Journal of Infrastructure, Policy and Development 2024, 8(12), 8456.
https://doi.org/10.24294/jipd.v8i12.8456

Review

Total Quality Management (TQM) for the development of future smart and integrated cities and sustainable development

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CITATION

Lamdjad I, Alfalahi BOS. (2024). Total Quality Management (TQM) for the development of future smart and integrated cities and sustainable development. Journal of Infrastructure, Policy and Development. 8(12): 8456. https://doi.org/10.24294/jipd.v8i12.8456

ARTICLE INFO

Received: 7 August 2024
Accepted: 19 September 2024
Available online: 29 October 2024

Abstract: Sustainable cities have been among governments prevailing approaches for promoting and achieving goal 11 of the United Nations in urban areas. However, development of sustainable cities policies and measures of cities does not follow an organized and consistent approach for planning, designing, applying, and evaluating a comprehensive sustainable cities system. In that context, the objective of this article is to propose and present total quality management (TQM) as a tool that would aid cities in systematically developing to achieve this goal, literature review of research publications analyze. The research fellow descriptive analysis method.the results obtained in this literature review to find total quality management related to sustainable cities. It was concluded that creating a sustainable city and transportation urban requires understanding the total quality management (TQM) tools by policymakers and practitioners and urban center managers with the implementation and management of this tool. The total management for sustainable cities can assist as a viable management tool to more efficient use of resources in order to develop sustainable cities and achieve sustainability and sustainable transportation.

Keywords: sustainable cities; TQM; urban transportation; sustainability; sustainable development goals

1. Introduction

The sustainable development goals (SDGs) of 2015 recognise that cities around the world are playing an increasingly central role in sustainable development by going beyond the previous Millennium Development U, both from 2016, SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable posits cities as crucial arenas and actors for sustainability Goals (MDGs) 1 and dedicating SDG 11 explicitly to urban development (Eller et al., 2021).

During the past two decades Policymakers; researchers; Academics; practitioners; urban center managers and decision makers work on making solution challenges of cities sustainable cities and transportation urban and achieve sustainability due to the concentration of housing in the urban area and the strong population growth, the first time that over half of the world's population are urban dwellers; and these numbers are set to increase by 72% between 2000 and 2030 (United Nations Population Fund, 2007), which implies adapting the cities with the development goals Goal 11: Make cities and human settlements inclusive, safe, resilient, and sustainable.

Cities' sustainability is a complex concept about which it is rather difficult to reach consensus, some authors, such as include economic as well as socio-cultural and environmental aspects in an effort to delimit the meaning of the term and be able to

work with it. In this sense, one of the approaches most employed to determine the degree of sustainability is the city's quality of life level. (Prado-Lorenzo et al., 2012). In this sense, total quality management is a tool for making cities sustainable,transportation urban and sustainability by presenting a viable solution to develop by planning and designing and evaluating.

Moreover, the role of cities in sustainable development has become more prominent (Darlow, 1996; Portney, 2003) as a result of the growing urban population (Dempsey et al., 2009).

Being a sustainable city means using all available technology and resources in an intelligent and coordinated manner to develop urban centers that are at once integrated with transportation urban; habitable and sustainable (Barrionuevo et al., 2012).

The beginnings of shaping the concept of Total Quality Management back to the late fifties of the twentieth century, coinciding with the industrial revolution and its negative effects on humans. This concept was founded by W.Edwards Deming, Joseph Juran, and Kaoru Ishikawa in the United States of America, and gained great fame (Hackman and Wageman, 1995).

This period is considered a principal point in the development of the ideology of Total Quality Management.Ishikawa put forward a philosophy that led to the development of quality circles. Ishikawa played an important role in shaping the concept of Total Quality Management in Japan. He was called the "Father of Quality Circles" or "Quality Network in Japan" for his fundamental role in promoting Total Quality Management in the country during the sixties and before.

Ishikawa's philosophy was based on rejecting the idea of the American management style, as the basis of the American management style is "Managers lead and subordinates execute". His philosophy was summarized in integrating and coordinating work methods with the cultural trend towards craftsmanship, and promoting the group-oriented approach to work within factories.

In 1962, the concept was expanded throughout Japan. By 1978, there were one million quality circles in Japanese factories, involving ten million workers. Today, the concept of quality circles has expanded globally, extending to the service sector.

Ishikawa also wrote a book called Total Quality Control, in which he focused on seven indispensable tools for quality management: Pareto analysis, fishbone diagram, counting chart, histogram, scatter plot, stratification, and control chart.According to Ishikawa, these tools are simple and easy to understand. He believed that 95% of organizational problems could be solved using these basic tools (Sripan, K. 2024).The basic concept of total quality management is a broad concept and cannot be defined by only one definition, as it has diverse and multiple definitions (Hackman and Wageman, 1995). Total quality management is defined as any strategic approach that aims to improve the performance of organizations and individuals (Jensen and Wruck, 1994).

In the same context, Ishikawa defined total quality management as a management system that focuses on customers and involves every employee in continuous improvement efforts to provide the best products and services (Ishikawa, 1985).

Both Ishikawa and Deming agreed that the main factor for the continuity and survival of an organization is work, as it enhances the stability of society, provides services to customers, and works to achieve the satisfaction and happiness of

employees in organizations. Ishikawa emphasized the happiness of employees and ensuring their comfort and well-being, as he said that an organization whose employees are not happy does not deserve to exist (Ishikawa, 1985).

Even though these existing reviews provided a timely overview of the overall subject area, there is a lack of studies focusing on the connection of the concept of smart cities and UN SDG goals. Thus this study aims to bridge this gap in the literature by conducting a comprehensive analysis of the role of smart cities in creating sustainable cities and communities, which is one of the 17 UN sustainable goals. The findings of this study can provide an informative framework for research on smart cities for academics and practitioners.

The remaining sections of this study are organized as follows. Section 1 Introduction provides a brief overview of the Total Quality Management and sustainable Cities. Section 2 Literature Survey and Analysis. Section 3 method of research. Finally, section 4 conclusion.

The originality and value of this study lies in several aspects. Firstly, it introduces a novel TQM tailored for sustainable cities and transportation urban and sustainable development. Finally, this study represents a new field of application for TQM, expanding its scope beyond its traditional domains.

2. Literature survey and analysis

"A literature review of ten articles and research papers was conducted in order to determine the research gap and ensure that the topic is original".

Literature Survey and Analysis This section performs an extensive literature review, examining current research and knowledge in total management and sustainable cities This investigation serves as a basis for comprehending.

Moraga et al. (2025) discusses the research entitled. Analyzing the Effect of TQM Practices on the Project Performance, among construction firms in the National Capital Region, Philippines.

This study aims to investigate the practices and the adoption of quality through implementing TQM in the construction firms. It contributes to the knowledge on TQM and project performance by presenting the theoretical significance of TQM as a management system to bolster the performance of the construction sector in the Philippines.

The data method of this research covering 62 samples comprising top to senior management employees from small, medium, and large construction firms. Data were analyzed with regression analysis. The findings of this research show that all TQM practices in a joint manner are of statistical significance. The findings also found that leadership, strategic planning, customer focus, workforce focus, measurement, analysis and knowledge management, operations focus, and results individually have a positive significance on project performance (Moraga et al., 2025).

Kumar et al. (2024) present research entitled: A case study evolving quality management in Indian civil engineering projects using AI techniques: a framework for automation and enhancement .The research aims to examine a wide range of civil engineering projects across India, each providing a distinct platform for investigating quality management, automation techniques, and improvement activities using

artificial intelligence (AI) techniques. The research utilized both qualitative and quantitative methods.

The study method uses many tools and techniques such as Building Information Modeling (BIM), Lean Construction, Six Sigma, Total Quality Management (TQM), ISO 9001 Certification, AI techniques such as Artificial Neural Networks (ANN). This makes the search more complex and intricate.The research concludes that AI techniques show good terms of agreement while studying the case studies of similar attributes.

Automation tools demonstrate the combination of human creativity and technology, from Minitab and Au to desk Revit to ISO 9001 Quality Management Software and the Quality Management Suite. These tools are essential to the goal of improved quality assurance and effective project management; they are not just add-ons.

Hussain et al. (2024) present research entitled: Examining the role of responsible management, CSR, and TQM in enhancing renewable energy projects: An empirical analysis.

The research aims to investigate the significance of responsible management, corporate social responsibility (CSR), and total quality management (TQM) in relation to sustainability in renewable energy projects. The purpose is to fill the existing knowledge gap regarding the role and consequences of these variables, and to examine the mediating effect of TQM on the relationship between responsible management, CSR, and sustainability in renewable energy projects. The researchers employed a data collection process involving 420 individuals engaged in renewable energy projects. The data was analyzed using partial least squares structural equation modeling (PLS-SEM), The findings indicate that TQM plays a significant role as a partial mediator between responsible management, CSR, and sustainability in renewable energy projects. The study reveals that organizations that prioritize the efficiency of responsible management, CSR, and TQM are more likely to achieve sustainability goals in the context of renewable energy projects (Hussain et al., 2024).

When searching international databases such as Scopus and Elsevier, we did not find any research on comprehensive quality, sustainable cities, or urban mobility.

This research discovered the absence of research papers examining the TQM in sustainable cities and sustainability and urban transportation, all the previous study that we analyze limited to only the field of the TQM and renewable energy projects, the construction firms, he Project Performance Among Construction Firms. This is the research gap filled by this study.

2.1. Research method

The research used the descriptive analytic method.

3. The principles of TOM

The Principles of TOM is based on four -main main factors, which are quality, people, organizations, and senior management roles. It is as follows:

3.1. Quality factor

The quality factor is important in the science of total quality management, as the higher the quality of commercial services or manufacturing, the lower the financial costs. However, if the costs of quality are poor, it will lead to greater financial costs for the institutions, as the theory of commercial manufacturing is based on the idea that the costs of poor quality are much greater than the costs of developing processes that produce high-quality products and services. This means that organizations that produce high-quality goods will ultimately achieve better results compared to organizations that try to keep costs low by compromising quality (Deming, 1986; Ishikawa, 1985; Juran, 1974). From the point of view of Juran and Ishikawa, the production of high-quality products and services by organizations not only reduces high financial costs, but also works to keep the organization for a longer period.

3.2. People factor

Employees in organizations play a major role in achieving quality work.

Employees, if provided with experience and training in improving quality, will naturally care about the quality of the work they do. Deming and Ishikawa add that the organization must remove all organizational systems that hinder the achievement of quality in work (Deming, 1986; Ishikawa, 1985).

3.3. Organizational factor

Organizations are systems of closely interconnected parts, and face many functional problems. Both Deming and Juran believe that interfunctional problems should be addressed collectively by representatives of all relevant functions (Deming, 1993; Juran, 1969). In contrast, Ishikawa believes that the solution of interfunctional problems takes place at the level of each department, which sets its own goals (Ishikawa, 1985).

3.4. Senior management factor

Senior management is responsible for achieving quality in organizations because it is responsible for the process of establishing organizational systems and determining how to design products and services and improving quality is dependent on management's commitment to total quality.(Deming, 1986; Ishikawa, 1985; Juran, 1974).

4. Conclusion

The primary objective of this study was to the objective of this article is to propose and present total quality management (TQM) as a tool that would aid cities in systematically developing. To achieve this goal, literature review of research publications analyze.

The research concluded that creating a sustainable city and transportation urban requires understanding the total quality management (TQM) tools by policymakers and practitioners and urban center managers with the implementation and management of this tool. The total management for sustainable cities can assist as a viable

management tool to more efficient use of resources in order to develop sustainable cities and achieve sustainability and sustainable transportation.

The (TQM) technique proposed in this study proved to be highly effective in developing and analyzing sustainable cities and urban transportation, offering valuable insights for the future.

Future research should develop more user-friendly systems so citizens can be informed about the environment in the places they live and be able to participate in the decision making process about future actions connected to the planning, development and improvement of smart cities infrastructure.

Future research could explore additional factors and tools to develop the sustainable cities and transportation urban and sustainability to enhance the generalizability of the findings.

Conflict of interest: The authors declare no conflict of interest

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