

Theory of constraint application on quality management and organizational performance in the construction industry

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Abstract

This paper aims to review the relationship between the construction industry and the theory of constraints, which significantly impact quality management and organizational performance. Several studies have shown that adopting and implementing quality management is likely to improve an organization's performance. As a result, the relationship between quality management and organizational performance in the construction industry has not been extensively researched by linking this theory (e.g. theory of constraint). This review paper contributes to the body of knowledge on quality management and organizational performance by linking the theory of constraints to improve performance in the Malaysian construction industry through empirical evidence. Practically, this paper gives construction industry practitioners a push to better understand the roles of quality management and its ability to improve organizational performance through its theory of constraint (TOC) use. This review recommended that the analysis of structures should continue by using long-term activity-based costing (ABC) tools in future research.

Keywords

Constraint Theory, Quality Management, Organizational Performance, Construction Industry

Introduction

An ever-changing business environment characterizes by a dynamic market situation and a high level of competition (Eltawy & Galleary, 2017). Large and small organizations continue to face challenges from globalization to rapid technological advancements to disruptive business models to emerging new markets that are constantly changing (Žitkienė & Deksnys, 2018). Global economic development depends heavily on the construction industry, specifically on urbanization and sustainable development (Alaloul *et al.*, 2021). The construction industry is crucial to the country's economy, health, and quality of life (Lean, 2001, Alaloul *et al.*, 2021); however, it is also the backbone of any country's economic growth. It affects every sector at all economic levels (Hillebrandt, 1985; Alaloul *et al.*, 2021). A literature review of the Malaysian construction industry's characteristics reveals that the industry's attributes and current practices have led to

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severe issues. Although the public sector is a global manufacturing hub, the industry has grown due to public sector investments. Malaysia's construction industry is highly fragmented. Clients, consultants, main contractors, subcontractors, and workers on the job site are separate by a wide margin. Due to the large number of contractors working in the small domestic market, competition in the industry is fierce and results in a long chain of subcontracting culture; outsourcing different elements of jobs to sub-contractors, a project awarding system based on competitive price. A high degree of design, cost and other claims are therefore subject to disagreements.

However, the construction industry is characterized as fragmented, which requires the development of a project team consisting of several entities. Teamwork, communication, and a clear set of team goals are necessary for such a team. In the opinion of Irfan *et al.*, (2021), the industry's high performance was due to a high level of leadership among project managers and project contributors. The project team members are often at odds with each other because of the fragmentation of the industry. As a result, high levels of communication lead to better understanding among project members, which leads to high levels of productivity. One who has an appropriate leadership style is capable of leading this group of people to success.

In this case, Malaysian construction industry is no doubt that quality management practices have had a positive impact on the escalating organizational initiatives. Permana *et al.*, (2021) found that quality management techniques had significant effects on organizational networking and organizational success. Therefore, quality management is any practice that improves the quality of products while reducing costs and increasing consumer satisfaction. Perhaps quality management in the construction industry is to determine if this concept and method are still relevant and effective in improving business performance and customer satisfaction (Permana *et al.*, 2021). In Indonesia, Sutrisno (2019) conducted a study in an SME and concluded that quality management significantly improved operational performance, customer satisfaction, and product quality for the company in Indonesia. As a result of these improvements, an organization's competitive advantage and business sustainability will enhance successfully. Similarly, Nugroho & Nurcahyo (2018) conducted a study on SMEs in Indonesia and concluded that quality management implementation improved SME financial performance.

Even today, quality management is used widely in a wide range of industries and many countries. The fact that quality management focuses on increasing customer satisfaction and organizational performance by improving the quality of product, quality of service, and overall quality of the organization is one of the most crucial reasons why the quality management method is still relevant in today's world. A company's performance stands out as an essential factor in the administration's evaluation and is unquestionably the most important indicator of organizational success. Create and implement a theoretical framework for measuring performance as the primary condition to improve and achieve perfection in the business. Also, quality management is implemented with total commitment from the manager and employee involvement, resulting in a solid concept that is simple to understand and easy to implement in the construction industry. Perhaps the paper explained that finding the correct theory led to better quality management and better organizational performance for the outcome identification in the Malaysian construction industry.

Theory of Constraint

As early as 1984, Eliyahu M. (Goldratt & Cox, 1984) published his liberal book, The Theory of Constraints (TOC). When used with the Endgame TOC, it provides a method for identifying which aspects of a framework need to be changed and how they should change in enhancing its performance. It is because TQM views modification as a process that progresses. However, instead of focusing on limited enhancements across the board, it focuses on the one limitation or bottleneck that slows down the framework's performance. A key component of quality management will be the use of TOC.

In the construction industry, the Theory of Constraints (TOC) is a new concept. Time and cost overruns and their consequences plague the large proportion of Nepal's road construction projects, all of these completed and ongoing. As a result of the overruns, some projects have lost money and cost more, while others would be plagued by technical and managerial issues between all parties involved (Sha'ar *et al.*, 2017). The Theory of Constraints uses to solve construction constraints problems (TOC). However, its application in the construction sector, especially in Nepal, has yet to be tested. To identify and remove the major constraint in the system, TOC recommends five focusing steps. Critical Chain Project Management (CCPM) is a very effective method for removing the time constraints associated with buffer management in TOC. Buffer management includes manipulating activity time estimates while taking into account human behaviour to create time buffers. To ensure that construction projects are completed on time, the theory of constraints is discussed. By identifying and removing the constraint, this paper has the potential to optimize project and organizational performance. Any construction project manager can benefit from this paper by learning how to apply the Theory of Constraints (TOC) to improve project performance and increase organizational productivity (Mishra, 2020). Theory of Constraints (TOC) uses to identify and remove constraints and improve internal capacity. Also, subordination is suggesting to ensure that resources are available in a given project environment. The application of theory constraints (TOC) can increase the quality of management and organizational performance. In a wide range of business sectors, the theory of constraints is also used to optimize production processes (Melendez *et al.*, 2018) and improve service quality and business performance (Sumardi *et al.*, 2020). The applications of theory of constraints (TOC) in different areas have been discussed as follows:

Table 1: Application of TOC (Goldratt & Cox, 1984)

No.	Author/ Year	Application of Constraints Theory (TOC)
1.	Salazar <i>et al.</i> , (2017); Rangel <i>et al.</i> , (2017)	In TOC management, methods and techniques are used to increase organizational productivity, including manufacturing, human resources, and other aspects of the business.
2.	Simić <i>et al.</i> ,(2017)	The TOC has also been implemented to optimize business distribution systems and supply chain management.
3.	Thürer <i>et al.</i> , (2017)	TOC has been shown to reduce bottlenecks in the manufacturing sector when used in tests with load flows as part of production planning and control.
4.	Chawla & Kant, (2017)	TOC can implement in a variety of ways, with varying degrees of success. It can use in production, logistics, supply chain management, project management, land transportation system, service sector banking, etc. The TOC can also use by non-profit organizations to improve performance towards non-financial goals and financial survival.

5.	Melendez <i>et al.</i> , (2018)	For management sciences and general administration, the TOC developed a new approach that encourages employees to participate in decision making based on the results obtained.
6.	Thürer <i>et al.</i> , (2018)	Diversifying the TOC application to reduce bottlenecks.
7.	Altug & Firat, (2018)	As part of the assessment of multiple business processes, the TOC utilizes systems that assist in determining restrictions that limit the free flow of operations in any productive or financial area.
8.	Serigar, (2019)	In the manufacturing sector, the TOC will eliminate bottleneck workstations to improve overall production flow.
9.	Talib & Kashkol, (2019)	Defining the constraints, types, and impacts of a construction project allows the project to be successful.
10.	Bacelar-Silva <i>et al.</i> , (2020)	To help organizations achieve their goals, the Theory of Constraints (TOC) offers various tools. In TOC, the focus is on the system constraint, which is the leverage point for managing (functions include: planning, scheduling, executing, and controlling) the system so that other parts operate as synchronized moving parts in support of the constraint rather than as individual parts trying to achieve their own goals.
11.	De Jesus Pacheco <i>et al.</i> , (2021)	Wu <i>et al.</i> , (2020) report that TOC has had a significant impact on productivity improvement in manufacturing systems, and it can use in almost any type of business (Janosz, 2018).

Discussion of Method

TOC's core idea is that each system has at least one constraint that prevents the objective from being fulfilled to a greater extent. Limited resources or policies may be physical resources. To identify and enhance these limitations, TOC develops a set of procedures and methods. So that, activity-based costing (Al-Dhubaibi, 2021) is used by organizations that use cost management systems such as target costing and theory of constraint in enhancing quality management and organizational performance (De Jesus Pacheco *et al.*, 2021; Wu *et al.*, 2020). Activity-Based Costing (ABC) is used by organizational to handle the cost management methods such as target costing and theory of constraint. The long-term approach used by ABC to evaluate productivity has been described as a short term by the constraint theory (TOC) because constraint theory highlights only material-related costs, but active costing covers all product costs. In this case, ABC does not explicitly include resource constraints and production activity capacity. Therefore, ABC cannot use to determine the best product composition in the short term. According to Savino *et al.* (2004), the main differences between Theory of Constraint and Activity-Based Costing are as described in Table 2:

Table 2: Differences between TOC and ABC (Savino *et al.*, 2004)

No.	Classification	Theory of Constraint	Activity Based Costing
1.	Assumptions	Maximum profit by maximum performance. TOC is not a cost system for the product.	Precise and relevant information is not the same as the connection of resources for a cost object for recall decisions.
2.	Resource Capacity	Once capacity is installed, managers will not adjust costs quickly.	Managers assume that they can change their resources.

3.	Direct Labor Cost Behavior and Operational Cost	The cost assumption is fixed cost and will replace labor expert work.	The assumption that all resources in the short term are essentially variable costs and thus can be collected based on activity analysis
4.	Process / Quality Improvement	The focus is on increasing throughput by eliminating production limitations, reducing cycle's production time and overcomes limitations.	Define value-added and non-value-added activities, which need improvement and which do not need improvement
5.	Profit Improvement	Manufacturing products for construction building purposes are determined based on the theory of margin constraint and cycle time on these limitations.	Product mix and volume determination are created from a long-term perspective by entering the number of products, channels and customer profitability mix.
6.	Horizontal plan for mixed products and volume	Short-term orientation and the assumption that most costs except direct materials are sunk costs.	Long-term orientation and the assumption decisions made are less favorable to the product channel from the customer.

Discussion of Finding

Since managing and utilizing internal resources effectively cannot improve the performance of the work process, extra resources were proposed for the additional constraint, i.e. elevating the system constraint. It was expecting that using TOC, the project will complete by its deadline. The empirical studies of following are a description of the theory of constraints with contribution, finding, and industry:

Table 3: Empirical Studies

No.	Author / Year	Industry	Contribution	Finding
1.	Kumar <i>et al.</i> , (2019)	Lean manufacturing, Six Sigma, Business Process Reengineering (BPR), Supply Chain Management and Logistic System	The most complicated part of the job is identifying the perfect theory of constraints tool to achieve the desired result.	Lean manufacturing, Six Sigma, Business Process Reengineering (BPR), Supply Chain Management (SCM), and logistic systems can incorporate into TOC by treating them as a system inside a system.
2.	Zakaria <i>et al.</i> , (2020)	Construction	As a decision-making tool, the TOC could be used by quantity surveying firms, especially when dealing with delays of project participants and improving the	As a result of the study's findings, quantity surveying organizations could increase profits by eliminating constraints and improve

		quality of quantity surveying services provided by the firm. Better organizational performance can assure if constraints are better to understand at the outset. If you want your organization to perform better, you need a well-organized management system that leads to better time and resource allocation.	overall service quality by implementing TOC.
3.	Orue <i>et al.</i> , (2021)	Manufacturing company	TOC is appropriate to use the drum-buffer-rope method when managing a production plant in complex environments, such as those involving make-to-order scenarios (MTO) in developing the organizational performance. By enhancing the quality management by involving the MTO.
			To apply DBR in MTO scenarios, Lizarralde, Apaolaza, and Mediavilla (2020) proposed a change in the first two steps of the TOC methodology.

The Theory of Constraint (TOC) will be a primary tool in implementing quality management. However, it should not be used as a substitute for quality management but rather as a district of service to the organization to find problems in its execution and focus quality management efforts toward the association's objective. Improving system performance by removing constraints is the most effective way to improve overall system performance (Goldratt, 1990). TOC is a revolutionary approach to non-stop modification, but it has received little attention from the general public. The results of rigorous academic testing have confirmed that manufacturing systems using TOC techniques outperform those using Manufacturing Resource Planning (Najy, 2020), Lean Manufacturing (Osman et al., 2020; Hemalatha et al., 2021), Agile Manufacturing (Hemalatha et al., 2021) and Just-in-Time (Taghipour et al., 2020). A decision must make regarding the level of quality management and the theory of constraint execution. When working with resource-constrained systems, the Theory of Constraints (TOC) is useful for improving processes and maximizing efficiency (Pacheco et al., 2019; Bisogno et al., 2017).

Quality management has become increasingly popular in recent years due to its direct impact on the overall performance of construction organizations. In addition to having a direct impact on the organization, quality also has a significant theoretical impact. Quality management is one of the most effective strategies for boosting the fight against construction. The construction has begun to adopt quality-conscious management practices. As a result of these theories findings and discussions, practitioners and researchers in the quality assurance and project performance field can gain valuable insights from the information presented. A better understanding of quality management can improve organizational project performance. Malaysian construction companies, for example, can benefit from the theories by implementing quality management in their operations. Developing, testing, and studying a high-quality management framework within the relevant context is essential for success.

This analysis acknowledges that quality management practices contribute to a winning organizational performance culture within the industry. As a result, quality management must be

continuously implemented in these organizations to achieve the best results. Due to filling the difference between TOC, quality management and organization's performance, the activities-based costing (ABC) techniques were encouraged in the future study.

The measurement of TOC by using assessments of throughput, inventory and operating costs to improve the quality management and organizational performance. There are five steps in the analysis of TOC, namely;

- 1) Identify required constraints,
- 2) Determine the most efficient utilization of required constraints,
- 3) Manage flow in required constraints,
- 4) Increase capacity on limited resources, and
- 5) Redesign the manufacturing process for greater flexibility and throughout.

Activity-based Costing and the Theory of Constraints are used in analyzing profitability in the construction industry. ABC method uses a long-term approach, and TOC uses a short-term approach. The study found that the ABC method is unique to meet the organizational goals and at the same time to improve product quality within the construction industry.

Conclusions

The organizational outcomes resulted from the performance of employees' abilities, attributes, and associations' products, which is incompatible with the quality centre and construction by implementing TOC. The construction company determines the need for execution documents in organizational performance, work directions, scrutiny regimes, method files, action plans, etc. for the execution and management of processes, based on the complexity of the activity, the qualifications of the personnel, and therefore the expertise of the team. The arrangement is the necessary resources and documents are determined (lists, getting documentation, machinery, equipment, etc.). To comply with ISO 9001, an organization must demonstrate its ability to consistently deliver products that meet the needs, wants, and requirements of customers, applicable legal requirements as well. Restrictive requirements focus on the standard management system, management responsibility, resource management, product realization and measurement, analysis and improvement in achieving organizational performance by practicing TOC tools. Only companies that meet the requirements of the ISO 9001 standard will be certified. Those who have been accustomed to authorizing the effectiveness of a top-quality management system will be able to do so regularly. If the goal is to increase potency, the ISO 9004 standard area unit's objectives are broader. Principles of quality management in these standards include client focus, leadership, individual involvement and participation, method approach, system approach to management, continuous improvement, fact-based decision making, and mutualism provider relationships. The study can be expanded by looking at the longitude study as a research paper to obtain accurate results in a future study.

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