether productivity mediates the link between Q and profitability.

On the basis of the literature reviewed, the study hypothesises directional relationships between QM, productivity and ultimately profitability. In addition, the study investigates whether productivity mediates the linkage between QM and profitability. Three hypotheses for the study are stated as follows:

- **Hypothesis 1**: QM practices are positively correlated with productivity.
- **Hypothesis 2**: QM practices are positively correlated with profitability.
- **Hypothesis 3**: Productivity mediates the linkage between QM and profitability.

Table 10 provides correlation results.

Table 10: Correlations between QM Practices, Productivity and Profitability

	Quality Management Practices	Productivity	Profitability
1	Benchmarking	0.274**	0.371**
2	Customer Focus	0.293**	0.055
3	People Management	0.266**	0.177**
4	Process Management	0.208**	0.095
5	Leadership	0.307**	0.189**
6	Strategic Planning	0.024	0.011
7	Knowledge of Customer Needs	.105	.091
8	Information and Analysis	-0.009	0.035

** Correlation is significant P≤0.01; 2. All t-tests are one-tailed.

Pearson's correlation analysis was conducted to investigate relationships between QM practices, productivity and profitability. The results confirm the close associations between these constructs. Productivity has significant positive correlations with benchmarking, customer focus, people management, process management and leadership (Hypothesis 1). Profitability has significant positive correlations with benchmarking, people management and leadership (Hypothesis 2). These findings are consistent with several studies that proclaimed better organisational transformations as a result of QM initiatives (see for instance, Bayazit and Karpak, 2007; Kaynak, 2003; Ebrahimpour and Withers, 1992; Bowen and Lawler, 1992; Ortiz et al., 2006, Agus et al. 2009). In an effort to improve profitability, findings indicate that manufacturing firms in Zambia should implement benchmarking, focus on people management and obtain the commitment of top leadership. Improved productivity, however, will require that in addition to benchmarking, people management and top leadership commitment, firms focus on customer satisfaction and secure high quality supplies.

4.5 Results of Multiple Linear Regression

Multiple linear regression analysis was conducted to investigate the relationship between a set of predictor variables and a dependent variable (Black, 2001). Testing the regression coefficients using t-tests not only gives researchers some insight into the fit of the regression model, but it also helps in assessing the strength of the individual predictor variables in estimating the dependent variable (Hair et al. 1995), Black, 2001). However, testing statistical hypothesis using multiple linear regression requires that some specific assumptions are met before making further progress. According to Gujarati (1992:144), it is only appropriate to use multiple regression if the data "passes" eight assumptions that are required for multiple regression to give valid results. The eight assumptions are:

(i) The dependent variable should be measured on a continuous scale;

(ii) There must be at least two or more independent variables, which can either be continuous or categorical;

(iii) There should be independence of observations (i.e. independence of residuals);

(iv) There needs to be a linear relationship between the dependent variable and each of the independent variables and the dependent variable and independent variables collectively;

(v) The data needs to show homoscedasticity, which is where the variances along the line of best fit remain similar along the line;

(vi) The data must not show multicollinearity, which occurs when two or more independent variables are highly correlated with each other;

(vii) There should be no significant outliers, high leverage points or highly influential points, and;

(viii) Residuals (errors) should be approximately normally distributed.

Preliminary Analysis

At the preliminary level of checking whether multiple regression assumption were met, analyses were conducted to: 1) examine the descriptive statistics of the dependent variables obtained from principal components analysis to ensure it conforms to measurement at the continuous level, 2) check that the two independent variables in the model met the normality assumption, and 3) check the linearity assumption by examining the significance of the correlations between the dependent variable and each of the independent variables, and collectively.

Further checks for multicollinearity, homogeneity of variance, independence of observation, normality of residuals' distribution, and multivariate outliers and influential cases were performed simultaneously while running multiple regression analysis.

Dependent variable measured on continuous scale assumption.

The assumption was met by the extraction process under principal component analysis that transformed the data collected at ordinal level to continuous scale measures by computing composite factor scores well suited for parametric testing such as multiple linear regression analysis. On examination of the descriptive statistics of the continuous variables, it was further observed that all component scores were less than three standard deviations from the mean, confirming that there were no significant outliers. Besides, the values for skewness and kurtosis indices were generally very small which also indicated that the variables most likely did not include influential cases or outliers (Table 11).

Table 11: Descriptive Statistics of the Continuous Variables

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Benchmarking	200	-3.6006	3.2565	.000000	1.0000000	-.554	.172	1.395	.342
Customer focus	200	-3.47302	3.35858	.0000000	1.00000000	-.622	.172	1.009	.342
People management	200	-3.83626	3.08898	.0000000	1.00000000	-.306	.172	1.133	.342
Process management	200	-3.93453	1.70849	.0000000	1.00000000	-.939	.172	1.122	.342
Leadership	200	-4.03125	3.25051	.0000000	1.00000000	-.428	.172	1.568	.342
Productivity	200	-2.67209	2.83094	.0000000	1.00000000	-.372	.172	.040	.342
Profitability	200	-2.58535	4.35758	.0000000	1.00000000	1.020	.172	4.063	.342
Valid N (listwise)	200								

Two or more independent variables assumption.

The assumption was met since the initial conceptual framework model had two independent variables which were initially measured on a categorical scale but transformed to continuous measures using principal components analysis' transformative procedure.

Linearity assumption.

Another multiple regression assumption is that the relationship between the dependent and independent variables is linear. This assumption was checked by calculating the Pearson moment correlation coefficient to examine the indication of the magnitude of the relationship between the dependent and independent variables. Table 12 shows results of the correlations between variable pairs.

Table 12: Correlations between Variable Pairs

		Profitability	Productivity	Benchmarking	Customer focus	People management	Process management	Leadership
Profitability	Pearson Correlation	1	.332**	.371**	.055	.177*	.095	.189**
	Sig. (2-tailed)		.000	.000	.439	.012	.180	.007
	N	200	200	200	200	200	200	200
Productivity	Pearson Correlation	.332**	1	.274**	.293**	.266**	.208**	.307**
	Sig. (2-tailed)	.000		.000	.000	.000	.003	.000
	N	200	200	200	200	200	200	200
Benchmarking	Pearson Correlation	.371**	.274**	1	.000	.000	.000	.000
	Sig. (2-tailed)	.000	.000		1.000	1.000	1.000	1.000
	N	200	200	200	200	200	200	200
Customer focus	Pearson Correlation	.055	.293**	.000	1	.000	.000	.000
	Sig. (2-tailed)	.439	.000	1.000		1.000	1.000	1.000
	N	200	200	200	200	200	200	200
People management	Pearson Correlation	.177*	.266**	.000	.000	1	.000	.000
	Sig. (2-tailed)	.012	.000	1.000	1.000		1.000	1.000
	N	200	200	200	200	200	200	200
Process management	Pearson Correlation	.095	.208**	.000	.000	.000	1	.000
	Sig. (2-tailed)	.180	.003	1.000	1.000	1.000		1.000
	N	200	200	200	200	200	200	200

Leadership	Pearson Correlation	**.189****	**.307****	**.000**	**.000**	**.000**	**.000**	**1**
	Sig. (2-tailed)	**.007**	**.000**	**1.000**	**1.000**	**1.000**	**1.000**	
	N	**200**	**200**	**200**	**200**	**200**	**200**	**200**

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results indicate a significant positive correlation between profitability and productivity and significant positive correlations between productivity on one hand and benchmarking, customer focus, people management, process management and leadership on the other. There are also significant positive correlations between productivity on one hand and benchmarking, people management and leadership on the other. Overall, results of the correlation coefficient assessments of the independent and dependent variables entering the multiple regression model indicates linearity was a reasonable assumption.

Based on these preliminary analyses, multiple linear regression analyses were conducted. Further checks for multicollinearity, homogeneity of variance, normality of residual distribution, independence of observations, and outliers and influential cases assumptions were performed simultaneously while running the multiple regression analysis. In this paper, two models were developed to represent an attempt to account for the contributions of critical determinants of QM on profitability and productivity.

Testing the Overall Regression Model

The overall significance of the multiple regression models are tested with the following hypotheses.

H_0 : $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 \ldots B_i = 0$

H_a : At least one of the regression coefficients is ≠ 0

Table 13: Regression Summaries

Model	Dependent Variable	R	R2	Adjusted R2	Std Error (SE)	F	Sig
First Model	Productivity	0.608	0.369	0.353	0.809	22.72	0.00
Second Model	Profitability	0.453	0.205	0.193	0.898	16.82	0.00

A rejection of the null hypothesis indicates that at least one of the predictor variables is adding significant predictability for the dependent variable. Two multiple regression analyses were conducted where the first model had productivity as the dependent variable. Briefly, multiple stepwise regression analyses indicated that strong relationships between constructs existed for both models. The first model (Table 13) which highlights the impact of quality management practices on productivity, has a good fit and significantly high values of R(0.608) as well as R^2 (0.369) and a significant F-Value of 22.72. The model exhibits a significant F value. The model suggested that five quality management practices (benchmarking, customer focus, people management, process management and leadership) were able to explain almost 37% of the variation in the dependent variable (productivity). The second model (Table 13) which presents the relationship between quality management practices and profitability, has a reasonably good fit and has significant values of R (0.453) and R^2 (0.205) and a significant F-Value of 16.82. The model suggests that three quality management practices (benchmarking, people management and top leadership) are able to explain almost 21% of the variation in the dependent variable (profitability). This value is considered reasonably high, given the multitude of factors affecting profitability (Stevens, 1986; Agus et al. 2009).

Significance of the Individual Regression Coefficients

Regressions results of the relationship between quality management practices and productivity are summarised in Table 14.

Table 14: The Relationship between Quality Management Practices and Productivity: A Stepwise Regression Analysis (The First Model).

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	**3.304E-16**	**.057**		**.000**	**1.000**		
	Benchmarking	**.274**	**.057**	**.274**	**4.797**	**.000**	**1.000**	**1.000**
	Customer focus	**.293**	**.057**	**.293**	**5.136**	**.000**	**1.000**	**1.000**
	People management	**.266**	**.057**	**.266**	**4.673**	**.000**	**1.000**	**1.000**
	Process management	**.208**	**.057**	**.208**	**3.654**	**.000**	**1.000**	**1.000**
	Leadership	**.307**	**.057**	**.307**	**5.388**	**.000**	**1.000**	**1.000**

Dependent Variable: Productivity

Testing the regression coefficients using t-tests not only gives researchers some insights into the fit of the regression model, but it also helps in assessing the strength of the individual predictor variables in estimating the dependent variable (Hair et al. 1995, Black, 2001, Agus et al. 2009). The result in Table 14 indicates that regression coefficients or slopes of QM variables especially benchmarking, customer focus, people management, process management and leadership have significant impacts on productivity.

In addition, the findings (Table 15) also indicate that regression coefficients or slopes of benchmarking and leadership have significant contributions towards profitability. These findings further support the alternate hypotheses that these regression coefficients or slopes are significantly different from zeros and have predictive power in estimating productivity or profitability.

Table 15: The relationship between Quality Management Practices and profitability: A stepwise Regression Analysis (The Second Model)

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	VIF
2	(Constant)	-3.879E-18	.064		.000	1.000		
	Benchmarking	.371	.064	.371	5.830	.000	1.000	1.000
	People management	.177	.064	.177	2.775	.006	1.000	1.000
	Leadership	.189	.064	.189	2.963	.003	1.000	1.000

Dependent Variable: Profitability

The model output, including findings were then examined with regard to multicollinearity, violation of homogeneity of variance and normality of residuals, independence of observations and presence of outliers and influential cases.

Multicollinearity Assumption

Table 14 and Table 15 also show collinearity statistics. From the collinearity statistics, it appears multicollinearity was not a concern because the Variance Inflation Factor (VIF) scores are less than 3. According to Gujaranti (1992), if VIF is greater than 3 there could be multicollinearity problems. Apparently, tolerance was greater than .10 (1.0), and the variance inflation factor was less 3 (1.0). In aggregate, therefore, the evidence suggests that multicollinearity was not an issue.

Normal Distribution of Residuals (Errors) Assumption

Another assumption of multiple linear regression is that the residuals follow the normal distribution (Gujanrati, 1992:186). A residuals histogram (with a superimposed normal curve) was used to check the extent to which this assumption was fulfilled (Figure 4 and Figure 5). The residuals histograms show a fairly normal distribution. Thus, based on this result, the normality of residuals assumption was satisfied for both models.

Figure 4: Residuals Histogram with Superimposed Normal Curve (Productivity)

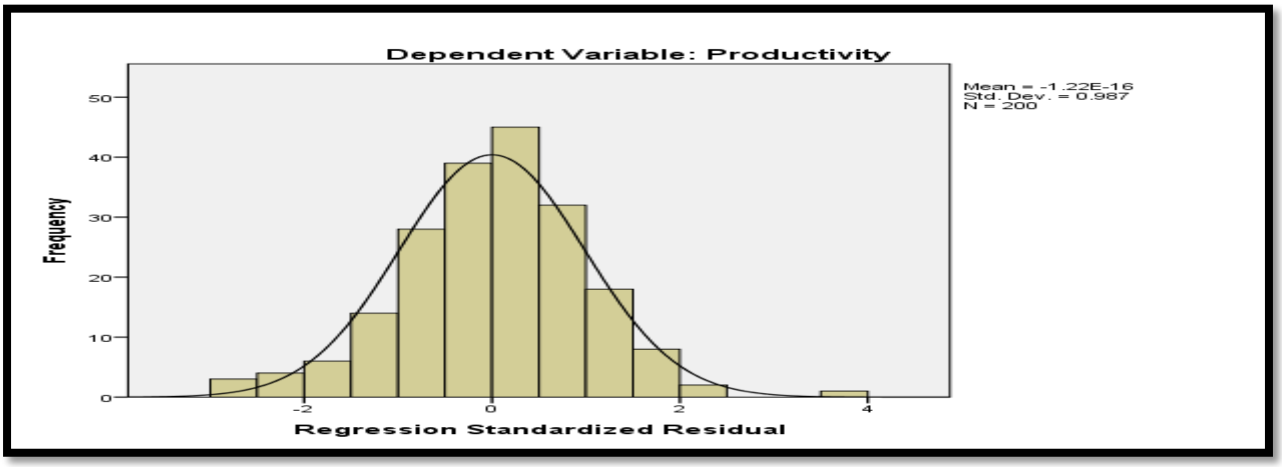
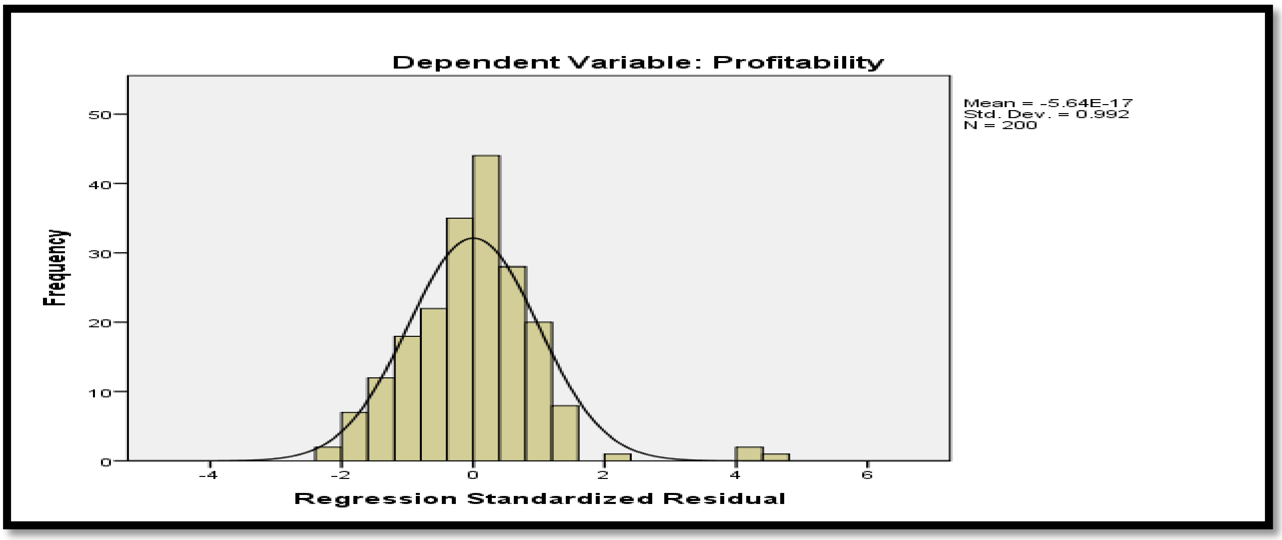


Figure 5: Residuals Histogram with Superimposed Normal Curve (Profitability)



Homogeneity of Variance Assumption

In terms of homogeneity of variance assumption, which is where the variances along the line of best fit remain similar along the line, this was checked by examining a scatter plot of the residuals against the predicted values. According to Lundau and Everitt (2004), if this assumption is met, there should be no pattern to the residuals plotted against the predicted values. The scatter plot of the residuals against the predicted values are shown in Figure 6 and Figure 7. In the scatter plots, there was a relatively random display of points, where the spread of residuals against the predicted values did not strongly point to an inherent pattern. This indicates that homogeneity of variance (i.e. homoscedasticity) was a reasonable assumption in both models.

Figure 6: Scatter Plot of Residuals against the Predicted Values

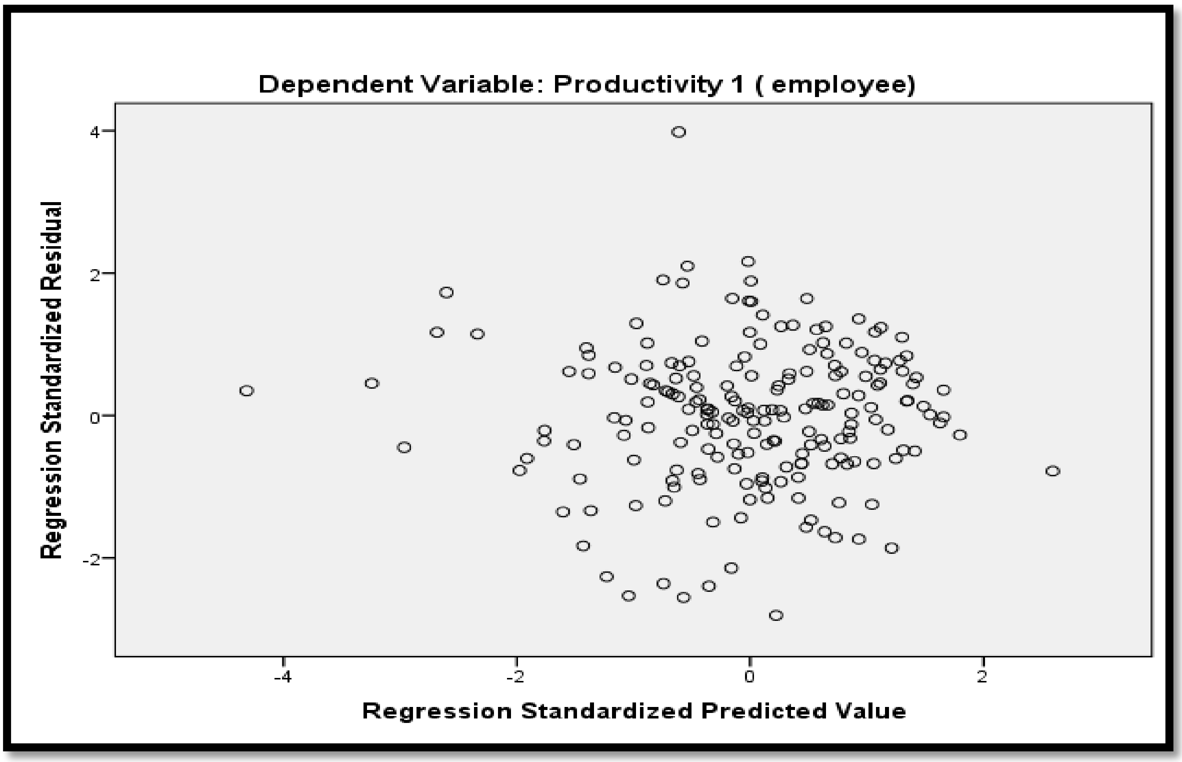
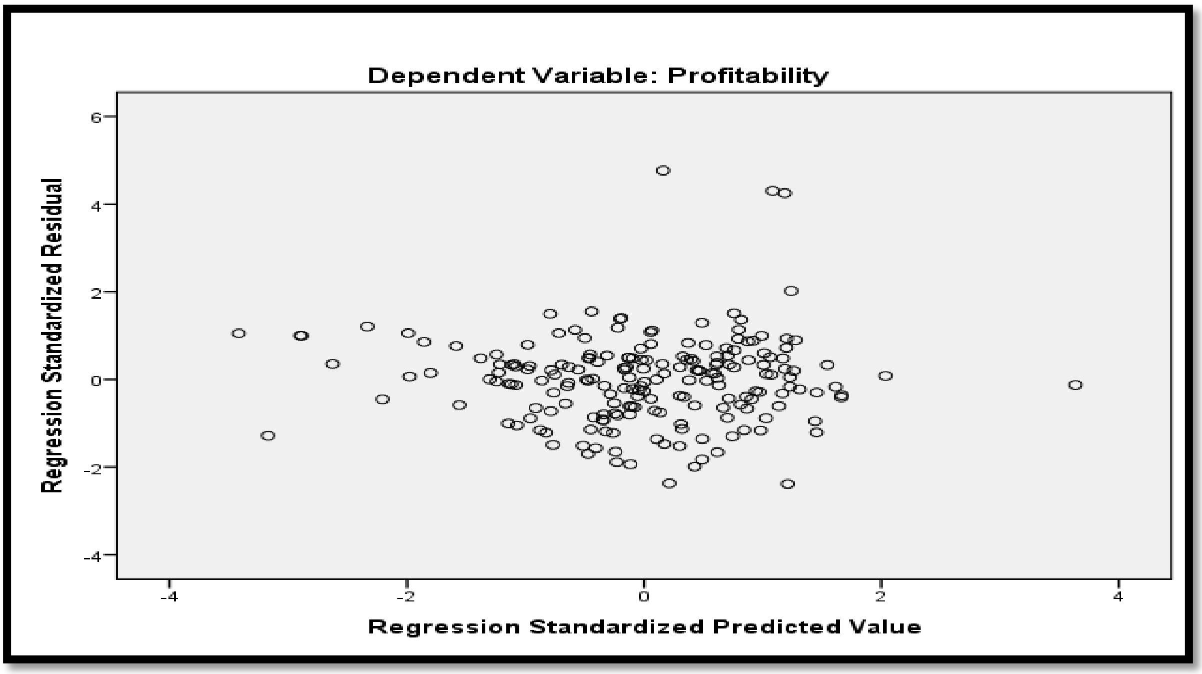


Figure 7: Scatter Plot of Residuals against the Predicted Values



Independence of Observation (i.e. independence of residuals) assumption

The Durbin-Watson statistic was computed to evaluate independence of errors and was 2.08 for model 1 and 1.95 for model 2 which are considered acceptable since they are both in the region 2. This suggests that the assumption of independent errors was met.

No significant outliers or highly influential cases assumption

In order to check whether the assumption of no significant outlier or influential cases was met, the values of the standardised DfBetas and standardised residual values was used. Large values of standardised DFbetas and standardised residual values suggest outliers or influential cases. Note that the results thus far (histograms and scatter plots of the continuous variables and residuals) showed no data point(s) that stood out as outliers. Thus, it is unlikely that large standardised Dfbetas or standardised residual values would be found. Nonetheless, standardised Dfbeta values were used to verify this. The values of the Standardised Dfbetas were added as additional variables in the dataset. Outliers or influential cases must have large (<-2 or >2) standardised Dfbetas. Maximum and minimum standardised DFbeta values are shown in Table 16. The results show no standardised Dfbeta values <-2 or > 2. It was, therefore, concluded that the data set entering both models did not include outliers or influential cases.

Table 16: Standardised DFBeta Values Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Standardized DFBETA Intercept	200	-.20816	.29836	-.0000358	.07302701
Standardized DFBETA QMP1_1_Benchmarking	200	-.36514	.42486	-.0002720	.07953061
Standardized DFBETA QMP2_1_Customer_focus	200	-.57460	.44441	-.0001005	.08270065
Standardized DFBETA QMP3_1_People_mgt	200	-.39985	.35501	-.0000472	.08322490
Standardized DFBETA QMP4_1_Process_mgt	200	-.58654	.38230	-.0002152	.08388244
Standardized DFBETA QMP5_1_Leadership	200	-.55784	.35289	-.0001784	.07862803
Standardized DFBETA Intercept	200	-.17403	.36153	.0002169	.07280154
Standardized DFBETA QMP1_1_Benchmarking	200	-.29178	.33140	-.0000008	.06632032
Standardized DFBETA QMP3_1_People_mgt	200	-.31261	.34555	-.0001409	.06811161
Standardized DFBETA QMP5_1_Leadership	200	-.32993	.35468	-.0001059	.07194596
Valid N (listwise)	200				

An examination of case wise diagnostics, including Mahalanobis distance, Cook’s distance and Centred leverage values further suggested that there were no cases exerting undue influence on the multiple linear regression model. In aggregate, therefore, the evidence suggest that the assumptions of multiple linear regression analysis were not seriously violated. The results of the regression analysis are, therefore, valid and reliable.

4.6 The Mediating Effect of Productivity on QM and Profitability Linkage

Having found that there are significant relationships between QM and productivity as well as QM and profitability, the question is now directed at examining whether productivity mediates the relationship between QM and profitability (Baron and Kenny, 1986; Judd and Kenny, 1981; Agus et al. 2009). This was in line with Hypothesis 3. In testing the mediating effects, QM scales were substituted by a single variable, obtained from the mean of the scores as determined through principal component analysis. Table 17 below shows the results of the mediating effect of productivity on QM and profitability.

Table 17: The Mediating Effect of Productivity on QM and Profitability Linkage

Independent Variable	**Mediating Variable**	**Beta Coefficients**		
		Model 1	Model 2	Model 3
Mean Quality Management	Productivity	0.371**	0.271**	0.303**

Regression analyses were conducted separately to test the mediating effect of productivity on the QM and profitability linkage (Table 17). Model 1 shows the relationship between QM and profitability ($\beta = 0.371$, $p < 0.000$) without the inclusion of productivity (mediator). Model 2 exhibits the relationship between QM and the mediator (productivity), ($\beta = 0.274$, $p < 0.000$), where the mediator is treated as an outcome variable. Model 3 is the mediating regression that shows the relationship between QM and profitability with the inclusion of the mediating productivity variable ($\beta = 0.303$, $p < 0.000$). For the mediating effect to exist, the value of beta coefficient of QM in model 3 should be lesser than the value of the slope in model 1 (Agus et al., 2009). The results indicate that the beta coefficient of QM with the inclusion of productivity in Model 3 has a lower value than in Model 1. Since the beta coefficient in Model 3 is of lesser value (0.303) than the beta coefficient of the independent variable in Model 1 (0.371), this suggests that productivity has a mediating effect on the linkage between QM and profitability thus, confirming hypothesis 3.

The Sobel (1982) procedure was then used to statistically investigate the effect of the proposed mediator on the predictor–outcome relationship. Research indicates that this procedure is appropriate for investigating mediation in a multivariate modelling framework and displays suitable power and Type 1 error rates to do so effectively (Pituch et al., 2005). The Sobel test indicated that productivity ($t = 3.02$, $p < .002$) was a significant mediator of the influence of the QM on profitability. On the basis of this evidence, Hypothesis 3 was accepted.

5. Conclusion and Implications

5.1 Conclusions

QM provides a vision that focusses everyone in an organisation on quality improvement. The pursuit of quality improvement is not only requested by the product or service market but also driven by the need for firms to survive. Manufacturers must make quality products better, faster, and cheaper than those of their competitors. Adoption and effective implementation of quality management practices will be one of the critical factors for success in the Zambian manufacturing industry. Overall, the empirical findings in this study suggests that quality management practices have positive impact on productivity and profitability.

The findings of the empirical study are clear, and suggest several things. Firstly, it has been established that benchmarking, people management, customer focus, process management and top leadership support have strong contributions toward QM implementation in the Zambian manufacturing industry. Secondly, there is a significant positive impact of QM on productivity and profitability of the manufacturing industry in Zambia. This study also found a significant mediating effect of productivity on QM and profitability link. That is, higher level QM implementation would lead to higher productivity and ultimately higher levels of profitability.

The conclusion emerging from this study is that QM will ultimately result in positive gains. The results validate some of the key linkages and support beliefs and evidence by researchers of the relationship between QM, productivity and profitability. Quality makes manufacturing process efficient, and productivity is the ratio of output over input (Rothman, 1994, Agus et al., 2009). QM can lead to decreased waste, rework and ultimately to a variety of related improvements. It is aimed at improving processes, eliminating mistakes, and satisfying customers (customer focus). No doubt quality and productivity go hand in hand. Nonetheless, continuous improvement in quality and productivity must be matched by profits. Continuous improvement for total customer satisfaction should be an integral part of the way a manufacturing company conducts its business.

It is very important that a company determine what the customer wants and needs because they determine the sales and ultimately profitability (Blanchard, 1994; Agus et al., 2009). After all, involving employees, empowering them, and bringing them into the decision-making process provide the opportunity for continuous process management. The untapped ideas, innovations, and creative thoughts of employees can make the difference between success and failure (Besterfield et al., 1995). However, to enhance their knowledge and skill requires people management. Finally, another approach to quality improvement is to engage in benchmarking. This involves studying, and attempting to emulate, the strategies and practices of organisations already known to generate world-class products and services (Weiers, 2005).

It is also important to note that this study attempts to enrich the literature review and make a contribution in quality-related studies. The purpose is obvious, to make it explicit what other researchers have perhaps known implicitly, particularly in the context of Zambian manufacturing. The empirical results support long-standing beliefs and anecdotal evidence by researchers about the relationships between QM, productivity and profitability, and lend credibility to causal hypotheses that improving quality in processes and practices leads to improvements in external performance results. This study to some extent helps in resolving controversy about measurements of performance gains from implementing QM. By strengthening QM practices, improved performance will likely occur. This result provides evidence that improving internal practices will positively impact the most important performance measures. Admittedly, adopting and implementing quality management systems, training and certification has associated costs. In the Zambian manufacturing context, for instance, certification from the Zambia Bureaus of Standards that a company has established and implemented quality management systems based on ISO 9001:2008 standards has associated costs. However, the evidence that this study provides suggests that the costs of QM are more than offset by the productivity and customer loyalty and sales effects as to be profit enhancing.

The paper will be of particular interest to practicing managers as it suggest what factors should be emphasised to stimulate the adoption of quality management concepts with their limited resources. Admittedly, the scope of quality management principles is broad and resources may not be available at the same time to adopt and implement them wholesale. Within the constraint of limited resources, the results obtained in the study indicates that manufacturing companies in Zambia should, as a matter of priority, emphasise:

1) Greater attention to the quality management aspects of the **manufacturing process**;
2) Greater degree of **top leadership commitment** for quality programmes such as process management, benchmarking and customer focus, and;
3) **People management** which is important in preparing an organisation for a change, in accomplishing the change itself, and institutionalizing it as a permanent part of the organisation.

5.2 Policy Implications

The findings of the study also bear on some policy implications for improving the national economy's quality management and total factor productivity for improved international competitiveness, leading to increased employment opportunities and national income. These are as follows:

1. Quality management and productivity improvement can lead to sustainable job creation

The productivity enhancing role of quality management practices that this study establishes resonates with the government's goal of promoting productive employment in Zambia. The sustainability of Zambia's employment promotion agenda will depend to a large extent on the total factor productivity of manufacturing firms in the economy. Thus, a significant relationship between quality management practices and productivity that the study establishes suggests the need for better design and implementation of employment policy that rests on promoting total factor productivity improvement as a basis for sustainable job creation in manufacturing. With this finding, government can leverage its job creation strategy anchored on quality management and factor productivity improvement.

2. Enterprise support to achieve improved performance through quality management.

The study establishes that by strengthening QM practices, improved performance will likely occur. This result provides evidence that improving internal practices will positively impact the most important performance measures. Admittedly, adopting and implementing quality management systems, training and certification has associated costs. In the Zambian manufacturing context, for instance, certification from the Zambia Bureaus of Standards that a company has established and implemented quality management systems based on ISO 9001:2008 standards has associated costs. The evidence that this study provides suggests that the costs of QM are more than offset by the productivity and customer loyalty and sales effects as to be ultimately profit enhancing. However, the immediate costs require to be offset by official enterprise support through appropriate tax incentives that can encourage manufacturing firms to invest in quality management systems and in training that increases the supply of managers with quality management expertise and thus, ensure increased ISO 2000:2008 certification for Zambian manufacturing firm.

3. Basic quality management training would improve productivity

Many of the shortfalls with quality management practices in Zambian manufacturing could be addressed through more widespread basic quality management training. For example, industry, government and university provision of 3-month quality management training courses.

4. **Strategic Government partnership with role players in industry is necessary for accelerated quality management system uptake and practice**

The significant link that this study establishes between management quality, productivity and profitability urges the need for capacity enhancement for the economy to improve its innovativeness and management qualities. Achieving productivity driven growth through the application of quality management practices require that government engages with role players in industry (such as the Zambia Association of Manufactures) to make the profitability of quality management well known to its membership.

5. **Institutional framework for coordinating quality management and productivity improvement is necessary for sustained quality management and productivity improvement**

The absence of an institutional framework (e.g., a National Productivity Institute) that should provide cutting-edge quality management and productivity improvement solutions through research and development, programme management, facilitation, training and dissemination of knowledge and information constitutes a gap needing to be filled in order to strategically position the national economy and manufacturing industry towards ensuring that sustainable quality management and productivity performance in sectors and organisations is achieved in an inclusive, collaborative manner.

Appendix: Survey Questionnaire

PART I: BACKGROUND INFORMATION

(i) Please indicate your company name:___________________________________

(ii) Please indicate your company address, ___________________________________

(iii) Please indicate your position within the company:_________________________

(iv) Please circle the sector in which your firm belongs and the type of products you manufacture.

Manufacturing Sub-sector	Circle	Indicate type of product manufactured
Agro-processing, food and beverages	1	
Textile, apparel and leather	2	
Wood and wood products	3	
Paper and paper products	4	
Chemicals/pharmaceuticals	5	
Plastics and rubber	6	
Non-metallic products	7	
Base metals	8	
Fabricated metal products	9	
Energy, electrical & electronics	10	
Machinery and equipment	11	
Other, please specify	12	

(v) Please circle the number of employees you currently have.

Number of employees	Less than 50	51-100	101-150	151-200	Above 200
	1	2	3	4	5

(vi) Please circle the number of years for which you have been in operation in Zambia.

Years	Less than 3 years	4 to 6 years	7 to 10 years	10 to 15 years	16 years or more
	1	2	3	4	5

Part II: Quality Management Practices

Instruction: For each of the following statements concerning quality management practices, circle the appropriate code number to indicate the extent to which you agree or disagree that this happens in your firm/company. For example, if you strongly agree that the management practice described in the statement happens in your firm circle the number 5. If you agree but less strongly, circle number 4, and so forth.

		Strongly agree	Agree	Neutral	Disagree	Strongly disagree
A1	**Leadership**					
A11	Senior managers actively encourage change	5	4	3	2	1
A12	There is a high degree of unity of purpose throughout the firm	5	4	3	2	1
A13	'Champions of change' are effectively used	5	4	3	2	1
A14	We proactively pursue continuous improvement	5	4	3	2	1
A15	Ideas from production operators are	5	4	3	2	1

	actively used					
A2	**People management**					
A21	The concept of the 'internal customer' is well understood	5	4	3	2	1
A22	We have organisational-wide training and development	5	4	3	2	1
A23	There is effective 'top down' and 'bottom up' communication	5	4	3	2	1
A24	Employee satisfaction is formally and regularly measured	5	4	3	2	1
A25	Occupational health and safety practices are excellent	5	4	3	2	1
A26	Employee flexibility, multi-skilling and training are actively used	5	4	3	2	1
A3	**Customer Focus**					
A31	We know our customers' current and future requirements	5	4	3	2	1
A32	Customer requirements are disseminated and understood	5	4	3	2	1
A33	We consider customer requirements when designing new products and services	5	4	3	2	1
A34	We have an effective process for resolving customer complaints	5	4	3	2	1
A35	Customer complaints are used as a method to initiate improvements	5	4	3	2	1
		Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
A4	**Strategic Planning**					
A41	The mission statement is communicated throughout the company	5	4	3	2	1
A42	We have a comprehensive and structured planning process which regularly reviews short and long term goals	5	4	3	2	1
A43	Our plans focus on achievement of 'best practice'	5	4	3	2	1
A44	When we develop our plans, policies and objectives, we always incorporate customer requirements	5	4	3	2	1
A45	We have a written statement of strategy covering all manufacturing operations which is used by senior managers	5	4	3	2	1
A46	All operations of the company are aligned with the mission statement	5	4	3	2	1
A5	**Information and Analysis**					
A51	We have undertaken benchmarking relative to cost position	5	4	3	2	1
A52	We have undertaken benchmarking of operating process	5	4	3	2	1
A53	We have undertaken benchmarking of technology	5	4	3	2	1

A54	We have undertaken benchmarking of quality procedures	5	4	3	2	1
A55	We have undertaken benchmarking of customer service	5	4	3	2	1
A56	We have undertaken benchmarking of other firm's product quality and procedures	5	4	3	2	1
A6	**Process management**					
A61	Suppliers work closely with us in product development	5	4	3	2	1
A62	We work closely with our suppliers to improve each other's processes	5	4	3	2	1
A63	Our suppliers have an effective system for measuring the quality of the materials	5	4	3	2	1
A64	We have methods to measure the quality of our products and service	5	4	3	2	1
A65	All employees believe quality is their responsibility	5	4	3	2	1

Part III: Productivity

<u>Instruction</u>: For each of the following statements concerning productivity, circle the appropriate code number to indicate the extent to which you agree or disagree that this happens in your firm/company. For example, if you strongly agree that the indicator described in the statement happens in your firm circle the number 5. If you agree but less strongly, circle number 4, and so forth.

		Strongly agree	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**
B1	**Productivity**					
B11	Our employees' morale is high	5	4	3	2	1
B12	Our employees' commitment to the organisation is high	5	4	3	2	1
B13	Our employees' job performance is high	5	4	3	2	1
B14	Our employees' absenteeism is low	5	4	3	2	1
B15	There is an accurate and faster data flow in the company	5	4	3	2	1
B16	Our work design is continually improved	5	4	3	2	1
B17	Our work environment is pleasant	5	4	3	2	1
B18	The defect rate on our products is low	5	4	3	2	1
B19	Warranty claims on our products is low	5	4	3	2	1
B20	We deliver in full on time to customers	5	4	3	2	1
B21	Our employees' productivity is high	5	4	3	2	1

Part IV: Profitability

Instruction: For each of the following statements concerning the firm/company's profitability, circle the appropriate code number to indicate the extent to which you agree or disagree that this has happened over the last three years (i.e., 2013-2015 financial years) in your firm/company. For example, if you strongly agree with the profitability indicator described circle the number 5. If you agree but less strongly, circle number 4, and so forth.

C1	**Profitability**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
C11	Return on assets of our company has increased	5	4	3	2	1
C12	Market share of our company has improved	5	4	3	2	1
C13	Profits of our company have grown	5	4	3	2	1
C14	Sales of our company have grown	5	4	3	2	1
C15	Returns on equity of our company has increased	5	4	3	2	1
C16	Returns on investment of our company has increased	5	4	3	2	1

References

Ahire, S.L.,Golhar, D. Y. & Waller, M. A. (1996). Development and validation of QM implementation constructs. *Decision Sciences*, 27(1) , 23-55.

Anonymous. (1995). ISO and Total Quality. *International Journal of Health Care Quality Assurance*, 8(4), 34-35.

Agus, A & Hassan, Z. (2000). Exploring the relationship between the length of QM adoption and financial performance: An empirical study in Malaysia. *International Journal of Management*, 17(3), 323-333.

Agus, A. (2001). A linear Structural Modelling of Total Quality Management Practices in Manufacturing Companies in Malaysia. *Total Quality Management*, 12(5) , 561-573.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social pychological research: Conceptual, Strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.

Bayazit, Ozden & Karpak, Birsen (2007). An analytical network process-based framework for successful total quality management (TQM): An Assessment of Turkish manufacturing industry readiness. *International Journal of Production Economics* , 105, 79-96.

Black, K. (2001). *Business Statistics: Contemporary decision-making*. USA: South-Western College Publishing, Thompson Learning.

Blanchard, Ken . (1994). Competitive Trends, *Executive Excellence*. March.

Bowen, D., & Lawler, L. (1992). Total quality-oriented human resource management. *Organizational Dynamics*, 24(4), 39-41.

Bentler, Peter M. (1990) Comparative fit indexes in structural models. *Psychological Bulletin* , 102(2), 238-246.

Besterfield, D. H., C. Bester-Michna, G. H. Besterfield, and M. Besterfield-Sacre. (1995). *Total quality management. 2nd ed*. Englewood Cliffs, N.J.: Prentice Hall.

Boone, E. Louis & Wilkins, Dianne. (1995). The Role of Benchmarking in Total Quality Management. *International Journal of Management*, 12(1),123-131.

Chau, P.Y.K, (1997). Reexamining a model for evaluating information center success using a structural equation modeling approach. *Decision Sciences*, 28(2), 309- 334.

Cherkasky M., Stanley. (1992). Total Quality for a Sustainable Overall Service Performance. *Quality*, 13(8), 47-48.

Churchill, Gilbert A. Jr. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, 16(2), 64-73.

Cronbach, L.J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16, 297-334.

Crosby, P.B. (1979). *Quality is free*. London : Penguin Books Ltd.

Deming, W.E. (1986). *Out of crisis: Quality, productivity and competitive position*. Cambridge: Cambridge University Press.

Ebrahimpour, M., & Withers, B.E. (1992). Employee involvement in quality improvement: A comparison of American and Japanese manufacturing firms operating in the U.S.. *IEEE Transactions on Engineering Management*, 39(2), 142-148.

Hair, J.F., Anderson, R.E., Tatham, R.L. & Black, W.C. (1995). *Multivariate data analysis, Englewood Cliffs*. NJ: Prentice-Hall.

Judd, C. M. & Kenny, D. A. (1981). Process analysis: Estimating mediation in treatment evaluations. *Evaluation Review*, 5, 602-619.

Juran, J.M. (1992). *Juran on quality by design: The new steps for planning quality into goods and services*. New York: Free Press. Macmillan, Inc.

Kaynak, Hale. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management*, 21(2003), 405-435.

Malcom Baldrige (1992). *National quality award application guidelines*. Gaithersburg, USA: National Institute of Standards and Technology.

Nunnally, J. (1978). *Psychometric Theory*. New York: Mc Graw Hill Book Co. Opara, Emmanuel Uzoma. (1996). The Empirical Test of Total Quality Management: An Application of QM at Chevron and Its Impact on Productivity. *Quality Management Journal*, 4(1), 10.

Ortiz, J.P., Benito, J.G. & Galende, J. (2006). Total quality management as a forerunner of business innovation capability. *Technovation*, 26(10) , 1170-1185.

Powell, Thomas C. (1995) Total Quality Management as overall service performance: A Review and Empirical Study. *Strategic Management Journal*, 16, 15-37.

Richman, Eugene & Zachary, William. (1993). Quality and Reliability Management: Review and Update. *Quality Management*, 35(4), 8-11.

Rothman, Howard. (1994). Quality's Link to Productivity, *Nation's Business*, February, 33-34.

Saraph, Jayant V., Benson, George P., & Schroeder, Roger G. (1989). An Instrument for Measuring the Critical Factors of Quality Management. *Decision Sciences*, 20, 810-829.

Schaffer, R H & Thompson H. (1992). Successful Change Programs Begin with Results. *Harvard Business Review*, September/October, 80-89

Shores, Richard, A. (1992). Improving the Quality of Management. *Systems Quality Progress*, June, 53-57.

Stevens, J. (1986). *Applied multivariate statistics for the social sciences*. Hillsdale,
NJ: Lawrence Erlbaum Associates

Weiers, R. M. (2005). *Introduction to Business Statistics*. Belmont, USA: Thompson Brooks/Cole.

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