

Implementation, Advantages and Management of ISO 9001 in the Construction Industry

Fazal Ali Shaikh ^{a*}, Samiullah Sohu ^b

^a University of Sindh, Jamshoro, Sindh, Pakistan.

^b Faculty of Civil and Environmental Engineering, Universiti Tun Hussein Onn Malaysia, Batu Pahat 86400, Johor, Malaysia.

Received 26 February 2020; Accepted 02 May 2020

Abstract

Since 1987, construction companies all over the world welcomed a system for quality management ISO 9001 which was created by the International Organization for standardization. This study aims to recognize the implementation intensity of essential elements of ISO 9001 and the key advantages of ISO 9001 in construction firms after implantation of these elements. Total 51 recognized Pakistani construction companies were considered and studied however the respondent rate remained 59%. Moreover, the analysis of data was done by Statistical Package for the Social Sciences (SPSS) version 27. The most significant advantages and essential elements of ISO 9001 are the results evaluated by the study. Total 34 basic aspects were identified from the previous literature review. The findings of the result showed that the implementation of ISO are very important in construction projects. Identification of current issues and removal of preventable credentials is found most important implementation. Advantages of ISO in the construction industry are Satisfaction of employees, Increment in the ratio of captivation new projects, Decrease in wastage of material and better contacts in global markets respectively. The study will advantage Pakistani construction companies in improving quality work, performance and interest of implementing ISO 9001 will be created in construction firms in regard to groom quality standards.

Keywords: Construction Industry; Advantages of ISO 9001; ISO 9001 Certifications; Pakistan.

1. Introduction

Quality work is the key objective of any construction project. Low quality of construction work is a common problem occurred in progressing countries. For successful completion of construction projects; modification or improvement of quality management systems in construction firms becomes obligatory [1-2]. Failure or success of a construction project depends upon its quality (3). For upholding the quality and dropping budget and time of project; several management tools, methodologies and techniques are utilized, ISO 9001 standards are one of them [3]. Preceding two decades ISO 9001 is globally adopted in the construction industry. It was first introduced in 1987 then the next version in 1990 by the International Organization for Standardization (ISO) with regard to satisfy customers and to put forward quality work [4-5] ISO 9001 quality management system enhances performance and quality, in addition, it reduces the cost and time of construction projects; it is the result of the number of research studies [6]. It is compulsory to implement fundamental constituents of ISO 9001 in construction projects as recommended by Hoyle (2009) [3]. Study on Implementation of fundamental constituents of ISO 9001 and its advantages to the construction industry of Pakistan are compulsory to study because the extent of the subject is limited.

* Corresponding author: fazalshaikhpk@gmail.com

 <http://dx.doi.org/10.28991/cej-2020-03091535>



© 2020 by the authors. Licensee C.E.J, Tehran, Iran. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (<http://creativecommons.org/licenses/by/4.0/>).

It is necessary to identify the importance of ISO 9001 in construction industry and its implementation along with strategies. Furthermore it is also necessary to find out the advantages of implementation of ISO 9001 in construction industry. Hence this study identified the basic aspects of the ISO 9001, its implementation in construction industry as well as its advantage.

2. Literature Review

International Organization for Standardization (ISO) is the most popular and globally recognized organization in regards to quality. The body has 180 plus member countries. The main aim of this organization is to support the government, manufacturers, business sector and other industries by setting up principles of quality management. ISO 9001 is a largely accepted standard of quality management from ISO 9000 line [7]. After a number of studies experts have recommended ISO 9001 for successful completion of a construction project because cost, time and quality are fundamentals of it. Firms worldwide large or small, public or private have accepted this system. Moreover, the establishment of an understandable method for the affiliate of organizations and management of method by strategic plans (i.e. Plan Do Check Act) are two theories that support ISO 9001[9]. Construction firms in Indonesia implemented 20 factors of ISO in 2012 to improve the construction process and results. Those important factors of ISO 9001 include; design control system, quality system, process control, purchasing, product availability, inspection, contract review, management responsibilities, controlling for quality control, mitigation measure for internal and external causes and handling, external and internal quality audit, a system of controlling nonconforming products, statistical techniques, storing, control documentation and data, testing and measuring of performance of equipment, servicing, training, packing and preservation of material, system for customer-supplied products [10-11].

The basic 34 elements identified with the help of the literature review can be implemented for the effective development of construction firms while it also serves considerable advantages to the company. According to Kaliannan et al. (2018) [12] study that some of the advantages of implementing quality management systems in small manufacturing enterprises are accessible leadership at the workplace, hire talented staff for making quick and accurate decisions, and train to staff members for communicating to other ISO certified organizations [13]. The case study by Sohu et al. (2017) presents the main advantages of the implementation of quality management systems in Australian organizations [14]. The advantages comprise as following; decrease in the number of imports damaged while transfer and construction, shortage in time of material delivery at site, good control on processes results in uniformity of design by delivery and shrinks fallout of chemicals, reduction in construction duration, perfection satisfaction of customers in the company and increase productivity [15]. The advantages of implementing quality management system mentioned in a research conducted in United Kingdom of America as presented as; control on rework at construction site, better output, reduced customer complaints, increase performance, customer satisfaction, improved quality of work, reduction in wastage of all construction resources and effectiveness of QMS [16]. Similarly, advantages observed in construction firm later to implementation of ISO quality management system are as following; better job gratification of the employee, reduction in quality costs, work was carried out correctly right from the beginning, closer relationships with subcontractors and suppliers, recognition by clients and suitable system of quality management [17-18]. USA has worked to implement the ISO 9001 in construction projects which has given better results after implementation ISO 9001 [19].

Many advantages are being observed and experienced by different categories of industries including manufacturing, electrical, construction, commercial, etc. the table below represents ISO 9001 advantages in construction industries of the international level.

Table 1. Advantages of Implementation of ISO 9001 in other Countries

Country	Advantages
Australia	Increased productivity and Improvement of customer satisfaction and reduced construction duration, Decrease in the number of imports damaged and construction, Late delivery of good in time to the site [21]
Ghana	Reduction in client's Complaints and savings on the cost incurred, reduction in wastage and contraction time [22]
Malaysia	Good communication network, easy to detect problems, less repeated work [21]
Hong Kong	Direct supervision, improved management system, cost reduction, reduction in the amount of work, wastage reduction [23]
USA	Training of new employees, waste reduction, worldwide recognition, control of subcontractors and suppliers, increase in customer confidence, more effective data analysis, improved efficiency and productivity, quality track record [24]

Several research studies had been carried out in the number of countries in regard to the implementation of ISO quality management systems in various industries. However, investigation on performance and results of ISO in the construction industry is at the crest. Consequently, it has been essential to determine factors affecting the implementation of ISO 9001 in construction firms of Pakistan.

3. Research Methodology

ISO certified companies were targeted for collection of opinions based on factors and advantages of ISO 9001. The suitable method for this exercise was found questionnaire survey. The questionnaire includes demographic details of respondents, basic elements of ISO 9001 and the main advantages of ISO 9001 after implementation. The distribution of the questionnaire was made in person and through email. Selected respondents were professionals of ISO certified construction firms. The graph below represents the response of the respondents in percentage. Total 51 construction professionals from ISO certified companies involved in the data collection process.

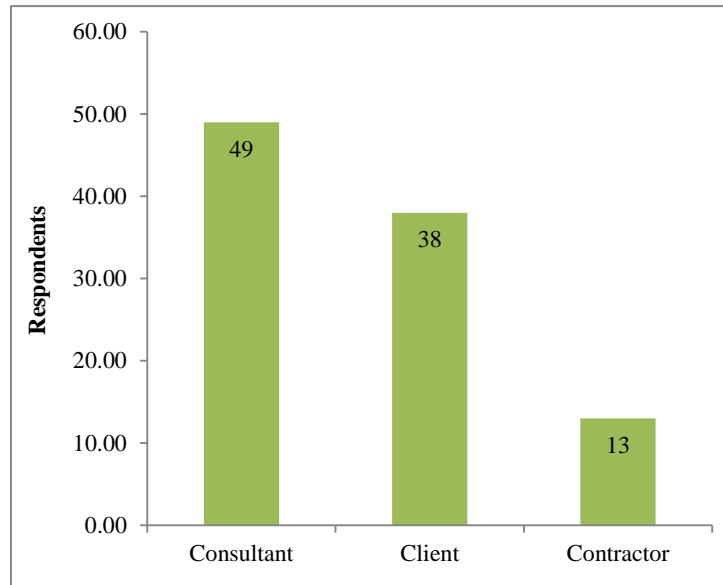


Figure 1. Response of Stakeholders

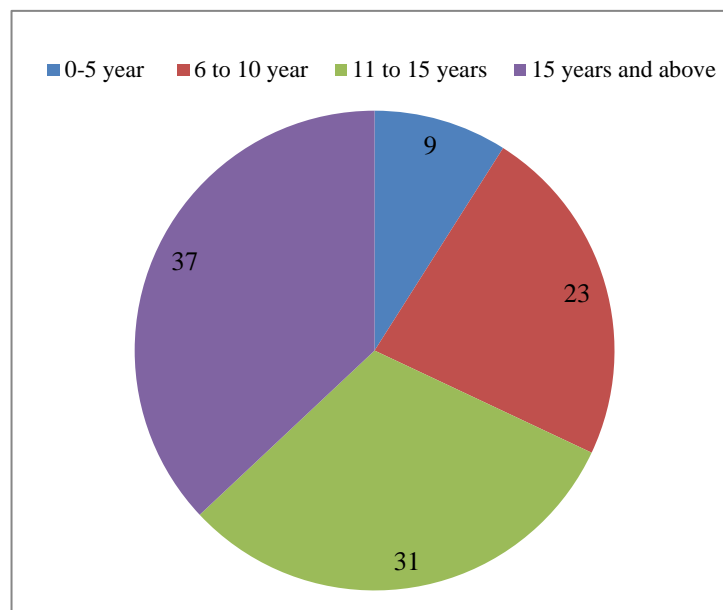


Figure 2. Working experience of Respondents

Figure 1 shows that respondents who were selected for this research were mostly consultants with 49%, client with 38% and contractor with 13%. Figure 2 also shows that the working experience of the respondents involved in this research. 9% of the respondents having experience from 0 to 5 years, 23% of the respondents having experience from 6 to 10 years, 31% of the respondents having experience from 11 to 15 years' experience and 37% of the respondents were having more than 15 years' experience in the construction industry. Pilot study was carried out among 5 respondents who were having highly experience. Data of pilot study was analyzes to check internal consistency of data. Value of Cronbach's alpha was 0.84 which is more than 0.7 which indicates that collected data is reliable [20].

4. Results and Discussion

The results achieved by one of the portions of the questionnaire survey are represented in Table 2. The basic aspects of ISO 9001 “identification of current issues and removal of preventable credentials” and “achievement of quality requirements are based on quality system” were declared at the top as per ranking with RII value of 0.86 and 0.80 respectively. The scale set here expresses that ISO elements having RII value 0.80 and above are fully implemented (F.I). Likewise, ISO elements having RII value between 0.80 and 0.65 are partially implemented (P.I) and ISO elements having RII value below 0.65 are not implemented (N.I).

Table 2. Questionnaire survey results on the endorsement of basic aspects' in their firms

No.	Basic aspects of ISO 9001	FI	PI	NI	RII	Rank
1	Identification of current issues and removal of preventable credentials	29	17	5	0.86	01
2	Achievement of quality requirements is based on the quality system	28	18	05	0.84	02
3	Inspection before the usage of material	26	19	06	0.83	03
4	Regular inspection of construction work	28	18	05	0.83	03
5	Regular inspection of quality by team	27	17	07	0.83	03
6	Specification and information must be obtained prior to the purchase of any material or asset	25	18	08	0.82	04
7	Each phase of the construction project must be monitored	24	19	08	0.82	04
8	Must track damage protection procedure during construction	26	18	07	0.81	04
9	Designs are carefully handled and necessary changes are made	27	17	07	0.80	05
10	Suppliers are continuously monitored	29	18	04	0.79	06
11	Identification of every customer's project	28	17	06	0.79	06
12	Inspection of all measuring equipment's	25	19	07	0.78	07
13	Final outcome is as per customer demand	24	18	09	0.77	08
14	To judge if services are as per demand procedures are recognized	26	18	07	0.77	08
15	Inspection of project when it is completed	28	17	06	0.77	08
16	Documentation of quality system within the agenda of ISO 9000	29	18	05	0.76	09
17	Data and documents are organized	26	17	08	0.77	09
18	Time to time calibration of each instrument	28	18	06	0.77	09
19	Project is tested after completion and tests are inspected	26	19	06	0.76	09
20	Suitable training is offered	29	17	05	0.75	09
21	Regular inspection of quality system	25	19	07	0.74	10
22	Modification in contract are evaluated and customer confidence is built in regard with modifications	29	18	06	0.74	10
23	Quality based suppliers are selected	27	19	05	0.74	10
24	External and internal auditors get complete reference form quality records	26	18	07	0.73	11
25	Customer satisfaction must be achieved by our quality system	24	20	07	0.73	12
26	An apparent policy for quality must be developed	25	17	09	0.73	12
27	Customer must be reported if the project goes under any damage	27	18	06	0.72	13
28	Documentation of training activities	29	19	03	0.71	14
29	An appropriate and skilled person must be assigned work	26	19	06	0.70	15
30	Demonstration of planning to achieve customer satisfaction	28	18	05	0.70	15
31	Determination of accuracy of equipments	26	19	06	0.69	16
32	Controlling and maintaining projects carefully	25	18	08	0.69	16
33	A manager who watches quality is employed	27	17	07	0.68	17
34	Materials not per requirement and specification are rejected	29	16	06	0.66	18

The results attained by another portion of the questionnaire survey are represented in Table 3. Advantages of implementation of ISO 9001 in their firm were inquired by respondents by giving choices as; extremely significant (ES), very significant (VS), most significant (MS), slightly significant (SS) and not significant (NS). According to the

results, two factors “satisfaction of employees” and “increment in the ratio of captivating fresh projects” remained at the top as the greater part of respondents mark them as ES. Furthermore, the decrease in wastage of material was ranked second as the main advantage after the Implementation of ISO 9001. The AI values of first and second advantages are 0.87 and 0.86 respectively.

Table 3. Questionnaire survey results on advantages after implementation of ISO 9001 in firms

No.	Factors	ES	VS	MS	SS	NS	Total	AI	Rank
1	Satisfaction of employees	31	07	08	03	02	51	0.88	01
2	Increment in ratio of captivation new projects	30	08	06	04	03	51	0.88	01
3	Decrease in wastage of material	28	09	07	03	04	51	0.87	02
4	Better contacts in global markets	27	08	09	02	05	51	0.84	03
5	Overall efficiently of organization is improved	25	07	09	04	06	51	0.82	04
6	Increased market reputation	24	08	07	05	05	51	0.80	05
7	Defected work are improved at early stage	23	09	08	04	07	51	0.80	05
8	Optimization of resource usage	22	08	09	06	06	51	0.79	06
9	Record maintenance	23	07	08	08	05	51	0.77	07
10	Improved customer satisfaction	24	09	07	07	04	51	0.77	07
11	Product and service quality improved	25	08	06	06	06	51	0.77	07
12	Better communication	26	06	09	05	05	51	0.75	07
13	Development and innovation in work	28	04	08	08	03	51	0.74	08
14	Developed business	29	07	05	06	04	51	0.73	09
15	a smaller amount of rework is required	30	08	04	04	05	51	0.73	09
16	Professional team work	28	07	06	07	03	51	0.70	10
17	Boost in profit	29	08	05	05	04	51	0.68	11
18	Ease in identifying quality issues	27	09	07	06	02	51	0.64	12

5. Conclusion

Adoption of ISO 9001 (Quality Management system) is found necessary to adopt in construction projects for the last few years. Although the implementation of this ISO 9001 is already in process in other industries like manufacturing and petroleum industries. The main objective of this research was to identify the factors that implementation of ISO in the construction sector. Results showed that main factors are Identification of current issues and removal of preventable credentials, Achievement of quality requirements is based on the quality system, Inspection before the usage of material, Regular inspection of construction work and Regular inspection of quality by team are identified as most five factors which barriers the implementation of ISO 9001 in construction industry of Pakistan. Most advantages of implementation for implementation of ISO are employees are satisfied, winning ratio of new construction projects, decrease in waste of material, increased efficiency of the company and contacts in the global market respectively. It has been observed that identified factors which barriers the implementation of ISO 9001 can be neglected by implementation of ISO 9001. Hence, there are many advantages of implementation of ISO 9001 in construction industry. This study will help to construction holders to observe the advantages of implementation of ISO in respective construction projects.

6. Conflicts of Interest

The authors declare no conflict of interest.

7. References

- [1] Rumane, Abdul Razzak. “ISO Certification for the Construction Industry.” *Quality Auditing in Construction Projects* (June 3, 2019): 27–108. doi:10.1201/9781351201872-2.
- [2] Mintah, S., and S. Darkwah. “Drivers of Informal Sector Participation of Small and Medium Enterprise in Ghana.” *Scientia Agriculturae Bohemica* 49, no. 1 (March 1, 2018): 60–67. doi:10.2478/sab-2018-0010.
- [3] Hoyle, David. “ISO 9000 Quality Systems Handbook - Updated for the ISO 9001:2008 Standard” (October 26, 2009). doi:10.4324/9780080958033.

- [4] Khan, Asif, and Jamal Ahmad Farooque. "MOTIVES AND BENEFITS OF ISO 9001 QUALITY MANAGEMENT SYSTEM: AN EMPIRICAL STUDY OF INDIAN SMEs." *Brazilian Journal of Operations & Production Management* 13, no. 3 (September 29, 2016): 320. doi:10.14488/bjopm.2016.v13.n3.a8.
- [5] Khattak, A. B., and D. I. Arshad. "Barricades in Implementation and Adoption Level of ISO-9001 in Construction Industry of Pakistan." *European Journal of Business and Management* 7, no. 13 (2015): 203-211.
- [6] Mirshokraei, Mehrdad, Carlo Iapige De Gaetani, and Federica Migliaccio. "A Web-Based BIM-AR Quality Management System for Structural Elements." *Applied Sciences* 9, no. 19 (September 23, 2019): 3984. doi:10.3390/app9193984.
- [7] Neyestani, Behnam, and Joseph Berlin P. Juanzon. "Developing an Appropriate Performance Measurement Framework for Total Quality Management (TQM) in Construction and Other Industries." *IRA-International Journal of Technology & Engineering* (ISSN 2455-4480) 5, no. 2 (December 12, 2016): 32. doi:10.21013/jte.v5.n2.p2.
- [8] Neyestani, Behnam, and Joseph Berlin Juanzon. "Effects of ISO 9001 Standard on Critical Factors of Project Management in Construction Industry." *SSRN Electronic Journal* (2017): 23-24. doi:10.2139/ssrn.2947698.
- [9] Akhund, Muhammad Akram, Aftab Hameed Memon, Hafiz Usama Imad, Fida Hussain Siddiqui, and Ali Raza Khoso. "Motivational Factors for the Implementation of ISO-9001 in Construction Firms of Pakistan." *Civil Engineering Journal* 4, no. 9 (September 24, 2018): 2023. doi:10.28991/cej-03091135.
- [10] Jusoh, Ahmad, Abbas Mardani, Rozeyta Omar, Dalia Štreimikienė, Zainab Khalifah, and Ali Sharifara. "Application of MCDM Approach to Evaluate the Critical Success Factors of Total Quality Management in the Hospitality Industry." *Journal of Business Economics and Management* 19, no. 2 (October 8, 2018): 399-416. doi:10.3846/jbem.2018.5538.
- [11] Ullah, K., M. S. Khan, M. T. Lakhari, A. A. Vighio, and S. Sohu. "Ranking of Effects of Construction Delay: Evidence from Malaysian Building Projects." *Journal of Applied Engineering Sciences* 8, no. 1 (May 1, 2018): 79-84. doi:10.2478/jaes-2018-0011.
- [12] Kaliannan, Suaathi, Sasitharan Nagapan, Abd Halid Abdullah, Samiullah Sohu, and Ashfaq Ahmed Jhatial. "Determining Root Cause of Construction Waste Generation: A Global Context." *Civil Engineering Journal* 4, no. 11 (November 29, 2018): 2539. doi:10.28991/cej-03091179.
- [13] Sainis, George, George Haritos, Thanos Kriemadis, and Ioanna Papasolomou. "TQM for Greek SMEs: An Alternative in Facing Crisis Conditions." *Competitiveness Review: An International Business Journal* 30, no. 1 (December 19, 2019): 41-58. doi:10.1108/cr-11-2019-0126.
- [14] Sohu, Samiullah, Abd Halid Abdullah, Sasitharan Nagapan, Abdul Fattah, Kaleem Ullah, and Kanesh Kumar. "Contractors Perspective for Critical Factors of Cost Overrun in Highway Projects of Sindh, Pakistan" In *AIP Conference Proceedings*, vol. 1892, no. 1, p. 080002. AIP Publishing LLC, (2017). doi:10.1063/1.5005728.
- [15] Neyestani, Behnam, and Joseph Berlin Juanzon. "Impact of ISO 9001 Standard on the Quality Costs of Construction Projects in the Philippines." *Multi-Disciplinary Manila (Philippines) Conferences* Jan. 23-24, 2017, Manila (Philippines) (January 23, 2017): 23-24. doi:10.17758/uruae.ae0117504.
- [16] Sohu, Samiullah, Kaleem Ullah, Ashfaq Ahmed Jhatial, Muhammad Jaffar, and Muhammad Tahir Lakhari. "Factors adversely affecting quality in highway projects of Pakistan." *International Journal of Advanced and Applied Sciences* 5, no. 10 (2018): 62-66. doi:10.21833/ijaas.2018.10.009.
- [17] Sweis, Rateb Jalil, Rawan Ali Saleh, Yousra Sharaireh, and Alireza Moarefi. "An Investigation of the Satisfaction of Project Managers and Team Members." *International Journal of Quality & Reliability Management* 36, no. 5 (May 7, 2019): 708-734. doi:10.1108/ijqrm-03-2018-0071.
- [18] Willar, Debby, Bambang Trigunaryah, and Vaughan Coffey. "Organisational Culture and Quality Management System Implementation in Indonesian Construction Companies." *Engineering, Construction and Architectural Management* 23, no. 2 (March 21, 2016): 114-133. doi:10.1108/ecam-02-2015-0026.
- [19] Konefal, Jason, Maki Hatanaka, and Douglas H. Constance. "Multi-Stakeholder Initiatives and the Divergent Construction and Implementation of Sustainable Agriculture in the USA." *Renewable Agriculture and Food Systems* 34, no. 04 (October 13, 2017): 293-303. doi:10.1017/s1742170517000461.
- [20] Teixeira, Joaquim, Nylvandir Liberato Fernandes de Oliveira, Andrey Pimentel Aleluia Freitas, and João Alberto Neves dos Santos. "Critical Factors and Benefits in the Use of Earned Value Management in Construction." *Brazilian Journal of Operations & Production Management* 17, no. 1 (2020). doi:10.14488/bjopm.2020.007.
- [21] Iranmanesh, Mohammad, Sajad Fayezi, Suhaiza Hanim, and Sunghyup Sean Hyun. "Drivers and Outcomes of Eco-Design Initiatives: a Cross-Country Study of Malaysia and Australia." *Review of Managerial Science* 13, no. 5 (March 26, 2018): 1121-1142. doi:10.1007/s11846-018-0282-3.

- [22] Asah-Kissiedu, Millicent, Patrick Manu, Colin Booth, and Abdul-Majeed Mahamadu. "Towards the Development of an Integrated Safety, Health and Environmental Management Capability Maturity Model (SHEM-CMM) for Uptake by Construction Companies in Ghana." *Construction Health and Safety in Developing Countries* (August 22, 2019): 116–127. doi:10.1201/9780429455377-8.
- [23] Hossain, Md. Uzzal, Zezhou Wu, and Chi Sun Poon. "Comparative Environmental Evaluation of Construction Waste Management through Different Waste Sorting Systems in Hong Kong." *Waste Management* 69 (November 2017): 325–335. doi:10.1016/j.wasman.2017.07.043.
- [24] Muñoz, Mirna, Jezreel Mejia, and Claude Y. Laporte. "Implementing ISO/IEC 29110 to Reinforce Four Very Small Entities of Mexico under an Agile Approach." *IET Software* 14, no. 2 (April 1, 2020): 75–81. doi:10.1049/iet-sen.2019.0040.