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

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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.

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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.

| 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 construction 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](image)

![Figure 2. Working experience of Respondents](image)

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 (FI). Likewise, ISO elements having RII value between 0.80 and 0.65 are partially implemented (PI) and ISO elements having RII value below 0.65 are not implemented (NI).

| No. | Basic aspects of ISO 9001 |
|-----|--------------------------|
| 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 contact 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.

| 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.

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