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SAKARYA UNIVERSITY
GRADUATE SCHOOL OF BUSINESS

A META-ANALYTICAL REVIEW OF THE RELATIONSHIP BETWEEN TOTAL QUALITY MANAGEMENT PRACTICES AND THE OPERATIONAL PERFORMANCE OF MANUFACTURING COMPANIES

MASTER'S THESIS

Yakubu Mohammed JIBRIL

Institute: Business Administration
Department : Production Management and Marketing

Supervisor: Assoc. Prof. Mustafa Cahit ÜNGAN

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"This thesis was approved by the following Juries on 24/05/2019 by Unanimity / Majority."

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Yakubu Mohammed JIBRIL

24/05/2019

DEDICATION

This thesis is wholeheartedly dedicated to the memory of my late Dad.

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ABBREVIATIONS

CMA : Comprehensive Meta-Analysis
EFQM : European Foundation for Quality Management
JUSE : Union of Japanese Scientists and Engineers
KalDer : Turkish Society for Quality
MBNQA : Malcolm Baldrige National Quality Award
QA : Quality Assurance
QC : Quality Control
TQM : Total Quality Management
TÜSIAD : Turkish Industry and Business Association

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Sakarya University, Graduate School of Business **Abstract of Master's Thesis**

Title of Thesis: A Meta-Analytical Review of The Relationship Between Total Quality Management Practices and The Operational Performance of Manufacturing Companies

Author of Thesis: Yakubu Mohammed JIBRIL **Supervisor:** Assoc. Prof. Mustafa Cahit ÜNGAN

Date Accepted: 24/05/2019 **Number of Pages:** xi (pre-text) + 114 (body) + 4 (App.)

Department: Business Administration **Subfield:** Production Management and Marketing

In a global society like ours where the perception of quality influences greatly the purchasing decisions of customers, organisations that seek to achieve global competitiveness and financial growth must as a matter of urgency, adopt business strategies that guarantee maximum performance excellence in quality and customer satisfaction. Although the operations management literature explicitly highlights business strategies with such prospects, Total Quality Management undoubtedly stands tall among the rest. Previous studies on the topic have however reported conflicting and ambiguous results regarding the effect of TQM implementation on operational performance. This study is therefore aimed at investigating the possibility of a statistical relationship between TQM practices (as captured in the Baldrige Excellence Framework) and the operational performance of manufacturing firms through the meta-analytical review of 21 studies published between 1997 and 2017. The study sample, obtained through a rigorous literature search of both online and offline databases, was subjected to a specific but extensive inclusion/exclusion criteria purposely designed for this analysis.

Guided by the Hunter & Schmidt (2004) meta-analysis of correlation approach, the results of the study reveal a strong and positive relationship between aggregate TQM practices and operational performance. Furthermore, with the exception of Strategic planning that is non-significant and Customer focus that has a medium effect on operational performance, the other TQM constructs (Top Management Leadership, Information & Analysis, Human Resource Management and Process Management) are all positively related to operational performance. The test of heterogeneity also indicates that almost all the tested hypotheses were greatly influenced by the moderating variables; Firm size, Industry type, and Geographical location.

Keywords: Total Quality Management; Operational performance; Effect sizes; Heterogeneity; Moderating variables; Meta-analysis

Tezin Başlığı: Toplam Kalite Yönetimi Uygulamaları Ve Üretim Şirketleri Operasyonel Performans Arasındaki İlişki Bir Meta-Analitik İnceleme

Tezin Yazarı: Yakubu Mohammed JIBRIL **Danışman:** Doç. Dr. Mustafa Cahit ÜNGAN

Kabul Tarihi: 24/05/2019 **Sayfa Sayısı:** xi (ön kısım) + 114 (tez) + 4 (ek)

Anabilim Dalı: İşletme **Bilim Dalı:** Üretim Yönetimi ve Pazarlama

Bizim gibi küresel bir toplumda, kalite algısının müşterilerin satın alma kararlarını büyük ölçüde etkilediği durumlarda küresel rekabet edebilirliği ve finansal büyümeyi sağlamak isteyen kuruluşlar acil olarak, kalite ve müşteri memnuniyetinde mükemmelliği garanti eden iş stratejileri benimsemelidirler. Üretim yönetimi literatürü bu tür beklentileri karşılayan çeşitli iş stratejilerine açıkça yer verse de, hiç şüphesiz Toplam Kalite Yönetimi'nin (TKY) bunlar arasındaki yeri çok farklıdır. TKY uygulamalarının operasyonel performans üzerindeki etkisine ilişkin bundan önceki çalışmalarda çelişkili bulgular elde edilmiştir. Bu çalışma, 1997 ve 2017 yılları arasında yayınlanan 21 çalışmanın meta-analitik incelemesi yoluyla, TKY uygulamaları (Baldrige Mükemmellik ödülünde ele alınan) ile imalat firmalarının operasyonel performansı arasında istatistiksel bir ilişki olasılığını araştırmayı amaçlamaktadır. Hem çevrimiçi hem de çevrimdışı veri tabanlarından titiz bir literatür taraması yoluyla elde edilen makaleler, bu analiz için özel olarak tasarlanmış spesifik ancak kapsamlı bir dahil etme / hariç tutma kriterlerine tabi tutulmuştur. Hunter ve Schmidt (2004) tarafından geliştirilen meta analizi kullanılarak, bütün TKY uygulamaları ile operasyonel performans arasında güçlü ve pozitif bir ilişki bulunmuştur. Ayrıca, herhangi bir etkiye sahip olmayan stratejik planlama ve orta etkiye sahip olan müşteri odaklılığı haricinde, diğer tüm TKY uygulamalarının (Üst Yönetim Liderliği, Bilgi ve Analiz, İnsan Kaynakları Yönetimi, ve Süreç Yönetimi) operasyonel performansla pozitif ilişkili olduğu ortaya konulmuştur. Heterojenlik testi sonuçları test edilen hipotezlerin neredeyse tamamının firma büyüklüğü, endüstri tipi ve coğrafi konum gibi moderatör değişkenlerden büyük ölçüde etkilendiğini göstermektedir.

Anahtar Kelimeler: Toplam Kalite Yönetimi, Operasyonel Performans, Etkisi boyutları, heterojenite, Denetleyici değişkenler, Meta-analiz

INTRODUCTION

Background

All over the world, the purchasing decisions of customers have always been influenced by a lot of factors. From prices, to taste, durability and user friendliness, customers always make their purchasing decisions by placing emphasis on one or more factors. These factors are so important that they do not only determine how financially successful a company can be but an economy in general.

It can be observed that, successful firms of today aren't those with large financial budgets but those that design their processes in such a way that it produces to meet the needs of customers. The degree to which a product or service meets or exceeds the expectations of its customers is largely regarded as the quality of the product or service. Thiagaragan et al. (2001) observed that the emergence of quality as a top priority in many corporate entities is primarily due to the globalization of world trade and the competitive pressure brought about by the escalating demand of customers, who want better products and services.

The term quality occupies a greater part of the minds of customers. Although the phenomenon has been recognised by many producers, the term has been subjected to different interpretations. To some producers, quality is all about producing to meet a particular standard. Once the product or service conforms to the set standard a quality product or service will be deemed produced. The other school of thought however emphasise that, quality need to be determined by the customer and not the producer. Meaning, no product or service will be deemed to have passed the quality test unless it conforms to the specifications of the customer to whom it was purposely produced. The fundamental issue therefore is transmuting quality from the past emphasis of reducing what has gone wrong for the customer, to emphasize on the increase of things gone right for the customer, which consequently improve sales and revenue growth (Feigenbaum, 1999).

As most developing economies are largely driven by agriculture and that of industry, local companies need to diligently implement quality management practices to control the influx or inflow of foreign goods - especially those that be produced locally- into their countries. The surest way to achieve this is by subjecting every unit and process to

rigorous quality controls that ensure that the output of that process yields higher customer satisfaction. Every industry or economy as a result of globalization is now under the mercy of global competition and companies that provide superior quality or customer satisfaction survive. In the view of Chakrabarty and Tan (2007), the management of quality is the primary strategy for the attainment of competitive advantage in an industry by taking into consideration some quality initiatives such as statistical quality control, total quality management or zero defects.

Among the many quality initiatives in the system, the most tested and result oriented has been Total Quality Management (TQM). TQM is an approach to quality management that emphasises on customer needs and process improvement (Powell, 1995). Cheng (2007), believes that TQM is aimed at assisting organizations to improve product and service quality, customer satisfaction and reduce management costs. Having been introduced in the USA in the 80s, TQM has been recognized as the most significant contributor to quality management developments in the past two decades. The zeal to alter the culture, processes, strategic objectives and the belief system of an organization is significantly considered in TQM implementation (Motwani, 2001). TQM presents an avenue for organizations to market their potentialities and synergistic in promoting efficient process management for the creation and delivery of value in the extremely dynamic and competitive market (Mele, 2007). It is one of the management approaches that requires the involvement of all organizational members at every stage of the production process.

Osayawe and McAndrew (2005), identified TQM as one of the most effective practices that helps companies improve their competitiveness and prosperity with a guaranteed sustainable growth. Although a strong relationship exists between TQM and market orientation in view of customer satisfaction, TQM also has a strong and positive effect on organizational performance (Mehmet and Lenny, 2006). Jaworki and Kohli (1993) defined market orientation as the organization-wide generation, dissemination and respond to market intelligence across all the departments or units of the organization. They argued further that, market orientation is all about the behaviours and activities within an organization. Authors such as Narver and Slater (1990), Deshpande et al. (1993) and Deshpande and Farley (1998) however maintained that, market orientation isn't about the culture but a set of organizational activities (Farrell, 2000).

Many companies have failed to deal with quality the "Japanese way" as more emphasis is placed on product quality than the overall TQM culture. Quality management in the Japanese style involves focusing on product quality as well as extending quality to everyday process of the organization. In doing this, the "functional rational" and "groupism-affective" dimensions to quality management are both highly taking into consideration. Whiles the former reflects the efforts of individuals towards quality the latter lays emphasis on the contribution of groups/teams towards the quality agenda. Companies therefore need to strategically mould the Japanese style in a way that suit their local available resources (Shaari, 2008).

In a global society where quality is generally considered as a measure of customer satisfaction, organizations that seek to gain competitive advantage and to compete both locally and globally need to adopt the TQM strategy. It is only with such a strategy that quality is assured at any point or stage of the production process and every unit of the organization can contribute meaningfully towards quality improvement. It's however worthy to note that a successful implementation of TQM depends largely on three things – organizational culture, leadership support and training of staff. An organization that is characterised by poor organizational culture, minimal leadership support and inadequate staff training cannot implement TQM successfully and therefore cannot reap fully the benefits that come with the fine strategy.

Purpose of the Study

The manufacturing sector is gradually becoming the backbone of most developing and emerging economies for a simple reason that the global demand for manufactured products from most of these economies continue to increase at an increasing rate. Although the governments of these economies having realised the potential of the sector have rolled series of measures to grow the sector, the efforts of local manufacturers can never be underestimated. With the likes of aggressive marketing strategies, expansion of production capacities, continuous improvement of quality, local producers are poised to expand as well as satisfy the ever-growing demand for their products.

It has become so obvious that most managers or quality practitioners have perceived the implementation of TQM as the most reliable way to improve the performance of their companies with respect to competitiveness, customer satisfaction, growth in sales and profitability, reduction of waste etc. The difficulty of most of the practitioners however

has been how to measure the overall effect on performance as well as determine the TQM practices that really produce results and those that are merely added to make up the list. The purpose of this research therefore was to examine the possibility of a statistically significant relationship between TQM practices and the operational performance of manufacturing companies through the quantitative synthesis of effects from previous studies. Practitioners will also get to appreciate the degree at which the proposed relationships are affected or influenced by third variables (moderators) as well as how that can be deployed to their advantage.

Research Objectives

This study was conducted with the principal aim of facilitating the understanding of the degree of effects TQM practices have on the operational performance of manufacturing companies. Since several TQM practices have been identified by many scholars and quality award schemes, the practices identified by the Malcolm Baldrige National Quality Award (MBNQA) were adopted in this study. To achieve the above-mentioned aim, the under listed objectives have been developed.

- To determine the extent at which TQM implementation contributes to the operational performance of manufacturing companies.
- To assess the degree of importance of the individual TQM practices in the improvement of operational performance.
- To explore the effects of potential moderators on the TQM-operational performance relationship in manufacturing companies.

Research Questions

Considering the main objective of this study – examining the relationship between TQM practices and operational performance of manufacturing companies of all sizes, the research will target and answer by means of literature and empirical findings, the following questions;

1. To what extent does TQM implementation influence operational performance of manufacturing companies?
2. Which TQM practices are best predictors of operational performance?
3. To what extent is the TQM-operational performance relationship influence by moderating factors?

Significance of the Study

Globalization, the presence of new knowledge and technology, information and communication capabilities, constantly changing and increasing needs and demand of customers and the like have greatly influenced the need for companies to adopt effective and efficient business philosophies. Companies especially in Japan and USA since the 80's responded to these trends through the implementation of TQM; a quality management approach that coordinates business operations to produce goods and services with maximum quality (Snezana, 2014). A successful implementation of TQM guarantees quality and customer satisfaction; the two major influencers or determiners of higher sales and profitability. Since this research aims to improve the understanding of businesses on the TQM practices that really trigger internal (operational) performance, the number one beneficiary will therefore be the businesses and the government, because higher operational performance means higher sales and profits which directly translate to higher revenue for the government (in the form of taxes).

The literature also revealed that although a lot of success stories highlights the achievements of companies that successfully implemented these initiatives, other stories depict failures of projects even after the implementation of same initiatives. The results have always been characterised by cynicism and confusion as to what and how to implement these generic and incongruous initiatives in a specific environment (Tiwari et al. 2007). Companies therefore often get frustrated or disappointed when TQM programs do not rapidly produce tangible results (Waldman, 1994). This research will therefore serve as a tool to inform managers of manufacturing companies that adopting TQM does not necessarily guarantee success unless it's well planned and executed.

The study will also contribute to the TQM body of knowledge by attempting to establish the relationship between the "enablers" criteria and the "results" criteria (operational performance). To elaborate clearly the link between the two major (enablers and results) categories of TQM practices, appropriate research and statistical methods have been employed in the study. Even though the researcher acknowledges the amount of work that has gone into the studies of these topics, the adopted study design will help bring to an end the era of contradictory findings on the TQM practices that really predict operational performance of manufacturing companies as well as help widen the horizon of knowledge

with regards to the degree at which the relationship between TQM and operational performance is affected by moderating variables.

Scope and Limitations of the Study

The main focus of this study is to investigate the impact of TQM on the operational performance of manufacturing companies. To fully achieve the research goals, a lot of energy was invested in the examination of the relationship between aggregate TQM practices and operational performance as well as the contributions of the individual TQM practices to the operational excellence of manufacturing companies. Through the adoption of meta-analysis as a study design, the findings of previous studies on the topic were systematically and quantitatively synthesized to arrive at conclusions about the impact of TQM implementation on the operational performance of manufacturing firms. Meta-Analysis in this sense was used as a tool to integrate the results (mostly contradictory) reported by primary studies especially in relation to the degree of importance of the individual TQM practices.

Notwithstanding the numerous positive commentaries associated with the meta-analytical design, its adoption among other factors has brought about a number of restrictions (limitations) on the current study. The first limitation has to do with the processes leading to the inclusion or exclusion of primary studies for the analysis. The inclusion criteria as would be discussed in the methodology section, has limited the number of included studies based on several factors including the year of publication (1997-2017), the language in which a study is published, the nature of the sample etc. This phenomenon in the view of the researcher may have caused some deficiencies in the number of included studies and the results reported.

Extremely important and tedious at the same time in the whole meta-analytical process is the coding of study characteristics to be used as the data for the analysis. It involves the extraction of all the relevant data from each and every included study before the main meta-analysis can be conducted. This undoubtedly swells up its relevance and the level of diligence needed when undertaking that activity. It is for this reason that some meta-analysts ensure coding reliability by involving others (mostly specialist) in the coding process. But as clearly captured in the methodology section, the coding process was solely handled by the researcher and that also may have caused some deficits in the availability or veracity of the data for the analysis.

Additionally, the study lays emphasis on manufacturing companies and that restricts or limits the generalizability of the study findings. Finally, the results cannot also resolve issues relating to the effect of TQM on other performance types as it focuses only on operational performance.

Delimitation of the Study

Despite the numerous limitations associated with this study, the major delimitation lies in the number and nature of the included studies. Although there is no consensus on the number of studies sufficient for a meta-analysis, a higher number of participants which mostly depends on the number of included studies helps researchers to control both Type I error and statistical power. With 21 included studies making up over 3,000 participants, the researcher is very confident that both types of errors would be dully controlled, and the shortcomings of individual studies overcome. The diversified nature of the participants especially in relation to their firm sizes, geographical locations and the industries they operate all contributed to making the findings of this review more generalizable and extremely reliable.

Organization of the Thesis

This meta-analytical study is divided into four main chapters. The introductory part provides a brief overview of the research with emphasises on the problem definition, purpose of the study, research objectives, research questions and the significance of the study. In addition, the scope, limitations and delimitations of the study have also been looked at.

Chapter one presents the conceptual framework of the study with emphasises on the concept of quality, evolution of TQM, discussions on the notable TQM gurus, and the global quality award models. The chapter also provides results of the literature review on the TQM practices (base on MBNQA), operational performance, the theoretical framework of the study as well as the overview of the hypothesis to be tested.

The second chapter describes in detail the methodology for conducting this study. It provides insights into the research design adopted, the search for primary studies, the inclusion and exclusion criteria, the coding of studies, the computation and interpretation of effect sizes. The statistical model for analysis of collected data, the correction of statistical artefacts, moderator analysis as well as the test for publication bias were all presented in detail.

Chapter three presents the results of the study in which tables and figures are employed to better communicate the study results. To facilitate understanding, the results has been presented in order of the research questions and the tested hypothesis.

Chapter four being the final chapter provides a summary the whole study, conclusions drawn from the study findings as well as recommendations for future research.

CHAPTER 1: CONCEPTUAL FRAMEWORK

1.1. Introduction

The significance of TQM in both manufacturing and service organisations has occupied the central focus of attention of scholars and quality practitioners especially in the past two decades. Even with such a phenomenon, quality experts and scholars harbour divergent views on different aspects of the topic (TQM), from the most basic level of what the term "Quality" means, how it has been conceptualised, how it is measured, to how it influences the performance of organisations. The literature on the topic equally reveals the ambiguity of TQM concepts and constructs that can be attributed to the different frameworks advanced and/or advocated by many quality experts and scholars. A better understanding of TQM and its relevance to organisations therefore relies heavily on the understanding of the origin of TQM and the various stages of its development. This chapter therefore presents the review of the TQM literature with emphasis on the definition of quality, quality management, Total Quality Management and its evolution. It further provides detailed information about the contributions of certain individuals to the TQM philosophy, the TQM practices, several Quality Awards Schemes, TQM implementation in Turkey as well as the effects of TQM practices on the operational performance of manufacturing companies.

1.2. The Concept of Quality

It is obvious from the literature that, Quality as a term has not lend itself to be easily defined. And so, most of the definitions offered by most scholars are based on the aspect of quality the scholar focuses on. The Oxford dictionary (2010) for instance considered quality generally as "the standard of something as measured against other things of similar kind" or "the degree of excellence of something". Aside being broad in nature, the Oxford dictionary's definition does not take into consideration the fact that quality is what it is based on the role of the person defining it or better still the kind of product (whether tangible or intangible) under consideration.

By the person's role, the emphasis is on whether individual is a producer or a customer, because they both obviously understand quality from different perspectives. The kind of product under consideration also influences greatly the definition of quality because

certain product features that communicate or indicate quality in a tangible product may not reveal the same thing about intangible products.

It is for this and many other reasons that Reeves and Bender (1994) concluded that a distinctive, universal and all–embracing definition of quality does not exist. The approaches adopted by individuals to define quality therefore determine the aspect of quality that will be defined. A very popular framework for quality determination that supports the fact that quality is what it is based on the adopted approach is the framework put forward by Garvin (1984). Fields et al (2014) believe that the surest way to answer the question "what is quality?" is by relying on Garvin's framework.

The framework outlines five approaches for determining or defining quality: Transcendent approach, Product-Based approach, User-Based approach, Manufacturing-Based and Value-Based approach. These approaches in Garvin's opinion emerged from scholars in the field of Philosophy, Economics, Marketing and Operations management. He attributes the difficulty in finding a universally accepted definition of quality to the different vantage points from which scholars especially those in the four disciplines view quality from. Whereas Philosophy focuses on definitional issues; Economics focuses on profit maximization and market equilibrium; Marking, on customer satisfaction and the determinants of buying behaviour; and Operations management lays emphasis on engineering practices manufacturing control (Garvin 1984). It is however worthy to note that a single approach is not in itself sufficient to define quality hence all the five approaches are needed to provide a holistic view of the concept. The approaches have been looked at in details below;

- Transcendent Approach: This approach considers the quality of a product as a natural or innate characteristic that is both absolute and universally recognizable. The proponents of this approach (mostly Philosophers) hold the view that quality just like beauty cannot precisely be defined. To them quality is a simple, unanalysable property that is recognised only through experience. The transcendent approach is heavily inspired by Plato's view of beauty as a "Platonic form" that cannot be easily and precisely be defined (Garvin, 1984). In the nutshell, this approach holds the view that quality is best known or defined only after it has been experienced.

- Product-Based Approach: Proponents of this approach holds the view that a product's quality is precise and measurable based on the presence of a certain amount of some ingredients in the product. For instance, whiles an ice cream with a higher butter fat content and rugs with a larger number of knots per square inch signifies higher quality ice cream and rugs respectively, the reverse indicates lower quality (Garvin, 1984).

Drawing its roots from the Economics literature, Product-Based definitions generally equate higher quality to higher cost due to the amount of ingredients needed to produce a quality product. The notion that an expensive product is of a higher quality is therefore fuelled by this approach. The thoughts of quality as an innate or inherent attribute of goods and not just merely adding some stuff to them make it easier for quality to be objectively assessed (Garvin, 1984).

- User-Based Approach: Contrary to the product-based approach that believes in the objective assessment of quality, the user-based approach views the quality of a product as nothing more than what the individual consumer defines or says it is. This approach is based on the premise that quality just like beauty "lies in the eyes of the beholder" where the beholder relates to the user of the product or service. The quality of any product or service therefore depends on the degree at which the individual consumer's needs, wants or preferences are satisfied (Fields et al., 2014). A particular user who for instance trusts in iPhone's ability to meet his needs better than a Samsung phone will definitely consider iPhone a higher quality product than Samsung. This approach is relatively important to an extent that it can be traced to the Marketing, Economics and Operations management literature although different concepts have been used to represent it.
- The Manufacturing-Based Approach: Unlike the user-based definitions that assess quality from the user or consumer perspective, the manufacturing-based definitions are primarily concerned with the supply side of the equation. This approach focuses on the engineering and manufacturing practices that when adopted will ensure that the resulting product or service conforms to pre-determined requirements or specifications. Simply put, the degree at which a manufactured product complies with the established standards or specifications determines the quality of the product under this approach. Excellence is in meeting

specifications and so on the slightest deviation from the established specifications signifies a reduction in quality of the manufactured product (Garvin, 1984). Although the approach acknowledges the interest of customers in quality, its primary focus is in adopting manufacturing design and statistical quality control techniques that eliminate deviations as early as possible.

- Value-Based Approach: This approach defines quality based on the cost and price of the product. A product that costs relatively low to produce and offered at an acceptable price is highly considered to be of higher quality than a product that is costly to produce and so expensive to be sold. Garvin however attributed the difficulty in adopting the value-based approach to its combination of the two related but distinct concepts (quality and value). Quality which measures excellence is highly associated with value which also measures worth. The outcome being the hybrid term "affordable excellence" that lacks precise limits and is hard to be applied in practice.

Aside the Garvin (1984) framework, the other way most researchers review the literature on quality is to classify quality definitions of other scholars (the quality gurus in particular) into two main groups;

1) Those that lay emphasis on the need to meet a particular pre-determined specification in the manufacturing process.
2) Those that focus on products or services that offer the highest customer satisfaction.

Group 1 definitions generally consider quality products or services to be those that perfectly conform to the pre-defined specifications. In essence, a product that experienced deviation of any kind during the manufacturing process is typically regarded as sub-standard. Group 2 definitions on the other hand define quality of products based on their ability to offer the highest satisfaction to customers. Fundamentally, whereas group 1 definitions look at quality from the supplier or manufacturing perspective, group 2 definitions do same from the perspective of customers. But what's important is that the former comparatively is more objective in determining quality than the latter since different consumers possess different tastes, preferences, needs and expectations. Most of the scholarly definitions of quality including the approaches of the quality gurus like Deming, Phil Crosby etc that will be discussed later, either fit into one group or both.

The International Organisation of Standardization (ISO) 9000's definition of quality for instance is a group 1 definition since it considers quality as the "degree to which a set of inherent characteristics fulfils requirement". On the contrary, Feigenbaum's (2004) definition of quality as "what the user, the customer says it is" perfectly fits into the group 2 definitions.

1.3. The Concept of TQM

The most practical way by which organisations gain comparative advantage over their competitors is in their ability to constantly produce quality and affordable goods or services that equally yield the highest satisfaction for customers. But considering the fact that the attainment of quality and customer satisfaction cannot be possible by accident, a well-planned approach or strategy to managing quality definitely need to be adopted. Although several of these approaches or strategies are available for managers in the system, the most prominent, tested and result-oriented especially in the last two decades is Total Quality Management (TQM). But just like quality that has got different definitions, TQM has been defined differently by different authors or scholars.

The US Department of Defence (DOD) (cited in Goetsch & Davis, 2014) for instance defined total quality as an approach that involves the continual improvement of people, processes, products, environments and any other thing that affects quality in order to attain organisational excellence, superior value and global competitiveness. This definition reveals two major issues about TQM. First and foremost, total quality reaffirms the belief that an organisation is a system that functions only when all its units receive fair attention. In this case, the attention involves the continual improvement of all the units - processes, people, products etc. Secondly, an organisation that successfully implemented total quality experiences drastic improvement in its overall performance. Kanji and Asher (1996) expressed a similar opinion when they defined TQM as the continuous process of improvement for individuals, groups, and organisations as a whole. Extremely conspicuous in both definitions has to do with the fact that TQM involves the incessant improvement of all the factors that affect quality in an organisation. Pointing out this major feature or aspect of TQM is especially significant that it will serve as a guide to managers or quality practitioners that particularly expect high returns from TQM implementation.

The review of the literature has also disclosed several technical definitions of TQM from prominent scholars and organisations. A clear example of such definitions is the one given by the American Federal Office of Management and Budget Circular (reported in Milakovich 1990, p.209). In their opinion "TQM is a total organisational approach for meeting customer needs and expectations that involves all managers and employees in using quantitative methods to improve continuously the organisation's processes, products, and services." TQM, according to the definition is both a technical and social system since it is highly identified with the organisation itself. This view has been supported by Pike and Barnes (1996) when they maintained that organisations are as human systems as they are technical systems.

TQM involves all the efforts put in to improve the competitiveness, effectiveness, and structure of the organisation (Oakland, 1993). On his part, Dele (1993) defined TQM as the mutual co-operation of everyone and associated business processes in the organisation to produce products and services that meet or hopefully exceed customers' needs and expectations. He added that TQM is a philosophy at the same time a set of guiding principles for managing all aspects of quality, including employees, customers and supplier management, and getting all of them fully integrated into the principal business process. Furthermore, TQM demands or requires that its principles be applied in every branch and level of organisations, most importantly with a fair balance between technical, human and managerial issues. It is therefore not surprising that many authors in the field have recommended strongly the active participation or coordination of all departments in the TQM implementation system, where management and employees combine and channel their efforts into creating value for money as well as outputs of higher quality.

Khan (2003) believes that the success of TQM largely depends on its acceptance as a philosophy by at least the top management and the right systems and tools instituted to promote the TQM culture. He further identified the four fundamental pillars of the TQM philosophy as; "*absolute customer focus"; "employee empowerment, involvement and ownership"; "continues improvement*"; and "*the use of systematic approaches to management"*. Among the four components, he pinpointed *"absolute customer focus"* as the core of the TQM philosophy whiles the rest provide all the support needed by an organisation to regularly create higher customer satisfaction. Oakland (2003) expresses a similar view in his definition of TQM as a management approach designed to enhance

organisations' effectiveness, competitiveness, and flexibility via the participation of management and employees, strategic planning and process improvement. Oakland believes that once TQM is fully recognised as a way of getting things done in the organisation and everyone directly involved in the continues improvement of products and processes, a long-term success on quality will definitely be achieved.

The ISO (2009) also define TQM as a "management approach for an organisation, centred on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organisation and to society." TQM regards an organisation as a unit consisting of integrated processes that continuously must be improved to yield organisational objectives and must be jointly operationalized by both management and employees in finance, human resource, manufacturing, purchasing and any other organisational activity (Hashmi, 2009). Powell (1995) shares a similar opinion about TQM when he defined it as a consolidated management philosophy and a series of practices that underscores, among others, continuous improvement, total customer satisfaction, management leadership and commitment, employee involvement, training and education, reducing rework and tight supplier relationships.

Goetsch and Davis (2014) observed that the most prominent factor that distinguishes the total quality management approach from the traditional methods of doing business is in how TQM is achieved. They identified the unique features of TQM to, among other things, include, customer focus, obsession with quality, teamwork, continual process improvement, employee involvement and empowerment, education and training, the usage of scientific approach in decision making and problem solving, with all offering the necessary support to the organisational strategy. TQM in the opinion of Kanji (2002) is a management philosophy that contributes to a good organisational culture, dedicated to the satisfaction of customers through continues improvement of processes, people and products. Powell (1995a) also considers TQM as a powerful initiative that yields numerous benefits including improvement in internal communication, enhanced problem-solving, better employee motivation and commitment, robust supplier relationship, better understanding of customers and their preferences, increased satisfaction to customers, reduced errors and waste.

Although TQM as a typical business strategy should be applicable to all kinds of organisations and to all departments, Sohal and Terziovski (2000) however observe that its application is prevalent in the manufacturing or operating departments with less attention paid to other departments. It's very observable from the review of the literature that definitions of TQM differ from each other based on countries, national and organisational cultures and the overall understanding of quality in that culture. What is however widespread among the TQM definitions is the fact that most of authors perceive TQM as a management philosophy, the adoption or implementation of which signifies management's commitment to improve the quality of their goods and services. Many a researcher and author in the field just like Hashmi (2006) identify management leadership, employee empowerment, customer focus and continues improvement as the fundamental TQM practice or principles.

1.4. Historical Development of TQM

TQM undoubtedly is one of the essential management issues that has gained global attention since the 80's as a result of the increasing level of competition in the global marketplace. The development of management philosophies like TQM has been necessitated by the ever-growing desire for quality products and services by global customers in any industry.

Many corporations over the years have survived or maintained their positions in the global marketplace because of the higher level of importance they attach to the implementation of TQM and other quality management initiatives. Surprisingly, this same term "TQM" that many of the scholars like Deming, Crosby, Juran etc. who contributed greatly to its development never in their lifetime used the term TQM. An important question most curious minds ask therefore is "what has been the development process of TQM and how and when did it come to be called as TQM?". This section of the chapter attempts to answer these questions by tracing the developmental stages of the term from the 19th century till date.

The origin of TQM dates back to 1949, when a committee of scholars, engineers and government officials set by the union of Japanese scientists and engineers with the responsibility of increasing the productivity of Japan as well as improve the quality of their lives after world war II (Powell, 1995). Powell also indicated that the attention of American firms has been drawn to the TQM philosophy only around 1980. Goetsch and

Davis (2014) however clinched the origin of the entire total quality movement to the Frederick Taylor's time and motion studies conducted in the 1920s. They assert that the most significant element of Taylor's scientific management theory that lays the foundation for the development of total quality undoubtedly is the concept of division of labour. The scientific management theory with division of labour as a concept completely abolished the old practice or system where the planning and production of quality products were in the hands of one or few highly skilled employees. This gave birth, for the first time, to the establishment of quality departments in most companies with the special task of managing the quality of the companies' products (Goetsch and Davis 2014).

The rise in production units (volume) coupled with the complexity of manufacturing processes made the management of quality especially in manufacturing companies extremely difficult. The business world responded swiftly to this trend with series of experiments and researches, all dedicated to finding solution(s) to the problem. This led to the introduction of quality and reliability engineering. Quality engineering which was introduced in the 1920s facilitated the use of statistical methods as a way of controlling quality, subsequently brought two fundamental concepts of total quality – control charts and statistical process control - into existence. Reliability engineering which also came into existence in the 1950s triggered a move towards redefining or repositioning quality control from the traditional approach where quality control is done at the tail end of manufacturing process to a trend towards injecting it throughout the manufacturing process.

Quality management in most part of the 1950s and 1960s was characterised by inspection that was aimed at eliminating products or parts that did not meet predefined standards or specifications (Goetsch and Davis 2014). It's worthy to note that, inspection as a way of managing quality was not without challenges. Aside the fact that, many inspectors were not given the required training for the job, many production managers mounted undue pressure on the inspectors to approve defective products just so their output can be increased. Although independent inspection departments were later created purposely to overcome the aforementioned challenges, their creation equally ushered in a number of issues. The chief inspectors serving as the head of the departments were expected to, among other things, design and implement the best training for their staff, setting up

efficient measuring instruments as well as keeping inspection-related data. However not all the chief inspectors and the departments as a whole appreciated the fact that their responsibilities go beyond just accepting or approving products (Ismail, 2012). This coupled with the complexity of aircraft technology especially during World War II exposed the ineffectiveness of inspection because of its staff and equipment requirements (Kanji, 2002). Several decades after its occurrence, the effect of the war on quality is prevalent even in today's world of business.

However, unlike US firms that were negatively affected due to their over reliance on meeting production schedules over quality, Japanese companies were positively affected because of it was the only opportunity they could ever get to compete globally. This was as a result of the many management practices Japanese manufacturers adopted to improve the quality of their products. The invitation of Deming in the 1950s and the numerous quality management principles introduced afterwards, unarguably/certainly is the most remarkable moments in the history of TQM.

By the 1960s, when the west felt the "Japanese pressure" they responded strongly through several measures including learning from the Japanese as well as studying the works of Deming, Juran and Ishikawa whose contribution secured "Made in Japan" goods the second to none position in the global marketplace. The integration of their quality approaches into the quality management systems of Japanese companies led to the mass production of high quality and affordable products. Inspection subsequently transformed into Quality Control (QC) in which quality was controlled through quality manuals, self-inspection, statistical methods, product testing etc. Within a short period of time, most companies either transformed their existing inspection departments into quality control departments or established it to inspect services as well as handle quality control engineering. Quality control in the opinion of Juran (1986) revolves around three main processes; measuring actual performance, contrasting that to set goals and then acting on the differences.

The growing desire for quality products in larger quantities led to the introduction of Quality Assurance (QA). As an initiative that upholds the principle of "***Right first time"***, the elimination of errors in the manufacturing process was considered the best approach to ensure quality. The focus therefore shifted from product quality to the quality of manufacturing systems with the conviction that an error-free manufacturing system will

automatically produce quality products. Quality assurance is implemented through periodic audits, systematic process controls, cutting down costs associated with poor quality as well as eliminating less relevant or redundant operations.

The extension of quality to all the functional units, systems and processes of the organisation then gave birth to Total Quality Management (TQM). TQM ensures that quality management is integrated into the very fabric of the organisation as a way of producing products that meet or exceed customer expectations. It's worthy to note that, different researchers hold divergent views about the evolution of TQM. Lau et al. (2004) for instance identified five stages of TQM development as; unaware, uncommitted, initiator, improver, and achiever. Chin et al. (2002) also recognise the developmental stages of TQM as; could be better, room for improvement, promising, vulnerable, potential winners and world class. However, researchers like Crosby, Weeb, Bryant and others identified Quality inspection, quality control, quality assurance and TQM as the stages of TQM development.

1.4.1. Quality Inspection

Despite the fact that quality inspection was initially adopted prior to First World War, its development was necessitated by the rise in manufacturing complexities and employee numbers which greatly affected the ability of organisations to meet quality standards especially after the Second World War (Feigenbaum, 1991). Dale and Bunney (1999) define quality inspection to include all activities that involves measuring, examining and testing one or more organisational results and comparing that to the set standards to determine whether or not conformity has been achieved. It's obviously an effective way to safeguard or ensure quality to a particular level in both manufacturing and service operations (Costin, 1994). Quality inspection in time past provided a singular opportunity to appraise the performance of both production processes and employees based on the amount of non-conformant products or components discovered. Depending on the degree of non-conformity, the products were either modified, reworked or disposed of. Besides that, the quality level of final products was ranked through the direct inspection of the final products and not the manufacturing process nor the views of external stakeholders like customers and suppliers. Wawak (2018) identifies three purposes of inspection to include the identification of quality problems, supplying the necessary information to management and the eradication of the problem by the management. He also observed

that quality inspection hasn't got any direct influence on the manufacturing process since it basically entails the post-production checks conducted on manufactured products before they exit the company's premises.

1.4.2. Quality Control (QC)

The ISO (2009) define QC broadly as "operational techniques and activities that are used to fulfil requirement for quality." The definition implies that, any activity be it product design, self-inspection, process design or review that's aimed at either controlling, managing or improving the quality of products is considered a quality control activity. Quality control is also the aspect of quality management that adopts statistical methods to determine whether or not pre-determined quality standards or specifications are met. Quality control is a quality approach that ensures that manufactured goods conform to set quality standards as well fit into the specifications of both producers and customers. Unlike Quality Inspection, QC establishes a feedback link between quality inspectors and factory workers such that any quality-related problem discovered through inspection as well as its possible causes are communicated to managers and the workers for further improvement (Wawak, 2018). Quality control involves the inspection of finished goods and services just like Quality Inspection but with keen interest in defect prevention whiles monitoring processes to determine their conformity to established requirements (Genasan et al. 2009). In effect, quality control is all about the processes or activities adopted to ensure that the customer is served with only defect-free goods and services. Statistical tools such as control charts are the most commonly used tools for undertaking the QC process.

1.4.3. Quality Assurance

Quality assurance relates to all the activities undertaken purposely to avert the occurrence of defects in both the manufactured products and the manufacturing process. Aside the quality inspection and control methods, quality assurance incorporates the concepts of ***"right first time"*** and ***"fitness to use".*** Wawak (2018) reveals that the quality assurance system distinguishes itself from quality control by providing a double feedback loop that sends quality-related information to workers, managers, designers and technologists for the purpose of improving the quality of products, technology and production systems.

The American National Standards Institute (ANSI) (1994) (cited in İsmail, 2012) defines quality assurance to include all the planned and systematic defect-preventive activities

undertaken to provide confidence that the organisation's products and services meet or exceed customer expectations. The aim of quality assurance has always been to avoid the occurrence of defects in products and services so that the needs of customers will be fully met. Unlike inspection and quality control that identify defective products at the end of the production line, quality assurance ensures that the whole production line - from the product design stage to the finished state - is rigorously monitored to detect and report mistakes to workers, managers, designers and technologists for a corrective action to be taken.

Besterfield (2003) however emphasised that, activities related to quality assurance are usually performed prior to the commencement of production to ensure that the satisfaction of customers is guaranteed. He pointed out that, whereas quality assurance focuses on defects prevention through the improvement of the production process, quality control primarily focuses on defects detection in which products are inspected and defective ones are blocked from reaching the customer.

1.4.4. Total Quality Management (TQM)

Just like the definition of quality, the emergence of the term "Total Quality Management" in the management literature has been presented in different narratives. Whereas some considered it a 1980s term, others believed that it could have been around a decade earlier. One school of thought particularly had it that, TQM began to emerge in the late 70s under the influence of the US Naval Air System Command (NAVAIR). Although TQM as a management philosophy has proven to be extremely successful or effective in most private sector organisations that it's been implemented, not much can be said about public sector organisations especially at the early stages of its development. NAVAIR however is noted to be the first public institution most especially in the US to have committed their energy and resources to the implementation of TQM in the 80s, thereby facilitating a deeper understanding of TQM's behaviour in public sector organisations. It's for this reason that the American Society for Quality believes that the term Total Quality Management (TQM) was coined from Total Quality Control in 1980 after a NAVAIR employee noticed that her colleagues weren't comfortable with the word control in the phrase.

TQM drastically changed or redefined the way individuals and organisations look at quality. It has proven time without number to be more effective than the traditional way

of managing quality. Whereas in the traditional view, process performance is determined or assessed based on the number of defective parts found in every hundred parts produced, the same assessment is done in total quality based on defective parts per million produced. In addition, TQM seeks to prevent the occurrence of problems by continuously improving processes, products and people whiles the traditional approach to quality predominantly focused on the inspection of finished products or services to ensure that defective ones are not delivered to the customer (Goetsch and Davis, 2014). The implication is that, with the traditional approach, organisations typically incurred extremely higher external failure, internal failure, and inspection costs when a well-designed poor-quality prevention system would've saved the organisations a lot of dollars. Furthermore, unlike the traditional approach that regarded the workforce as ardent followers of managers' and supervisors' orders, total quality ensures that employees are trained and empowered enough to actively participate in the continual improvement of products and processes.

TQM is one of the management philosophies that urges organisations to work actively towards reducing production costs, creating higher quality goods and services, satisfying customers, empowering employees, and the measurement of results (Gunasekaran & McGaughey, 2003). Antony (2009) buttressed this idea when he asserts that TQM strives to continuously meet customer needs and expectations through the production and delivery of their desired goods and services at the right time and at the lowest cost. Goetsch and Davis (2014) also observed that TQM implementation has been extremely successful in organisations that have a comprehensive strategic plan and the company's vision, mission and objectives specifically or precisely stated and communicated to all the stakeholders.

Dale (1994), one of the most outstanding researchers of TQM as a quality approach, presented the stages of TQM development as follows;

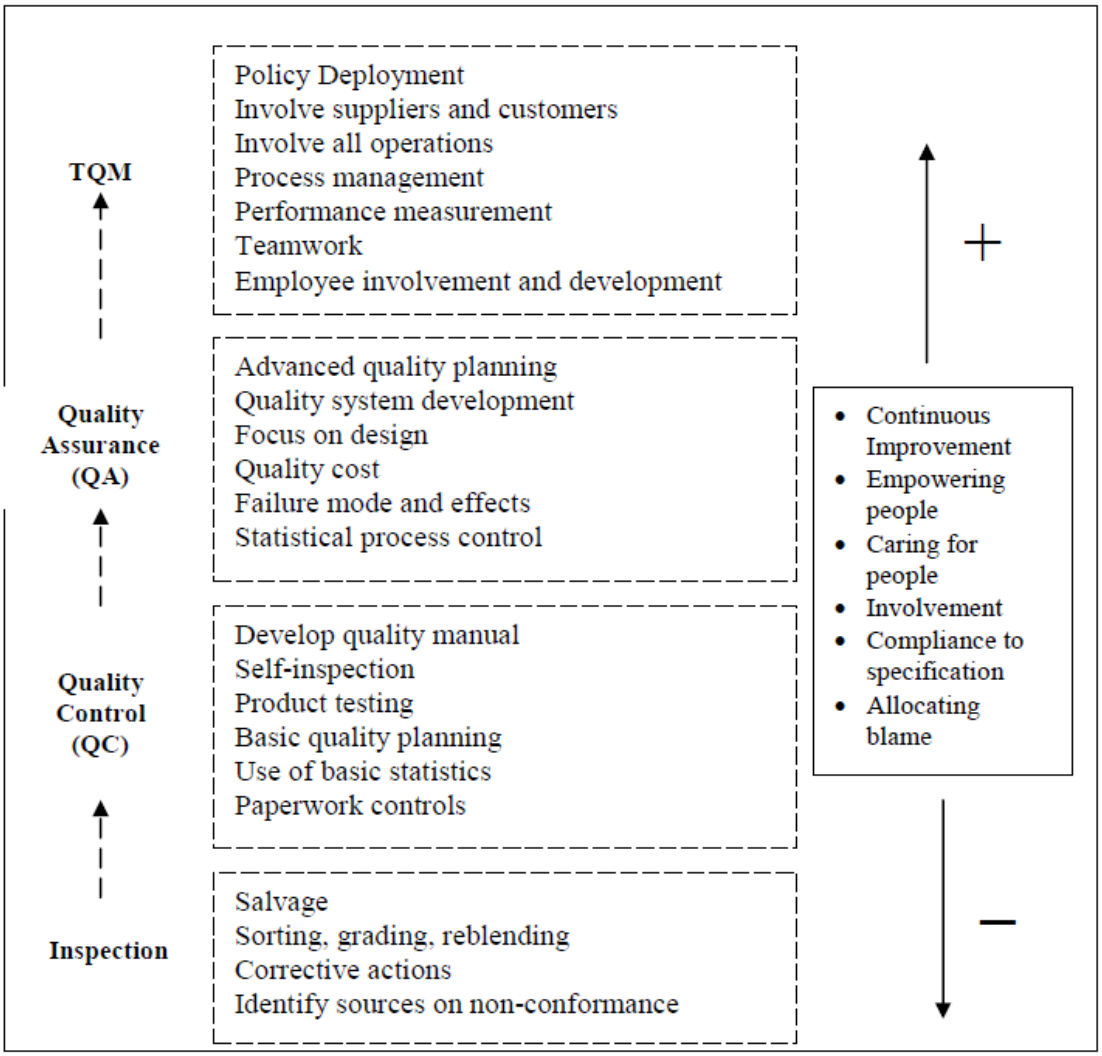

Figure 1.1: Stages/Levels of TQM evolution

Source: *Dale (1994)*

It's however important to emphasize that, the implementation of TQM does not automatically guarantee success because of the many challenges or limitations associated with it. Organizations are therefore required to put some measures to deal with the challenges as and when they arise. The major challenge of the TQM philosophy probably has to do with the fact that it requires a lot of time to produce results. As rightly captured in the ISO's definition, TQM targets long-term success, thereby becoming difficult if not impossible for companies in highly competitive environments to successfully implement. In addition, the costs associated with TQM implementation should be a matter of concern to managers of yet-to-be TQM organisations. As already established in the literature, TQM promotes the continual improvement of products, processes, people and all other factors that affect quality. A successful implementation of such a strategy definitely will

require huge financial resources for employee training, infrastructure improvement, team development and consultancy purposes. Notwithstanding the fact that, Feigenbaum and Juran vehemently demystified the widely held perception that higher quality automatically translates into higher costs, their argument that cost of poor quality is weigh more higher attracted the attention of everyone especially managers of small and medium sized businesses.

Furthermore, a good organisational culture is a major determinant of TQM success. A kind of culture that upholds continuous improvement of the organisational processes as well as customer satisfaction. An organisation with the good culture certainly recognizes the need for attitudinal change and the prioritization of their short, medium and long-term goals. A successful TQM implementation also requires the absolute support and commitment of top management as well as the continuous involvement of employees at all levels of the organisation. A fact worth acknowledging however is that, nothing can ever be more challenging in an organisation than changing the organisation's culture. The reason being that, organisational culture reflects the set of values, believes, attitudes, goals, processes, communications practices and the assumptions of the people in the organisation and so a change of any magnitude is perceived as a threat to their way of life and jobs hence the urge to resist the change.

1.5. Pioneers of TQM

It is safe to say that a comprehensive management philosophy like TQM is far from being the brainchild and efforts of a single person. It has become what it's today because of the meaningful contribution of many people in the past just like how more is required to make it greater in the future. TQM drives its form and vitality from the numerous related concepts that has been systematically harmonised or consolidated to create an extensive business strategy of its kind. The TQM journey has seen the contribution of many scholars, prominent among them being; W.E Deming, J.M Juran, Philip B. Crosby, Armand V. Feigenbaum and Ishikawa.

1.5.1. Deming's Contribution

The outstanding contribution of W.E Deming to the development of TQM has undoubtedly earned him the recognition as the most influential pioneer from the United States. Deming distinguished himself from the likes of Juran and Feigenbaum based on

the visionary role he played in harmonising diverse management concepts into this management philosophy (Gabor, 1992). His impact in the industrial revolution of Japan which has been acknowledged by the Japanese through the naming of their prestigious quality award (Deming Prize) after him testifies that his contribution to total quality was not limited to his country (USA) only.

Theoretically, the Deming approach to TQM is concerned with the creation of an organizational system that fosters cooperation and learning for facilitating the implementation of process management practices, which, in turn, leads to continuous process, product and service improvement as well as employee fulfilment, both of which are critical to customer satisfaction, and ultimately, to firm survival (Anderson et el. 1994a). He believed that companies that emphasize on producing quality products will eventually reduce waste materials and time required to produce these products. He therefore recognized the need for top management to take up the responsibility of changing processes and systems to ensure that quality goods and services are produced.

To drastically deal with inevitable variations that arise from "common causes" and "special causes" in production, Deming advocated for the adoption of methodical practices in the design, management and improvement of processes. In his view, "common causes" of variations are systematic as well as shared by operators, machines, or products. Among other things, they include poor product design, non-conformance of incoming materials, and poor working conditions. "Special causes" however relate to the lack of knowledge or skill to perform or produce the required product or service. So whiles "Common causes" are management's responsibility, "special causes" are employees' responsibility (Zhang, 2000).

Deming proposed 14 points to quality management, and they have been briefly explained below;

(1) Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.

(2) Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

(3) Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

(4) End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

(5) Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

(6) Institute training on the job.

(7) Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.

(8) Drive out fear, so that everyone may work effectively for the company.

(9) Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.

(10) Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

(11a) Eliminate work standards (quotas) on the factory floor. Substitute leadership.

(11b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

(12a) Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.

(12b) Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective.

(13) Institute a vigorous program of education and self-improvement.

(14) Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job

(Deming, 1986, pp. 23-24)

Aside the fourteen points, Deming is known widely by the Almighty Deming Cycle. The cycle requires organisations to channel their production efforts to the needs of customers

as well as deploying all departmental resources in a collective effort to satisfy those needs (Goetsch and Davis, 2014). The Deming cycle has been briefly explained as follows;

1. **Plan:** It involves setting plans to guide the production processes based on the findings of a well-conducted consumer or market research.
2. **Do:** It entails executing the plan by producing the products or services in line with the set plan.
3. **Check:** This involves all the possible measures taken purposely to ensure that the finished products conform to the set plan or standards.
4. **Act:** This involves acting to improve product quality (if necessary) and/or hitting the market with the product.

The Deming cycle has been presented in Figure 1.2

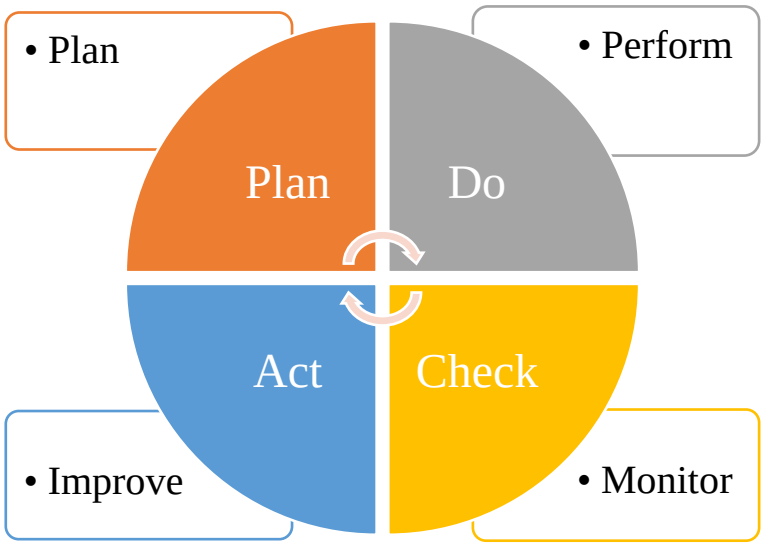

Figure 1.2: The Deming Cycle

1.5.2. Juran's Contributions

Joseph M. Juran is probably the only individual to have been accorded with almost the same degree of recognition as W.E. Deming, based on his monumental contribution to the total quality philosophy. Although he notably differed from Deming on a number of quality issues, his ability to back his views with facts and figures gained him all the global attention. The Juran Institute undoubtedly is the most popular organisation committed to the advancement of quality management through research, training programs and consultancy services. Juran and Gryna (1993) described the term TQM as a system of activities directed at achieving delighted customers, empowered employees, higher

revenue, and lower cost. Whereas Deming associated quality problems to both management and employees, Juran was of the view that main quality problems were as a result of management's doing and not employees. In his view, quality improvement is achievable through a firm-wide assessment of quality, supplier quality management, use of statistical methods, quality information system, and competitive benchmarking.

Even though Juran is best known for so many contributions to the quality management philosophy, the most outstanding among his contributions is the Juran Trilogy model. The term Juran Trilogy; thus Quality Planning, Quality Control and Quality Improvement was considered by Juran as the basic quality- oriented processes. He believed that, the best approach to managing quality involves; (1) establishing quality goals through quality planning (2) evaluate and compare actual performance with quality goals through quality control (3) establish the infrastructure and project teams through quality improvement (Juran and Godfrey, 1998).

Another critical contribution of Juran that greatly influenced the continuous quality improvement initiatives of organisations is the need for firms to constantly work towards meeting customer needs as opposed to their wants and requirements. In his opinion quality is "fitness for use" and so all the functional units of the organisation should endeavour to channel their efforts towards the production of products and services that satisfy the needs of customers and not necessarily their wants. Fitness for use depicts the quality of the product's design, conformance, availability, safety and easy to use. Juran explained that whereas "wants" reflect the metal picture of the product customers have especially regarding its physical properties, "needs" represent the purpose that the product will serve. He urged organisations to strive towards achieving zero defects in their output. As pragmatic as he was, he got the attention of top management rapidly through his advocacy for the cost-of-quality accounting system.

1.5.3. Feigenbaum's Contributions

Feigenbaum is another American who contributed greatly to the development of total quality having served as the President of the American Society for Quality for 3 years. He is credited for the introduction the concept of Total Quality Control (TQC) which was later transformed into Total Quality Management. He played an instrumental role in the shift of focus of total quality control from being a technical method to a business method where human relations are recognised as an essential components of quality control. He

stressed on the need to integrate quality into the production process rather than inspecting and controlling quality after production. He believed that a successful quality control programme is the one that gets the full support and involvement of top management and employees, in an environment where both parties freely and openly share ideas about product or service quality as well as how total quality can be achieved. Among his contribution to TQM development is the identification of the ten (10) critical benchmarks to a successful TQM which has been stated below:

1. Quality is a company-wide process.
2. Quality is what the customer says it is.
3. Quality and cost are a sum, not a difference.
4. Quality requires both individual and teamwork zealotry.
5. Quality is a way of managing.
6. Quality and innovation are mutually dependent
7. Quality is an ethic.
8. Quality requires continuous improvement.
9. Quality is the most cost-effective, least capital-intensive route to productivity.
10. Quality is implemented with a total system connected with customers and suppliers.

Feigenbaum is also known for the introduction of the "Hidden plant" concept. He maintained that up to 40% of the capacity of every factory or plant is wasted through not getting it right the first time.

1.5.4. Crosby's Contributions

Known best as the originator of the popular "Zero Defects" concept, Philip B. Crosby is an instrumental figure in the development of the TQM philosophy. He considered an efficient quality management system as the one that focuses on the prevention of defects with the conviction that mistakes are only but lack of knowledge, attention and awareness from employees of the organisation (Crosby, 1979). He emphasised that firms that strive to prevent the occurrence of defects by educating and training their employees end up "doing it right the first time" thereby maintaining a very reasonably low cost of quality.

In his book titled *"Quality is Free"*, Crosby explained the "Zero Defects" concept does not in any way depicts "perfection" in the quality of products and services but the degree at which the products conform to the specified requirements of customers and suppliers.

In effect, the supplier should be able to deliver exactly what he promised to provide to the customer (Fields et al. 2014). His TQM philosophy can best be described in his four absolutes of quality management;

(1) The definition of quality is conformance to requirements, not goodness.

(2) The system of quality is prevention, not detection.

(3) The quality performance standard is zero defects, not acceptable levels.

(4) The measurement of quality is the price of non-conformance, not by indexes.

The absolutes finally came together as the four basic concepts of quality improvement process (Petersen, 1999). Aside the four absolutes, Crosby also offered fourteen (14) steps to quality improvement. They are;

(1) Management Commitment;
(2) Quality Improvement Team;
(3) Measurement;
(4) Cost of Quality;
(5) Quality Awareness;
(6) Corrective Action;
(7) Zero Defects Planning;
(8) Employee Education;
(9) Zero Defects Day;
(10) Goal Setting;
(11) Error-Cause Removal;
(12) Recognition;
(13) Quality Councils;
(14) Do it Over Again (Crosby, 1984, P. 99).

1.5.5. Ishikawa's Contributions

Ishikawa is undeniably the most prominent Japanese to have dedicated his life to the studies and development of total quality in Japan and the world in general. Having served as the President of the Japanese Society of Quality Control and the International Academy of Quality with over 640 articles and 31 books on quality, he surely comes second to none among the Japanese quality gurus. Ishikawa gained global attention for, among other things, the introduction of the cause-and-effect diagram also known as the fishbone

diagram, the “quality circles”, the ‘seven basic quality tools” as well as the “company-wide quality” concepts. The fishbone diagram in particular served as an effective tool that management and work teams use to determine the potential root cause of variations or defects in product or service quality.

The year 1962 saw the introduction of the “quality circles” concept by Ishikawa with the main aim of developing and improving production processes, empowering employees as well as enhancing their participation in the management of quality (Beckford, 2002). Bank (2000) also shares a similar view when he indicated that the “quality circle” was intended to enhance company development, improve human relations, improve employee satisfaction on the job as well as bring out the potential of employees. An equally important contribution of Ishikawa to the development of total quality has to do with the introduction of the “Company-wide Quality” approach. He, just like Feigenbaum argues that, quality improvement is more of a shared responsibility than that reserved only for quality professionals. The central idea of this concept therefore is for organisations to recognise the need to actively engage the services of every organisation member (managers and employees) and all functional units (manufacturing, design, marketing, accounting etc.), in the quality improvement struggle. This Ishikawa believes will help companies reduce defects, reduce inspection and rework costs, increase revenues, and subsequently improve the quality of products. The fishbone diagram is presented in Figure 1.3

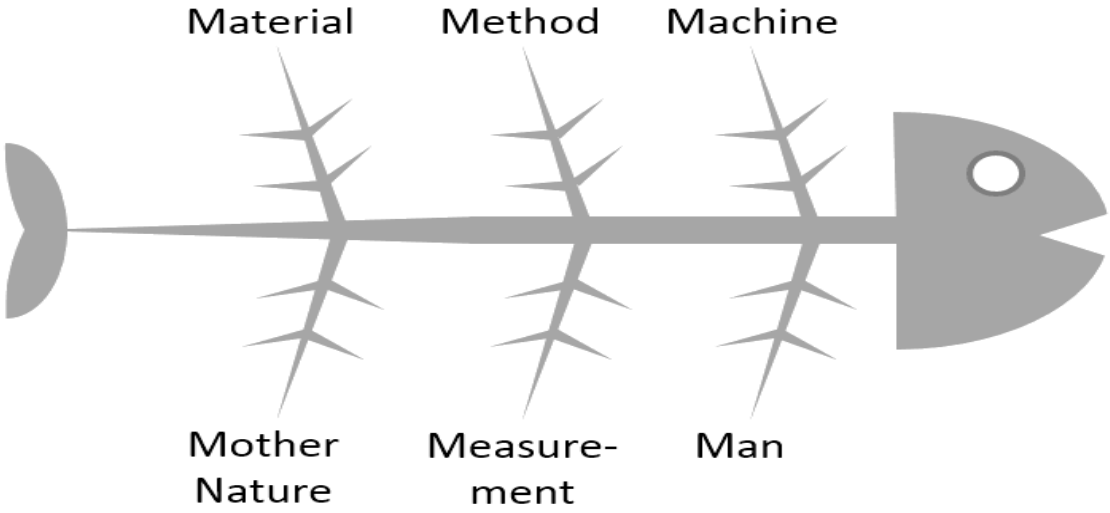

Figure 1.3: Fishbone Diagram

Source: Christoph Roser at www.allaboutlean.com

1.6. National Quality Awards

National quality awards basically are part of the contribution governments make to improve the competitiveness levels of business in their countries. In most instances, public institutions like ministries or state sponsored not-for-profit organisations are mandated by the state to identify and award companies that performed exceptionally based on some quality and excellence criteria. Organizations that filed to be considered for awards are evaluated thoroughly by a team of quality experts in the home country and in some cases abroad. As part of the evaluation process, the quality experts (examiners) pay a visit to the sites of short-listed companies to verify whether or not actually performance or practices correspond to what was reported by the companies. The competitive and prestigious nature of these awards therefore validates the achievements (quality wise) of awarded companies. Among the widely recognised quality awards around the world that this literature review will consider are the Deming Prize in Japan, the EFQM Excellence in Europe and the Malcolm Baldrige National Quality Awards (MBNQA) in the USA.

1.6.1. Deming Prize

Established in the year 1951, the Deming Prize is the longest-running quality award in the world. It was established purposely to honour W. Edward Deming for his contribution to the development or improvement of quality in Japanese companies. The award under the sponsorship of the Japanese Union of Scientists and Engineers (JUSE) originally recognises the contribution of both individuals and businesses to the successful implementation of TQM in Japan, until 1989 when the focus was extended to cover international companies. Aside the prizes for individuals and businesses, the Japanese Quality Control Medal which was instituted in 1969 is the other prize category that is opened only to companies that have already won the Deming Prize in the past. Among the many Japanese corporations that have bagged this award include, Toyota, Toshiba, TVS, Tata Steel, Mahindra and Komatsu.

The Deming Prize has however distinguished itself from the other quality award schemes for the simple reason that, it does not award companies based on the degree of conformance of their quality initiatives to a particular quality model. In fact, there's no quality model or criteria in place and so applicants are assessed based their understanding of their current situation they find themselves, their objectives, quality improvement goals

as well as how they work to achieve them. The main focus of the examiners therefore is to evaluate whether or not the processes of applicant organisations correspond to their prevailing situations.

1.6.2. The EFQM Excellence Award

The EFQM Excellence Award was first launched in 1991 as the European Quality Award by the European Foundation for Quality Management (EFQM) with the main aim of supporting, encouraging and recognising European businesses that have championed the total quality agenda with much vigour. Like other awards, the EFQM is characterised by an extremely rigorous evaluation or assessment procedure that ensures that applicant firms undergo a series of interviews and examinations of both their documents and factories by an independent jury of experts. The results of the assessment process configure either the title of "Finalist", "Prize winners" or "Award winners"; on the applicants, an indication that the applicant has satisfactorily implemented TQM in line with the EFQM Excellence Model. The EFQM award recognises and award both public and private sector organisations of different sizes.

The EFQM Excellence Model facilitates the understanding of the cause and effect relationship in organisations by grouping 9 quality dimensions called criteria into 5 Enablers and 4 Results. Whereas the Enablers basically cover the process, structure and means of the organisation and therefore drive the transformation of inputs into output, the Results criteria represent the outcome of a successful implementation of the enablers. Each and every enabler is however made up of a number of elements that regulate its implementation and assessment. The breakdown of the quality criteria with their respective sub-elements are presented below;

1. Leadership (100 points)
    - Develops the mission, vision and values, and a role model of a culture of excellence.
    - Directly involved in the development, implementation and continuous improvement of organisation's management system.
    - Continuously interacts with customers, partners and representatives of society.
    - Motivates, supports and recognises employees.

2. People (90 points)
    - Human resources are planned, managed and improved.
    - Developing and sustaining the knowledge and competences of employees.
    - Employees are actively involved and empowered.
    - Employees dialogue with the organisation.
    - Employees are recognised, rewarded and cared for.
3. Policy and Strategy (80 points)
    - Policy and strategy are based on the present and future needs and expectations of stakeholders.
    - Policy and strategy are based on information from performance measurement, research, learning and external related activities.
    - Policies are developed, reviewed and updated.
    - Are deployed through a framework of key processes which are communicated and implemented.
4. Resources (90 Points)
    - External partnerships are managed.
    - Finances are managed.
    - Buildings, equipment and materials are managed.
    - Technology is managed.
    - Information and knowledge are managed.
5. Process (140 Points)
    - Processes are systematically designed and managed.
    - All processes are improved, as needed using innovation in order to fully satisfy and generate increasing value for customers and other stakeholders.
    - Products and services are designed and developed based on customer needs and expectations.
    - Products and services are produced, delivered and serviced.
    - Customer relationships are managed and enhanced.
6. Customer Results (200 Points)
    - Perception measures
    - Performance indicators

7. People Results (90 Points)
    - Perception measures
    - Performance indicators
8. Society Results (60 Points)
    - Perception measures
    - Performance indicators
9. Business Results (150 Points)
    - Key performance outcomes
    - Key performance indicators (Moeller, 2001)

The EFQM Excellence model has been presented in Figure 1.4

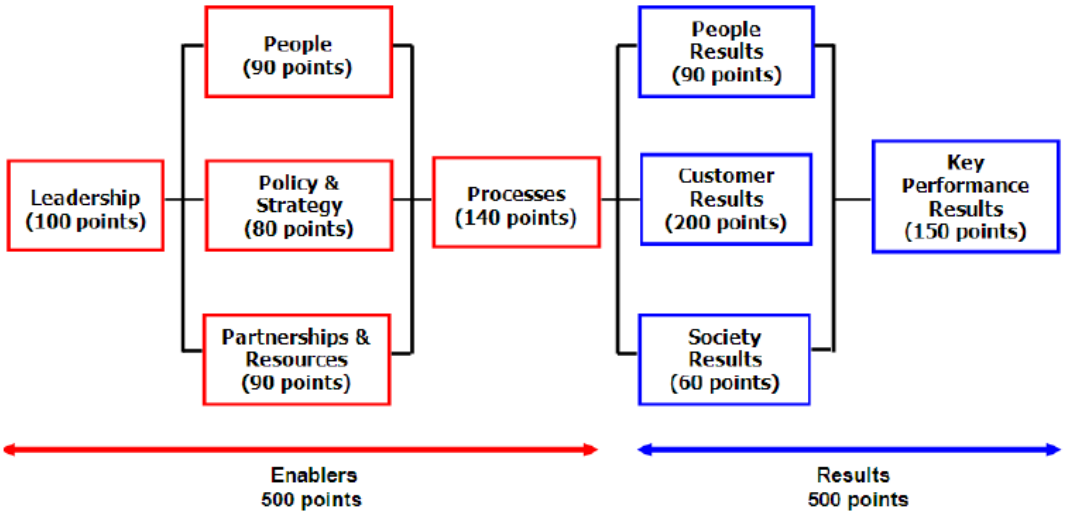

Figure 1.4: The EFQM Excellence Model

Source: *Eskildsen & Dahlgaard (2000)*

1.6.3. Malcolm Baldrige National Quality Awards (MBNQA)

The US government in the 1980s envisioned the creation of the MBNQA as a standard of excellence that recognises US organisations in diverse sectors and sizes for exhibiting a higher performance excellence in terms of quality, competitiveness and customer satisfaction using the Baldrige Excellence Framework. The award, under the sponsorship of the National Institute of Standards and Technology, was named after Malcolm Baldrige, a former US Secretary of Commerce as a recognition of his immense contribution to the growth of American businesses. Just like the EFQM model, the

MBNQA model has all that it takes to effectively strengthen or reinforce an organisation's efforts towards the implementation of the TQM philosophy. It provides a great opportunity for companies to improve their competitiveness and performance excellence through the continuous improvement of all the functional units, processes and people in the organisation. The model framework serves as a standard with which organisations assess the effectiveness of their improvement efforts, recognise their strengths and opportunities as well as analyse the efficacy of their overall performance management system. It also serves as a means by which the award organizers or sponsors identify and award outstandingly performing companies from whom other organisations can learn or look up to. Among the popular US organisations that have won this award include, Motorola Inc. (1988 & 2002), Xerox Corp. (1989, IBM Rochester (1990), Nestle Purine Petcare Co. (2010), Henry Ford Health System (2011), and PricewaterhouseCoopers (2014).

The Baldrige Criteria for Performance Excellence indisputably is the most essential element of the Baldrige Excellence Framework because of its enormous contribution to the achievement of the set goals of the Baldrige Award. Thousands of US organisations over the years have stayed ahead of the ever-increasing competition in both the local and global markets as a result of the adoption and full operationalisation of the Baldrige Criteria. The criteria reposition organisations to better respond to their present challenges, appreciate the significance of creating value for customers, as well as keeping pace with the rapid change in technology and innovation. Irrespective of the organisation's type or size, the Baldrige Criteria equip them with all the knowledge and systems required to satisfactorily achieve their respective objectives even in the most uncertain environment. The criteria are made up of seven (7) interrelated categories, which has been presented in figure 1.5.

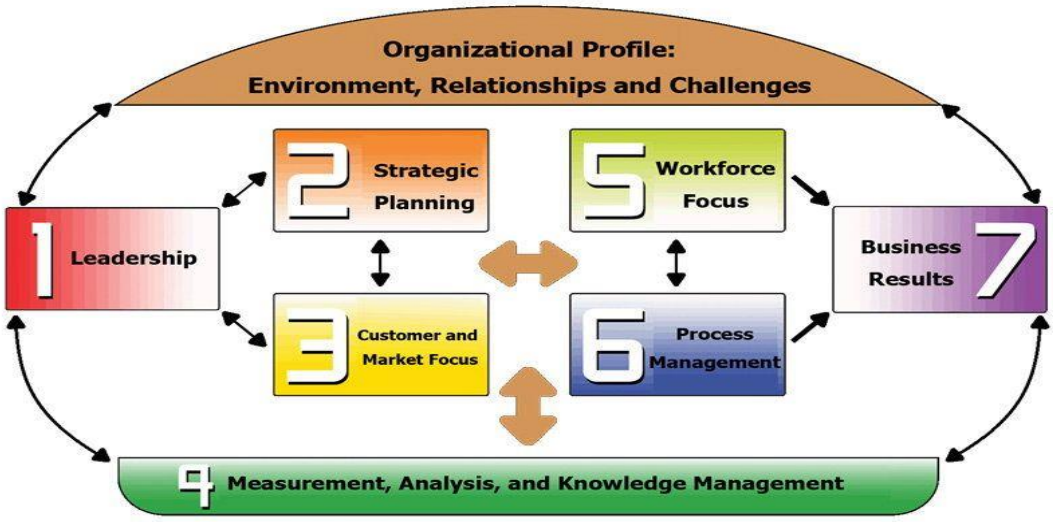

Figure 1.5: Baldrige Criteria for Performance Excellence

***Source*:** Hong Kong Productivity Council, (2019)

1. **Leadership:** Examines the amount of guidance senior executives provide or give to their organisations as well as how the organisations fulfil their responsibilities to stakeholders.
2. **Strategic Planning:** Analyses how the organisation establishes strategic goals and how it determines key action plans.
3. **Customer Focus:** Assesses how the organisation determines customers' needs and expectations; establishes customer relationships; as well as obtains, satisfies and retains customers.
4. **Measurement, Analysis, and Knowledge Management:** Considers management's effective use, analysis and improvement of data and information to support key organisation processes.
5. **Workforce Focus:** Examines how the organisation enhances the development of employees' potential and how employees' efforts are directed towards the achievement of organisational objectives.
6. **Process Management:** Analyses how key production and support processes are designed, managed and improved.
7. **Business Results:** Examines the organisation's performance as well as improvement in its key business areas such as customer satisfaction, financial and market performance, employees, products or services, supplier performance and

operational performance. It also considers the performance of organisations relative to their competitors.

1.7. Total Quality Management in Turkey

A critical observation of the nature of customers reveals that irrespective of their differences in educational levels, income levels, societal status, taste and preferences, the common ground for all of them has always been the strong desire for quality products and services. Although they hold divergent views about the meaning of quality, their urge to acquire what is deemed/perceived to be quality has been vigorously demonstrated in many markets, industries and countries. Business organisations in Japan and the US particularly understood this phenomenon earlier enough to channel all their production efforts into producing products and services that best meet or exceed the expectations of customers. The success stories of most businesses in both countries subsequently got other businesses and countries into thinking about the need to put much emphasis on the improvement of their processes, products and people. A lot of countries also adopted the idea of establishing quality award schemes that recognise the efforts of organisations with a record level performance excellence, so as to motivate other organisations.

It is worthy to note that the phenomenon isn't in anyway different in Turkey as much has been done by both businesses and the government improve the quality, customer satisfaction and business competitiveness. The establishment of the National Quality Awards in 1993 under the joint sponsorship of the Turkish Industry and Business Association (TÜSİAD) and the Turkish Society for Quality (KalDer) marked the greatest step the country has ever taken to improve quality delivery in both public and private organisations. Within a span of 10 years, the award went through a series of progress from 1993 when only large-scale enterprises were awarded, the Small-Medium-Enterprises (SMEs) category included in 1998, public institutions and civil society organisations in 2001 and 2002 respectively. In view of the significant contribution of the education, health and local government sectors to the quality of life of the people, and to further enhance performance excellence in those sectors, the Public sector category was divided into Education, Health care, and Public Administration sub-categories in the year 2004. And finally, in 2007, the "Sustainability Excellence Award" was included in the categories for Turkey or organisations that won grand prizes in Europe to apply. The National Quality Award has so far received 275 applications from organisations of which

a total of 93 awards has been given (KalDer, 2018). Among the major award-winning organisations are; Brisa, Tuşuş, Motor Netaş, Beksa, and Arçelik (Yamak, 1998). The strategic partnership between the Turkish Society for Quality and the European Foundation for Quality Management (EFQM) has enabled 25 Turkish organisations to win the EFQM Excellence awards, made up of 8 grand prizes and 17 awards.

1.8. Theoretical Framework and Hypotheses

The theoretical framework of this study has been designed with the help of various literature on Total Quality Management. The framework is purposely designed to facilitate the understanding of the impact of TQM practices on the operational performance of manufacturing companies. Theoretical frameworks generally serve as the "blueprint" for the study, always providing a deeper understanding of how the study will be approached philosophically, epistemologically, methodologically and analytically (Grant & Osanloo, 2014). This study's framework therefore examines the various TQM practices considered significant to the improvement of operational performance of manufacturing companies. But of course, for a very comprehensive, holistic and well researched philosophy like TQM, the existence of a single and generally accepted criterion for categorising its practices or elements is as impossible as raising the dead. However, upon all the numerous quality criteria available in the system, the most preferred criteria for most scholars are those established by the famous national quality awards, most definitely because of how reliable and properly organised they are.

The quality award models provide a useful audit framework against which organisations can evaluate their TQM practices and as well seek improvement opportunities (Zhang, 2000). It is however imperative to emphasize that there isn't any consensus among the quality award models with regards to the total quality criteria that should be adopted by organisations. Differences in culture and general business environments of countries have however become the major cause of the differences in the TQM criteria of these national quality awards. The empirical constructs of this research are however guided by the quality criteria of the most popular national quality award – Malcolm Baldrige National Quality Awards (MBNQA).

1.8.1. Total Quality Management Practices or Constructs

As indicated earlier, this research adopts the quality criteria of MBNQA. The MBNQA framework comes along with seven award criteria with which the empirical work aims to validate as constructs and determine the possibility of a significant between the first six practices (serving as independent variables) and the seventh one, that's operational performance. The quality criteria of MBNQA are presented in detail as follows;

1.8.1.1. Leadership

DuBrin (1995) defines leadership as the ability to instil the required confidence and support among all the individuals that work towards achieving organisational goals. It is the ability of top management to establish, practice, and lead a long-term organisational vision, that is guided or compelled by the dynamics of customer requirements as opposed to an internal or management influences (Anderson et al. 1994a). The significance of top management leadership and commitment to the successful implementation of TQM and by far, the achievement of the overall organisational objectives has been emphasised by both the EFQM and the MBNQA award models. They both recognised the relative importance of leadership by assigning relatively higher points to it in their respective quality criteria. The whole idea of leadership as a TQM construct is to highlight the crucial role of top management in the pursuit of continuous quality improvement.

The TQM pyramid of Dahlgaard et al. (2007) equally recognised the significance of leadership in the implementation of TQM when they reserved the first spot of the list to leadership ahead of the other TQM principles (focus on the customer and employees, focus on facts, continuous improvement, and everybody's participation). They posited that, for the achievement of "total quality", top management needs to be actively engaged/involved in the fundamental task of delineating or laying out the quality goals, policies and plans of the organisation as well as explaining them to the understanding of all employees. Whereas quality goals clearly indicate what is to be achieved in terms of quality, the organisation's quality policies vividly express how the goals are to be achieved by the employees (Dahlgaard et al., 2007).

Juran and Gryna (1993) also identified the roles of top management to include the establishment of quality policies and goals, provision of resources, provision of relevant training and inspiring improvement. It's evident from the literature that top management commitment takes a centre stage in the implementation and success of TQM. Brown et

al. (1994) categorically attributed the failure of TQM efforts in any organisation to, among other things, lack of top management commitment. It's however relevant to state that commitment alone is not enough, personal and active participation of top management in various TQM activities is equally required for the achievement of quality goals. Not only that, top management should inspire and actively involve employees in quality management activities at all levels and times. The most effective way of ensuring employee involvement is through empowerment. Workforce empowerment involves the delegation of decision-making authority to employees at the lowest levels of the organisation (Dahlgaard et al., 2007). So, to better lead the organisation effectively, top management must empower employees with the needed authority, education and training to tackle the day-to-day quality problems they confront in the performance of their duties. As a principal "driver" of TQM, leadership examines top management's involvement in the establishment of strategic objectives and a management system that greases the wheels for personal development, high organisational performance and learning (Samson & Terziovski, 1999). Proponents of TQM accentuate the roles of top management much like the transformational leadership theory (Burns, 1978; Bass, 1985). The successful implementation of TQM therefore requires an effective change in an organisation's culture, which is almost impossible without the concerted efforts of top management directed towards continuous improvement, open communication and cooperation throughout the value chain (Abraham et al., 1999; Adebanjo & Kehoe, 1999; Bell & Barnham, 1989; Choi, 1995; Daft, 1998; Ettkin et al., 1990; Goodstein & Burke, 1991; Hamlin et al., 1997; Handfield & Ghosh, 1994; Ho et al., 1999; Zeitz et al., 1997). Top management leadership has been found to have a positive impact on the operational performance of businesses in the studies of Ahire & O'Shaughnessy (1998), Dow et al. (1999), Phan et al. (2011) and Samson & Terziovski (1999).

1.8.1.2. Strategic Planning

Strategic planning as a TQM practice focuses on how best the organisation align their strategic and business plans to the satisfaction of customers, quality and operational performance excellence. Evans and Lindsay (1995) explained that strategic planning emphasizes on the deployment of strategic and business plans that enable the organisation to better meet customers and operational performance requirements. It lays emphasis on the need to make quality, customer satisfaction and operational performance an essential

component of the overall business or strategic planning. It is however imperative, at this juncture, to draw a line of distinction between strategy from the TQM perspective and corporate strategy. Whereas the TQM perspective focuses largely on decisions or plans that enable a business unit to compete for a set of customers, corporate strategy on the other hand involves deciding which customers to compete for. In essence, a TQM strategy determines and channels all production resources into the provision of quality and satisfaction to specific set of customers in a manner that no competitor can do. A well planned and implemented TQM strategy therefore increases companies' ability to better produce products that absolutely meet quality and customer requirements, thereby making the company more competitive than their counterparts in the market.

For the purpose of determining a company's suitability for a quality award, a matter of great importance to quality experts or examiners is the issue of determining the presence of a strategic plan that is laced with high quality goals and specific methods for its implementation (Kiran, 2017). Teh et al. (2009) postulate that strategic planning increases firms' ability to achieve their short and long-term goals through the formulation and deployment of participative plans as well as maintaining an improved relationship with their customers, suppliers and business partners. As an element of TQM, strategic planning advocates for the integration of issues related to quality and customer satisfaction into the organisation's strategic and operational plans, in a manner that enables the organisation to clearly establish key priorities and target goals and appropriately allocating resources among things that really matter in the organisation (Godfrey, 1993).

The improvement of quality is a long-term competitive strategy (Barclay, 1993; Deming, 1986; Juran, 1986; Lascelles & Dale, 1989; Peters, 1988; Tilley & Rutledge, 1991) that demands a long-term management orientation (Mahour, 2006). Like most total quality practices, several studies such as Phan et al. (2011) and Ittner & Larcker (1997) have found strategic planning to have significant correlation with operational performance, customer satisfaction, financial performance and overall organisational performance.

1.8.1.3. Customer Focus

So long as profit maximization remains the topmost priority or objective of business organisations, steps towards satisfying customers or clients must be given the necessary attention. Satisfying even a single customer however entails a lot of hard work and

dedication from all organisational members especially with respect to the design, production and distribution of goods and services. In short, organisations need to be customer focused in order to stay ahead of competition and achieve the desired financial growth. Customer focus is basically the rate at which an organisation fully and continuously meets the needs and expectations of its customers. The major distinguishing factor between successful and non-successful companies therefore lies in amount of importance they attach to the satisfaction of customer needs in all decisions. Evans and Lindsay (1995) indicate that the customer focus element of TQM examines the firm's ability to perfectly determine the current and emerging requirements and expectations of customers, establish and maintain effective customer relationships as well as ascertain the satisfaction of customers.

The Philips Quality (1995) categorically states that successful organisations are those that acknowledge the need to place their customers first in every decision they make. The central idea of quality management therefore is to maintain a good customer relationship that enables firms to fully understand the needs of customers as well as determine the extent at which those needs are met. It has been suggested by Deming (1986) that all the production efforts (products/services) of organisations should be geared towards satisfying the needs of customers.

To better serve customers, every organisation needs to establish an effective and continuous flow of communication between themselves and their customers such that the customers' needs, and complaints can easily be received. Customer complaints although undesirable, serves as the customers' evaluation of products and services acquired and therefore an opportunity to improve the quality of those products or services. Juran and Gryna (1993) advised firms to as a matter of great importance determine the "vital few" serious complaints that require full-scale analysis to unearth their root causes as well as ways to remedy the situation. Being a customer-focused company therefore has much to do with the amount of efforts the company puts into resolving the complaints of their customers. It also involves the critical assessment, preferably from customers perspective, of the finished products' ability to satisfy the needs of customers.

A reliable way by which organisations can easily obtain information about the rise and direction of customer needs is through a well-conducted market research. A market research if properly conducted, creates a platform for customers to freely express their

views about the products of the company. Most often than not, these market research results contain all the relevant information needed to fully understand the expectations, needs and complaints of customers, thereby helping the organisation to produce the best of quality for the customers. The studies of Tari & Claver (2008), Grandzol & Gershon (1997), Terziovski et al. (2003) and Samson & Terziovski (1999) all found customer focus to be a strong predictor of operational performance.

1.8.1.4. Measurement, Analysis and Knowledge Management (Information & Analysis)

TQM as a management philosophy strongly advocates for the need to have all management and production decisions made based on quality and reliable company data. Information and analysis as an element of TQM emphasises on the analysis of customers, operations and materials related data to improve the firm's ability to successfully achieve their quality goals. It requires that organisations adopt the most appropriate techniques from among the variety in the system to gather as well as effectively process information based on which key management decisions can be made. From the introduction of a new product, establishment of new distribution channels to the re-engineering of existing processes, the TQM element encourages strongly that all organisational decisions be supported by concrete and accurate data. Management are also required to continuously increase their financial, human and other resource commitment to raise the level of Information Technology in their organisations. It's strongly believed that organisations that fully appreciate the power of IT and are willing to integrate it into their processes are many times closer to the achievement of their goals than their counterparts. Information and analysis basically examine the sourcing, management and effective use of information and data to facilitate the smooth flow of key company processes, action plans and performance management systems.

An effective use of information drives the continuous improvement initiatives of companies as well as help them to stay ahead of their competitors (Kuratko et al., 2001). The fact has always been that having knowledge or information about the experiences of customers regarding the company's products and services crucial to the improvement of processes that create the needed customer satisfaction. The realization of the TQM vision is therefore strongly tied to the successful establishment of systems that continuously collect, measure, and report quality information or facts (Dahlgaard et al., 2007). The

quality management process must always begin with the effective measurement of external customers' satisfaction, internal customers' satisfaction as well as all the organisation's internal processes, such that quality managers can design quality management programmes that best suit their organisation. Although this is in sharp contrast to the traditional and retrospective approach that mainly measured company's business results, incorporating customer and employee satisfaction into the measurement naturally improves firms' ability to successfully achieve their overall objectives. It is however important to note that in measuring or collecting data about customer satisfaction, measurement efforts need to be extended to cover different quality parameters to enable organisations to design quality improvement techniques that actually yield the highest satisfaction to every customer.

Since every organisation's ability to satisfy their external customers is largely dependent on how satisfied their internal customers (employees) are, it's proper to make conscious efforts towards instilling quality into their people through the implementation of techniques that produce maximum employee satisfaction. Just like customer satisfaction, the satisfaction of employees needs to be carefully or regularly measured and communicated to top managers so that improvement can be made wherever necessary. Information related to employee satisfaction directly communicates the motivational levels of employees as well as how far they can go in the planning and execution of strategies that produce higher quality, customer satisfaction and competitive advantage.

Finally, quality control points must be established to measure the quality of outputs produced by the organisation's processes. TQM is process oriented (Dahlgaard et al., 2007) and so efforts must be made by management and employees to identify and deal with all the defects in their internal processes. For most processes, determining the "Total Defects per unit" becomes the most reliable way to assess their performance, although other tools such as cause-and-effect diagrams (fishbone), flowcharts, control charts, scatter diagram, checklists, Pareto charts and histogram exist. It's worthy to note that, many studies in the field (Lakhal et al., 2006; Valmohammadi, 2011; Sahoo & Yadav, 2017) have found a significant correlation between Information and Analysis as a TQM element and operational or overall performance of organisations.

1.8.1.5. Human Resources Management

Also instrumental to the success of TQM in any organisation is the management of the organisation's workforce. It involves aligning the coordinated efforts of the workforce with the strategic directions or plans of the organisation. Garvin (1991) believes that an ideal human resource management approach is the one that gives voice to the people in the organisation. The management of employees in the context of TQM implementation entails but not limited to, four main concepts; employee participation, employee incentive, employee training and employee satisfaction.

Employee participation describes the degree at which employees are engaged or involved in various quality management activities (Waleed, 2012). The participation of employees in total quality activities creates an enabling environment for them to acquire new knowledge, experience the benefits of quality disciplines, as well as obtains a high sense of accomplishment by addressing quality problems (Zhang, 2000). Juran and Gryna (1993) posited that participation is decisive in inspiring action on quality management. The participation of employees is epitomised by teamwork, employee suggestions and employee commitment.

Employee incentive explains the kind of recognition and reward system that an organisation puts in place to improve employee motivation and performance. Whereas recognition describes the public acknowledgement an exceptional performance or achievement of a specific activity or goal, rewards are the benefits, such as salary increment, bonuses, promotion etc. That are giving in honour of superior performance with regards to goals (Juran & Gryna, 1993). Deming (1986) believes that public recognition is an essential source of human motivation. A remarkable feature of any great quality improvement program therefore is in its ability to dully recognise individuals, sections, departments or divisions within the firm that have demonstrated significant improvement in their performance (Dale & Plunkett, 1990). Rewarded and recognition programs are means of approving certain behavioural patterns in humans, so an objective and well-instituted reward system motivates organisational members to put in their best. Organizations that value quality and customer satisfaction can have them easily achieved by integrating them into their reward and recognition programs. Hackman and Wageman (1995) observed that most TQM implementation organisations have had their

performance measurement and reward systems adjusted in a manner that specific quality goals achieved can be assessed and rewarded.

Employee education and training is another great way of managing the human resources of the firm to achieve higher performance. The reason being that education and training equip employees with the required skills and knowledge to effectively deal with organisational problems. Whereas education seeks to provide employees with the general knowledge needed to address varied organizational situations (Cherrington, 1995), training is aimed at providing employees with specific skills or knowledge needed to perform specific organisational activities. A sound education and training program however is the one that is systematically designed to provide employees with the specific skills and knowledge required to accomplish the goals of the organisation. Such a program transforms key organisational data such as the organisational goals, required skills of the workforce, and the strengths and weaknesses of the workforce. It's for this reason that training is the second most commonly used TQM implementation practice in the United States (Hackman and Wageman, 1995).

The involvement and satisfaction of employees exert a higher degree of influence on the continuous improvement and customer satisfaction efforts of businesses. The achievement of both concepts therefore largely depends on how satisfied and well-motivated employees of the organisation feel. It is therefore obvious that the satisfaction of the final users of the organisation's products and services can only be guaranteed when the internal customers (employees) are satisfied and motivated first. TQM has been established on the back of the entrenched theory that require employees to treat their colleagues as valued customers. Albrecht (1993) puts it perfectly well when he states that internal departments operate more like customer-oriented businesses, that will do everything possible to attract and retain customers in a free and competitive market.

An organisation that ensures an efficient internal service delivery among its employees and departments definitely achieve some of the major components of the TQM framework such as lower costs, lower waste, and enhanced external service quality. The significance of employees has also been emphasised or stressed after "People" has been featured in the "4Ps" (People, Partnership, Process and Products) every company needs to achieve excellence. Dahlgaard and Dahlgaard (1999) posit that for a company to be able to produce excellent products, excellent employees, excellent partners and excellent

processes need to be tactically combined. This drives home, the point that, employees of any organisation are the key drivers of business excellence. Previous studies (Dow et al., 1999; Samson & Terziovski, 1999; Fotopoulos & Psomas, 2009; Psomas et al., 2014) have found that Human Resource Management has a positive effect on operational performance.

1.8.1.6. Process Management

Process management is a fundamental element of TQM that helps to deepen our understanding of how total quality management distinguishes itself from the old-fashioned (Inspection) way of controlling the quality of products that reach the final consumer. TQM has proven to be the best approach to quality management partly because of the fact that it strongly advocates for quality to be built into the whole production process rather than checking for defective products at the end of the production line. In the view of Sit et al. (2009), process management is the systematic approach that involves the efficient and effective use of all organisational resources to achieve performance excellence targets. It also involves the systematic recording and control of significant processes as well as the quality of products (Gotzamani and Tsiotras, 2001). Process management adopts a preventative approach to quality improvement by ensuring that drastic efforts are made to design processes that are less prone to errors and defects in their outputs. Once variations in the production processes are reduced to the minimum, finished products will be highly uniformed as well as conformed strongly to pre-determined production specifications leading to decreased waste and rework costs.

Ideally, the quality of the processes in the entire value chain determines the quality of products or services to be produced. TQM as a quality management approach fully supports this fact and as such, recommends strongly that process management be given all the attention it deserves if the organisational objectives are to be achieved. Every activity in the value chain counts a lot, and to able to identify and rectify quality problems in time, employees must, as early as possible, personally report interruption of any kind to management for a redress. The fascinating aspect of process management is the fact that, it focuses on organisational activities rather than business results, through a set of methodological and behavioural activities (Sadikoglu & Olcay, 2014). It requires that businesses design proactive and protective approaches that see to it that business activities

are actively and continuously monitored to avoid the occurrence of higher variations in the processes that will end up affecting product quality (Sadikoglu & Zehir, 2010).

An effective way by which organisations can improve their product quality is by enhancing the reliability of machines as well as minimise obstructions in production through regular preventive maintenance of equipment (Ho et al., 1999). Having all production equipment in shape at all times reduces drastically the number of defects in their output of processes and thus reduce lead times and cost of rework. Effectively managed processes increase the percentage of products that passes through final inspection without the need for rework (Flynn et al., 1995). Ultimately, the more prevention-oriented processes get, the more costs are reduced, and profit maximization improves (Sadikoglu & Olcay, 2014).

Business organisations also have the chance to increase their efficiency as well as minimise waste and costs by strategically redesigning their processes. The achievement of better performance therefore depends on the degree at which organisations regularly evaluate and improve their processes (Appiah Fening et al. 2008). The research findings of Forza and Filippini (1998), Lee et al. (2003), Kaynak (2003), and Phan et al. (2011) all reported that a significant relationship exist between process management and operational performance.

1.8.1.7. Business Performance

Business performance as a TQM element focuses mainly on quality, operational, financial and many other performance dimensions of organisations. The comprehensive nature of the TQM philosophy makes it possible for organisations to successfully achieve their desired performance goals without any recourse to their size, geographical location, industry or organizational structure. This perfectly explains why the TQM literature is flooded with uncountable number of studies all examining the effects of TQM on one dimension of performance or the other. And even among studies that investigated the effect of TQM on the same performance indicator, the constructs used for the measurement surprisingly set them apart, hence the categorization of studies based on performance indicators becomes an extremely difficult task. The situation becomes even worse when the focus is on performance dimensions such as operational performance, quality performance, inventory management performance and market performance.

Notwithstanding that, the review of the literature particularly revealed rather a few numbers of published studies on the effect of TQM implementation on operational performance, prominent among them being Samson & Terziovski (1999) and Baird et al., (2011). For most of the studies (Kaynak, 2003; Sadikoglu & Zehir, 2010; and Sadikoglu & Olcay, 2014) too, operational performance only formed part of the multiple performance indicators investigated. The commutative effect of all these issues is that, most of the recent researchers on the topic are forced to either follow the quality framework of a particular quality award or adopt the research model of a well-conducted previous study. The case of this current study isn't in any way different as it followed the quality criteria of the most popular quality award (Malcolm Baldrige National Quality Award) and is as well inspired by the work of Samson & Terziovski (1999) and Baird et al. (2011). In contrast to Samson & Terziovski (1999) that measured operational performance using constructs such as customer satisfaction, employee morale, productivity, quality of output and delivery performance, Baird et al. (2011) measured operational performance based on inventory management performance (improved purchased material inventory turnover, and total inventory turnover) and quality performance (product/service quality, increased productivity, reduced cost of defects and reworks, and reduced delivery lead-time of finished products/services to customers). For this present study, operational performance was measured using product/service quality, cost of scrap and rework, productivity, inventory management, delivery lead-time of finished products/services to customers, and level of customer complaints. In effect, the operational performance constructs (product/service quality, cost of scrap and rework, productivity, inventory management, delivery lead-time of finished products/services to customers) of this study were adopted from Samson & Terziovski (1999) and Baird et al. (2011). The level of customer complaints construct was also adopted from Ahire and Dreyfus (2000).

What's however obvious and of course worth mentioning is the fact that, despite the differences in the research or TQM models adopted by previous studies, majority of them still presented similar findings on the effect of overall TQM practices on the operational performance of organisations. Studies such as Flynn et al. (1995), Samson & Terziovski (1999), Kaynak (2003), Zeng et al. (2015), Saleh & Sweis (2017) all reported a positive significant relationship between TQM practices and operational performance.

Surprisingly, an aspect of the topic that got researchers divided, which this meta-analytical study aims to address, is the effect of the individual TQM practices on operational performance. Evidence of the many conflicting findings on the issue has been discovered through a review of the TQM literature. The research findings of Lakhal et al. (2006), and Samson & Terziovski (1999) on the effect of "Information & Analysis" on operational performance, for instance, confirm that assertion. Whereas Lakhal et al. (2006) reported a direct and significant relationship, Samson & Terziovski (1999) reported that "Information and Analysis" is negatively related to operational performance. A widespread of such contradictions can also be traced to the other TQM practices.

1.9. Research Model and Hypotheses

1.9.1. Research Model

A model of the relationship between the TQM practices (Top management leadership, Strategic planning, Customer focus, Information and analysis, Human resources management, and Process management), operational performance (product/service quality, cost of scrap and rework, productivity, inventory management, delivery lead-time of finished products/services, level of customer complaints) and moderating factors designed for this study has been presented in figure 1.6. Aside the adjustment made to the operational performance dimension with regards to the constructs, explained earlier, possible moderating factors were also introduced to assess their possible effect on the TQM-operational performance relationship. It's in recognition of the fact that the relationship under investigation is very broad, and operational performance can be influenced by other factors aside TQM. In line with this, three moderating variables (firm size, industry type and geographical location) have been included in the model.

1.9.2. Hypotheses

Based on the discussion above, the following hypotheses are proposed to examine the effect of TQM practices on operational performance. The TQM-operational performance relationship itself has been examined/tested using Hypothesis (H_1) and (H_3) whiles Hypothesis (H_2 and H_4) were used to test for a possible influence of moderating variables on the TQM-operational performance.

H_1: Aggregate TQM practices have significant relationship with the operational performance of manufacturing companies.

H_2: The relationship between aggregate TQM practices and operational performance of manufacturing companies is influenced by moderating factors.

H_3: Individual TQM practices have significant relationship with the operational performance of manufacturing companies.

H_{3a}: Top management leadership is positively related to operational performance.

H_{3b}: Strategic Planning is positively related to operational performance.

H_{3c}: Customer focus is positively related to operational performance.

H_{3d}: Information & analysis is positively related to operational performance.

H_{3e}: Human Resource Management is positively related to operational performance.

H_{3f}: Process management is positively related to operational performance.

H_4: The relationship between individual TQM practices and operational performance of manufacturing companies is influenced by moderating factors.

H_{4a}: Top management leadership and operational performance relationship is influenced by moderating factors.

H_{4b}: Strategic Planning and operational performance relationship is influenced by moderating factors.

H_{4c}: Customer focus and operational performance relationship is influenced by moderating factors.

H_{4d}: Information and analysis and operational performance relationship is influenced by moderating factors.

H_{4e}: HRM and operational performance relationship is influenced by moderating factors.

H_{4f}: Process management and operational performance relationship is influenced by moderating factors.

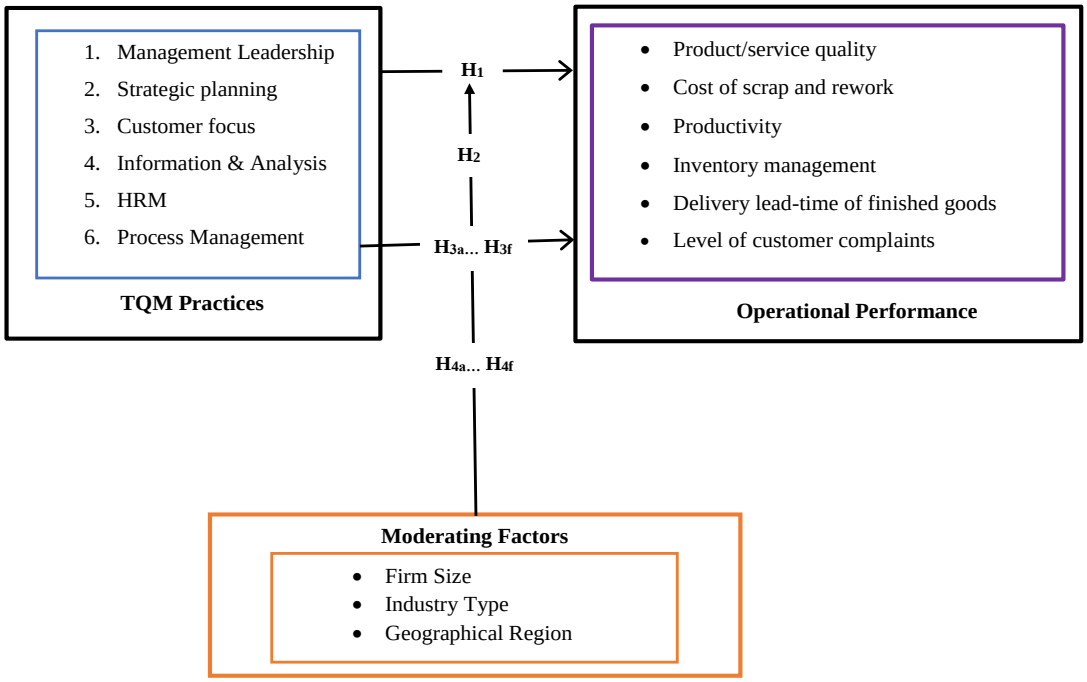

Figure 1.6: The Research Model

1.10. Summary

This meta-analytical study aims to examine the possibility of a significant relationship between TQM practices and the operational performance of manufacturing companies through literature review and the quantitative synthesis of the findings of previous studies. This chapter therefore presents the review of the TQM literature with emphasis on the concept of quality total quality, evolution of TQM, pioneers of the TQM philosophy, and the national quality awards. The chapter as well presented in detail, the theoretical framework for the study made up of six elements of TQM (Top management leadership, Strategic planning, Customer focus, Information and analysis, Human resources management, and Process management) mainly adopted from the MBNQA quality framework. The dependent variable (operational performance) is also measured with constructs such as product/service quality, cost of scrap and rework, productivity, inventory management, delivery lead-time of finished products/services, and level of customer complaints. The proposed research model also shows the relationship between TQM practices (individually and as a whole) operational performance as well as the effects of moderators on the proposed TQM-operational performance relationships.

CHAPTER 2: RESEARCH METHODOLOGY

2.1. Introduction

This quantitative research was carried out with the major aim of investigating the relationship between Total Quality Management (TQM) practices and the operational performance of manufacturing organizations. Meta-analysis was adopted to explore the magnitude of TQM implementation effect on the performance of businesses. This chapter therefore presents discussions of the methodology and research design, detailed explanation of sampling and sampling procedures as well as data analysis.

2.2. Research Design and Rationale

To fully understand the research design and of course the rationale of any study, the research questions and hypothesis of that study need to be clearly stated and understood. As this research was undertaken purposely to examine the strength of the relationship between TQM practices and the operational performance of manufacturing firms, posing certain questions as well as testing some hypothesis was deemed appropriate in achieving the research objectives. Among the questions raised in this study, the central question of which lots of efforts were made to address was;

RQ_2: Which TQM practices are best predictors of operational performance?

Addressing the research question was considered extremely important because several TQM studies as well as national quality award schemes identified several kinds of practices such that quality practitioners currently find it difficult to tell which practices really guarantee higher performance. Although the mighty Malcolm Baldrige National Quality Awards (MBNQA) model was adopted as a guide, due to its popularity and clarity, there is still the need to investigate the level at which each identified practice contributes to the operational performance of manufacturing organizations.

Aside the research questions, several hypotheses were also formulated and tested to provide a deeper understanding of the problem under investigation. The main hypothesis for this study is stated as;

H_1: Aggregate TQM practices have significant relationship with the operational performance of manufacturing companies.

From the hypothesis stated, it is evidently clear that TQM practices were the independent variables whiles operational performance was the dependent variable. And for the

purpose of drawing conclusions based on previous studies, a meta-analysis was adopted as the research design for this study. Meta-analysis is an objective and quantitative method through which previous studies on a topic are statistically synthesized to assess the magnitude of the effects across the studies (Burns and Burns, 2008). Hunter and Schmidt (2004) postulated that meta-analysis of correlation is a methodology that provides a deeper understanding of a phenomenon through the description of the independent and dependent variables. It has proven to be effective in the provision of quantitative descriptions in the operations management field (Gerwin & Barrowman, 2002; Nair, 2006; Mackelprang & Nair, 2010; Yu et al., 2005; Ataseven & Nair, 2017; Geng et al., 2017). The methodology is widely regarded as an essential component of scientific research and theory formulation (Rosenthal & Rosnow, 1991; Hunter & Schmidt, 2004). Meta-analysis was therefore used as a statistical technique to identify, aggregate and summarize the findings of TQM and operational performance studies from 1997 to 2017.

2.3. Sample and Sampling Procedure

Most often than not, it is highly impossible to investigate all the population of a study. For any study, the population relates to all the individuals or units of interest. This therefore makes sampling; the selection of a group from a larger population that is a representative of the larger population (Som, 1973) an integral part of any scientific research. Sampling provides a convenient avenue for generalization to the target or accessible population to be made based on the findings on a sample. It is for this reason that sampling is as important as the sample in any study. For it is believed that, the sampling technique adopted greatly influence the generalizability of findings based on the sample.

Generally, the two major techniques that are mostly employed to draw a sample from a population are the probability and non-probability sampling. Whiles the probability sampling techniques provides an equal chance for every character (person) in the population to be included in the sample and include methods such as the random sampling, stratified random sampling and cluster sampling, the non-probability sampling technique does not create a room for every member of the population to be included in the sample and includes purposive sampling, snowball sampling, quota sampling and convenience sampling methods. Also limited to non-probability sampling is the fact that,

researchers can draw samples purely based on their subjective judgements. But for the purpose of this meta-analytical study, a 3-stage literature review was conducted to constitute the sample.

2.3.1. Stage 1: Search for Literature

The first stage towards gathering primary studies (both published and unpublished) to constitute the sample for this meta-analytic study mainly involved a two-step extensive literature search: computerised database search and manual search of existing literature.

2.3.1.1. Computerized Database Search

With the help of the Sakarya University E-Library resource, a comprehensive search of the most prominent and popular databases especially in the field of business and economics was conducted. Worthy of mentioning among the databases accessed for published articles and dissertations were Emerald Insight, ScienceDirect, EBSCO$_{host}$, Taylor & Francis Online, ProQuest, SAGE Journals, Springer and Google scholar. The search was done with the combined following keywords: "Total Quality Management", "TQM", "Quality management practices" and "operational performance", "organizational performance", "firm performance" and "business performance".

2.3.1.2. Manual Search

Although the computerised search produced several articles and dissertations, the researcher undertook a manual review of the bibliographies of most of the published studies to identify studies that could not be found through the computerised search. Not only that, being strongly moved by the desire to prevent the "file drawer problem" where five percent of the studies in journals are Type 1 errored and 95 percent of the studies in the lab's file drawers are non-significant (Rosenthal, 1984), a comprehensive search for unpublished studies including dissertations was conducted on the ProQuest and EBSCO search engines which help to ensure that the findings of this meta-analysis are free of biases due to the absence of unobserved and unobservable effect sizes (Lipsey & Wilson, 2001). This move was especially necessary because a meta-analysis is considered incomplete if a portion of the population is intentionally left out (Doris, 2004).

2.3.2. Stage 2: Inclusion and Exclusion Criteria

To be included in this meta-analysis, every study needed to meet the specific but extensive inclusion criteria that was set up for the purpose of getting rid of studies that had little or no relation with the topic under investigation. Inclusion and exclusion criteria basically

are the key features of the target population that determine their ability to be used to answer the research questions (Patino & Ferreira, 2018). The criteria adopted to include or exclude primary studies in this thesis therefore were to help curb the file-drawer, garbage and apple-orange effect associated with meta-analysis. For inclusion purpose, each study should:

- Be quantitative and empirical in nature.
- Measure TQM practices and operational/organizational performance relationship.
- Focuses on manufacturing companies
- Be published in English; aside English, studies published in any other language were excluded.
- Be published between 1997 and 2017; the search for literature was conducted at the end of March 2018 to ensure that studies published in the last quarter of 2017 were retrieved.
- Define operational performance strictly as product quality, waste reduction, productivity, quick delivery and inventory control.
- Report adequate statistical information such as sample size and effect size (either correlation or mean difference).

The above stated criteria were strictly followed in determining studies that should or should not be included in the meta-analysis.

2.3.2.1. Results of Searches

The initial stage of the literature search which was characterised by a computerised search of key terms such as "Total Quality Management", "TQM", "Quality management practices", "operational performance", and "organizational performance" in databases such as Emerald Insight, ScienceDirect, EBSCO, ProQuest etc. produced a total of 469 published and unpublished studies. The manual review of the bibliographies of most of the studies also produced 6 studies which brought the total number of studies retrieved to 475. To determine whether the collected studies examined the relationship between TQM practices and operational performance and for that matter meet the inclusion criteria, the abstracts of all the retrieved studies were reviewed. For some studies however, the researcher had to go beyond the abstract to review the study methodology and/or results section just to be sure whether to include or exclude the study.

The review of the abstracts led to the elimination of 400 studies which were either not related to manufacturing companies, not quantitative and empirical or failed to report sufficient data to compute effect sizes needed for the meta-analysis.

2.3.3. Stage 3: Final Selection

The full text of the remaining 75 studies were carefully perused to determine their suitability for the meta-analysis. The full text review finally resulted to the exclusion of 54 studies, thereby leaving 21 studies for the meta-analysis. Out of the 54 excluded studies, 37 were expunged simply because no effect size of TQM-operational performance relationship was reported either through Pearson correlation coefficient or other test statistics like Cohen's d that can easily be converted to r, the Pearson's correlation. The remaining 17 studies were however thrown out based on their sample. They all had as part of their sample both manufacturing and service organizations in which service organizations formed the majority (in most cases above 65 percent). Simply put, those studies measured the relationship by focusing on business organizations in general and not just manufacturing firms. The researcher thought that including those studies in the meta-analysis will negatively influence the findings of the study and will therefore makes it highly impossible for the research objectives to be achieved.

To this end, 21 studies made it out of the comprehensive review process taking the specified inclusion criteria into consideration. The steps of the sampling procedure are presented in Appendix 1. So, for this meta-analysis, 21 studies with 21 effect sizes and an aggregate sample size of N=3,735 were considered. The summary of the studies used is captured in Table 2.1;

Table 2.1

Summary of Studies Included in the Sample

Paper	Sample	Method	TQM Practices	Performance	Findings
Samson & Terziovski (1999)	1024	Regression	1. Leadership 2. People management 3. Customer focus 4. Strategic planning 5. Information and analysis 6. Process management	Operational	TQM practices affect operational performance.
Ho et al (2001)	50	Regression	1. Employee relations 2. Training 3. Quality data & reporting 4. Supplier quality management 5. Quality performance	Organizational	TQM practices affect organizational performance.
Kaynak (2003)	214	SEM	1. Management Leadership 2. Training 3. Employee Relations 4. Quality data and reporting 5. Supplier quality management 6. Product or service design 7. Process management	Operational Organizational	TQM positively related to firm performance
Demirbag et al (2006)	141	SEM	1. Role of Top Management 2. Quality data and reporting 3. Employee relations 4. Supplier Quality Management 5. Training 6. Process Management	Organizational	TQM is strongly related to non-financial performance.

Table 2.1:
Continued

Feng et al (2006)	252	SEM	1. Leadership 2. People management 3. Customer focus 4. Process management 5. Strategic planning 6. Information and Analysis	Quality & Innovation	TQM practices directly influence quality and innovation performance.
Lakhal et al (2006)	133	SEM	Critical TQM Practices classified into: 1. Management practices 2. Infrastructure practices 3. Core practices	Operational Organizational	A positive relationship exists between TQM practices and organizational performance.
Chung et al (2008)	79	Correlation Analysis	1. Leadership and Management 2. Information and Analysis 3. Strategies and Planning 4. Human Resource Operations 5. Business process management 6. Customer Satisfaction	Operational	TQM execution directly influence operational performance.
Fening et al. (2008)	116	Regression	1. Leadership 2. Strategic planning 3. Human resources management 4. Customer focus 5. Information and analysis 6. Process management 7. Quality and operational results	Organizational	Significant relationship exists between TQM practices and firm performance.

Table 2.1:
Continued

Salaheldin (2009)	139	SEM	Strategic Factors: 1. Top Management Commitment 2. Top Management Commitment 3. Organizational culture 4. Leadership 5. Continuous improvement etc. Tactical Factors: 1. Employee Empowerment 2. Employee involvement 3. Employee training 4. Team building & problem solving. Operational Factors: 1. Product & service design 2. Process control 3. Management of customer relationships 4. Customer & market knowledge	Operational Organizational	There's a substantial positive effect of TQM implementation on both operational and organizational performance.
Fotopoulos & Psomas (2010)	370	SEM	1. Top management 2. Employee Involvement 3. Customer focus 4. Process and data management 5. Quality tools and techniques implementation	Operational Organizational	TQM practices significantly affect a company's performance.
Agus & Hassan (2011)	169	Correlation & SEM	1. Supplier relations 2. Benchmarking 3. Quality measurement 4. Continuous improvement	Operational (Production & customer-related)	TQM and its adoptions have significant correlations with

Table 2.1:
Continued

			5. Supplier relations 6. Benchmarking 7. Quality measurement 8. Continuous improvement		production and customer-related performance.
Baird et al (2011)	145	SEM & Multiple Regression analysis	1. Quality data & reporting 2. Supplier quality management 3. Product or service design 4. Process management	Operational	TQM practices help firms to achieve operational performance.
Awoku (2012)	17	Multiple Regression Analysis	1. Leadership-Employees Communication 2. On-time delivery 3. Competitive prices 4. Quality products 5. Employee inspiration	Organizational	TQM implementation affects organizations' performance positively.
Abusa & Gibson (2013)	56	Pearson's Correlation analysis	1. Top management commitment 2. Customer focus 3. Supplier quality management 4. People management 5. Continuous improvement 6. Process management	Organizational	TQM elements are significantly correlated with organizational performance.
Riyadi & Musran (2013)	118	Multiple Regression analysis	Critical TQM Practices: 1. Strategic factors 2. Tactical factors 3. Operational factors	Operational	Critical TQM practices have significant effect on operational performance.

Table 2.1:
Continued

Dubey (2015)	132	Regression	1. Leadership 2. Human Resource management 3. Quality culture 4. Relationship management	Financial and non-financial	Soft TQM practices are statistically significant determinants of firm performance.
Panuwatwanich & Nguyen (2017)	104	SEM	1. Leadership management 2. Training 3. Employee Relation 4. Quality data and reporting 5. Supplier quality management 6. Project design 7. Process Management	Organizational	TQM had significant and positive correlation with organizational performance
Patyal & Koilakuntla (2017)	262	SEM	Infrastructure Practices: 1. Top management 2. Customer relationship 3. Supplier relationships 4. Workforce management Core Practices: 1. Quality information and analysis 2. Product or service design 3. Process management	Organizational	Infrastructure and core QM practices directly influence firm performance.

Table 2.1:
Continued

Sahoo & Yadav (2017)	121	SEM	1. Cross-functional product design 2. Process quality Management 3. Quality Empowerment 4. Organization-wide employee training 5. Quality Information usage	Operational	TQM positively affects firm performance
Saleh & Sweis (2017)	40	Correlation	Soft – TQM practices 1. Customer focus 2. Education & training 3. Top management leadership 4. Supplier relationship Hard – TQM practices 1. Continuous improvement 2. Statistical quality control 3. Process management 4. Quality tools and techniques 5. Product design	Operational	Operational performance is significantly influenced by soft and hard TQM practices.
Valmohammadi (2011)	53	Regression	1. Leadership 2. Process management 3. Supplier relationship 4. Customer focus 5. Employee management 6. Communication & information system 7. Tools and techniques	Organizational	TQM practices have relationship with organizational performance.

2.4. Coding of the Studies

A very critical aspect of the methodology of this meta-analysis aside the research design and the sample, is the coding of the studies in the sample. In a typical meta-analysis, coding depicts the extraction and recording of the pertinent information or characteristics from individual empirical studies that has been included in the meta-analysis. Though tedious, coding provides an opportunity for the researcher to present underlining characteristics of the studies that meet the inclusion criteria. So far as this meta-analysis is concern, the coding of TQM-Operational performance studies was carried out through a three (3) step procedure; designing of coding form, establishment of coding instructions and the determination of coder reliability.

2.4.1. Coding Form

Like a questionnaire, coding form is an instrument used by researchers to extract all the pertinent information from every single study relevant for the meta-analysis. For each study, the coding form was purposefully designed to capture essential information such as the author's last name, year of publication, and the name of the journal. Worthy of mention also is the reliability (i.e. coefficient alpha) of dependent and independent variables, sample size (N), data analysis technique, TQM practices and performance measures. The researcher particularly gave much attention to the TQM practices identified in the various studies since different TQM practices were outlined by different researchers. Appendix 2 contains the coding form used to extract all the relevant information for the meta-analysis.

2.4.2. Coding Information

For each included study, a total of 12 pieces of information were retrieved by the coding form. The retrieved information was generally categorised into three; study identification, sample characteristics and outcome characteristics. The study identification category basically highlights the author's last name, year of publication and the journal of publication.

Sample characteristics on the other hand details the participants that took part in the study; either employees, top management or departmental heads. The company type was also recorded. Although manufacturing companies were the targeted sample for the meta-

analysis, those studies that included a minimal number of service companies in their sample were considered.

The outcome characteristics category then moves further to provide in-depth description of the TQM practices as well as the performance measures considered in the study. Even though operational performance was the major focus of the meta-analysis, some studies covered other performance measures such as organizational performance, customer satisfaction and market share growth. Closely related to this category of information was the statistical information used in calculating effect sizes. Though majority of the studies reported their effects through the Pearson's r, those reported in Cohen's d, means and standard deviation, F and t value etc. were equally documented. It was also a general rule that, studies that were deficient of the necessary statistical information be excluded from the meta-analysis since the previously established criteria for inclusion was not met.

2.4.3. Coding Instructions

A clear and concise set of instructions or guidelines were established to regulate the coding process. It provided a detailed description of all the relevant data needed for the meta-analysis as well as how to "fish" them out of every study. It was especially useful when the study characteristics appeared ambiguous. The coding instructions for this meta-analysis has been presented in Appendix 3.

2.4.4. Coding Reliability

To address the reliability of the coding procedure, the researcher decided to undertake the coding process a number of times. Firstly, about 10 of the included studies were randomly selected and coded to afford the researcher an understanding of the different ways by which the needed information was presented by different researchers. This was followed by the careful reading of the coding instructions and the coding of all the included studies. A comparison of the previous coding data of the 10 studies to the current data revealed that a lot of data was missing in the previous coding data. The coding procedure was repeated again, and the extracted data compared to the data extracted from the second coding. Having realised that the degree at which the coding data matches each other, coding data was deemed reliable for the meta-analysis.

2.5. Effect Size Conversion

For this meta-analysis, the Pearson's product-moment correlation, r, as suggested by Schmidt and Hunter (2004), was the effect size used. Although most of the included studies reported their findings in terms of product-moment correlation, they were some that reported theirs in Cohen's d (e.g. mean difference statistics, t-test or ANOVA). But for the purpose of integrating and/or appropriately synthesizing the findings of the various studies, it was highly essential to convert the different effect size statistics into a single common metric thus the product-moment correlation, r, using the Hunter and Schmidt's (2004) recommended effect size conversion formula. To ensure accuracy and transparency in the conversion process, the Wilson (2016) effect-size calculator, accessible through the Campbell Collaboration website was used. The Wilson effect-size calculator gives meta-analysts the opportunity to compute effect sizes from a variety of statistical tables and data as well as convert them from one effect size metric to another. After the study characteristics were properly coded and effect sizes converted to r (the common metric), the final meta-analysis was carried out.

2.6. Effect Size Estimates

Meta-analysis provides the basis upon which statistical data from multiple studies be combined to increase power, improve the size of effects or resolve uncertainty. A very important variable in the process of conducting meta-analysis is the effect size. Irrespective of the field of study, effect sizes remain the focal point around which meta-analysis revolved. Kelly and Preacher (2012) defined effect size as "a quantitative reflection of the magnitude of some phenomenon that is used for the purpose of addressing a question of interest".

Effect sizes generally can be expressed in so many ways (Durlak & Lipsey,1991) according to the nature and objective of the study. Studies that measure correlation association between dependent and independent variables usually use the product-moment correlation as the metric for effect size calculation, whiles studies concerned with group differences use the Cohen's d as the metric.

Without any regard to how effect sizes are expressed, they always form the bottom line for further and better analysis of the study findings. In line with the objectives of this

meta-analysis, each study in the meta-analysis sample produces at least one effect size, therefore the 21 studies produced a total of 21 effect sizes.

2.7. Interpretation of Effect Sizes

As much important to effect size estimation in the conduct of meta-analysis is the effect size interpretation. This is because, without an understanding of the standards for effect size interpretation, the results of any meta-analysis will never make any sense. Indeed, the meaningfulness of an effect size can be assessed by several standards (Cohen, 1977; Glass, McGaw & Smith, 1981; Lipsey, 1990). Cohen for instance regarded 0.1 as a minimal effect, 0.3 to be moderate effect and 0.5 as a meaningful effect.

Lipsey on the other hand categorised effect sizes into small, medium and large effect based on some ranges. Effect sizes below 0.32 are interpreted as small effect, medium effect is 0.32 – 0.55, and effect sizes greater than 0.55 are interpreted as large effect. So for this meta-analysis, the Cohen's (2003) effect size interpretation guideline was fully adopted.

2.8. Data Analysis

Like many meta-analytical studies, this meta-analysis follows the usual steps such as study selection, coding and the conversion of effect sizes into the appropriate statistics. Another essential step of the meta-analysis process was the choice of the appropriate model for the analysis. The researcher chose the random-effect model over the fixed-effect model mainly due to the diverse nature of the study samples. Schmidt and Hunter (2014) recommended that the fixed-effect model be used when all the studies under analysis are homogeneous across population effect sizes. But where the population parameters vary from study to study, the random-effect model should be used to conduct significance tests and confidence intervals.

2.9. Statistical Artefacts

Schmidt and Hunter (2014) identified 11 different artefacts that need to be given much attention in any meta-analytic study. Artefacts are simply errors in the primary studies that arise from study imperfections and therefore must be corrected using statistical information. As far as this study is concerned, two major artefacts; sampling error and error of measurement, were at the centre of consideration mainly because the information available could only correct the two and nothing else.

2.9.1. Sampling Error

Schmidt and Hunter (2014) considered sampling error as the most damaging artefact in narrative reviews. The size of the sample of any given study determines how accurate it can represent the study population. Whiles studies with larger sample size accurately represent their population, smaller-sized samples usually are non-representative and therefore results to sampling error. In line with the recommendation of Schmidt and Hunter (2014), sampling error was corrected in this meta-analysis by weighing the study findings by their sample sizes. This was done by calculating a weighted effect size for every study so that studies contribute to the meta-analysis conclusion based on their respective sample sizes. The Comprehensive Meta-analysis software particularly simplified the process of correction using the Schmidt and Hunter technique.

2.9.2. Error of Measurement

Being the second most frequently occurring artefact, measurement error is inversely related to reliability such that a decrement in reliability indicates an increment in measurement error and the vice versa. In this meta-analysis, error of measurement was corrected by adopting the Schmidt and Hunter statistical formula especially since the Pearson product-moment correlation is the metric for effect size calculation.

The formula is stated as;

$$\boldsymbol{r'_{xy}} = \frac{\boldsymbol{r_{xy}}}{\left(\sqrt{\boldsymbol{r_{xx}}} \cdot \sqrt{\boldsymbol{r_{yy}}}\right)}$$

Where; r'_{xy} is the corrected, weighted correlation coefficient; r_{xy} is the uncorrected, unweighted correlation coefficient; r_{xx} is the reliability for TQM practices; and r_{yy} is the reliability for operational performance.

2.10. Analysis of Heterogeneity

Variations in effect size that is attributable to systematic cross-sample variability was assessed in this study. This was necessitated by the model (random-effect model) adopted for this meta-analysis in which the assumption that the true effects are normally distributed. The heterogeneity test is therefore conducted purposely to assess the presence of heterogeneity in the study and for that matter the need to test for moderators. Although several methods have been developed over the years to perform this test, the Q statistic

and the I^2 index were adopted in this review. Hunter and Schmidt (1990) postulated that the Q statistic tests homogeneity in the true effect size across studies. Distributed as an approximate chi-squared distribution, the Q statistic indicates the presence of heterogeneity (moderators) whenever it is significant (Borenstein et al. 2009). At this stage, the I^2 index is needed to determine the degree of heterogeneity. Higgins et al. (2003) suggested that I^2 values on the order of 25%, 50% and 75% can be interpreted as low, moderate and high heterogeneity respectively.

2.11. Moderator Analysis

Meta-analysis is highly preferred over narrative reviews because of the opportunity it offers researchers to assess the effects of moderators on the relationship under investigation. Although several reasons may account for the across-study variability in effect size estimates, meta-analysis specifically allows for testing of the effects of third variables on the dependent and independent variables. Based on the recommendation of Nair (2006), this meta-analysis identified and examined three potential moderators – industry type, firm size and geographical regions. Just like the way the main meta-analysis results is interpreted, the degree at which moderators affect the proposed relationships would be determined by the summary effects and p-values produced after the moderator analysis is conducted. Whiles the summary effects communicate the strength of the moderating effects, the p-values would be used to determine the statistical significance of the moderator variables.

2.12. Summary

This research study used meta-analysis to identify, synthesize and summarize the findings of TQM-Operational performance studies from 1997-2017 to assess the relationship between TQM practices and the operational performance of manufacturing companies. The detailed description of how the meta-analysis was conducted is therefore presented in this chapter.

The chapter provides a detailed information on the various means by which previous studies were retrieved as well as the inclusion criteria that finally narrowed down the numbers to form the current sample of 21 studies. Since majority of the included studies reported their findings in terms of the product-moment correlation, the Pearson's

correlation coefficient (r) was adopted as the effect size matrix for this review. And the few studies that used other methods to report their findings were all converted into r.

Furthermore, individual studies were corrected for statistical artefacts (sampling error and measurement error to be precise) to get rid of errors in their findings that might have resulted from their samples, sampling techniques and statistical analysis of empirical data. Because the random-effect model was adopted for the analysis, there was a higher chance of heterogeneity even after the correction of the statistical artefacts. Hence, efforts were made to assess the degree of the heterogeneity as well as how that could affect the TQM-Operational performance relationship through a moderator analysis.

The next chapter therefore presents the processes leading to the quantitative synthesis of effect size data as well as the findings of the research. To facilitate understanding, the research findings has been carefully arranged in order of the hypothesis and research questions. Tables and figures were also used as a means of communicating the research results.

CHAPTER 3: RESULTS

3.1. Introduction

This research study adopts meta-analysis to examine the existing relationship between TQM practices and the operational performance of manufacturing companies. The magnitude of the TQM effect on operational performance is measured through the combination of effect sizes from TQM-performance related studies conducted between 1997 and 2017. The combination of effect sizes was carried out in a manner that clearly provides an avenue to find answers to the primary research question: To what extent does the application of TQM practices influences operational performance; as well as test the main hypothesis; TQM practices in a manufacturing company are positively correlated with operational performance.

This chapter therefore presents the profile of the primary studies that formed the sample of the meta-analysis, the heterogeneity analysis, main findings, moderator analysis and results of publication bias test.

3.2. Descriptive Sample Characteristics

As stated clearly in the previous chapter, primary studies for this meta-analysis were gathered through a rigorous online and manual search of some prominent databases. Through these searches, a total of 475 primary studies were identified and were subsequently narrowed to 21 based on the strictly applied inclusion criteria (see Appendix 1). Since a single effect was taken from each study, a total of 21 effect sizes were produced with an aggregate sample size of 3,735 respondents. While effect sizes (correlation coefficients) for the relationship between TQM practices and operational performance ranges from 0.221 to 0.904, sample sizes (N) for the included studies ranges from as low as 17 to as high as 1,024 respondents. The profile of the included studies with their effect sizes (r), sample sizes (N) and other relevant coding information is presented in Table 3.1;

Table 3.1

Profile of Included Studies

No	Study	N	r	Sector	Country	Method
1	Samson & Terziovski (1999)	1024	0.463	M	Multiple	Regression
2	Ho et al (2001)	50	0.610	M	China	Regression
3	Kaynak (2003)	214	0.296	M&S	USA	SEM
4	Demirbag et al (2006)	141	0.455	M	Turkey	SEM
5	Feng et al (2006)	252	0.483	M&S	Multiple	SEM
6	Lakhal et al (2006)	133	0.564	M	Tunisia	SEM
7	Chung et al (2008)	79	0.477	M	Taiwan	Correlation
8	Fening et al. (2008)	116	0.337	M&S	Ghana	Regression
9	Salaheldin (2009)	139	0.740	M	Qatar	SEM
10	Fotopoulos & Psomas (2010)	370	0.447	M&S	Greece	SEM
11	Agus & Hassan (2011)	169	0.539	M	Malaysia	SEM&Cor
12	Baird et al (2011)	145	0.240	M&S	Australia	SEM& Reg
13	Valmohammadi (2011)	53	0.318	M	Iran	Regression
14	Awoku (2012)	17	0.900	M	South M.	Regression
15	Abusa & Gibson (2013)	56	0.221	M	Libya	Correlation
16	Riyadi & Musran (2013)	118	0.904	M	Indonesia	Regression
17	Dubey (2015)	132	0.336	M	India	Regression
18	Panuwatwanich & Nguyen (2017)	104	0.750	M	Vietnam	SEM
19	Patyal & Koilakuntla (2017)	262	0.379	M	India	SEM
20	Sahoo & Yadav (2017)	121	0.803	M	India	SEM
21	Saleh & Sweis (2017)	40	0.466	M	Jordan	Correlation

Note: SEM = Structural Equation Modelling; M = Manufacturing; S = Service

3.2.1. Year of Publication of Primary Studies

In terms of year of publication of the individual studies, Figure 3.1 indicates that, 19% (4 studies) of the studies were Published in 2017, 14% (3 studies) were published in both 2006 and 2011 whiles studies published in 2008 and 2013 were 10% (2 studies) each. A single study representing 5% was published in the remaining years.

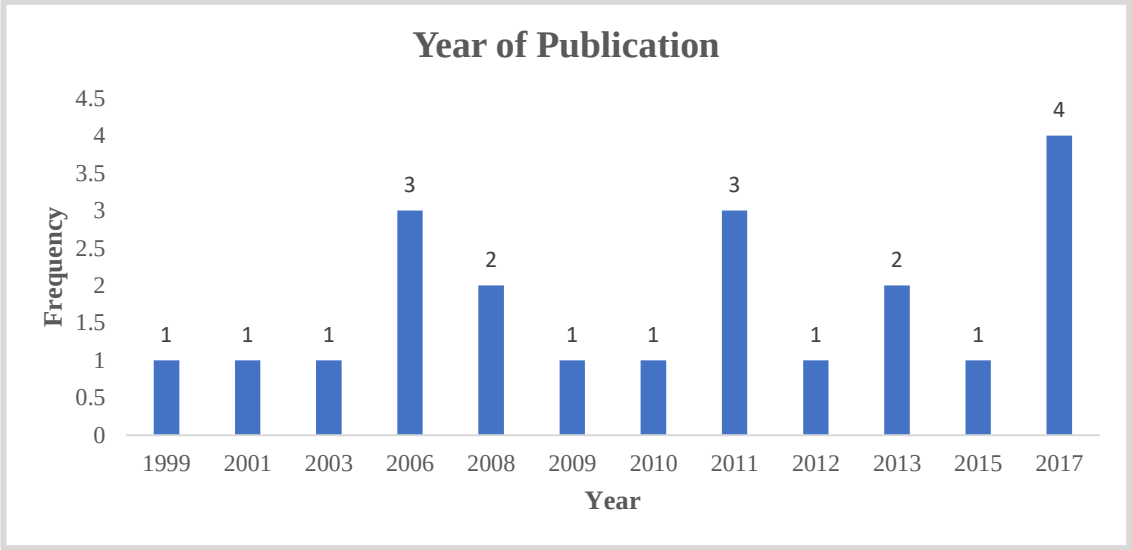

Figure 3.1: Distribution of Paper by Year of Publication

It is however worthy to note that the search for primary studies was done in April of 2018, to ensure that the studies published in the last quarter of 2017 were dully captured.

3.2.2. Sector of Operations of Primary Respondents

With regards to the sector of operations of the companies that participated in the primary studies, Figure 3.2 shows that 16 studies representing 76% focused only on the manufacturing sector whiles 24% (5 studies) considered both manufacturing and service companies. In line with the inclusion criteria for this review, studies that had 65% or more of its respondents from service providing companies were excluded from the current review. This is to ensure that the primary objective of the review which is to examine the relationship between total quality management practices and operational performance of manufacturing companies was successfully achieved.

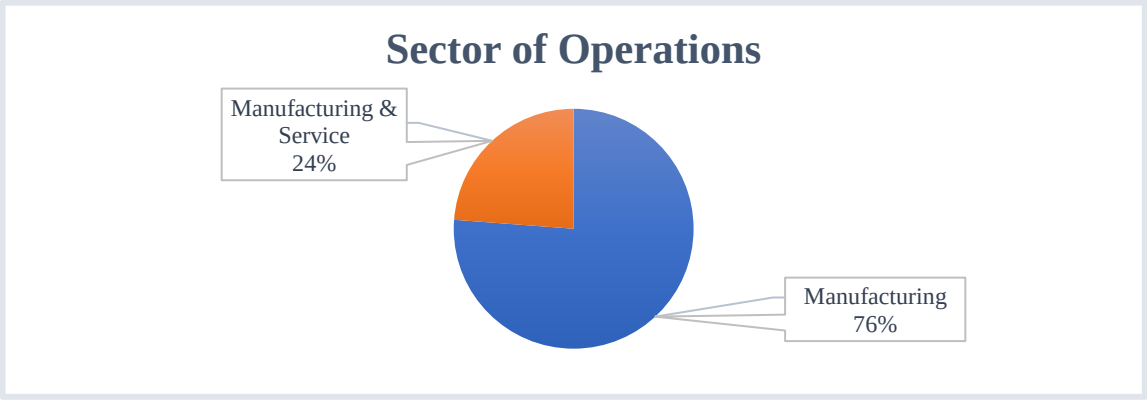

Figure 3.2: Sector of Operations of Primary Respondents

3.2.3. Geographical Distribution of Primary Studies

To better understand the effect TQM practices have on operational performance, notice was taken of the geographical regions in which primary studies were conducted. This was aimed at assessing how research results were influenced by the environmental factors in the various regions. Based on the data extracted during coding process, included studies were generally categorised into five (5) geographical regions thus Asia-Pacific, Africa, Middle East, Europe and North America. It is evidently clear from Figure 3.3 that majority of the studies (11 studies) were conducted in the Asia-Pacific, 4 studies conducted in the Middle East, three (3) in Africa and two (2) in North America and only one (1) was conducted in Europe.

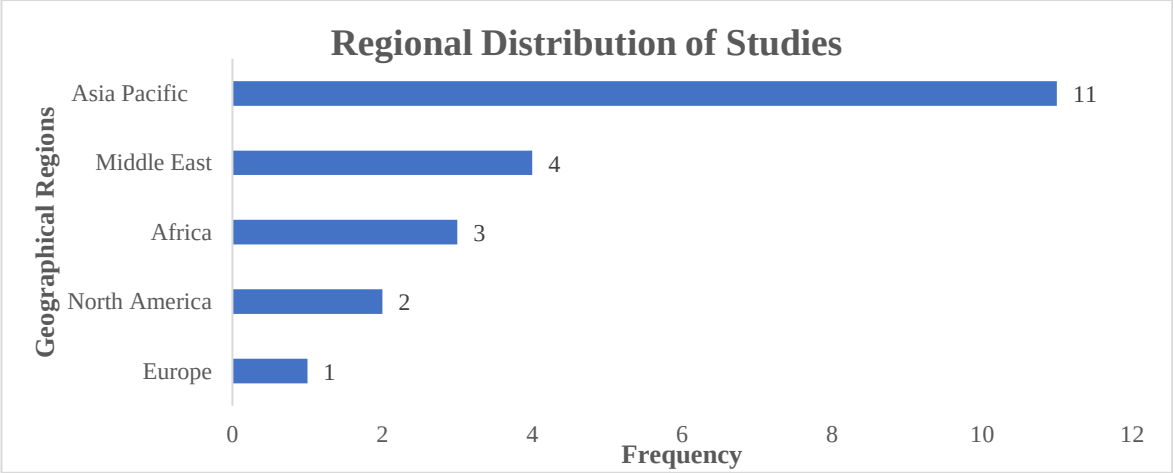

Figure 3.3: Regional Distribution of Primary Studies

3.2.4. Journal Distribution of Primary Studies

To assess the quality of journals from which included studies were published, the researcher adopted the latest version (2018) of the CABS journal quality guide. The Chartered Association of Business Schools (CABS) Journal Quality Guide is a reliable tool for assessing the quality of journals academics in the business and management field publish their papers based on peer review, editorial and expert judgements. It provides a wide range of journal coverage with high level of internal and external reliability in the Business and management field (Rowlinson et al., 2011). As per this study, most of the reviewed papers were published in high-ranked journals, which indicates the quality of the review. As clearly indicated in Table 3.2, International Journal of Operations and Production Management and the Journal of Operations Management hold the lead (ranked 4) with 1 and 2 papers respectively, followed by the International Journal of

Production Research (ranked 3) with one paper. The Business Process Management Journal and the International Journal of Quality and Reliability Management both have a CABS ranking of 2 with 1 and 3 papers respectively.

Table 3.2

Distribution of Papers by Journal

Journal	Freq.	%	CABS Ranking
Int'l Journal of Quality & Reliability Management	3	14%	2
Journal of Manufacturing Technology Management	2	10%	1
Journal of Operations Management	2	10%	4
The TQM Journal	2	10%	1
Benchmarking: An International Journal	1	5%	1
Business Process Management Journal	1	5%	2
European Journal of Business and Management	1	5%	n.a
European Journal of Innovation Management	1	5%	1
International Journal of Management Concepts and Philosophy	1	5%	1
International Journal of Operations & Production Management	1	5%	4
International Journal of Production Research	1	5%	3
International Journal of Productivity and Performance Management	1	5%	1
Journal of Applied Sciences	1	5%	n.a
Procedia Engineering	1	5%	n.a
Procedia Social and Behavioural Sciences	1	5%	n.a
UMI Dissertation Publishing	1	5%	n.a
Grand Total	**21**	**100%**	

Note: n.a means Not Available

3.2.5. Distribution of Papers by Statistical Methods of Analysis

Another characteristic of the primary studies that the researcher considered very relevant is the statistical method of analysis. Not only does it determine the amount of coding data

that can be extracted from the primary studies, it also greatly affects the findings of the primary studies. In line with this, a special attention was paid on the extraction of coding data relating to the statistical methods adopted to analyse the empirical data of primary studies. Although a variety of statistical methods were adopted, it is evidently clear from Table 3.3 that majority of the reviewed papers adopted Structural Equation Modelling (SEM) method (43%), followed by the regression analysis with 33% (7 studies). The correlation analysis was applied to analyse the empirical data of 3 studies (14%) whiles the SEM was combined with either correlation or regression analysis to analyse the data of 2 papers.

Table 3.3

Distribution of Papers by Methodology

Method	Frequency	Percentage
SEM	9	43%
Regression Analysis	7	33%
Correlation Analysis	3	14%
SEM & Correlation Analysis	1	5%
SEM & Regression Analysis	1	5%
Grand Total	**21**	**100%**

3.3. Meta-Analysis Procedure

The Meta-analytic procedure employed to investigate the TQM-operational performance relationship is mainly based on the Hunter and Schmidt's (2004) meta-analytic procedure. In the view of Hunter and Schmidt (2004), meta-analysis is that quantitative combination that facilitates the analyses of effect sizes across the literature. A review of the TQM literature reveals rather a huge number of small-scale empirical studies characterised by controversial findings regarding its impact on organizational performance. Empirical studies of this nature to a larger extent lack generalizability due to the disparities in sampling criteria (Rosenbusch et al., 2011). The most reliable way to generalise the empirical results of previous studies therefore is meta-analysis (Raudenbush et al., 1991). The heuristic nature of the Hunter and Schmidt's (2004) approach especially in dealing with the difficulties of the statistical power of significance tests when smaller number of

studies are involved (Gerwin and Barrowman, 2002) has made it the preferred choice of many meta-analysts. Additionally, it creates a room for a lot of artefacts that otherwise could have affected the correlations to be easily corrected before analysis is done. For this study, corrections were made for measurement and sampling errors.

Effect size estimates used for the analysis represented the average of the sample size's weighted correlation (ř) of included studies. Primary studies that reported correlations for multiple indicators of operational performance like waste reduction, productivity, cycle time and regulatory compliance were averaged to obtain a single effect size estimate for the study. For the purpose of correcting measurement errors, reliability coefficients for both dependent and independent variables for each study were recorded and the average of the available reliabilities was regarded as the reliabilities of the few studies (Demirbag et al., 2006; Lakhal et al., 2006; Awoku, 2002; and Panuwatwanich & Nguyen, 2017) that did not report reliability coefficients. This enable the researcher to correct measurement errors for each study based on the Hunter and Schmidt's (2004) recommended formula $\check{r}_c = \frac{\check{r}}{\sqrt{\check{r}_{xx}} \cdot \sqrt{\check{r}_{yy}}}$ before proceeding with the main analysis.

The main analysis itself was carried out in three main stages based on the research questions and hypotheses. But prior to the test of hypotheses, a heterogeneity test was conducted for all the proposed relationships to assess the significance and the degree of variation in effect sizes that is attributable to systematic cross-sample variability. With the most frequently used method of heterogeneity analysis being Q-test together with the I^2 index (Higgins and Thompson, 2002), in which the existence of heterogeneity is determined by Q-test and its degree determined by the I^2 index (Huedo-Medina et al., 2006). Both statistics were therefore calculated and reported in this meta-analysis. The detailed description of the three stages as well as the heuristics of analysis is presented as follows;

3.3.1. Stage I: Aggregate TQM Practices (H_1)

This stage was dedicated to the examination of the relationship between aggregate TQM practices and operational performance (H_1). It was aimed at assessing the presence of positive association between the dependent and independent variables.

It is important to state at this juncture that steps were taken to correct sampling error just like it was done for measurement error. Since meta-analytical reviews quantitatively

aggregate the findings of primary studies to draw conclusions, it is only proper to ensure that included studies contribute to the meta-analytical findings accordingly. This implies that studies with large sample sizes should be weighted higher than those with small sample sizes. Hence, the compound attenuation factor for each study was multiplied by the study's sample size to arrive at the weight of the study. Since this approach is highly recommended by Hunter and Schmidt (1990), the formula recommended by them was used to calculate the attenuation factor thus, A = $\sqrt{\check{r}_{xx}} . \sqrt{\check{r}_{yy}}$ and the weights; W = N x A^2. The error variance (e) which largely depends on the weighted sample mean correlation across studies (ř) was then computed using this formula: e = $(1 - \check{r}^2)/(N-1)A^2$.

The statistical data used to test the hypothesis is presented in Table 3.4. The table contains all the data (sample sizes (N), correlation coefficients, reliabilities and the weights of every study) required to test the hypothesis. Whereas the sample sizes range from as low as 17 to 1024, the corrected effect sizes (ŕ) range from 0.262 to 0.999 and the weights, which largely depends on the sample sizes, also ranged from 11.96 to 539.72.

Table 3.4

Data for Stage 1

Study	N	Tα	OPα	r	ř	W
Samson & Terziovski (1999)	1024	0.782	0.674	0.463	0.638	539.72
Ho et al (2001)	50	0.878	0.840	0.61	0.710	36.88
Kaynak (2003)	214	0.886	0.855	0.296	0.340	162.11
Demirbag et al (2006)	141	0.860	0.856	0.455	0.530	103.80
Feng et al (2006)	252	0.816	0.876	0.483	0.571	180.13
Lakhal et al (2006)	133	0.821	0.856	0.564	0.673	93.47
Chung et al (2008)	79	0.859	0.892	0.477	0.545	60.53
Fening et al. (2008)	116	0.727	0.844	0.337	0.430	71.18
Salaheldin (2009)	139	0.930	0.870	0.740	0.823	112.46
Fotopoulos & Psomas (2010)	370	0.885	0.835	0.447	0.520	273.42
Agus & Hassan (2011)	169	0.920	0.912	0.539	0.588	141.80
Baird et al (2011)	145	0.766	0.850	0.240	0.297	94.41
Valmohammadi (2011)	53	0.789	0.890	0.318	0.379	37.22
Awoku (2012)	17	0.822	0.856	0.900	0.999	11.96
Abusa & Gibson (2013)	56	0.831	0.856	0.221	0.262	39.83
Riyadi & Musran (2013)	118	0.776	0.735	0.904	0.999	67.30
Dubey (2015)	132	0.765	0.843	0.336	0.418	85.13
Panuwatwanich & Nguyen (2017)	104	0.822	0.856	0.750	0.894	73.18
Patyal & Koilakuntla (2017)	262	0.881	0.850	0.379	0.438	196.20
Sahoo & Yadav (2017)	121	0.760	0.753	0.803	0.999	69.25
Saleh & Sweis (2017)	40	0.839	0.912	0.466	0.533	30.61

NB: N: Sample Size; Tα: TQM reliabilities; OPα: Operational performance reliabilities; r: TQM-Performance sample correlation; ř: TQM-Performance corrected correlation; W: weight of studies

3.3.2. Stage II: Individual TQM Practices (H_{3a} – H_{3f}).

This stage considered the separate relationship between all the individual TQM practices (Top Management Leadership, Strategic Planning, Customer Focus, Information & Analysis, Human Resource Management, and Process Management) and operational

performance (H_{3a} – H_{3f}). Just like the first stage, this stage examined the presence of positive association between the individual TQM practices and operational performance to enable quality practitioners to fully appreciate the degree at which each TQM practice contributes to organizational success. Here, the sample data was put into groups based on the TQM practices and the scope of analysis extended to cover all of them. The data used at this stage is presented in Table 3.5.

The table provides all the data; sample sizes (N), correlation coefficients, reliabilities and the weights of every study required to examine the effect of the individual TQM practices on operational performance. Each TQM construct goes with the number of studies that investigated its impact on performance. As can be seen, the least construct investigated is Strategic planning (with only 2 studies) and the highest being Human Resource Management with 12 studies

Table 3.5

Data for Stage II

Study	N	Tα	Pα	r	ŕ	W
Top Management Leadership						
Kaynak (2003)	214	0.920	0.855	0.311	0.351	168.332
Lakhal et al (2006)	133	0.810	0.856	0.420	0.504	92.217
Demirbag et al (2006)	141	0.750	0.856	0.500	0.624	90.522
Chung et al (2008)	79	0.819	0.892	0.390	0.456	57.713
Fening et al. (2008)	116	0.748	0.844	0.461	0.580	73.232
Fotopoulos & Psomas (2010)	370	0.863	0.835	0.432	0.509	266.624
Valmohammadi (2011)	53	0.830	0.890	0.514	0.598	39.151
Riyadi & Musran (2013)	118	0.718	0.735	0.473	0.651	62.272
Dubey (2015)	132	0.807	0.843	0.217	0.263	89.800
Patyal & Koilakuntla (2017)	262	0.860	0.850	0.578	0.676	191.522
Strategic Planning						
Chung et al (2008)	79	0.805	0.892	0.760	0.897	56.727
Fening et al. (2008)	116	0.823	0.844	0.276	0.331	80.575
Customer Focus						
Lakhal et al (2006)	133	0.830	0.856	0.440	0.522	94.494
Chung et al (2008)	79	0.921	0.892	0.365	0.403	64.901
Fening et al. (2008)	116	0.787	0.844	0.302	0.371	77.050
Fotopoulos & Psomas (2010)	370	0.836	0.835	0.358	0.428	258.282
Valmohammadi (2011)	53	0.790	0.890	0.279	0.333	37.264
Abusa & Gibson (2013)	56	0.921	0.856	0.218	0.246	44.149
Information & Analysis						
Kaynak (2003)	214	0.900	0.855	0.183	0.209	164.673
Demirbag et al (2006)	141	0.750	0.856	0.640	0.799	90.522
Lakhal et al (2006)	133	0.820	0.856	0.570	0.680	93.355
Chung et al (2008)	79	0.825	0.892	0.321	0.374	58.136
Fening et al. (2008)	116	0.206	0.844	0.778	1.866	20.168
Fotopoulos & Psomas (2010)	370	0.899	0.835	0.432	0.499	277.746
Baird et al (2011)	145	0.900	0.850	0.361	0.413	110.925
Valmohammadi (2011)	53	0.750	0.890	0.272	0.333	35.378
Dubey (2015)	132	0.744	0.843	0.189	0.239	82.789
Patyal & Koilakuntla (2017)	262	0.780	0.850	0.453	0.556	173.706
Sahoo & Yadav (2017)	121	0.843	0.753	0.591	0.742	76.808
Human Resource Management						
Kaynak (2003)	214	0.905	0.855	0.309	0.351	165.588
Demirbag et al (2006)	141	0.710	0.856	0.680	0.872	85.694
Lakhal et al (2006)	133	0.795	0.856	0.855	1.036	90.509
Fening et al. (2008)	116	0.786	0.844	0.510	0.626	76.953
Chung et al (2008)	79	0.889	0.892	0.377	0.423	62.646
Fotopoulos & Psomas (2010)	370	0.882	0.835	0.315	0.367	272.494
Valmohammadi (2011)	53	0.850	0.890	0.271	0.312	40.095
Riyadi & Musran (2013)	118	0.825	0.735	0.529	0.679	71.552
Abusa & Gibson (2013)	56	0.873	0.856	0.282	0.326	41.848
Dubey (2015)	132	0.901	0.843	0.161	0.185	100.260
Sahoo & Yadav (2017)	121	0.722	0.753	0.470	0.637	65.784
Patyal & Koilakuntla (2017)	262	0.860	0.850	0.562	0.657	191.522
Process Management						
Kaynak (2003)	214	0.780	0.855	0.292	0.358	142.717
Demirbag et al (2006)	141	0.735	0.856	0.540	0.681	88.712
Chung et al (2008)	79	0.908	0.892	0.717	0.797	63.985
Fening et al. (2008)	116	0.326	0.844	0.267	0.509	31.917
Valmohammadi (2011)	53	0.870	0.890	0.487	0.553	41.038
Baird et al (2011)	145	0.710	0.850	0.300	0.386	87.508
Agus & Hassan (2011)	169	0.920	0.912	0.523	0.571	141.798
Riyadi & Musran (2013)	118	0.825	0.735	0.681	0.875	71.552
Abusa & Gibson (2013)	56	0.747	0.856	0.330	0.413	35.808
Sahoo & Yadav (2017)	121	0.739	0.753	0.523	0.701	67.333
Patyal & Koilakuntla (2017)	262	0.830	0.850	0.555	0.661	184.841

NB: N: Sample Size; **Tα:** TQM reliabilities; **OPα:** Operational performance reliabilities; **r:** TQM-Performance sample correlation; **ř:** TQM-Performance corrected correlation; **W:** weight of studies.

3.3.3. Stage III: Moderator Analysis (H_2 & H_4)

This stage was undertaken specifically to provide an explanation to the variations (heterogeneity) discovered in the proposed relationships by means of the moderator analysis. The moderator analysis was regarded as the only way to measure the degree at which the results of stage 1 and 2 (proposed relationships) were affected by external factors. The three main moderating factors considered in this analysis were firm size, geographical region and the industry type of the samples.

Although conscious efforts were made to avoid or minimise the effects of the "file – drawer problem" during the literature search by ensuring that unpublished studies were included in the meta-analysis, the possibility of publication bias was explored. To this end, the funnel plot and the Classic fail-safe N were adopted to perform the analysis in this study. Although several techniques have been developed to estimate the effect of publication bias as well as correct it, the researcher's choice was based on their popularity and ease of understanding. Whereas the funnel plot graphically displays the reported effect sizes plotted against a measure of precision or sample size as a way of communicating how symmetric or asymmetric the points are distributed around the population effect size, the Classic fail-safe N estimates the number of unpublished studies needed to make a significant population effect size estimate a non-significant one. The fail-safe N is calculated as; $N_{fs} = k\left[\frac{Z_s}{Z_\alpha}\right]^2 - K$, where k is the number of studies in the meta-analysis, Z_s is the Stouffer's sum and Z_α is the one-tailed Z score associated with the desired α.

3.4. Heuristics for Hypothesis Testing

Although the Hunter and Schmidt (2004) meta-analytic procedure was adopted and implemented through the Comprehensive Meta-Analysis software, the heuristics for hypothesis testing was based on Cohen's (1992) guidelines as well as the significance level (p-value). According to Cohen (1992) an effect size (r) of 0.1 indicates a small effect, 0.3 representing medium effect and 0.5 and above indicates large effects. Whiles the Cohen's (1992) guidelines define the strength of the relationship (effects), a p-value less than or equal to 0.05 will help determine the statistical significance of the relationship.

Heterogeneity, the variation in study outcomes between studies, as indicated earlier is measured by the combination of the Cochran's Q and the I^2 statistics. As a typical chi-square statistic, Q is calculated as the weighted sum of squared differences between individual study effects and the pooled effect across studies. Gavaghan et al (2000) posited that possess a low power as a comprehensive test of heterogeneity. This is especially so when the number of studies in the meta-analysis is small. On the contrary, where the number of studies is large, Q turn to have too much power as a test of heterogeneity (Higgins et al., 2003).

The I^2 statistics which describes the percentage of variation across studies that's due to heterogeneity and not due to chance (Higgins and Thompson, 2002: Higgins et al., 2003), unlike Q, I^2 statistics is not affected in any way by the number of studies under consideration. It is usually calculated using the formula; $I^2 = (Q - df)/Q\ x\ 100\%$. An I^2 statistics value of 25% is generally considered as low heterogeneity, 50% as moderate and 75% as high heterogeneity. The test of heterogeneity in this study was therefore guided by this general rule.

3.5. Results of the Meta-Analysis

This section of the chapter presents the meta-analysis results based on the procedure explained above.

3.5.1. Heterogeneity Test

The heterogeneity test results for all the proposed relationships has been presented in Table 3.6. As clearly indicated in the table, except for hypothesis H_{3c} (customer focus-operational performance relationship) that has a non–significant Q value and the lowest I^2 index of 4.6%, the rest possess significant Q values and I^2 indexes above 80%. The overwhelming I^2 statistics reported indicate that a vast majority of effect size variation is attributable to systematic cross – samples variability. The choice of the random-effect model has also been corroborated by the significant Q statistics found in most of the relationships. It as well triggered strongly the need to assess the effects of potential moderators on the TQM-operational performance relationship most especially those that were heterogeneously significant.

Table 3.6

Test for Heterogeneity of Effect Sizes

Relationships	Q	df	P	e	I^2
H_1: TQM → Operational Performance	2463.755	20	0.000	0.115	99.188
H_{3a}: Top Management → O. Performance	46.766	9	0.000	0.000	80.755
H_{3b}: Strategic Planning → O. Performance	56.258	1	0.000	0.766	98.222
H_{3c}: Customer Focus → O. Performance	5.244	5	0.387	0.000	4.652
H_{3d}: Info & Analysis → O. Performance	1216.527	10	0.000	0.158	99.178
H_{3e}: Human Resources → O. Performance	1393.034	11	0.000	0.189	99.210
H_{3f}: Process Management → O. Performance	109.704	10	0.000	0.002	90.885

Note: df = degree of freedom; e = variance; H = Hypothesis

3.5.2. Relationship between Aggregate TQM Practices & Operational Performance (H_1)

Table 3.7 presents the meta-analysis results of the relationship between aggregate TQM practices and operational performance. Based on Cohen's (1998) benchmarks, it can confidently be reported that the relationship between aggregate TQM practices and operational performance is strong and significant (ř = 0.793; p = 0.000). This confirms the findings of most studies in the field (Kaynak, 2003; Samson and Terziovski, 1991 etc.) as well as lends support to hypothesis H_1.

3.5.3. Individual TQM Practices and Operational Performance (H_3)

The meta-analysis results of the impact of the individual TQM practices on the operational performance of manufacturing companies has been presented as follows;

3.5.3.1. Top Management Leadership and Operational Performance (H_{3a})

The results as displayed in Table 3.7 shows a strong, positive and significant relationship between top management leadership and operational performance with an effect size (ř) of 0.531 and p = 0.000. Accounting for about 48 percent of the total effects, this result emphasises strongly the contribution of top management leadership to the overall success of TQM implementation in organizations especially when the goal is to improve operational performance. Notwithstanding the fact that, this result confirmed findings of

a lot of previous studies, the Meta-analysis conducted by Nair (2006) revealed a negative correlation between top management leadership and operational performance.

3.5.3.2. Strategic Planning and Operational Performance (H_{3b})

Unlike the other individual TQM practices investigated in this meta-analysis, Table 3.7 shows a rather non-significant (p = 0.106) relationship between strategic planning and operational performance even though a high correlation (ř = 0.716) is found. This non-significant result can be attributed to the relatively low sample size (N = 195) involved in the analysis. Even with this, it is worthy to note that similar results can be found in the findings of other studies, Samson and Terziovski (1991) being an example.

3.5.3.3. Customer Focus and Operational Performance (H_{3c})

The result indicates that customer focus has a medium and significant (ř = 0.416; p = 0.000) impact on operational performance. Although the results support the hypothesis H_{3c}, it also revealed that customer focus has the least effect on operational performance. But of course, several factors including few effect sizes (6 effects), low sample size (N = 807) as well as findings of the primary studies may have caused that relatively low correlation. For instance, notable studies like Chung et al. (2008), Fening et al. (2008), Valmohammadi (2011) and Abusa & Gibson (2013) that contributed to the total effects of this TQM practice each reported a simple correlation coefficient lower than 0.4. Quality practitioners however need to appreciate the fact that the customer focus-operational performance relationship is not in any way affected by moderating factors, as such, irrespective of their firm size, industry type and geographical location, a moderate level of operational performance is still guaranteed when they focus on their customers.

3.5.3.4. Information and Analysis and Operational Performance (H_{3d})

Regarding the relationship between information and analysis on operational performance, the ř value of 0.698 provides evidence of a highly positive correlation between the two variables. Not only that, the p-value of 0.001 indicates the significance of the effect of information and analysis on operational performance. The results did not come as surprise because similar findings have been reported in a lot of previous studies (Fening et al., 2008; Lakhal et al., 2006; Chung et al., 2008). The study of Samson and Terziovski (1999) however found a negative correlation between information and analysis and operational performance.

3.5.3.5. Human Resource Management and Operational Performance (H_{3e})

The meta-analysis results again show that the impact of human resource management on operational performance is highly positive and significant (ř = 0.696; p = 0.002). This therefore strongly supports hypothesis H_{3e} at the same time confirmed the findings of several studies. The work of Fening et al. (2008) on the relationship between quality management practices and the performance of SMEs in Ghana particularly found human resource management to be the most significant and highly correlated variable among the independent variables tested. This lays emphasis on the crucial contribution of human resource management to the success of TQM and organizations in general.

3.5.3.6. Process Management and Operational Performance (H_{3f})

The correlation coefficient (ř) and p-value for the relationship between process management and operational performance are 0.621 and 0.000 respectively. A conclusion can therefore be drawn that process management is positively and significantly correlated to operational performance. This result corroborates the findings of Nair (2006), Kaynak (2003) and Fening et al. (2008) in which process management was found to be positively related to operational performance. Here again, Samson and Terziovski (1999) discovered that process management negatively affects operational performance.

Table 3.7

Impact of TQM practices on Operational Performance

Proposed Relationship	Effects	N	ŕ	p-value	95% CI		Std Error
					Lower Limit	Upper Limit	
H_1: TQM → Operational Performance	21	3,735	0.793	0.000	0.608	0.896	0.338
H_{3a}: Top Management → Operational Performance	10	1,618	0.531	0.000	0.442	0.609	0.017
H_{3b}: Strategic Planning → Operational Performance	2	195	0.716	0.106	-0.19	0.963	0.875
H_{3c}: Customer Focus → Operational Performance	6	807	0.416	0.000	0.354	0.474	0.006
H_{3d}: Info & Analysis → Operational Performance	11	1,766	0.698	0.001	0.323	0.883	0.397
H_{3e}: Human Resources → Operational Performance	12	1,795	0.696	0.002	0.313	0.884	0.434
H_{3f}: Process Mgt → Operational Performance	11	1,474	0.621	0.000	0.502	0.717	0.041

Note: Effects represent number of studies, **N** is the sample size and **ř** is the effect size

3.5.4. Moderator Analysis

The heterogeneity test conducted and reported earlier on (see Table 3.6) revealed that majority (6 out of 7) of the hypothesis examined were greatly affected by moderating factors. The phenomenon necessitated the preparation of moderator analysis with three (3) distinct variables: industry type, firm size and geographical region; to assess the magnitude of the effects. Owing to the categorical nature of these variables, the subgroup method was adopted to analyse the variance in primary samples. With respect to industry type, the samples were grouped based on the participants' industry. The most dominant industries were construction, electronics and various industries. Firm size as a moderating variable also caused primary samples to be grouped into SMEs and various sizes. Finally samples were differentiated as Africa, Asia-Pacific and Middle East.

3.5.4.1. Industry Type as a Moderator

Table 3.8 presents results of the moderator analysis for the impact of industry type on the various relationships. As can be seen in the table, the relationship between aggregate TQM practices and operational performance is greatly moderated by industry type (ř = 0.706, p = 0.000). Generally, the relationship is significantly and positively affected by all the industry types with the most affected being various industries (ř = 0.709, p = 0.000), followed by construction (ř = 0.708, p = 0.000). Regarding top management leadership and operational performance (H_{4a}), the results indicate that the relationship is significantly affected by all industry types (ř = 0.523, p = 0.000). Here again, various industries exert more influence (ř = 0.553, p = 0.000) than electronics (ř = 0.456, p = 0.000) and construction (ř = 0.263, p = 0.002). The situation looked quite similar to hypothesis H_{4d} (Information and analysis – operational performance) and H_{4e} (Human Resources – Operational performance). Strategic planning and process management are both affected by the moderating variable in a similar fashion. Firstly, both are significantly affected by industry type (Strategic Planning: ř = 0.659, p = 0.000; Process management: ř = 0.603, p = 0.000). Moreover, both are influenced by just two of the subgroups (electronics and various industries) in which electronics exert more influence than various industries.

Table 3.8

Effect of Industry Type on Operational Performance under the Fixed Effect Model

Variables	Effects	N	ř	p	95% C.I	Q-value	Z-value	Std Error
H_2: TQM → Operational Performance	**19**	**3461**	**0.706**	**0.000**	**(0.689, 0.722)**	**2452.355**	**51.285**	**0.394**
Construction	2	236	0.708	0.000	(0.637, 0.767)	56.222	13.387	0.702
Electronics	2	129	0.615	0.000	(0.493, 0.713)	2.211	7.948	0.054
Various Industries	15	3096	0.709	0.000	(0.691, 0.726)	2390.557	48.899	0.491
H_{4a}: Top Management → Operational Performance	**8**	**1344**	**0.523**	**0.000**	**(0.483, 0.562)**	**43.742**	**21.113**	**0.024**
Construction	1	132	0.263	0.002	(0.096, 0.415)	0.000	3.059	0.000
Electronics	1	79	0.456	0.000	(0.261, 0.615)	0.000	4.291	0.000
Various Industries	6	1133	0.553	0.000	(0.511, 0.593)	28.623	20.811	0.023
H_{4b}: Strategic Planning → Operational Performance	**2**	**195**	**0.659**	**0.000**	**(0.571, 0.732)**	**56.258**	**10.880**	**0.875**
Electronics	1	79	0.897	0.000	(0.843, 0.933)	0.000	12.699	0.000
Various Industries	1	116	0.331	0.000	(0.158, 0.484)	0.000	3.656	0.000
H_{4d}: Info & Analysis → Operational Performance	**9**	**1492**	**0.651**	**0.000**	**(0.620, 0.679)**	**1203.591**	**29.721**	**0.545**
Construction	1	132	0.239	0.006	(0.071, 0.394)	0.000	2.768	0.000
Electronics	1	79	0.374	0.001	(0.167, 0.550)	0.000	3.427	0.000
Various Industries	7	1281	0.693	0.000	(0.663, 0.721)	1148.194	30.321	0.724
H_{4e}: Human Resources → Operational Performance	**10**	**1521**	**0.481**	**0.000**	**(0.441, 0.519)**	**70.991**	**20.256**	**0.029**
Construction	1	132	0.185	0.000	(0.015, 0.345)	0.034	2.126	0.000
Electronics	1	79	0.423	0.000	(0.223, 0.589)	0.000	3.935	0.000
Various Industries	8	1310	0.510	0.000	(0.468, 0.549)	54.022	20.181	0.031
H_{4f}: Process Management → Operational Performance	**10**	**1333**	**0.603**	**0.000**	**(0.567, 0.636)**	**107.495**	**25.193**	**0.048**
Electronics	1	79	0.797	0.000	(0.699, 0.866)	0.000	9.505	0.000
Various Industries	9	1254	0.587	0.000	(0.549, 0.623)	95.066	23.595	0.048

Note: Effects represent number of studies, **N** is the sample size and **ř** is the effect size

3.5.4.2. Firm Size as a Moderator

The results of the moderator analysis on the impact of firm size on the relationships (hypothesis) under investigation is presented in Table 3.9. It is evidently clear that, firm size significantly influences the relationship between aggregate TQM practices and operational performance (ř = 0.699, $p < 0.05$). Besides, the effect is greater with SMEs (ř = 0.879, p = 0.000) than with various sizes (ř = 0.651, p = 0.000. An analysis of the impact on the individual TQM practices reveals analogous results for Top management leadership (H_{4a}), Information and Analysis (H_{4d}), Human resource management (H_{4e}) and Process management (H_{4f}) in which significant impact (ř > 0.5) exist for all the relationships and greater impact is experienced in SMEs than in various sizes. The scenario may have been different with strategic planning because of the number of effects (only 2 effects) analysed as well as the sample sizes of the primary studies.

Table 3.9

Effect of Firm Size on Operational Performance under the Fixed Effect Model

Variables	Effects	N	ř	p	95% C.I	Q-value	Z-value	Std Error
H_2: TQM → Operational Performance	**21**	**3735**	**0.699**	**0.000**	**(0.682, 0.715)**	**2463.755**	**52.473**	**0.338**
SMEs	5	570	0.879	0.000	(0.858, 0.896)	927.228	32.275	1.567
Various Sizes	16	3165	0.651	0.000	(0.630, 0.670)	1370.389	43.334	0.267
H_{4a}: Top Management → Operational Performance	**10**	**1618**	**0.531**	**0.000**	**(0.495, 0.566)**	**46.766**	**23.592**	**0.017**
SMEs	3	310	0.604	0.000	(0.527, 0.671)	0.301	12.122	0.011
Various Sizes	7	1308	0.513	0.000	(0.472, 0.552)	42.238	20.343	0.025
H_{4b}: Strategic Planning → Operational Performance	**2**	**195**	**0.659**	**0.000**	**(0.571, 0.732)**	**56.258**	**10.880**	**0.875**
SMEs	1	116	0.331	0.000	(0.158, 0.484)	0.000	3.656	0.000
Various Sizes	1	79	0.897	0.000	(0.843, 0.933)	0.000	12.699	0.000
H_{4d}: Info & Analysis → Operational Performance	**11**	**1766**	**0.667**	**0.000**	**(0.640, 0.693)**	**1216.527**	**33.549**	**0.397**
SMEs	4	431	0.922	0.000	(0.907, 0.935)	772.400	32.827	0.053
Various Sizes	7	1335	0.502	0.000	(0.460, 0.541)	92.394	19.991	2.168
H_{4e}: Human Resources → Operational Performance	**12**	**1795**	**0.681**	**0.000**	**(0.655, 0.705)**	**1393.034**	**34.842**	**0.434**
SMEs	4	431	0.712	0.000	(0.661, 0.756)	49.136	18.229	0.137
Various Sizes	8	1364	0.671	0.000	(0.640, 0.699)	1341.930	29.725	0.730
H_{4f}: Process Management → Operational Performance	**11**	**1474**	**0.611**	**0.000**	**(0.578, 0.642)**	**109.704**	**26.977**	**0.041**
SMEs	4	431	0.632	0.000	(0.571, 0.686)	7.400	15.233	0.020
Various Sizes	7	1043	0.602	0.000	(0.562, 0.640)	101.640	22.279	0.075

Note: Effects represent number of studies, **N** is the sample size and **ř** is the effect size

3.5.4.3. Geographical Region as a Moderator

An analysis of the impact of geographical region on the analysed relationships is presented in Table 3.10. The results show that geographical regions significantly influence the relationship between aggregate TQM practices and operational performance (ř = 0.727, p = 0.000) with the Asia-Pacific being more influential (ř = 0.755, p = 0.000) than Middle-East (ř = 0.653, p = 0.000) and Africa (ř = 0.524, p =0.000). The individual TQM practices responded positively to the moderating variables although at different magnitudes. Top management leadership, strategic planning and process management for instance are all strongly affected by geographical regions with correlation coefficients greater than 0.5 (Top management: ř = 0.572; Strategic planning: ř = 0.659, Process management: ř = 0.646). The common attribute among them is the fact that the impact is greater in the Asia-Pacific region than Africa and the Middle East.

In the same vein, the other individual practices (Human resources and Information and Analysis) exhibit a high sense of similitude in which both are strongly affected by the moderating effects of geographical regions. In both relations too, Africa is the most affected region among the rest.

Table 3.10

Effect of Geographical Region on Operational Performance under the Fixed Effect

Variables	Effects	N	ř	p	95% C.I	Q-value	Z-value	Std Error
H_2: TQM → Operational Performance	**18**	**3134**	**0.727**	**0.000**	**(0.710, 0.743)**	**2247.421**	**51.178**	**0.412**
Africa	3	305	0.524	0.000	(0.437, 0.602)	14.033	10.014	0.078
Asia-Pacific	11	2456	0.755	0.000	(0.737, 0.772)	2148.697	48.473	0.678
Middle East	4	373	0.653	0.000	(0.590, 0.709)	33.780	14.840	0.123
H_{4a}: Top Management → Operational Performance	**8**	**1034**	**0.572**	**0.000**	**(0.529, 0.612)**	**32.274**	**20.665**	**0.021**
Africa	2	249	0.540	0.000	(0.445, 0.623)	0.703	9.428	0.012
Asia-Pacific	4	591	0.569	0.000	(0.512, 0.622)	30.070	15.557	0.064
Middle East	2	194	0.517	0.000	(0.521, 0.698)	0.063	9.879	0.019
H_{4b}: Strategic Planning → Operational Performance	**2**	**195**	**0.659**	**0.000**	**(0.571, 0.732)**	**56.258**	**10.880**	**0.875**
Africa	1	116	0.331	0.000	(0.158, 0.484)	0.000	3.656	0.000
Asia-Pacific	1	79	0.897	0.000	(0.843, 0.933)	0.000	12.699	0.000
H_{4d}: Information & Analysis → Operational Performance	**9**	**1182**	**0.760**	**0.000**	**(0.735, 0.783)**	**1075.845**	**33.860**	**0.573**
Africa	2	249	0.976	0.000	(0.970, 0.981)	533.637	34.462	6.242
Asia-Pacific	5	739	0.547	0.000	(0.494, 0.596)	55.856	16.538	0.075
Middle East	2	194	0.715	0.000	(0.637, 0.778)	20.625	12.292	0.397
H_{4e}: Human Resources → Operational Performance	**10**	**1212**	**0.783**	**0.000**	**(0.760, 0.804)**	**1216.720**	**36.160**	**0.601**
Africa	3	306	0.965	0.000	(0.956, 0.972)	748.481	34.583	4.195
Asia-Pacific	5	712	0.565	0.000	(0.513, 0.614)	40.337	16.909	0.056
Middle East	2	194	0.790	0.000	(0.729, 0.838)	38.081	14.677	0.734
H_{4f}: Process Management → Operational Performance	**10**	**1260**	**0.646**	**0.000**	**(0.612, 0.677)**	**81.786**	**26.946**	**0.038**
Africa	2	172	0.480	0.000	(0.354, 0.588)	0.538	6.730	0.020
Asia-Pacific	6	894	0.671	0.000	(0.633, 0.706)	67.829	24.073	0.063
Middle East	2	194	0.650	0.000	(0.560, 0.725)	1.592	10.634	0.031

Note: Effects represent number of studies, **N** is the sample size and **ř** is the effect size

3.5.5. Test for Publication Bias

As stated earlier, the assessment for publication bias otherwise known as the "file – drawer problem" was done using the two most common methods – funnel plot and the Classic fail-safe N. The funnel plot is known widely for its ability to graphically represent publication bias in any meta-analytic review. As can be seen in Figure 3.4, the funnel plot employs scatter plot to present the sample sizes of primary studies (in the standard error form) on the vertical axis and the corresponding effect sizes (Fisher's Z) on the horizontal axis. The symmetrical distribution of the studies around the mean effect size indicates the absence of publication bias. The funnel plot is presented in Figure 3.4;

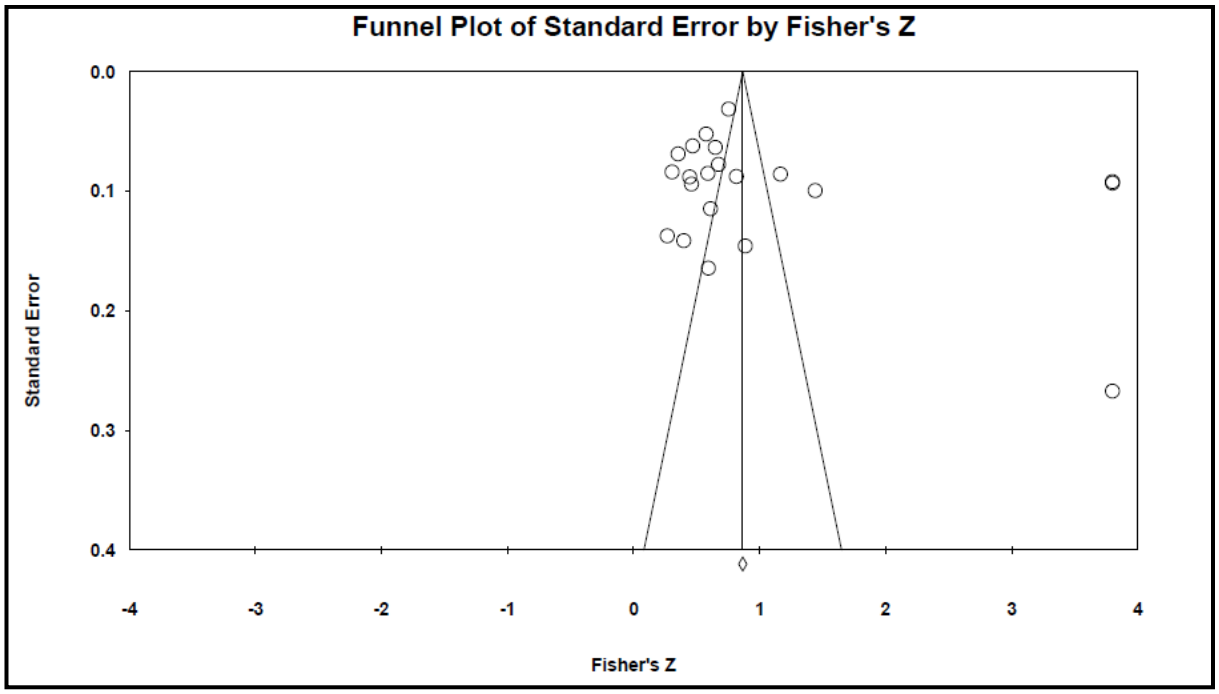

Figure 3.4: Funnel Plot for the Assessment of Publication Bias

The classic fail-safe N as an approach to dealing with publications bias assumes that, the results of the meta-analysis usually exclude studies with smaller effect sizes and if all the excluded or missing studies were to be retrieved and included in the analysis, the p-value of the summary effect would no longer be significant (Borenstein et al. 2009). It is therefore recommended by Rosenthal (1979) that the number of missing studies required to make the p-value non-significant be computed. Operating on the back of the assumption that, the mean effect of the missing studies is zero, a classic fail-safe N results that indicate the need for only a few studies to make the effect non-significant surely raises concern that the true effect was indeed zero. On the other hand, where a large number of studies is required to nullify the effect, there wouldn't be any reason to be concerned (Borenstein et al. 2009).

Hence, for this review, a fail-safe N of 5,070 was estimated, implying that over 5,000 studies with an average effect size of zero has to be introduced into the analysis before the cumulative or summary effect would become non-significant. The fail-safe N has been found to be significant ($z = 52.540$, $p = 0.000$), highlighting the absence of publication bias in the current review. Besides, considering the fact that only 21 of the studies that looked at the relationship between TQM practices and operational performance made it through the inclusion criteria and were therefore analysed in this review, it is very unlikely

that over 5,000 studies were missed. While the strength of the relations between the two (2) variables discussed earlier may have been overstated, it is highly unlikely that the true effect will be zero. The classic fail-safe N results is presented Table 3.11;

Table 3.11

Classic Fail-safe N results for the Assessment of Publication Bias

Z-value for observed studies	52.53955
P-value for observed studies	0.00000
Alpha	0.05000
Tails	2.00000
Z for alpha	1.95996
Number of observed studies	21.00000
Number of missing studies that would bring p-value to > alpha	5070.00000

3.6. Summary

This research study was undertaken with the sole aim of assessing the relationship between TQM practices and operational performance of manufacturing companies. To answer the research questions as well as test the formulated hypothesis, a search for relevant research work (articles, theses, dissertations, conference papers etc) published between 1997 – 2017 on the topic was conducted in both online and offline databases. This yielded a total of 475 studies of which only 21 studies made it through the inclusion criteria.

Being a study that focuses on the performance of manufacturing companies itself, the descriptive sample characteristics shows that majority (76%) of the included studies focused only on manufacturing-oriented companies, 52% of them conducted in the Asia-Pacific region, over 40% had its empirical data analysed statistically with the Structural Equation Model (SEM) and several too were published in high-ranking international business journals.

Adhering to the meta-analysis procedure of Hunter and Schmidt (2004) and with the help of the Comprehensive Meta-Analysis software, a summary effect of 0.793 ($CI_{95\%}$ = 0.608, 0.896; $p < 0.05$) with a Cochran's Q of 2463.755 indicate that a strong and significant relationship exist between TQM practices and operational performance. All the proposed

moderators were also found to have moderating effect on the relationship between the two variables. The next chapter (Chapter 4) presents a summary of the whole study, conclusions that can be drawn from the research findings, and recommendations for future research.

CHAPTER 4: SUMMARY, CONCLUSION AND RECOMMENDATIONS

4.1. Introduction

This study was undertaken purposely to examine the possibility of a significant relationship between TQM practices (individually and as a whole) and the operational performance of manufacturing companies through the quantitative combination of the findings of studies published between 1997 and 2017. The choice of the research design, data collection method, and data analysis technique were all geared towards finding answers to the research questions and for the testing of the hypotheses. This chapter therefore presents the summary of the thesis, conclusions drawn from the study results and some recommendations for future research.

4.2. Summary

Previous studies on total quality management have examined the effect of its implementation on multiple measures of organizational performance, confirming the power of TQM to be used as a tool for achieving varied organizational objectives. What is however evident from those studies is the absence of consensus among researchers especially on issues concerning the definition of TQM, its critical success factors, the elements of TQM and overall effects of TQM implementation on the performance of business organizations. This subjected the wonderful management philosophy to a series of misrepresentations and subjective judgement of what it is, the building blocks for its successful implementation as well as its benefits to organizations. Despite the fact that several research findings support the idea that TQM implementation has positive effects on organizations' operational performance, an alarming number of studies also presented conflicting findings on the contribution of the individual TQM practices to the operational performance of organizations. It does appear that, the effect of aggregate TQM practices on operational or organizational performance is far from being a controversy since majority of the studies on the topic have found the two variables to be positively related. The bone of contention, which of course is the target for this meta-analytical study, therefore is in the relationship between the individual TQM practices and operational performance. Not much has also been done to investigate and explicitly communicate to

quality practitioners and managers of manufacturing companies, the possible effects of TQM implementation on the operational performance of their companies. In response to the issues above, the following research objectives were developed to guide this study;

- To determine the extent at which TQM implementation contributes to the operational performance of manufacturing companies.
- To assess the degree of importance of the individual TQM practices in the improvement of operational performance.
- To explore the effects of potential moderators on the TQM-operational performance relationship in manufacturing companies.

In order to achieve the afore-mentioned research objectives, attempts were made to answer the following research questions;

1. To what extent does TQM implementation influence operational performance of manufacturing companies?
2. Which TQM practices are best predictors of operational performance?
3. To what extent is the TQM-operational performance relationship influence by moderating factors?

The efforts to find answers to the research questions, and for that matter achieve the research objectives, began with an extensive review of the TQM literature that helps the researcher to unearth the various definitions of quality, total quality and its evolution, the pioneers of TQM (Deming, Juran, Crosby, Feigenbaum, and Ishikawa) and their respective contributions to the TQM philosophy, the three main quality award models (the Deming Prize, the European Foundation of Quality Management and the Malcolm Baldrige National Quality Award), and TQM implementation in Turkey. Following the MBNQA criteria and being inspired by the work of Samson & Terziovski (1999), an outstanding theoretical framework that defined TQM as; a management philosophy that continuously improve the overall performance of businesses based on top management leadership, strategic planning, customer focus, information and analysis, people management and process management was adopted. The successful implementation of TQM therefore means that all the six inter-dependent constructs have to be tactically implemented using the relevant tools and techniques.

The literature review also reveals the various performance indicators that organizations attached much importance to, which includes customer satisfaction, quality performance,

operational performance, inventory management performance, employee satisfaction, financial performance and market performance. Being the only performance measure this study focuses on, operational performance was measured based on performance constructs such as product quality, cost of scrap and rework, productivity, inventory management, delivery lead-time for finished products, and the level of customer complaints. Three moderating variables (firm size, industry type, and geographical location) were also identified to be potentially capable of influencing the TQM-operational performance relationship. a research model of the TQM practices, operational performance and the moderating factors was formulated based on the results of previous researches. The model is made up of four main hypotheses, two of which examined the direct effect of the independent variables (TQM practices) on the dependent variable (operational performance) and the other two examining the potential effect of the moderating variables on the proposed relationships.

To be able to answer the research questions and as well test the proposed hypotheses, an extensive search for relevant primary studies (articles, theses, conference papers etc.) published between 1997 and 2017 was conducted both manually and on online databases. A specific but comprehensive inclusion/exclusion criteria was designed to help determine the suitability of the collected studies for this meta-analysis. Out of 475 studies gathered through the data search, 454 studies could not meet the inclusion criteria and were therefore excluded leaving only 21 studies to be used for the analysis. Guided by the Hunter and Schmidt (2004) meta-analysis of correlation approach, this meta-analysis was conducted using the Comprehensive Meta-Analysis (CMA) software after the correction of sampling and measurement errors. The CMA software was chosen over other meta-analysis software because of its user-friendliness and the tutorials that come with it.

It is worth stating that, each included study contributed one effect size (correlation coefficient) towards the study, hence 21 effect sizes with an aggregate sample size (N) of 3,735 respondents were used for the analysis. A look at the descriptive characteristics of the sample (included studies) indicates that 76% of them focused only on respondents in the manufacturing sector, 52% conducted in the Asia-Pacific, and 43% had their empirical data analysed through the Structural Equation Modelling (SEM) method. The heterogeneity test conducted before the meta-analysis indicates that, except ‘customer focus – operational relationship’ all the proposed relationships were heterogeneously

significant, supporting the choice of the random-effect model as well as the need to conduct moderator analysis on the affected relationships. The meta-analysis results then reveal that TQM implementation generally was positively related to operational performance. Apart from strategic planning that was non-significant, the rest of the individual practices were found to be positively correlated to operational performance. It was also clear from the results of the moderator analysis that, all the relationships analysed were strongly influenced by all the moderating variables. Having all the research questions answered indicate that the research objectives were successfully achieved.

4.3. Conclusion

The extensive literature review and the results of the meta-analysis have prepared the grounds for a number of conclusions to be made. In the first place, the alarming number of conflicting results in the literature especially on the effect of individual practices on operational performance, which obviously has much to do with the adopted research designs, trigged the need for a study that quantitatively combines the conflicting findings of the previous studies into a form that enables accurate and reliable judgements to be made about TQM and operational performance. It is in response to this that this current meta-analysis was undertaken to review studies published between 1997-2017.

Secondly, several conclusions can also be drawn from the results of the research model (hypotheses) tested. Based on the research objectives, three main categories of conclusions can be made; (1) those that are based on aggregate TQM-operational performance relationship (2) those based on individual TQM-operational relationships and (3) those that are based on the effects on moderators on all the relationships. In the first category, the conclusion that can be made from the test of hypothesis one (H_1) is that, aggregate TQM practices have positive significant effects on the operational performance of manufacturing organizations. The meta-analysis results specifically produced a correlation coefficient of 0.793 and a p-value of 0.000, indicating that the relationship isn't only positive but very strong as well. With regards to the second category that involves the testing of hypothesis three (H_3), the following conclusions can be drawn;

- Management leadership is strongly associated with operational performance ($\check{r} = 0.531$, $p < 0.05$).
- Strategic planning unlike the rest, is non-significantly related to operational performance although a high correlation coefficient of 0.716 was obtained.

- Customer focus has a medium significant (ř = 0.416, $p < 0.05$) effect on the operational performance of manufacturing firms.
- Information & Analysis is also significantly associated with operational performance (ř = 0.698, $p < 0.05$).
- Human resource management has a positively significant (ř = 0.696, $p < 0.05$) impact on operational performance.
- Process management is positively and significantly correlated (ř = 0.621, $p < 0.05$) to operational performance.

In essence, majority of the individual practices were positively and significantly associated with operational performance, hence H_3 be deemed accepted.

Thirdly, conclusions regarding the effects of moderators on TQM-operational performance relationship are drawn after a careful interpretation of the results of the moderator analysis. With the exception of customer focus that was heterogeneously non-significant, the sub-group analysis conducted under the fixed-effect model shows that all the relationships analysed were affected by the moderating variables, although at different degrees. The results specifically show that the relationship between aggregate TQM practices and operational performance is moderated by geographical location more than it is with industry type and firm size. Even with this, the Asian-Pacific region positively affect TQM implementation than the other regions, implying that manufacturing firms in that region are more likely to achieve their operational performance goals than their counterparts in the other regions (Africa and Middle East).

With regards to the effect of the moderators on the relationship between the individual practices and operational performance, the sub-group analysis reveals that the effect of top management leadership, information & analysis, people management, and process management, on operational performance was moderated by geographical location more than other moderating variables. And more important, the moderating effect is greater in Asian-Pacific than in any other region. This implies that with a good leadership, effective use of information, sound people and process management, organizations in that region would be closer to achieving performance excellence than firms in the other regions. The moderating effect on the relationship between strategic planning and operational performance is however constant across all three moderating variables.

In essence, this meta-analytical review contributes significantly to the TQM body of knowledge in so many ways. First of all, it provides a theoretical framework that examines the effect of TQM practices (individually and as a whole) on the operational performance of manufacturing companies. It further assesses the effects of moderating variables; firm size, industry type and geographical location, on the TQM-operational performance relationship.

The study findings also have some significant implications for managers and quality practitioners. Since the central findings of the study is that TQM practices significantly and positively affect operational performance of manufacturing companies, managers and quality practitioners will understand the benefits that come with the implementation of the TQM philosophy. The assessment of the effects of the individual practices on operational performance and its corresponding results will also serve as a guide to managers on the individual practices that best predict operational performance. The moderator analysis results also throw more lights on the magnitude of effect that factors such as their firm size, industry type and geographical location have on the operational excellence of their companies. An understanding of the moderating variables and the effects they exert on the TQM-operational performance relationship will also help the managers to manipulate them to their advantage.

4.4. Future Research

In an empirical study like this, recommendations for future research is needed to address the "shortfalls" of the study. First of all, this study quantitively combined the findings of 21 previous studies to arrive at its findings. It is presumed that a larger sample size would have produced more generalizable results. It is therefore recommended that the study is replicated with inclusion/exclusion criteria that allow large number of primary studies to be included in the study. The language criterion that particularly limited the number of studies included in this study can be widened to allow studies published in other languages like French, Arabic and Turkish to be included, thereby improving the size of the sample. In addition, the coding reliability of the replicated study should be improved through the involvement of other researchers, most preferably specialist, in the coding process. This would ensure that no relevant data is left out.

Secondly, the analysis of data for this study was done quantitatively, raising concerns that relevant but qualitative data on the topic might have been left unanalysed. To avoid such

cases, it is recommended that multiple data analysis techniques be adopted to facilitate the analysis of both qualitative and quantitative data.

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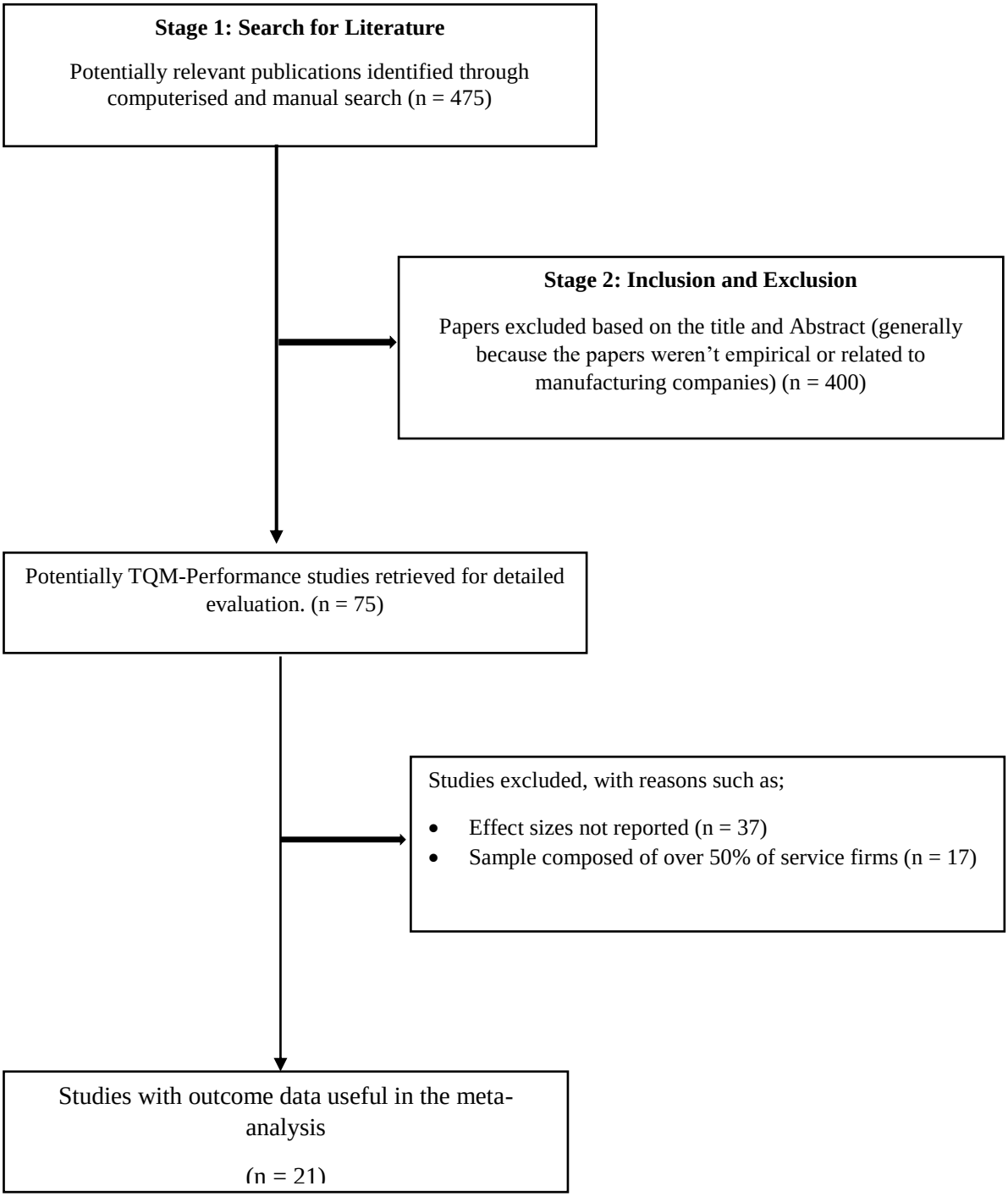
APPENDICES

Appendix 1: Summary of studies assessed and excluded through the stages of the meta-analysis



Appendix 2: Coding Form

The coding form for the meta-analytical review of the relationship between TQM practices and operational performance is given below;

1. Study Identification
   a) Study ID: ……..
   b) Author(s): …….....
   c) Year of Publication: …….
   d) Journal: …….
   e) Country/Region Conducted: ……..…
2. Sample Characteristics
   a) Sample Size (N): ……...
   b) Industry type of the Sample: …….
   c) Business Sector of the Sample: …….
   d) Firm Size of the Sample: ……
3. Outcome Characteristics
   a) Data Analysis Technique(s): …….
   b)

Effect Size Calculation			
	TQM Reliability	Performance Reliability	Effect Size
TQM Practices:			
Performance:			

Appendix 3: Coding Instructions

The coding process is guided by the following instructions

Study Identification	
Study ID	Assign a unique identifier to the study
Author(s)	Record the last name(s) of the authors.
Year	Record the year the study was published
Journal	Record the journal in which the study was published.
Country	Record the country/region where the study was conducted
Sample Characteristics	
Sample Size	Record the sample size (N) of the study
Industry	Record the industry type of the sample
Sector	Record the business sector the sample works
Firm Size	Record the firm size of the sample
Outcome Characteristics	
Method	Record the statistical method used to analyse study data.
TQM Practices	Record the TQM constructs identified in the study with their effect sizes.
Operational Performance	Record the operational performance constructs measured in the study with the reliabilities.

AUTOBIOGRAPHY

Yakubu Mohammed Jibril was born in the Northern part of the Republic of Ghana in the year 1991. Having had his elementary and Junior High education from Zoggu Primary and Zoggu Junior High School respectively, he proceeded to Tamale Business Senior High School (BISCO) where he got introduced to Business as a program of study for the first time. Right after high school, he got admitted to the Faculty of Business of the University of Education, Winneba in the year 2010, and graduated four years later (2014) with a B.Sc. Honours in Management Education. A year later, he got admitted to the School of Business of Sakarya University through the Turkish Government Scholarship to study M.Sc. Production Management and Marketing.