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## **Project Quality Management Research**

### Abstract

The quality of the construction process is a set of properties of the finished construction site that determine its suitability to meet specific needs.

Construction quality management is establishment, support and maintaining of the necessary quality level of construction products during their design, production and operation, carried out by a systematic monitoring and purposeful influence on the conditions and factors affecting the quality.

The introduction of various construction quality management systems improves the product quality, increases the production culture, and focuses on achieving the ultimate goal of production – the final product with the required quality level. In this paper we shall examine quality management in the construction process, the factors affecting quality in the construction process, and application of quality management in the construction process, and namely in the construction of the shopping mall.

As we all known that project quality occupies a very important place in construction. According to our experience, project quality is the major factor to ensure the customer's benefits. Besides, good quality management could help avoiding the rework happen, and thus the efficiency could also increase. Moreover, with a good quality management, the service life of the project would increase. Last but not the least, good quality management could improve the customer's investment benefits. Based on the advantages listed above, we could easily find out that it is very important for a project team prepare a good quality management plan. In this course, the project I am

working on now is a project of constructing a big shopping mall with an area of 60, 000 square feet and the total cost of around \$15 million. Here comes a question how to make sure that my team could build a wonderful project with high quality? In order to find an answer for this question, I choose to do a research of project quality management.

## **Preliminary Research Sources**

Total Quality Management. Lennart Sandholm (2000). Publisher:

Studentlitteratur (SW) (2000)

This book explains the reasons for growing interest in quality which include customers' increasingly demanding quality requirements, tougher competition in markets, demands for improved profitability, growing complexity of goods and services.

Research into Quality Management and Social Responsibility. Juan José Tarí (2011). Journal of Business Ethics, September 2011, Volume 102, Issue 4, pp 623-638

This article presents a systematic literature review on quality management and social responsibility. The quality management section would be very useful to my study.

Total quality management in the construction process. David Arditi, H Murat Gunaydin. International Journal of Project Management, Volume 15, Issue 4, August 1997, Pages 235-243

This article introduces the quality management, and the most important is that there is a section about the factors that affect quality. I consider that this section would help me with my paper.

## **Project Environment**

In my project, the shopping mall construction, there may be a lot of emergencies and some uncertainties may happen; these issues might affect the quality of the project. This research will reference my current construction project and give the project team some advice to help them improve the quality.

This paper would mainly focus on two parts. The first one is what kind of factors would affect the quality, and other one is how to improve the quality for project. With this study, I believe the project could execute in a high efficiency and result in high quality.

## **Quality Management: Concept Review**

At the present level of development the concept of quality is regarded as a complex component, including the quality of the final product, the quality of management, the quality of delivery or work, the quality of life of people (employees) and society in general.

Quality management means coordinated and interconnected management activities that were built in such a way as to ensure safe and smooth operation of the organization.

Organization management with regard to quality means that all the activities are subject to the objectives set for quality; and in order to achieve these objectives the organization has developed a system of plans, it has the necessary resources, and it carries out the actions necessary to achieve its objectives.

## **Quality management includes four basic components: quality control, quality assurance, quality planning, and quality improvement.**

Relationship between Quality Management and Social Responsibility

Many researchers consider that quality management and social responsibility are interrelated. For example, McAdam and Leonard (2003) suggest that the key issues of quality management are respect for people, ethics and principles; Holjevac (2008) argues that social responsibility practices are at the same time also quality management practices; Talwar (2009) proposes the review of sixteen quality models and after the review the author comes to conclusion that the core value of all these models is the social responsibility.

It is not possible to successfully manage quality if there is no clear emphasis on moral values. Simultaneously, in order to be able to provide an answer to the moral questions effectively and successfully, social and ethical matters in a business environment require complete and thorough quality control (Tari, 2011). The focus of both social responsibility and quality management is the same: responsibility of the company regarding its stakeholders.

According to Waddock and Bodwell, there are certain frameworks that are common to both quality management and social responsibility, and namely: leadership, people management, customer focus and supplier relations are the practices used to manage the quality; responsible vision, strategy, stakeholder engagement, values, human resource responsibility, leadership based on values, responsibility measurement systems, ecological outcomes,

transparency, accountability are the practices used to manage the social responsibility.

## **Factors Affecting Quality in the Construction Process**

In the struggle for improving the efficiency of investment activity at the present stage of economic development the improvement of the quality of construction becomes the matter of paramount importance. Factors that affect the quality in the construction process include: management commitment and leadership, training, teamwork, statistical methods, cost of quality, supplier involvement, customer service, and factors specific to the construction industry (Arditi and Gunaydin, 1997).

Management commitment and leadership include recognizing the fact that there is a problem that decreases the construction productivity and to develop a distinct comprehension of the fundamental principles and elements that form the basis of total quality management. After that management needs to demonstrate its commitment to quality by means of performing the required actions. There is a tendency to practice management by control, and not management by participation; management by control proved to be more effective in the present day competitive pressures, increasing quality demands, and tough performance schedules.

Training is extremely important; it is confirmed by all experts in the field of quality. Training must be provided for all categories of employees - managers, office staff, engineers, etc. Although construction work varies significantly depending on the site, project and requirements, it is still

possible to provide some basic training to employees involved in the construction work in order to increase their skills and qualifications. Training may also include such matters as team work and problem solving, effective communication, cause-and-effect analysis (Arditi and Gunaydin, 1997).

Teamwork is important because it gives an opportunity for each employee to obtain the assistance that is required in order to succeed, both individually as together as a team. Taking into account that construction process is project oriented, the whole project team (i. e. the owner, project manager, designers, contractor and subcontractors, manufacturers) must be involved in the process of improving quality.

Statistical methods play a significant role in the process of monitoring the quality of the construction process while they provide problem-solving tools to the quality management process (Arditi and Gunaydin, 1997). They can be used to improve the initial quality standards that were assumed at the start of the project.

Implementing the processes that ensure high quality of the final product is rather expensive. But the cost of the quality can be regarded as a lucrative investment. Having a reputation of a high-quality construction organization will provide an additional advantage over the competitors.

The quality of the final product depends on the relationship between all the parties involved in the process of production of this product - the supplier, the processor, the customer (Arditi and Gunaydin, 1997). Quality must be ensured at each stage of the process; if at on stage there will be some defects or drawbacks, the total quality of the final product will not be perfect. Thus, the materials provided by the suppliers must be of good quality. It is

recommended to establish close and longstanding relationship with the suppliers in order to have qualitative goods at the lowest possible cost. Customer service becomes more and more important as the demands to quality increase. Customer satisfaction plays a significant role in the provision of a high-quality product. The construction process has to be considered as a process where all customer needs must be satisfied (Arditi and Gunaydin, 1997).

Factors specific to the construction industry include quality of codes and standards, drawings and specifications, constructability analyses. It is important that they are concise, legible, distinct and uniform.

## **Quality Management in the Construction Process**

In the system of measures aimed at achieving a high quality of construction, control over the quality of construction occupies an important place. The main point of control over the quality of construction is to verify the compliance of construction and installation works as well as building materials and stuff on which depends the quality of construction products, to the requirements of the projects, standards and regulations.

The main task of monitoring the quality of construction is the prevention, detection, elimination of the causes of deviations that may result in the defects in construction (Ferguson and Clayton, 1998). Defects that have been detected early in the construction process in most cases are relatively easy to rectify with the lowest cost. Defects detected after the construction is finished are much more difficult to fix.

Quality control of construction and installation works is carried out by the



services of the state, public and institutional control, by customers and design organizations that prepared the projects. Depending on the bodies performing control functions, external and internal control in the construction process is distinguished. External control includes state and public control, and control of the customer; internal control comprises institutional control. Internal control over the quality of construction has various forms: the front, technological (operational), intermediate, acceptance (Ferguson and Clayton, 1998).

The customer has the right to exercise control and supervision of the progress and quality of work, timeliness of their performance (schedule), the quality of materials provided by the contractor as well as the proper use of the customer's materials by the contractor, provided he is not interfering in the operational and economic activities of the contractor. During the construction control is also performed by technical supervision workers appointed by the customer (the developer) or the management of the enterprise that is being constructed.

Supervision is one of the types of construction quality control. It is performed by the design organization that developed the project (Stasiowski and Burstein, 1994). Supervision of the construction by project organizations was introduced in order to improve quality, reduce the duration and lower the cost of construction, as well as to increase the responsibility of design and construction companies for the quality of constructed facilities.

Design organizations and their representatives engaged in supervision have the right to stop certain construction and assembly work, if construction technology is violated, if designs and materials used are of poor quality, if

there are deviations from the project that can lead to alterations or that are associated with a decrease in strength and stability of the structure (Stasiowski and Burstein, 1994). They have the right to prohibit the use of constructions and building materials that do not meet the standards, design and other technical documentation.

## **Application of Quality Management in the Construction Process**

In order to improve the quality in the construction process and to ensure the high quality of the final product – the shopping mall, it is necessary that all the factors that affect the quality are combined together in the most effective way. The quality of construction is understood as the conformity of the quality of constructed buildings to design decisions and regulations.

Quality should be formed at all stages of the construction process: pre-production (design), production (construction and assembly processes) and after production (operation). If all the stages of the construction process are performed qualitatively it will provide an opportunity to solve the key challenge of the shopping mall construction, and namely the high quality of the final product. Therefore, quality in the construction process is a complex issue that depends on all parties: public authorities, customers, design and construction organizations, manufacturers, transport companies and organizations involved in the operation of construction projects.

Managers and workers need to understand the importance of the high quality of the final product and the necessity to carry out various types of control at all stages of construction. Control over the quality of construction should be operational and multi-layered; it has to be performed by

construction laboratories, construction engineers, the builders, the authors of the design documentation, and special state regulatory agencies. In addition, workers have to carry out public control during the handover-acceptance of the construction work. Thus plasterers, before they start plastering stone walls, have to check the quality of work of masons, painters need to check the quality of work of plasterers, etc. This will create an opportunity to check the quality of the works performed at various stages by various workers and to find defects early in order to be able to eliminate them at a relatively low cost and with less effort.

The quality of construction largely determines the cost of construction; this factor determines such criteria as, for example, wear resistance and durability of capital construction. As a rule, omissions in quality turn into rising costs of construction, more significant costs of the facility exploitations, poor comfort conditions of the edifice, as well as the possibility of various emergency situations. Thus it is necessary because it provides an opportunity to ensure that all the stages of construction and all works are performed at the top-quality level in order to minimize costs and avoid elimination of defects and repeated performance of works.

Quality control of the construction works leads to the eligibility criteria of the building quality and involves testing of appropriateness in accordance with the requirements of design solutions, standards and specifications laid down by the legislation on the construction. In terms of competition for technical customer the quality control system of the construction will work quite effectively.

In order to ensure the high quality of the shopping mall construction it will be

necessary to start with an initial control. It is carried out before the application of building materials in the construction process and includes checking the existence and content of the documents of suppliers containing information about the quality of delivery, compliance with material requirements of working documentation, technical regulations, standards and codes of rules. This type of control covers such factor as supplier involvement; if the supplier of the materials is reliable it is highly probable that this type of control will be passed without any problems. Initial control is entrusted to the contractor. He is entitled to make necessary measurements and testing of construction materials in accordance with the established procedures; the constructor can do this himself or he can entrust this to an independent accredited organization. This type of control is important because it gives an opportunity to detect the defective materials before the start of construction process and not to utilize such materials in the construction; if the materials are of low quality there is no point in taking any measures and investing costs in increasing the quality at other stages of the construction process - the quality of the final product will not be high if the quality of the materials used is low.

If the initial control shows unsatisfactory results and if the construction materials do not correspond to the set requirements, their use in the construction is not allowed. In order to be sure that the initial control was carried out properly, the technical customer can check the completeness of the initial control performed by the contractor, compliance with deadlines and the reliability of the documentation of the results.

After the construction process has started, it is necessary to conduct control

of construction operations. This is the main stage of construction quality control, which tests the observance of the sequence and structure of technological operations carried out, their compliance with technical regulations, standards, codes of practice, project documentation, results of engineering studies, land development plan, and the appropriateness of the quality of technological operations and results to the project requirements and technical documentation, as well as technical regulations, standards and codes of practice. Control of construction operations can be performed by the contractor and by the technical customer of the capital construction.

It is possible to conduct other types of control activities if they are stipulated in the construction contract agreement; thus, it will be necessary to include certain clauses regarding control of the construction quality in the contract.

During construction process or at the end of this process it is possible to carry out operational control; during this type of control measuring method and the technical inspection are utilized.

Visual and measuring control is carried out in accordance with a specially developed documentation. Visual and measuring control of materials at the stage of the initial control is performed when receiving the material (semi-finished products, details, parts) by the construction organization in order to confirm its compliance with the requirements of standards, specifications, and design documentation. The results of the control procedure should be documented.

Apart from that it will be necessary to conduct an external control. This type of control is a form of testing that is usually initiated by the technical customer and involves an independent supervision organization. Generally,

external control by an independent organization is accompanied by technical supervision of the customer, field supervision of the designer, control of the commissions at the time of acceptance of construction facilities into operation, state fire control, state sanitary and epidemiological surveillance, technical labor inspection, state mining and industrial supervision of safety, state architectural and construction supervision.

Acceptance control is the type of control that is performed at the end of the construction of the facility or of its stages, the hidden works and other objects of control. According to the results of the acceptance control a documented decision is taken on the suitability of the object of control for the operation or implementation of subsequent works.

Thus, in order to ensure the high quality of the shopping mall construction it is necessary to ensure various types of control at every stage of the construction process. All the factors that affect quality in the construction process need to be combined together in the most effective way. It is necessary that management understands the importance of control and that it participates in the control process and in the quality improvement process as well. The workers involved in the construction process have to be skilled and need to be able to work as a team. Besides, it is necessary to establish lasting relationships with the suppliers of the materials, but nonetheless the materials supplied have to be checked before the construction process as to their compliance to the quality requirements and technical specifications. Quality control should be carried out constantly in order to detect defects early at to eliminate them at low cost and effort. If all these requirements are

met, it can be expected that the quality of the shopping mall construction will meet the high expectations.

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