CONNECTING QUA WITH SAFETY MAN in Construction

By Aubrey E. Harris

CONSTRUCTION MANAGEMENT is a process fraught with paradoxes. Improving processes requires being both deliberate and flexible (McGeorge, Zou & Palmer, 2013). Time and material resources are finite; therefore, the ability to mitigate risk may be the only assurance of a project's success, otherwise a project may be derailed for lack of resources. For any project, a reasonable approach must first define the project's objectives, then create a plan to ensure that those objectives are being met. The plan may be as simple as "remember the end goal." However, values that are applied to a project, such as prioritizing safety, maintaining employee welfare or managing customer expectations, may also factor in project success and attracting future customers. If we accept Murphy's Law, there are many ways for a project to get derailed; however, quality management posits that if one remains cognizant of the end goal, a quality management program may guide decisions, provide flexibility for adaptation, and ensure that safety remains a priority when urgent and competing interests push for project completion. This article discusses components of quality management and how it may be a tool for safety management.

Management as a Team-Oriented Process

Whenever a project is assigned, team members should articulate their individual values that would need to be fulfilled for them to deem the project successful. These values may be guided by a corporate mission statement, personal character, or best practices and experiences. Values may be many: an engineer may focus on design effectiveness or sustainable use of materials; a competitive work environment may encourage timeliness or innovative processes; a safety officer may focus on identifying risks during construction processes. Values compete to varying degrees in each team member's mind at different phases before the project's completion. Shifts in values may occur when timelines become compressed or budgets fall short, requiring compromise to finish the job. Safety should always be central and meaningful to any management program. Reducing risks and losses improves the bottom line (Rechenthin, 2004).

Safety and quality programs share similar challenges: all team members are responsible for fostering an environment that values quality and safety (Behm, Veltri & Kleinsorge, 2004). Having a team-oriented approach of defining and discussing goals (including safety) ensures that each team member has the same vision. This step is especially important when dealing with teams of varied skills and responsibilities. For example, the surveyor, the heavy equipment operator and the electrician may all have job phases that neither overlap nor continue for the duration of the project. However, if after the project mission and values are discussed and repeated, each project phase maintains cognizance of end goals and the success criteria, then each project team can strive to improve coordination, reduce missteps and provide opportunities to streamline processes (Figure 1).

Creating and implementing a program to measure quality ensures that the team is making measurable progress toward meeting the project's vision. When all team members participate in the process, the project owner, project manager and technical team members will develop a vested interest in maintaining quality assurance and quality control to mitigate unforeseen circumstances, improve jobsite safety and adjust to field conditions.

> **Example:** Company A has a mission statement of quality services and maintaining a rigorous safety program. Company A demonstrates its values by supplying and requiring safety training for employees, having mechanisms in place for employees to report issues and of responding to reported issues. Values require action to be effective and meaningful.

Components of Quality Management

A large percentage of workplace deaths are 'probably' or 'definitely' caused by design-related issues (McGeorge et al., 2013). This places a distinct burden on designers, as their planning and construction decisions can greatly affect the safety of a project. Going through the process of safety-oriented design and planning has the potential to reduce costs. Retrofitting safety features after construction has begun can be costly and inconvenient.

Generally, quality programs are an opportunity to generate information about how well actual performance measures up to intended performance. A quality management plan should be incorporated early in the project, perhaps as early as general project planning. As measurable objectives are defined, so should the objectives will be

KEY TAKEAWAYS

- **Quality management plans should be incorporated in all phases of project development, with safety management being a key consideration during design and construction.**
- **The entire team is responsible for applying critical thinking during quality and safety management.**
- **Project leaders should be prepared to constantly improve management processes to promote a safe working environment.**

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met (Furst, 2015). During the development of a project, some techniques include visualizing the life cycle of the construction project (Golabchi, 2018) and engaging all stakeholders and participants meaningfully on how the project design will impact those involved.

Methods to implement safety considerations during design have been presented in NIOSH's Prevention Through Design (PTD) initiative as a methodology to reduce safety-related losses during the design process. To further increase cost savings, project managers should engage stakeholders early in the process to identify safety and health risks while the cost associated with changing decisions is still low. For example, field visits are necessary to determine whether site access challenges or particular features on the site exist that should be avoided or preserved. For example, the stakeholder meeting may reveal the presence of an endangered species habitat or archeological features that are fragile or of cultural importance.

The project management plan should include a quality control plan and a quality assurance plan (USACE, 2006). At this time, safety management should be incorporated as a quality management goal. Safety management is like other management processes: policy, procedures and measurement are all necessary phases for implementation (Karanikas, 2014). Therefore, safety management is well-suited for full integration with the development of quality management plans.

Two key and distinct processes in quality management have been raised: quality control and quality assurance. In construction projects, a quality control specialist ensures that the construction is being built to specifications, particularly with regard to meeting structural demands. This may be the time for testing concrete, surveying grade or ensuring that the punch list is completed. This is also an opportunity to determine whether different processes may be streamlined, whether waste can be reduced, or whether safety can be improved. Quantitative observations can be done at this time: safety incidents reported, units produced, number of errors and any other records of performance during the quality control phase.

Another aspect of quality management, separate and discrete from quality control, is quality assurance. This measures how well the effort meets stated project goals. Note, the term *stated project goals*. If goals are not articulated, how can a team be expected to achieve them? As stated, clearly defined project goals and values are a critical lifeline when the project experiences turbulence.

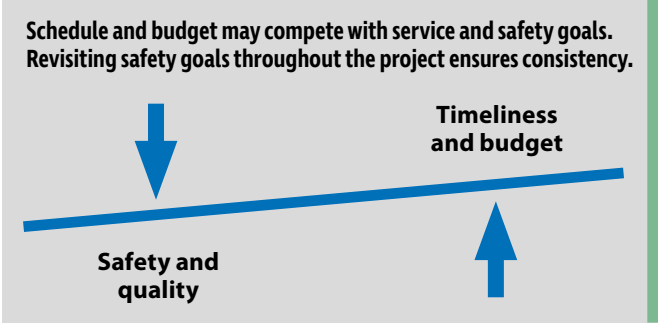
Example: Company A has been awarded a large contract. Within the proposal, the company describes its technical proficiency and safety protocols applicable to the service being supplied. Company A has a subcontract with Company B to provide quality assurance. Company A informs Company B of quality management criteria, including required personal safety measures, site safety considerations and criteria that describe "quality performance." The quality criteria are specific and measurable. Company B responds by implementing a quality management plan: comparing actual performance to the stated goals. Company B may provide this by monitoring the site, recording achievements and deficiencies in quality and safety, and providing guidance on how to keep performance on track.

Imagine this situation if the role of Company A is replaced by a project or program manager, and Company B is replaced by a team member in your organization. Could this scenario be implemented in real life? What obstacles would you face implementing a quality assurance program?

The quality assurance program provides for consistent communication between the project action and the project goals. Quality assurance gives feedback to the owner, indicating locations where processes should be improved, although not necessarily how. Separating quality assurance and quality control is fundamental, because if the same entity is set to the task of evaluating how work is going and whether work can be improved, there will likely be some bias to think that everything is fine. Instead, if a quality program is maintained with two distinct operations, there are dual perspectives maintaining the course for project success.

The ability of a quality assurance specialist to do his/her job is limited by the ability to understand 1) the owner's expectations;

FIGURE 1
SAFETY & QUALITY MANAGEMENT



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2) the specifications defined in the contract or service agreement; and 3) processes defined by quality control. If information is not shared across these three sectors, it would be understandable for conflicts in communication to occur on the jobsite.

As discussed, components of quality management include:

1) Quality assurance: Provides assurance that the quality metrics (previously referred to as values) will be met throughout the project.

2) Quality control: The process through which quality is controlled by observation and correction.

Safety may be increased via concerns of the project owner, the legal terms of the contract and as a good business practice for an effective jobsite. Conducting a project safely saves time and money. When developing a quality assurance plan, the risks inherent in the project, special considerations and critical design features should be identified (USACE, 2006). These aid in communicating risks that may not be obvious otherwise.

When implementing a quality management plan, an effective way to implement quality assurance is to supply the inspector with a complete checklist and standard operating procedures. The checklist is a tool to record whether the expectations are being met (Figure 2). When a new quality assurance inspector encounters a site, having a checklist ensures that oversight on all project items remains consistent. Acquiring quality assurance feedback can ensure that processes continue smoothly, especially for long-term or complex processes. Being aware that these items are being watched brings project goals to the forefront. Such cognizance is necessary for safety programs to be effective, as it translates to all parties acknowledging, repeating and enforcing that the criteria shall be met.

The Business Case for Integrated Construction Safety & Quality Management

Many costs are incurred when a company is found liable after an injury or fatality: work injury compensation, return-to-work job training, prorated insurance rates and survivor's benefits for dependents (Rechenthin, 2004). Conversely, maintaining workplace safety requires ongoing project costs to be effective: housekeeping, reducing clutter and maintaining tidiness, supplying PPE, and proper access and siting (e.g., scaffolding locations, reducing workplace strain from processes that require reaching or lifting). They affect worker health and thereby foster efficiency. These processes are less expensive than the costs associated with a workplace fatality or injury.

Both quality and safety management systems, require congruent organizational measures and philosophies (Karanikas, 2014). To be effective, both systems require a commitment by senior management and workers. Both also require training in place to communicate expectations and provide skill development. Documentation allows for consistent communication and review as the project progresses. After documentation, managerial review is necessary for incremental improvement, streamlining processes and reducing waste. By integrating safety and quality management goals, it is monitoring and the project itself will likely result in reduced duplications, higher efficiency and productivity improvements (Winder, 2000).

Example: Through Process C, a product is assembled in an assembly line. The process manager may observe the process to ensure that all steps in the assembly are performing effectively. During this time, if safety was included in the quality management goals, the process manager may also inspect the use of protective equipment: Are steel-toed boots intact and without excessive wear? Are workers following proper lockout/tagout protocol? If processes are being streamlined, are they still being conducted in a way that minimizes safety risks or injury to the employees? Also, if the company workforce as a whole values safety as well as quality, are workers empowered to manage safety among themselves, correcting unsafe procedures as they are observed? Despite analogous processes in safety management and quality management, conflicts will likely arise. This is due to perceived conflicts in values between productivity and safety.

Example: Company D practices a policy of stopping production when safety concerns arise, while also emphasizing high productivity goals. Shutting down a project for safety would directly affect the production rate. Unsafe construction practices greatly increase the cost of business over time. However, higher production rates directly translate into gains for the company, whereas safety defers costs, a concept that may seem more intangible to a naive employee (Forrest, MacFarlane & Ross, 1997).

Assigning safety officer responsibilities to a worker may be more problematic than assigning safety responsibilities to the same person who conducts quality assurance. Placing the burden of safety enforcement on the worker may reduce the safety oversight of a project, as the worker may experience conflicting objectives to both produce work and enforce safety concerns. As time is a limited resource, the worker would be put in a position of constantly weighing both of these values. This would be especially challenging in a workplace where safety culture is weak, because in addition to time constraints, there may be social pressures to neglect safe or proper procedures.

Managing for Quality in Construction Safety Programs

Designers and project owners set the tone for a project. If risks have been considered, plans have been made for potential safety issues and communication channels have been established from the beginning, the project team should have a good foundation to process critical issues as well as a means to implement standard policies for unforeseen obstacles. These policies may be implemented by training for reporting and identifying hazards and quality concerns, responding

FIGURE 2

EXAMPLE QUALITY ASSURANCE INSPECTOR'S CHECKLIST

Set up the worksheet to be simple and concise, require only the most important tracking information. The checklist should evolve over time and consider feedback from inspectors.

Quality Assurance Inspector's Checklist

Date/Time:

Activity:

Safety equipment on site:
(Check for every item, if maintenance schedule applies, confirm that maintenance is up to date.)

Production rate:
(for duration of observation, record production rate, and consistent measures of quality, such as "successful," "exceptional" or "needs work." Consistent wording aids in qualitative assessment of progress.)

Concerns:
(for any notes on safety or quality concerns)

to concerns, rewarding mitigation, and streamlining processes, thereby creating a positive feedback loop to constantly improve workplace processes. Managing for change becomes much more tangible during the construction phase. The most thoughtful plan for reporting and response are useless if not implemented. The success of a program is dependent on buy-in from the organization and its parts.

When managing for quality, discussing the quality of safety programs themselves may be one of the most sensitive topics in data collection. Workers who are asked to provide input on a safety program may respond dishonestly for various reasons, likely because they want to present themselves and their employer in the best light. Respondents may fear fallout from reporting honestly, be defensive, have their egos involved or respond to maintain their self-deception (McGeorge et al., 2013). McGeorge et al. present several strategies to reduce the resistance and to reassure respondents to gain useful data. For example, ask "when an incident does happen, what do you think would happen in your organization?" The response could be enlightening when answered honestly. Other questions may focus on whether organizational and reporting information has been disseminated well and can gauge whether employees are empowered to address construction safety issues: "Are you aware of the safety program in your organization?" or "Who is the quality manager and the safety officer of this project at this phase?"

More Examples of Quality Management

U.S. Army Corps of Engineers (USACE, 2006) indicates specifications for developing the project and conducting risk assessments and specifications for the quality management program. These specifications compose the plan and the quality control for the project. This means that while a project description is being developed, there is an analogous recording of safety concerns, mitigation methods, site risks and best practices. Once this project development is complete, if the primary agency is a government firm, the contract for construction may be drafted. A private firm may draft internal service agreements for the task. Public contractors may submit proposals that are evaluated for their technical effectiveness, their safety plan for the project and their past experience.

Whoever is performing the construction work should have a clear understanding of 1) the field conditions; 2) the critical safety concerns and how they are to be managed; 3) the resources available and the magnitude of the large, long-term project; 4) the offeror's specifications and expectations of quality. It may be helpful for the contractor to have access to the offeror's quality assurance plan and the quality control plan to understand the expectations for the project.

Having an outside entity manage the quality assurance responsibilities is a wise choice. With this method, the assigned quality assurance is nearly last in line to receive information and does not have internal bias from designing the contract specifications. The chain of command, methods of reporting and systems operations are clearly defined, vetted and communicated. Change is managed and, as new safety issues or site concerns are raised, procedures and policies are adapted to address them.

The following example shows how quality management can progress through a project:

•A systematic process brings normality to construction operations, even if each construction phase is different. If each phase has a safety toolbox session, a specific quality assurance task, a safety checklist and the same methods of reporting concerns, quality management remains consistent throughout the process.

•Quality control personnel generate inspection worksheets for quality assurance personnel. Quality assurance personnel are trained on filling out the worksheet at the jobsite to check construction activities and safety. The worksheets may be updated as processes change, metrics are better defined or safety issues arise.

•Project managers allow for change in work schedules to improve safety, such as reducing the hours worked per week, allowing ample breaks for worker, as reducing the hours worked per week makes workers better rested and less prone to mistakes.

•Team members should be empowered to identify and address near-misses during heavy equipment operation.

•Project managers should provide resources for internal checks, such as supervision at critical processes (e.g., materials removal, brake checks before operating in hilly areas, frequent site and support facilities inspections.

•To be effective, project managers should analyze the documentation received from jobsites.

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Conclusion

The process for developing a design and a quality management plan and implementing that plan has become increasingly important. Project management has begun to incorporate many interdisciplinary specialties. The resulting expansion of scope increases the likelihood of miscommunication and unmet expectations. Generating an atmosphere in which employees are empowered to participate in safety programs is challenging. The magnitude of the task is somewhat offset by the fact that it is an iterative process. Generally, if participants are perceptive and responsive, many incidents can be anticipated. Whether safety concerns are addressed requires the support of senior management. Considering that site conditions for construction are constantly in flux, the eruption of conflict or concerns will surely a continuing issue. What can be improved, however, is the process to resolve quality and safety issues. The nature of the task may explain why developing a value-oriented workforce has come to be a critical issue in recent years. Humans have demonstrated the capacity to construct fantastic feats, but successful project completion greatly depends on whether individuals have the will to achieve it. **PSJ**

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