

Advances in Project Management Series¹

Lean Quality in Construction Project Delivery – a new model and principles²

By John Oakland and Marton Marosszeky

Construction Industry Challenges and Solutions

All industries are undergoing rapid change under the pressure of technological innovation and changing client needs. The construction sector is no exception, the past 10 years has seen accelerating globalisation, a demand for larger and more complex projects, and a requirement for them to be delivered in ever shorter timeframes. Meanwhile clients of the industry are increasingly concerned that this sector is not keeping pace with the rates of improvement seen in other sections of the economy. In addition, in this sector, the rate and cost of errors in quality and safety have been too slow to improve.

In today's construction industry, many among clients, designers and contractors are seeing BIM (Building Information Modelling) as the silver bullet that will transform the industry. We are convinced that this position is misguided. BIM provides the basis for improved communications within the design team and with external stakeholders, and it provides support for solution optimisation in both the design and construction stages of projects. However, it is no more than a very powerful enabling technology. The authors contend that it is the philosophical foundations of lean quality that will underpin the coming transformation of this sector globally, significantly improving productivity and increasing the industry's potential for value creation for its customers. This viewpoint provides a foundation for organisational excellence across entire supply chains, it offers a powerful new perspective for policy makers, and helps to create the organisational prerequisites necessary for the effective deployment of technologies such as BIM.

Lean quality a new model for improved outcomes in the construction sector

Pressure from clients and governments as well as commercial competitive pressures have continued to force leading organisations in the construction sector to differentiate themselves on

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the basis of customer focus, overall product & process quality, cost of products and services and value creation for clients.

In response to these pressures, senior management in leading design and construction organisations worldwide are embracing the philosophy and principles of what we have now called *Lean Quality*. Often approaching the overall task from different perspectives, some adopt frameworks of performance measurement and benchmarking, others use the goal of continuous improvement while others choose to follow the values and concepts of lean construction. We see these as different perspectives through different lenses of the same broad objective, improving performance in all the activities of a business.

Traditionally, in conversations about quality, the building and construction sector has had a natural orientation towards product quality. Given the complexity of its organisational relationships and traditional craft-based processes, most of the construction quality literature reflects this product focus; providing either a guide to compliance with the ISO9001 quality system standards or pragmatic advice on tools for the control of quality. However, lead organisations in every area of the building and construction industry have recognised that the broad focus that *Lean Quality* brings to all aspects of organising and managing is as relevant to building and construction as it is to the manufacturing and service sectors. Furthermore, teachers and researchers in building and construction have recognised that a traditional product centred paradigm does not provide a sufficiently broad and robust basis for performance improvement within the sector.

Many books on the application of lean thinking are based on the tools of lean. Our book *Total Construction Management – Lean Quality in Construction Project Delivery* (Oakland & Marosszeky, 2017) is designed to provide organisations within the sector a broad and robust conceptual platform on which to build their overall process improvement endeavours, the book integrates and places into a unified perspective the many seemingly disparate management innovations of the past twenty years – into *Lean Quality*.

Increasing the satisfaction of customers and stakeholders through effective goal deployment, cost reduction, productivity and process improvement through lean systems has proved to be essential for organisations to stay in operation and to remain or become competitive. Lean quality is far wider in its application than assuring product or service quality – it is a way of managing organisations and their supply chains so that every aspect of performance, both internally and externally is improved.

The book is based on a further development of John Oakland’s well known TQM model (2014) as shown in figure 1– improving *Performance* through better *Planning* and management of *People* and the *Processes* in which they work. The core of the model will always be performance in the eyes of the customer, but this has been extended to include performance measures for all the stakeholders. This new core still needs to be surrounded by *commitment* to quality and meeting customer requirements, *communication* of the quality message, and recognition of the need to change the *culture* of most organisations to create lean quality. These are the *soft* foundations which must encase the hard management necessities of planning, people and processes.

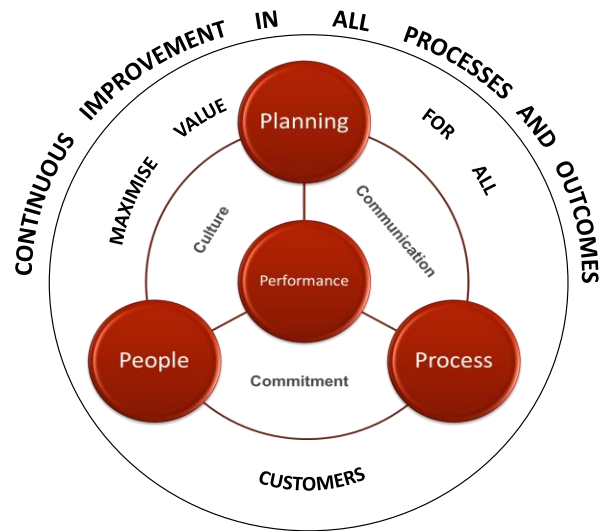


Figure 1: The new model for lean quality management

To this we have added *continuous improvement in all processes and outcomes* as this is now such a key aspect of every successful organisation's operations and a focus on *maximising value for all customers*.

This new lean quality model, based on all the excellent work done during the last century, provides a simple framework for excellent performance, covering all angles and aspects of an organization and its operation. Performance is achieved using a ‘business excellence’ approach (see BQF 2000 & 2002; EFQM 2018 and NIST 2018) and by planning the involvement of people in the improvement of processes, by focusing on value creation for customers and by driving continuous improvement in all processes and outcomes:

Planning – the development and deployment of policies and strategies; setting up appropriate partnerships and resources; and designing in quality;

Performance – establishing a performance measurement framework – a ‘balanced scorecard’ for the organization; carrying out self-assessment, audits, reviews and benchmarking.

Processes – understanding, management, design and re-design; quality management systems; continuous improvement;

People – managing the human resources; culture change; teamwork; communications; innovation and learning.

Driving all of this to ensure successful implementation is, of course, effective leadership and commitment. This framework can be used then to set out the essential steps for the successful implementation of *Lean Quality* and its management.

The principles of lean quality in construction

Lean can be characterized in terms of the lean ideal, principles, and methods or tools. The lean ideal is to provide a custom product or service, exactly fit for purpose delivered as required with no waste. It describes the ideal outcome from a service or product.

Lean principles on the other hand are the beliefs or rules that guide the actions that support the achievement of the ideal. These are not a prescriptive set of rules, rather they are guidelines to inform thinking about the way forward, either at the individual or organisational level.

The methods and tools of lean are the how, these are practices that have been proven to be productive in moving towards the lean ideal. However, it is important to understand that a fundamental tenet of lean thinking is that this is not a rule bound approach. Every organisation and every situation has its unique characteristics, the lean approach is to use the lean principles and practices (tools or methods) to guide action, lean is a path and the milestones are progress towards the achievement of the ideal.

In this section we propose a set of principles specifically designed to guide enterprises in the construction sector towards the implementation of a lean business framework. The importance of adopting a clear set of principles should not be underestimated, this defines the values which will guide an organisation in its development. These principles are in large part very similar to the lean frameworks that have been successfully adopted in manufacturing and service industries. However, there are some principles that are particularly relevant to organisations in the construction sector.

Because much of the construction sector is faced with the challenge of designing, fabricating and erecting unique facilities, every project offers the prospect for design and construction optimization. The lean quality approach builds on the process approach and brings into focus the continuous search for opportunities for improvements in customer service; efficiency; and the elimination of waste. This is as applicable to design processes as it is to fabrication and construction.

Jeffrey Liker, a leading researcher and teacher within the lean movement, in his ground-breaking book, *The Toyota Way* (2004) structured his approach around the 14 principles of the Toyota Way arranged in 4 groupings:

1. Long term philosophy.
2. The right process will produce the right results.
3. Add value to the organisation by developing your people and partners.
4. Continuously solving root problems drives organisational learning.

Liker's principles address the broad organizational issues as well as the detailed processes of production in more detail:

1. Adopt a long-term philosophy
2. Strive for continuous flow
3. Use pull systems
4. Level out workload
5. Stop to fix problems
6. Standardize tasks
7. Use visual control
8. Only use reliable technology
9. Grow leaders who understand work
10. Develop exceptional teams and people
11. Respect external partners
12. Go see for yourself
13. Slow decisions by consensus, implement rapidly
14. Become a learning organisation

We have built on Liker's approach and expanded it, referring to the contributions of other leading thinkers in the lean construction community of researchers and practitioners.

In contrast to Liker, Lauri Koskela (1992, 2000) focused his attention on the principles of production systems. Early on Koskela (1992) proposed the following principles for the improvement of production processes:

1. Systematically focus on customer value
2. Focus control on the whole process
3. Balance improvement in flow and conversion
4. Simplify processes
5. Reduce the share of non-value adding work
6. Reduce variability
7. Increase output flexibility
8. Reduce cycle time
9. Benchmark

Later Koskela (2000) analysed in detail the wide-ranging principles that underpin theories of production and he developed an integrated Transformation-Value-Flow (TVF) view of production which is underpinned by the following three high level principles:

1. Transformation—getting production realised efficiently
2. Flow—elimination of waste (non-value adding activities)

3. Value—elimination of value loss (achieved value relative to best possible value)

While this broad set of principles was based on the manufacturing literature, and demonstrated that the principles of lean in manufacturing are applicable in the construction environment, it did not reflect much of the construction specific thinking developed by the community of researchers and practitioners in the lean construction movement.

Ballard (2016) in a chapter on Lean Construction turned his attention to the unique characteristics of construction, and he introduced 4 new principles which reflect the particular characteristics of the modern construction process:

1. allow money and resources to move across contractual and organisational boundaries in search of the best project level investment;
2. improve the predictability of near term work load to drive efficiency and reliability of operations;
3. drive the design to realize an optimum, fit for purpose, product design within the cost constraints of the customer; and
4. involve upstream players in downstream processes to realize innovative and efficient design and construction solutions.

We present a synthesis of these ideas in the context of their application to lean quality in the delivery of capital projects. Our framework is set out in the mind map of Figure 2, which is consistent with the model which we proposed in Figure 1.

In this framework, the three Ps (*Planning, People and Processes*) are clearly articulated, while *Performance* and the three Cs of *Communication, Culture and Commitment* are all included in the foundation category of Values and Long-Term Philosophy. For the purposes of this article, we will expand only on Principle 1, the foundations concerned with the underpinning values and long-term philosophy.

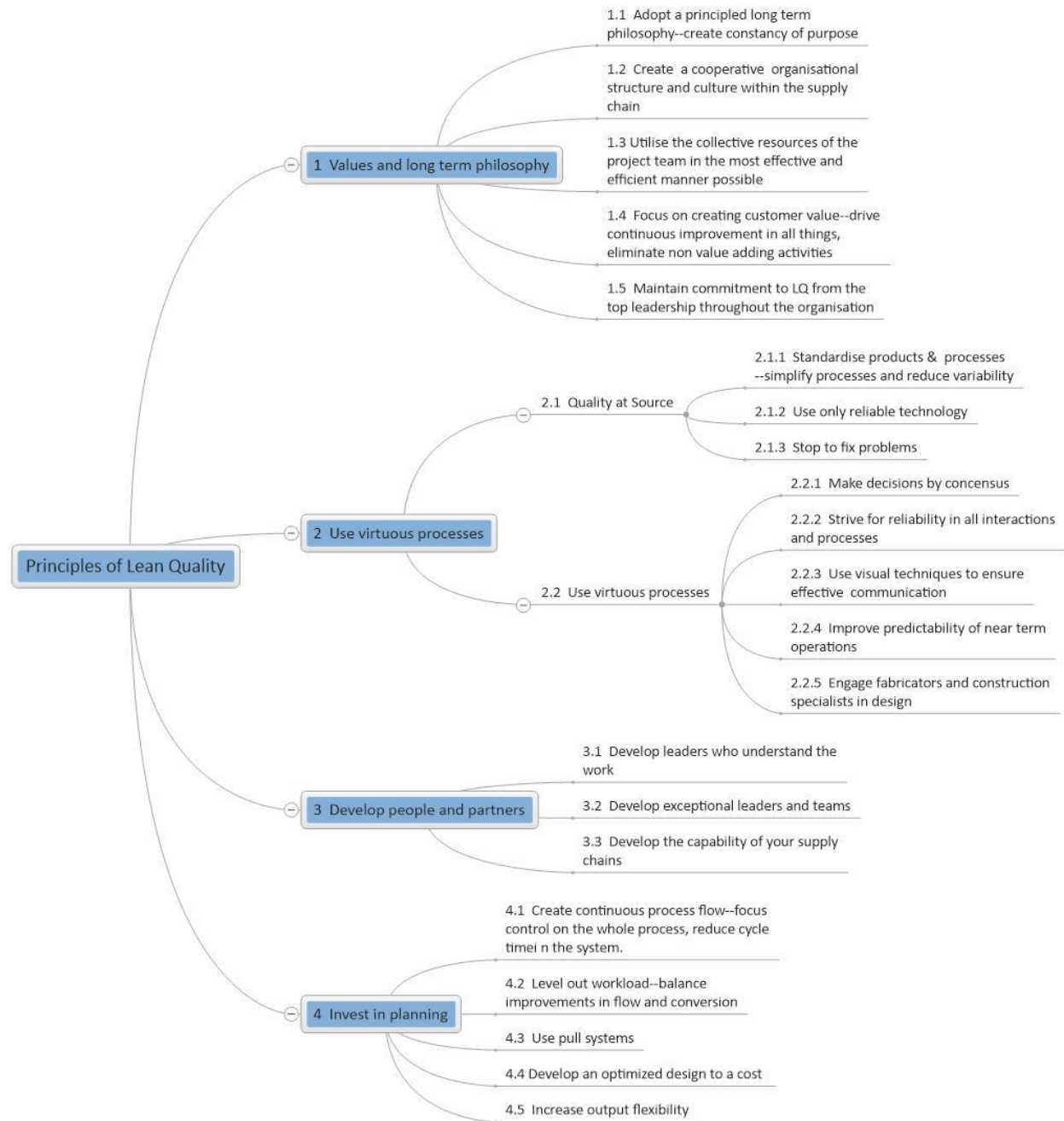


Figure 2: A new framework for the principles of lean quality in construction

Values and long-term philosophy

Basing management decisions on a long-term philosophy will ensure stability and sustainability. It is essential to create a cooperative culture with long-term supply chain relationships and to structure agreements to allow for flexibility in response to changes that may occur during project delivery. Visible leadership commitment to lean quality values and processes will ensure compliance by the rest of the workforce, including the supply chain, and lead to the development of a skilled and well-trained workforce that seeks continuous improvement based on learning and reflection. Essential to continuous improvement is stability in corporate values and leadership. Principle 1 is broken down into five sub-principles which are expanded and described below:

Principle 1.1 Adopt a principled long term philosophy—create constancy of purpose.

To ensure stability and sustainability, determine a long-term vision and mission based on your values and aspirations. Companies that practice lean quality are values based and ethically driven enterprises, which seek to maximize their contribution to their customers, to their employees, supply chain partners, and to the communities in which they operate.

Principle 1.2 Create a cooperative organizational culture and structure within the supply chain

Large, complex construction projects require close collaboration across all disciplines and companies in the supply chain to achieve optimum outcomes. The lead companies, designers, contractors and clients must build a culture of open communication and collaboration to ensure that downstream fabricators and constructors are involved in the design development and optimization process. Innovation across disciplinary boundaries requires an open collaborative culture. Commercial frameworks should be designed to encourage such collaboration to occur.

Principle 1.3 Utilize the collective resources of the project team in the most effective and efficient manner possible

Organizational and commercial structures should be designed to permit the most effective and efficient use of collective resources on a project. This should enable resources to be shared across contractual and organizational boundaries to achieve the most efficient deployment of collective resources. As projects increase in complexity and uncertainty, the up-front relationship between work scope and compensation becomes more tenuous. Changes in scope during the project become more likely and with them the need to renegotiate work scope and cost. This principle addresses the need for flexibility in the use of all resources, ensuring that they are used in the most efficient manner possible.

Principle 1.4 Focus on creating customer value—Drive continuous improvement in all things and eliminate non-value adding activities

A key aspect of lean quality is that targets are set for key inputs and outcomes, and performance is measured as a means of driving continuous improvement. Furthermore, everyone in the organisation is tasked with looking for waste, non-value adding activities that can be modified or eliminated as they do not add value to the end customer.

Principle 1.5 Maintain commitment to lean quality from the top leadership throughout the organisation

Lean quality is a committed, long-term approach to doing business. It is not a short-term fix. Lean quality drives incremental improvement in all the key aspects of a business and focusses the organization on continuously improving customer value. It is essential that leadership at all levels in an organization is visibly committed to the long-term values and processes of lean quality.

Conclusions and future articles

The long term perspective embedded through the different principles encourages responsible consideration of resources and people offering value to the organisation. We see *Lean Quality* as providing the fundamental building blocks for the management of any organisation, and, hence, people working in every part of each organisation need to understand this broad perspective. This article outlines a comprehensive approach to the management of any business enterprise – one that has been used successfully by many design and construction based organisations throughout the world.

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He is author of several books, including the best selling: *Total Quality Management; TQM & Operational Excellence; Total Organisational Excellence, Oakland on Quality Management, Total Construction Management – lean quality in construction project delivery; Statistical Process Control and Production and Operations Management*. He has written literally hundreds of papers, articles and reports on various topics in these fields.

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*Professors Oakland and Marosszky are the authors of **Total Construction Management: Lean Quality in Construction Project Delivery**, published in 2017 by Routledge. For information about the book, [click here](#).*