Language of Design and Construction Quality

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Construction Quality Programs

A challenge with construction quality is that it has typically been mandated by owners through contracts, with a focus on finding problems that had already occurred – costing everyone a lot of time, effort and money to resolve. In addition there has been increased complexity and risk of systems being constructed, an on-going creation and transformation of quality programs in owner organizations, and additional translation of quality programs from manufacturing into construction.

The end result is that over the past fifteen years there has been a renewed emphasis – a renaissance – regarding quality programs amongst both designers and contractors throughout the United States. This renaissance has begun to clearly define Design/Construction-Centric Quality Programs that focus on the unique processes and projects relevant to the design-construct-operate challenges.

However, with the renaissance, has come a variety of approaches to quality within the built environment, as well as a significant amount of marketing. The intent of this *Language of Design and Construction Quality* publication is to provide an overview of the foundational elements of quality in design and construction and how a Design/Construction Centric Quality Program aligns and interacts with an Owner's, Designer's, Contractor's, Trade Partner's and Supplier's Quality Programs.

Quality Map

As Quality Programs in design and construction become more robust and refined, with the goal of becoming Integrated Quality (see *Integrated Quality Process* publication), they have become specialized with respect to the unique requirements of the individual company. A lesson learned through this refinement has been that it is important to understand the relationship of design and construction quality programs to that of others (owners, trade partners, suppliers, etc.). A concept to describe this and understand how to align quality programs is that of "Quality Maps".

A Quality Map graphically conveys several key concepts between the various team members' quality programs:

- Precedence – the order of the circles (top to bottom) demonstrate which program takes precedence over others. This is fairly intuitive, but is important to show. A simple example from manufacturing is that the manufacturer's quality program takes precedence over that of the suppliers. For design and construction, the same typically applies where the owner's quality program (requirements) takes precedence over the contractor's quality program, and so forth.
- Strength – the size of a circle shows the strength of a quality program compared to others – the larger the circle, the stronger the quality program. While often subjective, strength typically relates to definition, robustness and consistency of the quality program.
- Alignment – the overlap between circles demonstrates alignment between quality programs. When there is complete alignment (e.g., a Trade Partner adopts a Contractor's quality program), there is a circle completely within in the other circle. When there is no alignment between quality programs, there is no overlap (e.g., a manufacturer's quality program relative to the Contractor).

Figure 1 provides a couple examples of Quality Maps, with varying strength levels and alignment.
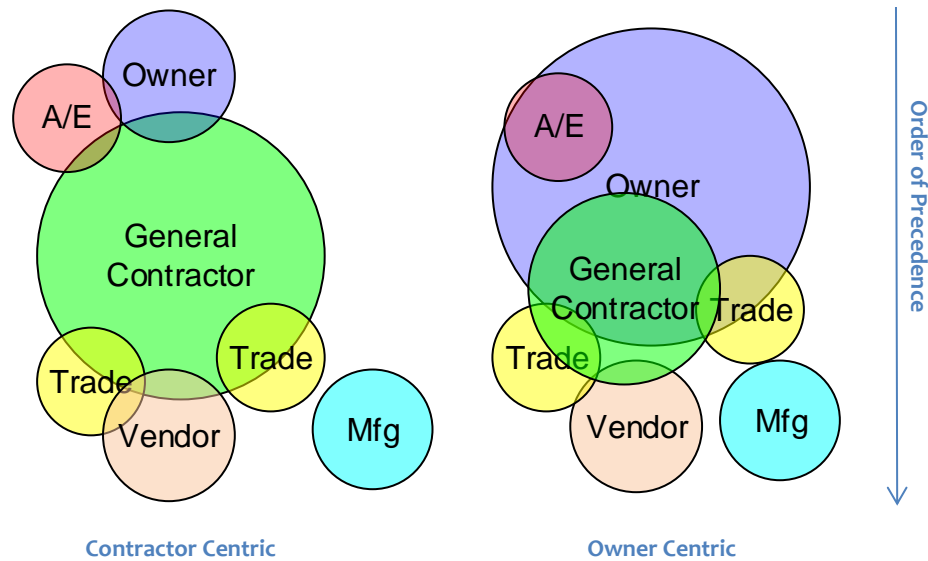

Figure 1: Construction Project Quality Maps

A key value of Quality Maps is that they allow for understanding and discussion of individual entity quality programs without issues of terminology of one program compared to another. For example, many owners have robust quality program requirements in their project specifications, which are created around an owner's needs and program elements. A Contractor's Quality Program typically covers these requirements, but extend to include other elements with regard to risk mitigation, historical trends and best practices.

Agreeing Upon "What is Quality"

One of the key elements of the Quality Map is that of alignment. Put another way, how well do the various programs and individuals (companies) agree upon *What is Quality*? Therefore, in creating a Quality Map for a specific project, the team can address alignment through several simple questions:
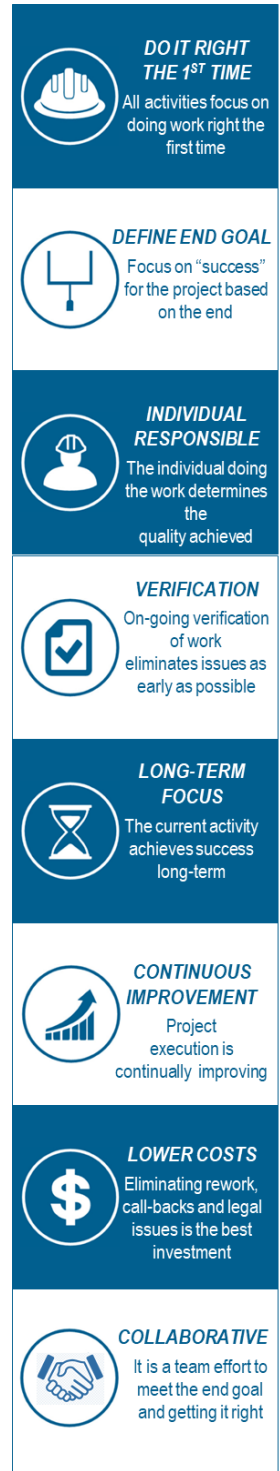
- How to Do Work Right the First Time
- Understanding of Expectations/Intentions
- The Use and Creation of Knowledge
- Setting of Performance Measurements
- Approach to Accountability

Each of these key questions can be answered by addressing the Quality Program Core Elements on the project.

Quality Program Foundational Elements

All quality programs have similar foundational elements, regardless of what name has been associated with it (e.g., quality control/quality assurance, lean, six sigma, total quality management, etc.). The DCX Quality Exchange's Quality Foundational Elements are:

- Do It Right the First Time – also known as preventative and planning focus items, this foundational element conveys the fact that a primary intent of all quality programs is to get ahead of and avoid quality issues. Ultimately, by doing work right the first time, we eliminate rework, avoid loss productivity of all having to resolve issues, work safer and avoid generation of waste.

- Define End Goal – just like a roadmap for a trip, it is important to understand what the end goal is for the project (all stakeholders) as well as generally how you will get there. Therefore, a foundational element of quality programs is helping team understand and manage expectations and the end goals of the project.

- Individual Responsible – for any quality program to be successful, it is critical that the entire quality program is focused on getting the right information/tools, to the right person, at the right time, so they can do their job right the first time. Bottom line is that the quality we get is determined by each individual on the project, not because of subsequent verifications that are done to find and resolve problems.

- Verification – a critical foundational element of any quality program is to have an on-going process of verification that is embedded into all aspects of activities. Verification relies upon knowing both what is the end goal, as well as what is right for the specific work activity. The goal of verification is that the individual doing the work verifies their work against agreed upon "right". This should eliminate the finding of issues by others – aka rework.

- Long-Term Focus – an important aspect of quality programs is that their focus is often much longer than that of simply the project. This is required to capture the longer-term lessons, issues and perceptions in order to understand disconnects from meeting the end goal as well as to continually improve the overall process. A critical aspect of long-term focus is the collection and use of predictive metrics – those systemic issues across project, time and companies that need to be addressed.

- Continuous Improvement – quality programs are not stagnant and must have a continuous improvement component that is measurable, typically at the individual, project and program levels. A key component of continuous improvement is the creation and use of knowledge to continually improve what and how things are done.

DO IT RIGHT THE 1ST TIME
All activities focus on doing work right the first time

DEFINE END GOAL
Focus on "success" for the project based on the end

INDIVIDUAL RESPONSIBLE
The individual doing the work determines the quality achieved

VERIFICATION
On-going verification of work eliminates issues as early as possible

LONG-TERM FOCUS
The current activity achieves success long-term

CONTINUOUS IMPROVEMENT
Project execution is continually improving

LOWER COSTS
Eliminating rework, call-backs and legal issues is the best investment

COLLABORATIVE
It is a team effort to meet the end goal and getting it right

- Lower Costs – there is both cost of quality and value of quality. The cost is composed of both the investment in people and activities to implement the quality program, as well as the cost due to failures in quality (i.e., rework). The value of quality is often harder to quantify, as when an issue is avoided due to the process, there was not a cost. However, it is critical to document the value, as the value of quality should always be orders of magnitude greater than the cost of quality in a robust quality program.

- Collaborative – to achieve quality requires close collaboration among all project participants to clearly define what quality is, prevent quality issues and hold each other accountable to continuously improve approaches and deliverables.

Contributing Factors to Quality

There are many factors that contribute to the quality that is achieved on a project and within an organization. These include:

- Planning – a quality process is all about planning the work and working the plan. The time and attention allocated to planning the work is therefore directly related to successful execution of the work.

- Skill – the skill level of the individual project team members, especially the craft workers, has a large impact in the quality received. Simply put, those with more experience often produce better work by knowing how to do their activities better.

- Schedule – the more compressed a schedule, the more pressure there is on quality and the potential for degradation. This is due to the fact that craft workers are typically given less time to do their activities, or that multiple trades are working in the same location at once, causing overlapping of activities, and adversely impacting planning and coordination of on-going activities and ability to address issues when they do arise.

- Resources – to maintain quality on a project, there needs to be a balance of resources with that of schedule and skill. The more compressed the schedules, the more concurrent the crews typically required to achieve milestones. The less skilled the craft workers, the more oversight typically needed.

- Alignment/Behavior – the more aligned the individuals are to the overall quality program, the better the resultant quality. This is due to individual buy-in and behavior to the quality program and the project expectations. Conversely, when there is not buy-in to the quality program, the behavior is to not do the activities and the amount of issues created and resultant rework increases significantly.

How to Use

To gain value out of a Project's Quality Map, it is important for the Owner, Designers, Contractor and Trade Partners meet to discuss and create the unique Quality Map for the project. A starting point prior to creation of the Quality Map would be for each participant to document the activities that align with each of the Quality Foundational Elements.

A great way to accomplish this is for each team member to add the activities they do associated with each Foundational Element on a whiteboard. Once every team member has added their items, there can be a discussion of how well items align or do not (remember, they do not have to align).

Once the items are discussed and understood, the next step is to have a discussion on both strength and precedence. An easy way to determine strength is to simply look at the number of overall items – the more quality-related items being accomplished by an entity, the stronger their program (typically). For precedence, this is often contractual in nature as the owner's requirements cascade to the designer and contractor, which then cascades to trade partners and then suppliers.