

# Quality and Productivity Management

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**Abstract**— considering the world population which is on the increase daily as well as the corresponding high demand for goods and services, a lot of companies and organizations have come to settle thereby making the supply to these demands competitive. Based on this, for a company to survive in the competitive supply of goods and services as well as making profits from businesses, a suitable technique has to be adopted at the management level to deliver quality goods and services while making efficient or optimal use of the available resources to make these products available. This research has pointed out the essence of quality and productivity management as well as some techniques to be adopted in the course of aligning these two factors that define a company's ability to survive and be competitive in the global village.

**Index Terms**—Quality, Productivity, Management, Technique.

## I. INTRODUCTION

Productivity is a tool of measurement that determines the efficiency of the organization in terms of the ratio of output produced with respect to inputs used. Hence, operations managers need to carry out a regular review of all these factors to maintain as well as improve productivity. The service economy is considered to be the largest portion of the industrialized world's economic activity and this development has dramatically raised the importance of maximizing productivity excellence in service organizations. [1]

Productivity and quality are integral components of organizations' operational strategies. Productivity plays an important role at both macro and micro levels. At micro-level, firms use productivity as a performance measure to benchmark against best-in-class companies, to identify best practices. [2] Quality management has become an important part of management culture, particularly in new enterprises characterized by supply chain, e-commerce and virtual enterprise environments. [3].

Quality management maintains consistency in an organization's product and services. Quality management, in essence uses quality assurance and control of processes as well as products to achieve more consistent quality. Smarter service systems serve customers better and create more

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opportunities for win-win, or benefit-benefit, interactions that result in value co-creation for both service providers and customers [4]. This pushes the focus on service science as an emerging discipline of high relevance to both practice and academia which fosters a cross-disciplinary approach to the study of service systems. Understanding, creating, managing, and delivering successful services calls for systematic studies of managerial, technical, and social issues. Businesses typically reach their greatest output potential when productivity is maximized among employees. Productivity stagnates for reasons frequently connected to motivational issues and communication problems. When management takes no action to increase business productivity, it can foster a work environment that accepts average work output. [5]. Quality management is the act of overseeing all activities and tasks needed to maintain a desired level of excellence. This includes the determination of a quality policy, creating and implementing quality planning, assurance, control and improvement. It is also referred to as total quality management (TQM). In general, quality management focuses on long-term goals through the implementation of short-term

## II. BACKGROUND

Quality is conformance to requirements. During the last decade, the service sector has been the fastest growing segment and represents a major and increasing part in the global economy [6]. The significance of services for the prosperity of the world economy has been widely recognized. A well designed product without any error may not be considered as a quality product by the customers if it does not satisfy their initial requirements or need.

Practice of quality has changed over the years. Olden day's quality focused on adherence to defined and implied customer needs. Today, it is much more than that. Value obtained out of a product is key for every customer. Customers only accept best-in-class, innovative, technologically modern and reliable products. Note that, for most products, after sales service quality is an important factor.

The roots of Total Quality Management can be traced to early 1920's production quality control ideas, and notably the concepts developed in Japan beginning in the late 1940's and 1950's, pioneered there by Americans Feigenbaum, Juran and Deming. The Japanese quality gurus who developed and extended the early American quality ideas and models: Kaoru Ishikawa, Genichi Taguchi, and Shigeo Shingo; and the 1970-80's American Western gurus, notably Philip Crosby and Tom Peters, who further extended the Quality Management concepts after the Japanese successes.

In the 1920's statistical theory began to be applied effectively to quality control, and in 1924 Shewhart made

the first sketch of a modern control chart. His work was later developed by Deming and the early work of Shewhart, Deming, Dodge and Romig constitutes much of what today comprises the theory of statistical process control (SPC). However, there was little use of these techniques in manufacturing companies until the late 1940's.

At that time, Japan's industrial system was virtually destroyed, and it had a reputation for cheap imitation products and an illiterate workforce. The Japanese recognized these problems and set about solving them with the help of some notable quality gurus – Juran, Deming and Feigenbaum.

In the early 1950's, quality management practices developed rapidly in Japanese plants, and become a major theme in Japanese management philosophy, such that, by 1960, quality control and management had become a national preoccupation.

By the late 1960's/early 1970's Japan's imports into the USA and Europe increased significantly, due to its cheaper, higher quality products, compared to the Western counterparts.

In 1969 the first international conference on quality control, sponsored by Japan, America and Europe, was held in Tokyo. In a paper given by Feigenbaum, the term "total quality" was used for the first time, and referred to wider issues such as planning, organization and management responsibility. Ishikawa gave a paper explaining how "total quality control" in Japan was different, its meaning "company-wide quality control", and describing how all employees, from top management to the workers, must study and participate in quality control. Company-wide quality management was common in Japanese companies by the late 1970's.

The British Standard (BS) 5750 for quality systems had been published in 1979, and in 1983 the National Quality Campaign was launched, using BS5750 as its main theme. The aim was to bring to the attention of industry the importance of quality for competitiveness and survival in the world market place.

Since then the International Standardization Organization (ISO) 9000 has become the internationally recognized standard for quality management systems. It comprises a number of standards that specify the requirements for the documentation, implementation and maintenance of a quality system. [8]

Recently, the European Organization for Quality and the European Foundation for Quality Management held a special workshop to discuss quality research activities in Europe and the United States. The intent is to drive research in effective approaches to organizational learning and redesign, strategic and cultural change, quality and process improvement, innovation, new product and service development, and the development and integration of new technologies. [9].

The need for productivity excellence has led service organization managers to use benchmarking techniques to identify and adopt best practices in their organizations. Benchmarking has enabled service organizations to continuously improve by allowing service units to learn from methods that prove the most efficient and effective.

Service Productivity Management systematically explores complex service issues and suggests the most appropriate methods to improve service productivity, quality, and profitability

According to Taylor, productivity is defined as outputs divided by inputs. It has always been recognized this way since the term was first mentioned in the late 1800s. The outputs represent products and goods (and later services) generated while the inputs include key resources used for this generation, especially in the immediate factors such as labor, materials and machines.

### III. DEFINITION OF QUALITY AND PRODUCTIVITY MANAGEMENT

According to the American Society for Quality, "quality" can be defined in the following ways:

✓ based on customer's perceptions of a product/service's design and how well the design matches the original specifications.

✓ the ability of a product/service to satisfy stated or implied needs.

#### What Is a Quality Management System?

A quality management system is a management technique used to communicate to employees what is required to produce, the desired quality of products and services and to influence employee actions to complete tasks according to the quality specifications.

Productivity; Productivity describes various measures of the efficiency of production. A productivity measure is expressed as the ratio of output to inputs used in a production process, i.e. output per unit of input.

Productivity indicates the ability of all related activity to produce. Instead of independently and separately focusing on the input and output sides, productivity represented a major philosophical shift in how a work system (including a workstation, an assembly line, a process, and a plant) would be analyzed for continuous improvement. When dividing the outputs by the inputs, the implications show how well the inputs (which can be described as the resources) are utilized in order to generate the outputs. These implications help shape the analysis from the improvement perspective.

Productivity=

Output(s) (in physical quantity) / Input(s) (in physical quantity)

Productivity management can be defined as design, development and deployment of techniques to effectively utilize or optimize resources (inputs) so as to get higher output while maintaining quality standards.

Quality and Productivity management therefore can be considered a very vital aspect of organization's management structure, and can be defined as the design, development and deployment of techniques methods to optimally utilize the available resources to get a product that conforms to standards, specifications and satisfying the requirements of

the consumer.

#### IV. GOALS AND OUTCOMES

The primary aim of this research is to sensitize organizations and companies on the importance of quality and productivity and the role the organization's management should play to achieve high level of productivity with quality consideration. The higher productivity level implies the lower operating cost. In other words, being productive is equivalent to being competitive.

Various organizations, companies can benefit from this research considering the competitiveness of industries now, this they can achieve through management because, quality products will maintain customer satisfaction as well as faith in the product and productivity management will ensure proper optimization in the use of inputs for higher profitability.

#### V. QUALITY AND PRODUCTIVITY MANAGEMENT METHODS

##### A. Principles

Quality management ensures that an organization, product or service is consistent. It has four main components: quality planning, quality assurance, quality control and quality improvement. Quality management is focused not only on product and service quality, but also on the means to achieve it. Quality management, therefore, uses quality assurance and control of processes as well as products to achieve more consistent quality.

The International Standard for Quality management (ISO 9001:2015) adopts a number of management principles that can be used by top management to guide their organizations towards improved performance. They include;

- Customer focus; The primary focus of quality management is to meet customer requirements and to strive to exceed customer expectations. This is because Sustained success is achieved when an organization attracts and retains the confidence of customers and other interested parties on whom it depends. Every aspect of customer interaction provides an opportunity to create more value for the customer. Understanding current and future needs of customers and other interested parties contributes to sustained success of an organization.
- Leadership; Leaders at all levels establish unity of purpose and direction and create conditions in which people are engaged in achieving the organization's quality objectives. This is important because Creation of unity of purpose and direction and engagement of people enable an organization to align its strategies, policies, processes and resources to achieve its objectives.
- Engagement of people; Competent, empowered and engagement of people at all levels throughout the organization are essential to enhance its capability to create and deliver value, it is necessary because to manage an organization effectively and efficiently, it is important to involve all people at all levels and to respect them as individuals. Recognition, empowerment and enhancement

of competence facilitate the engagement of people in achieving the organization's quality objectives.

##### B. Quality Improvement Methods

There are many methods for quality improvement. These cover product improvement, process improvement and people based improvement. In the following list are methods of quality management and techniques that incorporate and drive quality improvement:

ISO 9004:2008 — guidelines for performance improvement.

ISO 9001:2015 - a certified quality management system (QMS) for organizations who want to prove their ability to consistently provide products and services that meet the needs of their customers and other relevant stakeholders.

ISO 15504-4: 2005 — information technology — process assessment — Part 4: Guidance on use for process improvement and process capability determination.

QFD — quality function deployment, also known as the house of quality approach.

Zero Defect Program — created by NEC Corporation of Japan, based upon statistical process control and one of the inputs for the inventors of Six Sigma.

Six Sigma —  $6\sigma$ , Six Sigma combines established methods such as statistical process control, design of experiments and failure mode and effects analysis (FMEA) in an overall framework.

Quality circle — a group (people oriented) approach to improvement

TQM — total quality management is a management strategy aimed at embedding awareness of quality in all organizational processes. First promoted in Japan with the Deming prize which was adopted and adapted in USA as the Malcolm Baldrige National Quality Award and in Europe as the European Foundation for Quality Management award (each with their own variations).

#### VI. CRITICISM

The central concepts of Quality Management (QM), such as; process orientation, controllability, and zero defects as modern myths.[10] She demonstrates that zero-error processes and the associated illusion of controllability involve the epistemological problem of self-preferentiality. The emphasis on the processes in QM also ignores the artificiality and thus arbitrariness of the difference between structure and process. Above all, the complexity of management cannot be reduced to standardized (mathematical) procedures. According to her, the risks and negative side effects of QM are usually greater than the benefits.

## VII. METHODS

The birth of modern quality can arguably be pinpointed to the mid-1920s. Walter A. Shewhart, a statistician at Western Electric, began to focus on controlling processes, making quality relevant not only for finished products, but for the processes that created those products. Shewhart recognized that all processes yield data that could be analyzed using statistical techniques to determine if a process is stable and in control. His work laid the foundation for statistical control charts, a landmark modern-day tool that would revolutionize the management of processes and launch generations of quality experts.

As part of U.S. efforts to harness the civilian economy to the war effort, a branch of the War Production Board focused on training courses for statistical tools such as control charts and sampling plans, which had evolved with the Bell System from the 1920s. The Department of Defense (DOD), in its Lend Lease program, procured the services of leading experts in the “quality field” to conduct this work. Joseph M. Juran and W. Edwards Deming (both mentored by Walter Shewhart) were just two who worked to train civilian suppliers to the wartime effort.

Productivity and Quality hence should be given appropriate attention at the higher echelon of management since the two tools form the basis for the success or failure of a company.

## VIII. RECOMMENDATION

I recommend that more discoveries related to this work should be made, since the competition in the industries is on the increase, there is need for more research on better means of delivering quality goods and services as well as optimizing the resources for production which would lead to profit maximization and cost minimization.

## IX. CONCLUSION

To achieve the aim of quality product delivery and high level of productivity, organization management should endeavor to consider the investment in human resources to train their personnel on various quality management technique as well as productivity.

## REFERENCES

- [1] Sherman, H. David, Zhu, Joe, (2006); “Service Productivity Management; Improving Service Performance Using Data Envelopment Analysis (DEA), Springer, pp. 1-274..
- [2] Kiraci, Ercihan, Turley, G. A., Attridge, Alex, Olifent, Alan and Williams, M. A. (2016); “Evaluating the Capability of Laser Scanning to Measure an Automotive Artefact: A Comparison study of Touch Trigger Probe and Laser-Scanning”, International Journal of Productivity and Quality Management, vol. 18, iss. 4, pp. 440-450.
- [3] A. M. Braccini, Nunzio Casalino, A D Atri. (2012); “A Quality Management Training System Concerning ISO Standards for sustainable Organisational Change in SMEs” International journal of productivity and quality management (IJPQM)”, vol. 9, no. 1, 2012..
- [4] Bilal Balci, Alicia Hoiman, Christopher Rosenkranz, (2011) “Service Productivity: A literature review and agenda” Conference paper, pp. 1-14.
- [5] Henry Chesbrough, and Jim Spohrer, (2006); “A Research Manifesto for Services Science”, Communications of the ACM, vol. 49, no. 7, pp. 34-40.
- [6] Carlos Guillermo Benavides-Chicón, (2014); “ The Impact of Quality Management on Productivity in the Hospitality Sector”, International Journal of Hospitality Management, vol. 42, pp. 165-173.
- [7] Priyanju Pal, Car Enthusiast, Sports Lover, Latest Technology Follower. Yahoo answers, January, 8, 2017.
- [8] Stracke, Christian M. (2006); “Process-Oriented Quality Management”, Handbook on Quality and Standardisation in E-Learning: Springer, pp. 79-96.
- [9] Joseph M. Juran, A. Blanton Godfrey, “Juran’s Quality Handbook”, 5th Edition, McGraw-Hill Companies, Inc.
- [10] Bettina Warzecha (2017) The problem with quality management: Process orientation, controllability and zero-defect process as modern myths (Philosophy in Practice)