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Factors Affecting the Implementation of Total Quality Management (TQM) in Contractors

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Abstract: Maintaining quality in construction projects is critical to project success, which is achieved through total quality management (TQM) techniques. Total quality management (TQM) is a systematic management technique for developing a process-driven culture within an organisation to achieve quality and customer satisfaction. Contractors, as the main actors in this industry, have a central role in ensuring the quality and success of a construction project. Thus, it is essential to identify the factors that influence the implementation of TQM to determine which factors can improve construction quality from the contractor's perspective. Therefore, this study aims to identify, rank, and analyse the factors that influence TQM implementation in North Moluccas contractor companies. A case study approach was utilised, and a survey data was collected from 96 respondents. Validity and reliability tests were conducted to ensure each indicator was valid and reliable. Relative Importance Index (RII) was used to identify factors affecting TQM implementation. As a result of the RII analysis of the 11 research variables, the most critical factor affecting the implementation of TQM based on all respondent groups (directors, site managers, quality control, and field implementers) was teamwork with an RII value of 0.820, identified as the most crucial factor. Despite the critical factor identified, all contributing factors significantly influence successful performance.

Keywords: Sustainable construction**,** Total Quality Management (TQM), Contractor, North Moluccas, RII.

1. Introduction

The construction sector is complex, nonlinear, energetic, and isolated [1]. Causality is an essential characteristic of the sector [2]. The construction industry contributes significantly to developing countries financial development and social improvement [3]. Compared to the manufacturing industry, the construction industry is a concern due to the low output quality. This is seen in the final product produced and in processes, labor, and materials [4]. The main objective of construction projects is to achieve the three basic requirements of cost, time, and quality [5−6]. However, construction projects are plagued by several quality issues that result in budget overruns, delays, financial losses, environmental damage, and even fatalities [7]. Therefore, many contracting companies are implementing management strategies to improve their quality. One of the management strategy approaches used is Total Quality Management (TQM) [8].

TQM is a quality management method that aims to achieve long-term success through client satisfaction. TQM is a crucial approach to maintaining competitive advantage and a management process that meets the needs of customers and workers, improves production

and effectiveness, and ultimately produces high-quality services and products [10−11]. Such performance can be improved through collaboration between parties and by establishing the nature of teamwork [11]. The application of TQM has become essential in today's construction industry. Over time, TQM has significantly improved organizational and economic effectiveness [12]. Within the past four decades, TQM made advances in continuous improvement in administration frameworks. TQM has proven effective in numerous industries, particularly manufacturing [13]. Therefore, integrating TQM into the contractor's administration framework will improve quality issues [14].

Several studies have been conducted related to implementing TQM in the Construction sector. Likita et al. (2018) found that when TQM is completely implemented, processes within the development division will be controlled much better [15]. Pinandhita and Latief (2020) proved that implementing TQM in contracting companies as a quality improvement strategy helps companies achieve a competitive advantage [4]. Jong et al. (2019) investigated the relationship between TQM and project performance in Malaysia. It was observed that total quality management (TQM) essentially influences performance. In addition, labour engagement and continuous operational focus are critical components for for project performance[16]. Alawag et al. (2023) examined the role of TQM drivers in overcoming the challenges of implementing TQM in Industrialized-Building-System (IBS) projects in Malaysia: Experts' Perspectives. The findings show that implementing TQM in IBS projects could be better. According to the experts, local companies are still unable to implement TQM because they are reluctant to apply the TQM system as a strategy implementation throughout the construction process. Furthermore, according to the content validity ratio (CVR), there is an agreement that TQM will provide significant benefits to IBS projects, such as enhancing cooperation, improving communication, increasing customer satisfaction, reducing costs, and increasing productivity [17]. Lau et al. (2015) examined the level of TQM implementation by construction contractors in Hong Kong [18].

2. Materials and Methods

2.1 Research Variables

This study investigates the various variables associated with implementing TQM in the construction industry. TQM is not only about controlling the quality of the final product but also about improving efficiency and productivity, as well as minimizing risks in the entire construction project cycle. Therefore, selecting appropriate research variables is essential to understand the factors that influence the implementation of TQM in construction projects from the contractor's perspective. The research variables were obtained from literature reviews and journals related to TQM such as Alawag et al. (2022) [19], Riaz et al. (2022) [20], Budayan and Okudan (2022) [21], and Alawag et al. (2023) [17]. This can strengthen the theoretical basis, increase relevance, maintain consistency, improve research efficiency, and facilitate comparison and reproducibility of research results. Thus, using previously tested variables can be a helpful strategy in designing robust research related to the context of this study.

The research variables are presented in tabular form (Table 1).

Table 1. Research variables

No	Variables	Indicators
1	Leadership	1. Leadership commitment to quality 2. Clear vision and mission of the organization 3. Leadership commitment to the performance of the TQM program
2	Organizational culture	1. Organizational values that drive quality 2. Attitude towards change 3. Concern for customer satisfaction
3	Strategic planning	1. Long and short-term planning 2. Quality goal setting 3. Integrity of quality in the plan
4	Communication	1. Effective communication between departments and management levels 2. Customer feedback utilized for improvement 3. Open reporting of quality performance
5	Teamwork	1. Team collaboration in the implementation process 2. The company ensures efficient coordination between various departments at the project site 3. Focus on achieving quality together 4. Meetings with stakeholders involved in project implementation and other activities on a regular basis
6	Continuous improvement	1. Continuous improvement 2. Implementing sustainable methods 3. Use of technology to support sustainability
7	Human resource management (HRM)	1. Fostering a professional workforce 2. Skills training for professionals 3. Personal attitude
8	Customer satisfaction	1. Assessment and understanding of customer needs 2. Regular measurement of customer satisfaction 3. Corrective action based on customer feedback 4. Effective communication to define the project concept 5. Organization considers customer needs as the basis for quality
9	Project performance	1. Manage the project successfully so that it contributes to the organization's performance and strategy. 2. Completion of the project on time, within budget, and achieving the desired objectives.
10	Process management	1. Intelligent communication method between multiple stakeholders, including consultants (engineers and architects), contractors, suppliers and clients 2. The company conducts inspections, test plans and checklists at the completion of construction projects 3. System for analyzing and assessing performance to meet project objectives 4. Communication to all project personnel in a timely and accurate manner
11	Supplier management	1. Measuring supplier performance 2. Joint quality planning

2.2 Population and Sample

The population refers to the entire group of subjects or objects with specific qualities and characteristics defined by researchers to study and then draw conclusions. The population in this study consists of contractor companies registered in North Moluccas. Prior to determining the number of contractor companies within the population, a preliminary survey was conducted. The survey results identified 41 active companies registered across from 6 contractor associations, as presented in tabular form (Table 2).

Table 2. Contractor association

No	Contractor Association	Total
1	GAPEKNAS	19
2	ASPEKNAS	8
3	GAPENSI	8
4	ASKUMNAS	4
5	INKINDO	1
6	AKAINDO	1

Of the six contractor associations in North Moluccas, three companies have ample qualifications, seven have medium qualifications, and 30 have minor qualifications. This study's intended population is the directors, site managers, quality control personnel, and field implementers.

2.3 Data Retrieval Method

The data required for this study is primary data. The primary data collection technique used in this study is a questionnaire. The distribution process for the questionnaires is outlined as follows:

2.3.1 Pilot survey

A pilot survey was conducted to enhance the validation of the survey. Before the full-scale survey, a series of pilot questionnaires were sent to five practitioners to test the relevance of the questionnaire to the application of TQM principles and elements in the construction industry, as well as the effectiveness and clarity of the survey questions. The questionnaires was then revised based on the results of the pilot survey.

2.3.2 Questionnaire preparation and distribution

Following the pilot survey, the revised questionnaire was distributed to respondents identified by the predetermined sample. The purpose of distributing this questionnaire was to collect data for subsequent analysis.

2.4 Validity Test and Reliability Test

2.4.1 Validity test

The validity test for this study involves comparing the rcount value with the rtable. If rcount > rtable, the results is considered valid; if rcount < rtable, the results is considered invalid. To determine the rtable value with N = 96 at 5% significance level, the rtable values obtained is 0.202. The validity test was calculated using the SPSS program (Statistical Package for the Social Sciences) The results of the validity test are presented in Table 3.

Table 3. Validity test

No of instrument Item	Person correlation R count	R table	Significance value	Description
X1.1	0,716	0,202	0,000	Valid
X1.2	0,370	0,202	0,000	Valid
X1.3	0,657	0,202	0,000	Valid
X2.1	0,749	0,202	0,000	Valid
X2.2	0,238	0,202	0,000	Valid
X2.3	0,296	0,202	0,003	Valid
X3.1	0,608	0,202	0,000	Valid
X3.2	0,381	0,202	0,000	Valid
X3.3	0,301	0,202	0,003	Valid
X4.1	0,360	0,202	0,000	Valid
X4.2	0,730	0,202	0,000	Valid
X4.3	0,755	0,202	0,000	Valid
X5.1	0,270	0,202	0,008	Valid
X5.2	0,315	0,202	0,002	Valid
X5.3	0,289	0,202	0,004	Valid
X5.4	0,389	0,202	0,000	Valid
X6.1	0,564	0,202	0,000	Valid
X6.2	0,613	0,202	0,000	Valid
X6.3	0,322	0,202	0,001	Valid
X7.1	0,421	0,202	0,000	Valid
X7.2	0,355	0,202	0,001	Valid
X7.3	0,265	0,202	0,009	Valid
X8.1	0,838	0,202	0,000	Valid
X8.2	0,402	0,202	0,000	Valid
X8.3	0,349	0,202	0,000	Valid
X8.4	0,372	0,202	0,000	Valid
X8.5	0,237	0,202	0,020	Valid
X9.1	0,543	0,202	0,000	Valid
X9.2	0,233	0,202	0,023	Valid
X10.1	0,563	0,202	0,000	Valid
X10.2	0,516	0,202	0,000	Valid
X10.3	0,421	0,202	0,000	Valid
X10.4	0,424	0,202	0,000	Valid
X11.1	0,661	0,202	0,000	Valid
X11.2	0,660	0,202	0,000	Valid

2.5 Reliability test

Reliability refers to the internal consistency and stability of the results obtained from a particular measurement scale. It focuses on the accuracy and consistency measurement results. Construct reliability is measured by examining the composite reliability output value for each construct. If the Cronbach's Alpha value is greater than 0.6 ($\alpha>0.6$), the construct is considered reliable. Cronbach's alpha is calculated using the SPSS software program (Statistical Package for Social Sciences software). The results of the reliability test are presented in tabular form (Table 4).

Table 4. Reliability test

Cronbach's Alpha	N of Items
885	35

2.6 Data Analysis

This study uses the Relative Importance Index (RII) on a five-point Likert scale for data analysis. The RII is employed to identify the dominant factors influencing TQM implementation. Shah and Dixit (2021) used RII to analyse the importance of delay factors in

their study [13]. Similarly, Dixit et al. (2017) used RII to evaluate the relative importance of factors affecting productivity [20]. The Relative Importance Index (RII) is calculated using Equation (1):

$$\mathrm{RII} = \frac{\sum \mathrm{W}}{\mathrm{A} \times \mathrm{N}} \quad (1)$$

where W is the weight (ranging from 1 to 5), A is the highest weight, and N is the total number of respondents. The RII value ranges from 0 to 1 (0 is not included). The higher the RII value, the more critical the factors influencing the implementation of TQM. SPSS or Excel can be used to assist in RII analysis. Both SPSS and Excel are statistical applications capable of processing research data. In this study, SPSS and Excel were used to analyze the data using the RII formula.

3. Results and Discussion

3.1. Demographics of respondents

After 116 questionnaires were distributed to respondents, 96 questionnaires were returned. These 96 questionnaires were used for analysis. Table 5 presents the statistical characteristics of the 96 respondents who participated in this survey.

Table 5. Descriptive statistics of research population

Respondents	Category	Frequencies	Percentage (%)
Total Respondents		96	100
Gender	Male	88	91.67
	Female	8	8.33
Age	< 26 y/o	6	6.25
	26 - 35 y/o	23	23.96
	> 35 y/o	67	69.79
Academic qualifications	Diploma		
	Degree	89	92.71
	Master	5	5.21
	doctorate more		
Position in the company	Director	36	37.5
	Site Manager	18	18.75
	Quality Control	19	19.79
	Field Organizer	23	23.96
Years of experience	1-5 years	53	55.21
	6-10 years	38	39.58
	11-15 years	5	5.21
	16-20 years		
Staff Headcount	< 50 people	91	94.79
	> 50 people	5	5.21
Size of the company	Large	12	12.50
	Medium	25	26.04
	Small	31	61.46

3.2. RII factors affecting TQM implementation

The 11 components were derived from the literature review and adjusted according to the respondents' understanding, knowledge, and experience. They were asked to rate 35 questions on these components using a 5-point Likert scale: 1 = Very Unimportant (STP), 2 = Not Important (TP), 3 = Moderately Important (CP), and 4 = Important (P), and 5 = Very Important (SP). The Relative Importance Index (RII) results are presented in tabular form (Table 6).

Table 6. Relative importance index (RII) analysis results

Variables	STP	TP	CP	P	SP	W	RII	RANK
Teamwork	1	1	58	222	102	1575	0.820	1
Customer Satisfaction	2	2	92	282	102	1920	0.800	2
Leadership	1	1	80	148	58	1125	0.781	3
Organisational Culture	2	1	85	139	61	1120	0.778	4
Strategic Planning	0	1	82	188	17	1085	0.753	5
Human Resources	0	28	82	124	54	1068	0.742	6
Continuous Improvement	2	9	84	181	12	1056	0.733	7
Communication	2	0	137	141	8	1017	0.706	8
Project Performance	1	42	84	62	3	600	0.625	9
Process Management	2	156	199	23	4	1023	0.533	10
Supplier Management	2	87	97	4	2	493	0.514	11

Based on the rankings in Table 6, the most important factor influencing TQM implementation, according to all respondent groups (directors, site managers, quality control personnel, and field implementer), is teamwork, ranked 1st with a value of RII= 0.821. This followed by customer satisfaction (RII=0.800), leadership (RII = 0.781), organizational culture (RII = 0.778), strategic planning (RII = 0.753), human resources (RII = 0.742), continuous improvement (RII = 0.733), communication (RII = 0.706), project performance (RII = 0.625), process management (RII = 0.533), and supplier management (RII = 0.514).

3.3. Teamwork (RII= 0.821)

Teamwork enables all employees within an organisation to unite and achieve successful quality improvement [23]. Based on this research, teamwork is identified as the most critical factor affecting the implementation of TQM among contractors in North Moluccas. This can be divided into three aspects: collaboration, skills development, and involvement in project implementation. Quality can be enhanced when the team actively collaborates in every stage of construction project implementation. Skills development is also crucial for achieving better work quality, and stakeholder involvement in project implementation further contributes to the effectiveness of targeted outcomes.

3.4. Customer satisfaction (RII=0.800)

According to research, customer satisfaction is highly dependent on consumers' thoughts and impressions of a particular service or product [24]. In this context, the company actively evaluates and understands customer needs and expectations. The results of measuring customer satisfaction serve as a key indicator for quality improvement. Additionally, the

organization consistently considers customer needs as the foundation for formulating quality standards to ensure that products or services meet or even exceed customer expectations.

3.5. Leadership (RII = 0.781)

Leadership is defined as the capacity to build trust and support in individuals responsible for achieving organisational goals [25]. Leadership is also one of the critical variables in TQM; To achieve ideal leadership from a TQM perspective, three aspects must be considered: leaders must be actively involved in identifying and addressing issues related to work quality; the organization's vision and mission should provide a clear direction for the work to be accomplished, and leaders must guide the project team to execute task in alignment with TQM principles.

3.6. Organizational culture (RII = 0.778)

Organizational culture refers to set of standards, convictions, and values all individuals share. One respondents in interview mentioned that the organization must foster support at all levels, particularly from the management team, to effectively build a quality-focused culture. Organizational culture must be aligned with quality, and creating a competitive culture is also a requirement to move toward an organization that prioritizes quality and customer satisfaction [23].

3.7. Strategic planning (RII = 0.753)

Strategic planning involves defining clear vision and mission statements, and using quality control methods, approaches, and other management tools. An effective quality planning system can improve product quality. Strategic planning can also be enhanced or implemented by the company through the development of clear short, medium, and long-term plans prior to the implementation of TQM. Additionally, the organization should have a transparent process to ensure that quality consideration are integrated in every strategic decision made during construction implementation.

3.8. Human resources (RII = 0.742)

Human resources are also a crucial consideration for organizations focused on quality aspects to maintain a competitive edge. Organizations must established a clear principles for improving human resources; one of the requirements for developing superior resources is to regularly send members to training programs to enhance their skills as valuable organizational assets.

3.9. Continuous improvement (RII = 0.733)

According to Anderson, continuous improvement is based on a process management approach that leads to continuous improvement of products, services, and processes as well as innovation [26]. Continuous improvement can be achieved through periodic reviews conducted by internal management. These reviews serve as a means to identify areas within operations, systems, or processes that can be improved. Mini-audits should also be conducted

across projects or departments to ensure that all employees consistently adhere to quality standards in their services or product delivery Simultaneously, the organization should continue to identify and implement technological innovations to support sustainable efforts in construction delivery.

3.10. Communication (RII = 0.706)

Communication is fundamental among all individuals of the organization or stakeholders involved in a specific project. Communication is closely associated with the quality process; in order to achieve the desired quality, leaders must emphasize effective communication. This involved management effectively communicates with the team to inform them any of changes or developments related to workforce quality , and ensuring that information on quality performance is readily accessible to all team members and internal stakeholders[23].

3.11. Project performance (RII = 0.625)

Project performance is one of the activities that cannot be dissociated from TQM, as it determines the project's success in implementing TQM management. Two key aspects contribute to achieving high-quality project performance: the regular monitoring and control of projects to ensure timely completion, and projects consistently meeting project goals related to quality and specifications.

3.12. Process management (RII = 0.533)

Process management is one of the lowest- ranking variable in this study. Several factors contribute to good process management. These includes ensuring effective communication among multiple stakeholders, such as consultants (engineers and architects), contractors, suppliers, and clients to uphold TQM principles. Additionally,the company conducts inspections, test plans, and checklists following construction projects, and the company always communicates to all project personnel in a timely and precise manner [27].

3.13. Supplier management (RII = 0.514)

Supplier management is the lowest-ranked variable, placed 11th out of the 11 TQM variables in this study. The construction industry in North Moluccas has yet to fully integrate quality management aspects, primarily due to the small scale construction projects in the region. Evaluating the quality of products provided by suppliers and fostering collaboration between companies and suppliers in planning and implementing quality improvement initiatives are two key recommendations for achieving effective supplier management[28].

A limitation of this study is it focuses on contractor companies. Future studies should aim to refine and extend this research to enhance its significance. Further research could include additional stakeholders, such as consultants and project owners. Additionally, further research could compare the application of TQM across different contractors qualifications: large, medium, and small firms.

4. Conclusion

This study ranked teamwork first, followed by customer satisfaction, leadership, organizational culture, strategic planning, human resources, continuous improvement, communication, project performance, and process management, with supplier management ranked last. These results were identified using Relative Importance Index (RII) analysis, based on information provided by respondents (directors, site managers, quality control, and site executives) from contracting companies in North Moluccas.

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Conflicts of Interest

The author declares no affiliation or involvement in any organisation or entity with a financial interest (such as honoraria, educational grants, participation in speaker's bureaus, memberships, employment, consultancies, shareholdings, or other equity interests and expert testimony or patent licensing arrangements), or non-financial interests such as personal or professional relationships, affiliations, knowledge or beliefs in the subject matter or material discussed in this manuscript.

References

[1] SW Alaloul. Cyber-Physical Systems in the Construction Sector; CRC Press: Boca Raton, FL, 2022, https://doi.org/10.1201/9781003190134.

[2] MN Mohd Nawi, N Baluch, and AY Bahauddin. Impact of Fragmentation Issue in Construction Industry: An Overview. MATEC Web of Conferences, 2014, 15, 1–8, https://doi.org/10.1051/matecconf/20141501009.

[3] EF Boadu, CC Wang, and RY Sunindijo. Characteristics of the Construction Industry in Developing Countries and Its Implications for Health and Safety: An Exploratory Study in Ghana. International Journal of Environmental Research and Public Health, 2020, 17, 11, 1–21,, https://doi.org/10.3390/ijerph17114110

[4] GPinandhita and Y Latief. Implementation Strategy of Total Quality Management and Quality Culture to Increase the Competitiveness of Contractor Companies in Indonesia.IOP Conference Series: Materials Science and Engineering, 2020, 930, 1, 1–11,, https://doi.org/10.1088/1757-899X/930/1/012012

[5] M Zoghi, D Lee, and SA Kim. A Computational Simulation Model for Assessing Social Performance of BIM Implementations in Construction Projects. Journal of Computational Design and Engineering, 2021, 8, 2, 799–811, https://doi.org/10.1093/jcde/qwab015

[6] L Jang, S Ahn, SH Cha, K Cho, C Koo, and TW Kim. Toward Productivity in Future Construction: Mapping Knowledge and Finding Insights for Achieving Successful Offsite Construction Projects. Journal of Computational Design and Engineering, 2021, 8, 1, 1–14, https://doi.org/10.1093/jcde/qwaa071.

[7] ET Banobi and W Jung. Causes and Mitigation Strategies of Delay in Power Construction Projects: Gaps between Owners and Contractors in Successful and Unsuccessful Projects. Sustainability **2019**, 11,21, https://doi.org/10.3390/su11215973

[8] EN Wanderi, H Mberia, and J Oduor. Evaluation Of Factors Influencing Total Quality Management Implementation in Rwadan Construction Companies: A Case of Fair Construction Company. European journal of business and social sciences. 2015,4(3),14-28.

[9] MS Abdullahi, UR Shehu, BM Usman, and AM Gumawa. Relationship Between Total Quality Management and Organizational Performance: Empirical Evidence From Selected Airlines in Nigeria Aviation Industry. Asian People Journal, 2020, 3, 1, 30–44,, https://doi.org/10.37231/apj.2020.3.1.128

[10] S Naghshbandi, B Yousefi, S Zardoshtian, and M Moharramzade. Assessment of Military Force Staff's Readiness for Total Quality Management (TQM) Approval in Tehran Province. Procedia-Social and Behavioral Sciences,. **2012**, 46, 5345–5349, https://doi.org/10.1016/j.sbspro.2012.06.436

[11] G Polat and A Damci. Barriers and Benefits of Total Quality Management in the Construction Industry: Evidence from Turkish Contractors. Quality **2012**, 1115–1120. https://doi.org/10.21272/mmi.2012.1115-1120

[12] AA Eniola, GK Olorunleke, OO Akintimehin, JD Ojeka, and B Oyetunji. The Impact of Organizational Culture on Total Quality Management in SMEs in Nigeria. Heliyon **2019**, 5, 8, e02293, https://doi.org/10.1016/j.heliyon.2019.e02293

[13] MN Shah, S Dixit, R Kumar, R Jain, and K Anand, K. Causes of Delays in Slum Reconstruction Projects in India. International Journal of Construction Management, **2021**, 21,5, 452–467, https://doi.org/10.1080/15623599.2018.1560546.

[14] I Othman, SNM Ghani, and SW Choon. The Total Quality Management (TQM) Journey of Malaysian Building Contractors. Ain Shams Engineering Journal, **2020**, 11, 3, 697–704, https://doi.org/10.1016/j.asej.2019.11.002.

[15] AJ Likita, NY Zainun, IA Rahman, ASMA Awal, AR Alias, MQA Rahman and FEM Ghazali. An Overview of Total Quality Management (TQM) Practice in Construction Sector. In IOP Conference Series: Earth and Environmental Science. **2018**, 140,1,IOP Publishing, https://doi.org/10.1088/1755-1315/140/1/012115.

[16] CY Jong, AKS Sim and TY Lew. The Relationship Between TQM and Project Performance: Empirical Evidence from Malaysian Construction Industry. Cogent Business & Management, 2019, 6, 1–31,, https://doi.org/10.1080/23311975.2019.1568655.

[17] AM Alawag, WS Alaloul, MS Liew, AO Baarimah, MA Musarat, ABA Al-Mekhlafi. The Role of the Total-Quality-Management (TQM) Drivers in Overcoming the Challenges of Implementing TQM in Industrialized-Building-System (IBS) Projects in Malaysia: Experts' Perspectives. Sustainability, 2023, 15, 8, https://doi.org/10.3390/su15086607.

[18] AWT Lau, SL Tang, YS Li. The Level of TQM Application by Construction Contractors in Hong Kong. International Journal of Quality & Reliability Management, 2015, 32, 8,, https://doi.org/10.1108/IJQRM-07-2013-0123.

[19] AM Alawag, WS Alaloul, MS Liew, MA Musarat, AO Baarimah, S Saad, and S Ammad. Critical Success Factors Influencing Total Quality Management in Industrialised Building System: A Case of Malaysian Construction Industry. Ain Shams Engineering Journal, 2023, 14, 2, 101877, https://doi.org/10.1016/j.asej.2022.101877.

[20] H Riaz, KIA Khan, F Ullah, MB Tahir, M Alqurashi and BT Alsulami. Key Factors for Implementation of Total Quality Management in Construction Sector: A System Dynamics Approach. Ain Shams Engineering Journal, 2023, 14, 3, 101903, https://doi.org/10.1016/j.asej.2022.101903.

[21] C Budayan, O Okudan. Roadmap for the Implementation of Total Quality Management (TQM) in ISO 9001-Certified Construction Companies: Evidence from Turkey. Ain Shams Engineering Journal, 2022, 13, 6, https://doi.org/10.1016/j.asej.2022.101788.

[22] S Dixit, AK Pandey, SN Mandal, S Bansal. A Study of Enabling Factors Affecting Construction Productivity: Indian Scenario. International Journal of Civil Engineering and Technology, 2017, 8, 6, 741–758..

[23] I Othman, SN Mohd Ghani, WS Choon. The Total Quality Management (TQM) Journey of Malaysian Building Contractors. Ain Shams Engineering Journal, 2020, 11, 3, 697–704,https://doi.org/10.1016/j.asej.2019.11.002.

[24] X Xu. Examining Consumer Emotion and Behavior in Online Reviews of Hotels When Expecting Managerial Response. International Journal of Hospitality Management, 2020, 89, 102559 https://doi.org/10.1016/j.ijhm.2020.102559.

[25] RN Amanchukwu, GJ Stanley, NP Ololube. A Review of Leadership Theories, Principles, and Styles and Their Relevance to Educational Management. Management, 2015, 5, 1, 6–14, https://doi.org/10.5923/j.mm.20150501.02.

[26] S Anderson, R Kumari. Continuous Improvement in Schools: Understanding the Practice. International Journal of Educational Development, 2009, 29, 3, 281–292,, https://doi.org/10.1016/j.ijedudev.2008.02.006.

[27] B Neyestani. Principles and Contributions of Total Quality Management (TQM) Gurus on Business Quality Improvement. SSRN Electronic Journal, 2018,, https://doi.org/10.2139/ssrn.2950981.

[28] V Singh, A Kumar, T Singh. Impact of TQM on Organisational Performance: The Case of Indian Manufacturing and Service Industry. Operations Research Perspectives, 2018, 5, 199–217, https://doi.org/10.1016/j.orp.2018.07.004.