



NAC Executive Insights

Quality Transformation

Key Points

- Corporate culture that is quality driven is essential for longer term success.
- Culture change consists of three overlapping phases.
- A common belief system is essential to transform to a quality driven organization.
- Transformation to a quality driven organization requires us to modify, expand, and create new processes while simultaneously streamlining and simplifying existing work processes.
- A three-phase implementation plan is laid out to systemically unlock the current paradigm and execute as a quality driven organization.
- Key activities are identified to support cultural change in an engineering and construction organization, i.e. communication, engagement, and developing a learning organization.
- In order to successfully achieve the transformation desired, we must address both tactical and organizational change.
- Specific change dimensions to be addressed in the transformation plan are identified.
- Three sets of barriers typically encountered in such transformations are described.

Introduction

This Executive Insight examines the process and challenges of transforming an engineering and construction organization to a quality aware and focused one. It reflects a composite of the author's experiences. In this Executive Insight the following seven topics are discussed:

1. Culture change to become truly quality driven
2. Core and enabling processes required for successful transformation
3. An implementation plan to instill a quality driven culture
4. Key activities to support culture change
5. Requirements to achieve transformation
6. Change dimensions
7. Typical barriers encountered

1. Culture Change To Become Truly Quality Driven

Creation and reinforcement of a corporate culture that is quality driven is essential for achievement of strategic objectives and longer term success. It is important this quality culture be consistently applied, independent of the delivery model selected by clients or the execution role being provided. Simply put, a quality culture must be an essential part of the corporate DNA.

The culture change required to become truly quality driven consists of three overlapping phases:

- **Phase 1** – Communicate the desired end state: a quality driven organization.
- **Phase 2** – Systemically unlock the current paradigm, which is at best characterized as delivering engineering and/or construction excellence.
- **Phase 3** – Execute holistically as a quality driven organization.

Each of these phases is discussed in more detail later and each will require addressing three significant aspects of transforming in parallel. These aspects include:

- **Common belief system** – it is essential that the transformation to a quality driven organization:
 - Be viewed as consistent with the organizational values of leadership, communication, culture, and empowerment.
 - Better support a client’s primary areas of concern as they relate to capital efficiency, capital certainty, and time to market.
 - Not confuse “quality driven” with quality assurance, quality control, or any singular quality management system such as ISO 9000, EFQM, or Six Sigma.

Table 1 shows the various elements of a typical common belief system that can lead to a culture change. This is discussed in a subsequent section.

Table 1 Common Belief System	
Values	Leadership
	Communication
	Culture
	Empowerment
Vision	Capital efficiency
	Capital certainty
	Schedule certainty (time to market driven)
Mission	Profitable growth
	Excellence in execution
Doctrine	Accountability
Policy	One Company

2A. Core Processes

Transformation to a quality driven organization requires us to modify, expand, and create new processes that address the strategic, operational, and tactical aspects of a quality driven organization while simultaneously streamlining and simplifying existing work processes to achieve our vision and mission. Table 2 highlights some of these processes and the timing, extent, implementation, and roll out

strategies are key elements to transformation of the firm’s culture to a quality driven culture and are discussed in a subsequent section.

Table 2 Core Processes		
Strategic	Culture change to become quality driven	Integrated with required culture change to become construction driven
		Integrated with increased focus on innovation
	Planning	Client needs driven
	Operating	Metrics linked to strategic objectives (mission)
		Quality driven engineering and other work processes
	Supporting	Continuous improvement
Operational	Planning	Flexibility and adaptability
	Operating	Business level metrics
		Data centric execution
		Financial reporting and accountability
		Efficiency/improvement identification and capture for competitive advantage (a better/different mousetrap)
	Supporting	Interface management
		Engineering quality system focused on capital efficiency
		Construction quality system – lean construction
		PSR/CSR – Project/Construction Status Report
Tactical	Planning	Flexibility and adaptability
	Operating	Activity level metrics
		Data centric execution
		Predictive analytics (AI enabled)
	Supporting	Quality assurance and management processes
		Quality control tools

2B. Enabling Processes

In many ways the core processes previously described represent the principle activities that are visible to the organization. The ultimate success of these core processes hinges on the necessary enabling processes, tools, resources, and structures being in place in the required timeframes. These enabling processes are described in Table 3. The role each plays in accomplishing transformation to a quality driven organization is described in a subsequent section.

Table 3 Enabling Processes	
Assessing	Past, present, future
Measuring	Performance, compliance, efficiency
Integrating	Expertise, data, feedback
Learning	Improving, innovating, surviving, growing
Communicating	Intent, awareness
Training	Staff, leaders

3. Implementation Plan to Instill a Quality Driven Culture

In order to create and embed this culture into an organization, the series of actions outlined below provide a longer term roadmap with key short- and long-term milestones to measure progress and drive transformation. These steps are designed to affect the transformation we desire without degrading an existing culture of engineering/construction excellence. The key activities in this transformation process include:

Phase 1 – Communicate and commit to being a quality driven organization.

- Upfront communication of initial roadmap

Phase 2 – Systemically unlock the current paradigm (illustrative elements follow).

- Develop of an expanded basis of design - BOD^x ¹.
- Integrate an innovation culture and associated work processes and practices into our core and enabling processes. This includes ensuring that work processes:
 - Empower people to innovate.
 - Provide a sound framework that is conducive to innovation.
 - Utilize a knowledge infrastructure that supports innovation.
 - Facilitate efficient knowledge flows and foster the development of networks that enable creation, circulation, and diffusion of knowledge.
 - Apply innovation to address client, project, and community challenges while improving our efficiency and effectiveness.
 - Treat innovation as a central component of policies, processes, and practices.
- Define, communicate, and train staff on the key attributes of a *differentiated* Quality Management System.

¹ NAC Executive Insight, “Business Basis of Design”

- Identify and modify existing work processes.
 - Confirm process ownership and identify current steps in process.
 - Eliminate 30 percent of steps collectively in current work processes within two years in conjunction with modifying them to address an expanded basis of design and innovation emphasis.

Phase 3 – Execute as a quality driven organization.

- Identify data required for management decision making to assure quality
- Develop and deploy a series of quality driven execution training programs that build on the initial (Phase 2) training on a *differentiated* Quality Management System.
- Initiate a continuous improvement process that systematically reviews the efficiency and effectiveness of work processes.
 - Efficiency – time and effort to complete a process
 - Level of rework (including field rework)
 - Capital efficiency²
 - Effectiveness
 - Achievement of desired outcomes
 - Repeatability (certainty) of outcomes

Each of these activities is described below.

4. Key Activities to Support Culture Change

4.1. Upfront communication of initial roadmap together with the imperatives that necessitate this reinforcement/expansion of your culture and how all employees will be engaged. We view total engagement of the enterprise as essential to cultural and organizational transformation. In the simplest terms we see this transformation process as involving three steps:

A. Defining and dimensioning the imperative. We see this imperative as being client driven and as such, it provides a basis for engaging clients in a proactive, value-adding manner from the outset of the transformation process. Specific client drivers that serve as the quality imperatives for transformation include:

i. Capital efficiency - Simply put, clients want more bang for less bucks. Increasingly clients have expressed concerns about "gold plated" designs (more than fit for purpose) and even more salient engineered designs that do not enable efficient and effective construction. Currently, constructability reviews confirm that a design can be built and, within a narrow range, offer suggestions to improve buildability. The organization you are seeking to transform to must be capable of much more. Quality must ensure that work processes meet (not exceed) the owner's project requirements and support BOD^x.

² NAC Executive Insight, "Capital Efficiency – Pull all the Levers"

ii. Capital certainty - The challenges clients face in financing large scale projects grow each day. Marginal capital efficiency is compounded by high degrees of capital uncertainty. Increasingly clients are interested in contract forms which shift risk-reward points to enhance capital certainty. To support both clients as well as the ability to transition to alternate contracting models requires high confidence in the outcomes of work processes related to total installed cost (TIC) as well as your own costs.

iii. Schedule certainty (time to market) - Fabrication and parallel design and construction offer opportunities to significantly shorten construction schedules, which creates multiple levels of value for your clients. Work processes must support not only distributed execution but also just-in-time design for accelerated construction and fabrication activities. You and your clients must have high confidence supported by high repeatability of outcomes.

B. Unlocking the current paradigm - We are creatures of habit, process, and procedure. This second step must include a mix of activities that brings focus on the process and procedure elements that must be transformed. It also must provide the new stories and narratives that engage the entire organization can feel is possible. This will create new opportunities for staff as well. Specific activities are described in subsequent steps.

C. Deploying and continuously improving the desired new paradigm - We become a **learning organization** that is focused on growing the organization through differentiated execution and offerings and providing first quartile returns through execution certainty supported by high quality, streamlined work processes. A series of short-, medium-, and long-term activities to ensure the required, sustaining, and enhancing frameworks are defined in the subsequent activities below.

4.2. Development of an expanded basis of design - Today we prepare a basis of design (BOD) to respond to the owner's project requirements (OPRs). Throughout the project this BOD is detailed and expanded upon. At later stages, the BOD begins to reflect constructability features and challenges. In current best-case scenarios, we also reflect operations and maintenance (O&M) considerations at more than a cursory level. The BOD in essence is reflected in our baseline-centric documents. These documents are inadequate, however, to sufficiently address the three client drivers of:

- Capital efficiency
- Capital certainty
- Schedule certainty (time to market driven)

Ensure that capital efficiency is embedded in all of the designs developed through two key activities. First, include an opportunity analysis in the bid stage work process that supports BOD^X. The opportunity analysis is seen as a parallel effort to any current risk process. This analysis must highlight key construction opportunities to be considered as well as the means and methods type questions that should be asked to ensure opportunities are being thought about at this stage in a sufficiently broad context. Key O&M opportunities and questions to ensure opportunities are being thought about at this stage in a sufficiently broad context.

Second, incorporate an expanded basis of design template in conjunction with OPR. This will result in an expanded basis of design that reflects an execution approach focused on capital certainty. As the BOD^x is used on prospects and projects, candidate solutions must populate a case history or innovations database that would further support the opportunity analysis while providing input to the various continuous improvement work streams. Importantly, BOD^x is critical to unlocking current reimbursable engineering mindsets so that we may reform and streamline work processes to support improved execution.

4.3. Identify and modify existing work processes to support improved execution and capital efficiency. We need to build on the BOD^x by first identifying those work processes that must change to implement the BOD^x in the engineering process. Second, identify those work processes that must be brought forward in time to support construction driven execution.

We do not believe that generally new, freestanding processes should be added as this will not support the culture change we are seeking. Importantly, construction thinking will define the level of design required for issuance for construction as well as how to change the sequence and timing of design to support construction. Similarly, widespread use of fabrication will fundamentally shift layouts and require certain engineering activities that might have occurred later to be brought forward to support parallel construction and fabrication activities.

Finally, the strengthened focus on innovation requires work process modification to capture the benefits of innovation throughout the project life cycle. All of these changes will necessitate a revamping and streamlining of work processes.

A target of a 30 percent reduction within two years in the number of work process steps we undertake is not unreasonable. We envision that increased use of task-oriented knowledge assemblies (knowledge objects, tools, training, procedures) linked to these revamped work processes will support this streamlining. This work process modification will happen in conjunction with a broader work process simplification.

In addition to the focus on engineering work processes, there must be a focus on putting in place the next generation of project and program management work processes (Figure 1). This will leverage advanced analytics as part of enhanced data-centric project management.

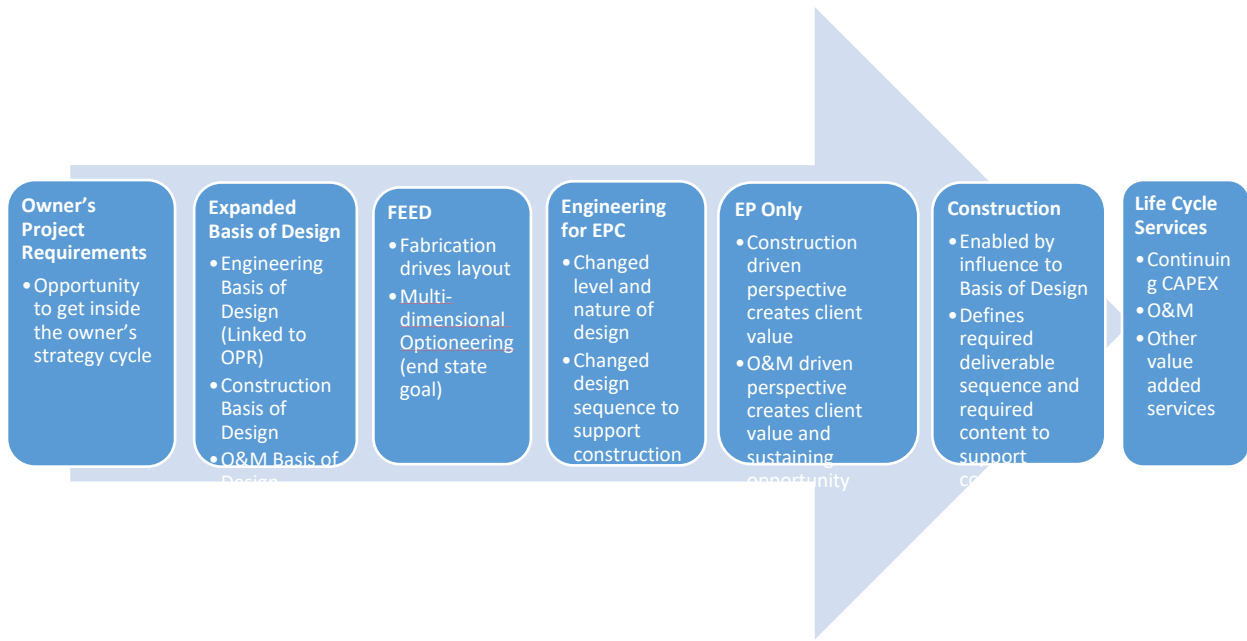


Figure 1. Next generation of project and program management work processes

4.4. Identify data required for management decision making - The data required for data-centric decision making is likely neither complete nor robust today. Focus efforts on two short-term aspects. First, short-term efforts must identify the management level information that should be collected from projects in order to support quality driven execution, including assessment of repeatability of outcomes and continuous improvements in execution. Pay particular attention to plan and estimate data as well as process activity level requirements and durations. This data must reflect for your own efforts and that of subcontractors in order to develop best of class work processes and practices.

Second, short-term efforts must be informed by emerging artificial intelligence (AI) analytics and should result in a narrowing of required, actionable data to be collected. The PSR must contain an integrated, single, outcomes focused project view.

4.5. Develop and deploy a series of quality execution training programs - Focus on various organization elements that at different phases of the project can enhance the capital efficiency of our projects through innovation and BOD^x execution principles and practices. At the earliest stages these programs serve many purposes, but key is to further communicate the imperatives laid out in action 4.1 above. Broadly engage the staff; capture and encourage innovating ideas from the staff; and continue to build supporting policies, processes, and tools for both the opportunity analysis and the BOD^x.

4.6. Initiate a continuous improvement process - Systematically review the efficiency and effectiveness of work processes.

Efficiency is defined as the time and effort to complete a process. Efficiency will consider improving the level of rework (including field rework) required. Currently many are unable to make that assessment and consequentially improve performance. Efficiency, importantly, is also defined in terms of capital efficiency. While ultimately this will require a comprehensive life cycle look as embedded in the BODX concept, initial emphasis should be on support of construction driven execution.

Effectiveness is defined two ways. First is achievement of desired outcomes. These will include OPR, but also the components of BODX that must drive improved capital efficiency. Second is repeatability (certainty) of outcomes. In this last regard, it will go directly to the client's desires for improved capital and schedule certainty.

5. Requirements to Achieve Transformation

In order to successfully achieve the transformation desired, the following must be addressed:

- Tactical change
- Organizational change - More than just change - *transformation*

This transformation process is firm-wide and as such must be broadly coordinated.

Some of the tactical changes that must be addressed include:

- The ways projects are organized and executed to support construction driven execution.
- Expanded basis of design – construction and O&M as shapers of design, not review items.
 - Changes sequence and level of design
 - Design supports construction/fabrication
 - Dispersed/*shared* execution
- Construction/fabrication as core offering (base or value alternative) (as appropriate).
- A competitively innovative, not just better, “mousetrap” throughout the entire project life cycle.
- Expanded basis of design that drives streamlining of all processes.
 - Radical schedule/effort reduction target for all processes – 30% within 2 years.
- Task oriented knowledge assemblies linked to revamped work processes (knowledge objects, tools, training, procedures)

Organizational change must address:

- Re-orientation of people to emphasize construction/fabrication focus.
 - BOD^x is an enabler.
- Re-orientation to a *shared* execution environment.
- Address all *change dimensions*.
- Increased cross-cultural and importantly cross-generational engagement.
 - Accelerate capabilities of younger generations.

6. Change Dimensions

Specific change dimensions to be addressed in the transformation plan include:

- Management roles

- Commercial patterns
- Design process
- Span of control
- Increased importance of cross-cultural/ cross-generational differences.

7. Typical Barriers Encountered

Three sets of barriers are typically encountered in such transformations. They include:

- **People**
 - Those who are threatened by any success of a new way of operating and how that success will affect their ability to return to doing things the old way after the program is done.
 - Those who tend to stay connected to their former chain of command and although they are in a new position, try to keep the old hierarchy in control.
 - Those who view what is happening in their cultural (country or business) frame of reference or paradigm and react accordingly.
- **Process**
 - Those who are wedded to the processes they have created or have been using forever.
 - Also in the process area are the walls that are created by business processes. These processes have been honed over the years. Collaborating when one party holds all the risk is problematical at best.
- **Technology**
 - Everyone has his or her favorite “mousetrap” they will champion as the best management technology to support the efforts.
 - There are always legacy systems which must be accommodated. Much energy is expended in picking the right system and then getting everyone to use it. This must be an upfront decision since the implementation process is often extended.

Quality has a key role to play in overcoming these traditional barriers to transformation, not only on an initial basis, but importantly as part of its continuous improvement role.

Summary

This Executive Insight looks at quality transformation in an engineering and construction organization. The intention is to give readers a starting point for quality transformation in their own organizations. Corporate culture that is quality driven is essential for longer term success. A common belief system is also essential in transformation to a quality driven organization. One common belief system is suggested, but that of any organization must be recognized and articulated. Transformation to a quality driven organization requires us to modify, expand, and create new processes while simultaneously streamlining and simplifying existing work processes.

About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries.

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