

Creative Construction Conference 2017, CCC 2017, 19-22 June 2017, Primosten, Croatia

## Evaluations of Construction Project Participants' Attitudes Toward Quality Management in Turkey

Turgut Acıkara<sup>a\*</sup>, Aynur Kazaz<sup>b</sup>, Serdar Ulubeyli<sup>c</sup>

<sup>a</sup>*Alanya Aladdin Keykubat University, Antalya, 07450, Turkey*

<sup>b</sup>*Akdeniz University, Antalya, 07058, Turkey*

<sup>c</sup>*Bulent Ecevit University, Zonguldak, 67100, Turkey*

---

### Abstract

In recent years, quality management became an important topic for the construction industry. This topic attracted the attention of many researchers and numerous researches were conducted in the literature. Although, quality management is common among institutionalized construction firms, small and middle-sized firms neglect it. Construction projects contain many project specific risks due to their complicated nature. Institutionalized construction firms with a quality management department and policy, minimizes wastes by effective material usage and productivity increasing. Therefore, they can prevent or bring under control time and cost dependent risks. On the other hand, lack of quality management policy or limited participation of project participants to quality management process will both negatively affect the management of the project and competitiveness of the firms. This will also decrease the survival potential of construction firms within the industry. In this study, it was aimed to determine the attitudes of construction project participants towards quality management. For this purpose, a questionnaire was administered to 120 participants of construction projects in Turkey. The results revealed that, although most of the participants have a positive attitude towards quality management, they are not able to evaluate it in a proper way.

© 2017 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the scientific committee of the Creative Construction Conference 2017

**Keywords:** Project management; project participants; quality;lity management; Turkish construction industry.

---

---

\* Corresponding author. Tel.: +90-242-510-61-20; fax: +90-242-565-10-99.

E-mail address: [turgut.acikara@alanya.edu.tr](mailto:turgut.acikara@alanya.edu.tr)

## 1. Introduction

The primary goal of project management is to finish a project within its scope. However, numerous activities which require different expertise, and the relation among them make construction projects complicated. In addition, construction projects also involve many uncertainties due to outdoor production which is dominated by labor force. Therefore, managing construction projects, where finishing an activity errorless at the first time is aimed, is a complicated and though process. In this sense, an effective construction management can only achieved by incorporating different authorities from different knowledge domains.

Quality is one of the main components which determine the scope of a construction project. Therefore, finishing a project with the desired quality will provide an advantage to construction firms in the competitive industry. On the other hand, the quality of construction project is primarily determined by labors that perform the activities. In this sense, it is clear that quality cannot be achieved only by constituting a quality department and documentation. For an effective quality management, a participative management approach must be established in which labors are also involved to the process. This approach allows getting all participants' opinions for quality improvement. In this study, it was aimed to determine the attitude of construction project participants towards total quality management. For this purpose, a questionnaire was administered to employees of three different infrastructure projects in Turkish construction industry and the results were statistically analyzed.

## 2. Total quality management in construction projects

Quality is a relative concept which creates different perceptions among people [1]. International Organization for Standardization (ISO) defined quality as “the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs” while Juran [2] simply as meeting the requirements. In the literature, quality definitions of construction projects have similar contents, but special emphasis on time and cost were laid due to their unique nature [1], [3], [4], [5], [6].

Although the definitions of quality show similarity, their scope changes according to some researchers. For example, Chung [1] restricted the definition with the building by arguing that a building has a good quality if only it operates as it was designed during its lifecycle. On the other side, Rumane [3] stated that not only materials and equipment used in the project, but also management mentality influences the quality and hence, included also project management concept to the definition. However, regardless of its scope to attain the desired quality in construction projects first customer requirements must be determined, then necessary activities that will meet the requirements must be planned and finally in the construction phase these activities must be properly realized.

Since the real quality of the buildings appears after many years later, the quality of the projects can only be interpreted from their design specifications [1]. In this sense, in construction industry management focuses mainly on the design and construction process qualities of the projects instead of the quality of building. In other words, it is assumed that if the project is accomplished with good quality then the building will also have a good quality. In Table 1 components of design and construction process qualities are summarized [6]. Actually, design quality components are the criteria which determine how an activity should be performed and show the expected situation after each activity is performed. Similarly, construction process quality components are the criteria which indicate how control activities should be performed to attain the desired quality. No matter how good the design quality is, attaining the quality depends on effective controls [3]. In this context, both designers and practitioners have a big impact on determining the quality of construction projects [4].

Table 1. Components of design and construction process quality

Components of design quality	Components of construction process quality
Reliability of initial brief	Reliability of organization, procedures and skills of builder to interpret the design
Reliability of all information used as basis of the design, and selection of products	Marshall required resources
Reliability of design solution and detailed specification	Provide the end product in accordance with design and specifications, and at contracted price
Reliability of estimates of quantities of materials and labors required and their costs	A workforce of appropriate skills
Reliability of management and site overheads	Products of specified quality
Predictions of possible contingencies	Reliability of all the materials, products, components and equipment
Reliability of calculations relating costs to benefits	Supplied to the site, and their handling storage and protection on site
Experience of designer	

Although, many construction firms in Turkey own the Quality Management Systems standard ISO 9001, they cannot establish an effective system due to the unique nature of the projects. In other words, in every project the aim, scope, methods, participants etc. varies and therefore a project-specific quality management system must be established at the start of each new project. In this aspect, ISO 9001 is not appropriate for the construction industry, but it is a good starting point for Total Quality Management (TQM).

TQM is defined as identifying and managing the necessary activities required attaining quality within an organization [5]. For establishing an effective TQM system involvement of all project participant is essential. Although, TQM is widely utilized in many sectors, there is not a standard method for applying it to the firms. Therefore, TQM may vary in every organization depending on their work culture. Struggling to improve the quality in a competitive environment to increase customer satisfaction makes TQM systems dynamic.

The increasing competition in the construction industry necessitates quality as a prerequisite for the investors. Although, TQM systems developed for other sectors cannot be directly transferred to the construction industry, some of their principles and components can be adapted. In this sense, construction firms can establish their own quality standards and these standards can be improved with data obtained from previous projects. In this study, it was argued that for an effective TQM system all project participants should be involved to the process and in this context the attitude of the participants were investigated.

### 3. Methodology

To obtain the necessary data, a questionnaire consisting of 3 parts was prepared. In the first part of the questionnaire beside the demographic information, the participants were also asked whether the construction firm owns a quality management system document and whether they participated to a quality related training. In the first part, also, knowledge degrees about TQM belong to each participants were assessed by themselves via 5-point Likert-scale. In the second part, questions were prepared to determine the attitude towards TQM. In the third part, questions for evaluating the implementation level of components of construction process quality in the current projects were prepared. Questions in the second and in the third parts were organized on a 5-point Likert-scale where 1 and 5 represented “not properly” and “most properly”, respectively. Finally, this questionnaire was administered face to face to 120 project participants employed in three different construction projects in Turkey. All interventions were made during the interviews and thus, all data were used in the statistical analysis. All participants were selected from projects executed by construction firms in Turkey own the Quality Management Systems standard ISO 9001. The results of the questionnaires were statistically evaluated for each project by using the Relative Importance Index (RII). RII is a statistical method which determines more precisely the relative weight of each variable among total variables [7]. The numeral interval of RII method used for 5-point Likert scale is shown in

Table 2.

Table 2. Numeral Intervals of RII Methods

Min RII Points	Definition	Max RII Points
1,00	not properly	1,80
1,80	somewhat properly	2,60
2,60	properly	3,40
3,40	more properly (comparative)	4,20
4,20	most properly (superlative)	5,00

#### 4. Discussion of results

The Test of Internal Consistency is one of the widely used methods for evaluating the reliability of the questionnaires. If the Cronbachs' alpha value obtained at the end of this test ranges between 0,600 and 0,900 then the questionnaires are accepted as reliable [8]. The Cronbachs' alpha values of determination of knowledge degree about TQM for each participant were calculated as 0.678, 0,640 and 0,664 for project 1, project 2 and project 3, respectively. The Cronbachs' alpha coefficient of utilization circumstance of TQM in the project 1, project 2 and project 3 were computed as 0.700, 0.682 and 0.732, respectively. The Cronbach alpha values of implementation levels of construction process quality components for project 1, project 2 and project 3 were counted as 0.716, 0.724 and 0.736, respectively. All computed Cronbach alpha values were in the expected interval and made the questionnaire reliable. Demographic information of participants is shown in Figure 1 and Figure 2.

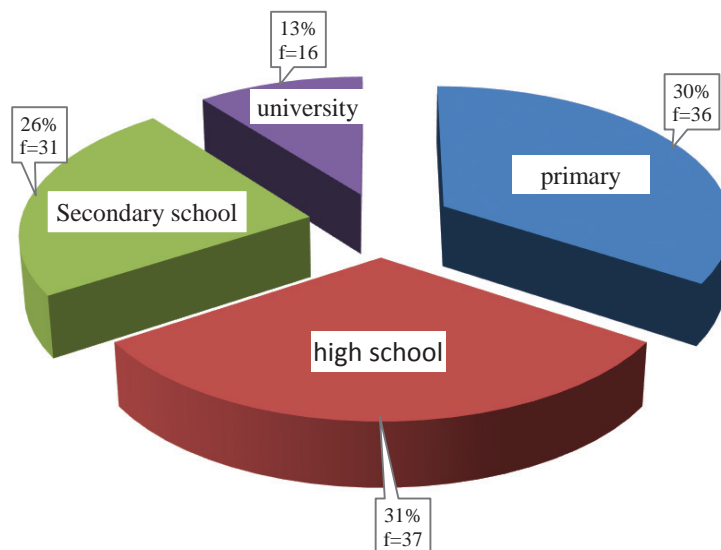


Figure 1. Educational status of the participants

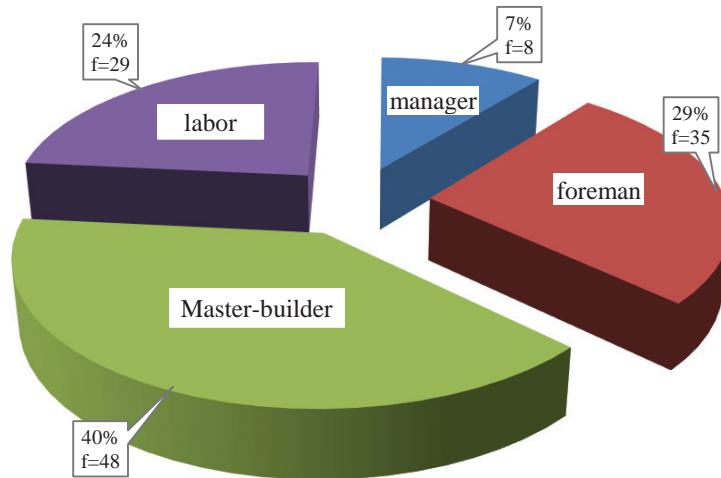


Figure 2. Position of the participants

To determine the quality knowledge level of the participants they were asked whether they attended to a quality related training and whether their quality knowledge is enough for TQM. Accordingly, it turned out that 44% attended to a training (Figure 3) and 28% believe that their knowledge is sufficient for TQM (Table 1). These results reveal that, less than halves of the participants are aware of TQM in construction projects.

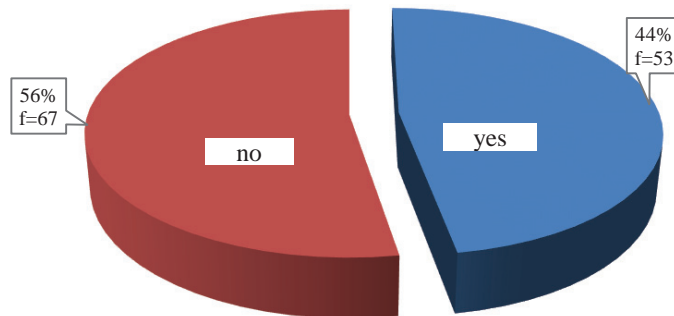


Figure 3. Attendance of participants to a quality related training

Table 3. Cross-match of TQM knowledge with educational status

		Project 1	Project 2	Project 3	Total Percentage
I have enough knowledge about TQM	absolutely agree	3	5	3	9
	agree	9	6	8	19
	no idea	8	10	12	25
	disagree	10	13	10	28
	absolutely disagree	4	6	13	19
		<b>34</b>	<b>40</b>	<b>46</b>	<b>100</b>

To examine the participation level of the employees they were first asked whether their construction firm owns a quality management document such as ISO 9001. Interestingly, only 18% of them responded positively and 66% had no idea whether the firm owns such a document, however, all considered firms possess ISO 9001. (Figure 4).

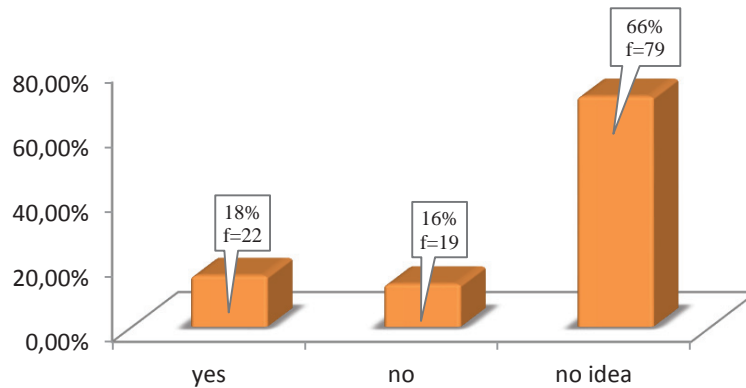


Figure 4. Possession of a quality management document

Table 4. Utilization circumstance of TQM

Utilization circumstance of TQM in the current projects	Most properly (superlative)	More Properly (comparative)	Properly	Somewhat properly	Not properly	Average Score
Project 1	12%	20%	36%	17%	15%	2,97
Project 2	8%	14%	40%	20%	18%	2,74
Project 3	10%	22%	35%	22%	11%	2,98

As shown in Table 4, utilization circumstance of TQM in current projects from number 1 to number 3 were evaluated by participants as properly with the average scores of 2.97, 2.74 and 2.98, respectively. When it comes to evaluate the implementation level of each quality component during the construction process, many of the average scores were weighed as higher than previous results by participants (Table 5, Table 6 and Table 7). Only the average scores of the component of provide the end product in accordance with design and specifications, and at contracted price were assessed as less proper than utilization circumstance of TQM. The comparison of construction process quality components' implementation levels' average scores and average scores of utilization circumstance of TQM in the projects is shown in Table 8. As can be seen in Table 8, average components' scores of all projects higher than average utilization circumstance scores. The results prove that, participants are not aware of utilization circumstance of TQM in the current project, even though implementation level of components were relatively higher in each project. The reason for this situation is that the construction firm did not inform their employees about their TQM policy and thus, they are not exactly involved to the TQM process. Considering the fact that 83% of the questionnaire participants were foreman, master-builder and labor, who actually performs the activities, it can be deduced that most of these participants focus on their own task instead of the total quality of the project.

Table 5. Implementation levels of construction process quality components on project number 1.

Component name	Most properly (superlative)	More Properly (comparative)	Properly	Somewhat properly	Not properly	Average Score
Interpretation of design	25%	40%	30%	5%	0%	3,85
Availability of Marshall required resources	28%	34%	20%	8%	10%	3,62
Provide the end product in accordance with design and specifications, and at contracted price	8%	20%	18%	24%	30%	2,52
Appropriate skills of workforce	32%	44%	16%	8%	0%	4,00
Production of specified quality	18%	25%	25%	20%	12%	3,17
Existence of reliable materials, products, components and equipment	15%	25%	30%	20%	10%	3,15
Supplementation to the site, handling storage and protection on site	32%	26%	20%	14%	8%	3,60

Table 6. Implementation levels of construction process quality components on project number 2.

Component name	Most properly (superlative)	More Properly (comparative)	Properly	Somewhat properly	Not properly	Average Score
Interpretation of design	20%	42%	32%	2%	4%	3,72
Availability of Marshall required resources	30%	36%	22%	6%	6%	3,78
Provide the end product in accordance with design and specifications, and at contracted price	12%	18%	30%	26%	14%	2,88
Appropriate skills of workforce	36%	36%	20%	6%	2%	3,98
Production of specified quality	20%	28%	22%	18%	12%	3,26
Existence of reliable materials, products, components and equipment	22%	30%	28%	12%	8%	3,46
Supplementation to the site, handling storage and protection on site	28%	28%	22%	12%	10%	3,52

Table 7. Implementation levels of construction process quality components on project number 3.

Component name	Most properly (superlative)	More Properly (comparative)	Properly	Somewhat properly	Not properly	Average Score
Interpretation of design	23%	35%	32%	8%	2%	3,69
Availability of Marshall required resources	30%	30%	26%	4%	10%	3,66
Provide the end product in accordance with design and specifications, and at contracted price	10%	12%	28%	25%	25%	2,57
Appropriate skills of workforce	40%	36%	14%	8%	2%	4,04
Production of specified quality	28%	20%	26%	16%	10%	3,40
Existence of reliable materials, products, components and equipment	30%	22%	15%	18%	15%	3,34
Supplementation to the site, handling storage and protection on site	25%	25%	30%	12%	8%	3,47

Table 8. Comparison of average scores

	Average scores of		
	Utilization circumstance of TQM in the current projects		Implementation levels of construction process quality components on the current project
Project 1	2,97	<	3,42
Project 2	2,74	<	3,51
Project 3	2,98	<	3,45

## 5. Conclusion

The complex nature of construction projects complicates its management. In this sense, attaining the desired quality became a prerequisite for the investors in contractor selection. Although, many construction firms own the ISO 9001 standard, this standard is not properly applicable due to the uniqueness of construction projects. Indeed, the dynamic environment of the projects forces to establish a project-specific TQM system. However, for an effective TQM in the construction industry all the project participants should be involved into the process.

In this study, it was aimed to examine the attitude of employees towards TQM in a construction project build in Turkey. In this context, a questionnaire consisting of 3 parts was prepared and administered face-to-face to 120 employees. The questionnaire results revealed that almost half of the employees attended to a quality related training and these trainings is not sufficient for TQM. On the other hand, since the construction firm did not give the necessary information about their quality policy, the employees were not properly involved to the TQM process. Therefore, almost all of the employees are not able to accurately evaluate the utilization circumstance of TQM during the construction project process. In fact, the questionnaire results uncovered that both employer and employees are not aware of the TQM dependency among each other. Since the quality of construction project is primarily determined by labors that perform the activities, it is beneficial for construction firms to involve the employees to the process by informing them about their quality policy instead of just controlling the activities after they are performed. Similarly, accomplishing a project with low quality will decrease the opportunity of getting a new job for the construction firms and accordingly, for the employees in the competitive environment. In other words, the preferability of construction firms increases as the labors accomplish the activities with high quality. To summarize, for an effective TQM in construction projects all the participants must be aware that they are working for a common purpose and thus, all of them participate into the process.

## References

- [1] H.W. Chung, *Understanding Quality Assurance in Construction: A practical guide to ISO 9000 for contractors*, E & FN Spon, England, 2002.
- [2] J.M. Juran, and A.B. Godfrey, *Juran's Quality Handbook*, McGraw-Hill, U.S.A., 2000.
- [3] A.R. Rumane, *Quality Management in Construction Projects*, CRC Press, U.S.A., 2010.
- [4] J.S. Oakland, and M. Marosszeky, *Total Quality in the Construction Supply Chain*, Butterworth-Heinemann, England, 2006.
- [5] S.L. Tang, S.M. Ahmed, R.T. Aoieong, and S.W. Poon, *Construction Quality Management*, Hong Kong University Press, Hong Kong 2009.
- [6] G. Atkinson, *Construction Quality and Quality Standards*, E & FN Spon, England, 2005.
- [7] Kazaz A., Acikara T. "Comparison of Labor Productivity Perspectives of Project Managers and Craft Workers in Turkish Construction Industry", *Procedia Computer Science*, vol.64, pp.491-496, 2015, doi: 10.1016/j.procs.2015.08.548.
- [8] Kaiser HF, Rice J. Little Jiffy, Mark IV *Journal of Educational and Psychological Measurement* 1974;p.111-117.