

Guideline for Optimized Quality Assurance in the Execution Phase

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ABSTRACT: The constantly increasing demands on architecture and building physics, along with economic objectives and time pressure, often lead to neglecting quality assurance during the construction of building projects. This neglect results in a higher occurrence of construction damages. Therefore, early and proper quality assurance is essential to achieve the desired quality and to avoid dissatisfied clients and rising costs.

This master's thesis addresses the topic of optimized quality assurance in the construction phase and explains why such measures are necessary and how they should be implemented. Firstly, the concept of quality is defined, emphasizing the importance of clearly declaring quality standards before the execution phase begins. The methods of conducting quality assurance are also explored. The significance of successful quality assurance is elucidated, and reference is made to applicable norms, guidelines, and specifications.

Additionally, the "PlanRadar" program is presented in this thesis, demonstrating how software support can enhance quality assurance. Furthermore, a practical example is used to illustrate the process of quality assurance in construction. The various steps, such as monitoring, reporting, and communication with project stakeholders, are showcased. The practical implementation of the quality assurance process in construction highlights how consistent monitoring and control of construction work positively impact the building project.

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KEYWORDS: Quality assurance, execution phase, quality, construction management

1 INTRODUCTION

The construction industry holds significant importance in our economic system and has become increasingly challenging and demanding due to rising complexity and risks. There is a strong emphasis on design freedom, hybrid construction methods, environmental friendliness, and, above all, consistent high quality. Balancing all these aspects with the economic considerations of cost-effective production, short construction times, and weather-independent progress, while complying with prevailing legal requirements, is the desire of every client. However, in many cases, the quality of work is neglected or not sufficiently monitored [1] [2].

As a consequence, there is a higher incidence of construction damages in both the building and civil engineering sectors, which can be attributed to errors in planning, lack of coordination among executing companies, use of inferior construction materials, or improper processing of construction products [2] [3].

To address these issues, measures to ensure required quality levels should be an integral part of all company processes through regular quality assurance. Traditionally, the focus has been on identifying deficiencies in execution and products after completion (during the building handover) to deliver a project without defects. However, it is crucial to conduct continuous quality controls during the execution phase to reduce or eliminate the number of later defects.

Therefore, the goal of this work is to provide a practical and easily understandable insight into the topic of quality assurance in a concise form. It serves as a reference for beginners or as a refresher for those with existing knowledge.

2 QUALITY

The term "quality" is used in both colloquial and technical language in various contexts and with different meanings.

Often, the term is associated with positive connotations. Advertising frequently employs the term to characterize a product, such as referring to high product quality or the highest quality standards. The origin of the word "quality" lies in the Latin root "qualis," which means "of what kind" and fundamentally has a value-neutral meaning [4] [5].

To ensure, monitor, and control qualities, they must be defined before the performance is provided. This is accomplished through quality definitions. Norms and guidelines describe the minimum requirements for qualities. Additional quality requirements are established through performance specifications, contractual agreements, or similar means.

The measurability of quality is limited to the degree of meeting the requirements. Therefore, there is no absolute quality but only a range between good and poor quality.

3 QUALITY ASSURANCE IN THE EXECUTION PHASE

Quality assurance in construction refers to all measures and processes aimed at ensuring the quality of a construction product or project. The primary objective of quality assurance is to secure or enhance the quality and does not explicitly focus on time and costs. However, the actual activities of employees are simultaneously influenced by quality, time, and cost-related factors and are mutually dependent. Nevertheless, the quality of a project remains of great importance to the customer even after purchase or completion. While costs primarily play a role during purchase, adhering to deadlines until the overall completion becomes increasingly crucial. Once the construction project is handed over, cost and deadline adherence quickly lose significance, and satisfaction or disappointment during usage become the focus. Hence, it is essential to prioritize quality from the early stages. Figure 3-1 illustrates the significance of quality, costs, and deadline adherence over time [5] [6].

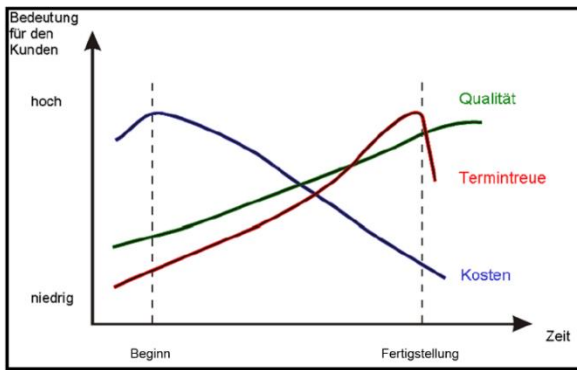


Fig. 3-1: Quality, Costs, and Deadline Adherence over Time

3.1 Comparison of Actual and Target (Planned) Situation

In the past, it was common practice in the construction industry not to conduct systematic quality checks during the construction phase. Instead, performance evaluations and inspections for defects were carried out only after the completion of the construction work. This approach had the disadvantage of identifying defects and deviations from the planned specifications only after the construction was finished or even going unnoticed. Therefore, it is essential to first establish the standard of quality requirements and continuously monitor them during the execution phase, based on the progress of the construction [7] [8].

This means that to ensure effective quality assurance, it is not enough to solely focus on the finished product. It is crucial to also analyze, identify, and review the process steps beforehand, where defects may occur. Only by doing so can appropriate measures be taken and suitable actions be implemented to prevent defects during the construction phase or address them as quickly as possible.

3.2 Meaning

On the one hand, through monitoring and controlling the executed work, adherence to the planned quality standards can be ensured. This allows for early detection and resolution of defects and errors, ultimately saving time and costs. Moreover, effective quality assurance can strengthen the trust of customers and clients in the construction project and contribute to a positive reputation for the construction company. Additionally, proper documentation of quality assurance measures can serve as evidence in case of disputes or claims.

3.3 Process

The process of quality assurance in the execution phase can be described as follows:

- Planning quality assurance
- Conducting on-site inspections
 - o Verification of materials
 - o Verification of dimensions
 - o Verification of execution
- Documentation of the results
- Measures to correct deviations
- Monitoring of the measures
- Preparation and distribution of the report

4 APPLICATION OF SOFTWARE-BASED QUALITY ASSURANCE ('PLANRADAR') IN A PRACTICAL EXAMPLE

Software-based quality assurance refers to the use of computer software to automate quality assurance processes and improve the quality of products or services. 'PlanRadar' is a software used for construction documentation, task management, and defect tracking. It is a cloud-based Software as a Service (SaaS) solution, allowing all information to be entered through a ticketing system. Additionally, 'PlanRadar' offers an open BIM solution, enabling users to upload BIM building models using simple drag and drop functions [3].

The practical application involves a residential complex comprising a total of 120 housing units and an interconnected underground parking garage.

5 CONCLUSION

In summary, it can be noted that the quality in the construction industry has undergone positive developments in recent decades. It can also be stated that effective quality assurance during the execution phase is of crucial importance. It aids in minimizing costs and risks, improving construction quality, increasing customer satisfaction, and maintaining transparent documentation. Additionally, economic competition increasingly demands proof of quality controls in construction.

6 OUTLOOK

Therefore, it can be said that in the future, quality assurance in construction will continue to be highly demanded as requirements and standards increase, and the construction industry increasingly focuses on sustainability and energy efficiency. New technologies such as BIM (Building Information Modeling) and digital monitoring systems will also contribute to enhancing and streamlining quality assurance.

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