

Implementing Lean in construction

Lean benefits realisation management

Stuart Smith, Bourton Group Ltd

Feedback

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However, before reading this guide, and without reference to the contents list, please write down five areas or specific questions that you are hoping the guide will help you with.

We invite you to list these points, and the extent to which they have been covered, in the Lean questionnaire, which can be found at: www.ciria.org/service/lean



Implementing Lean in construction: Lean benefits realisation management

Smith, S

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Why read this guide?

Currently, there is no universally accepted way of describing and classifying benefits from Lean within the construction sector. The measurement, reporting and communication of benefits is a key factor in the success of Lean. It follows that we need to have a clear way of describing benefits to stakeholders within an organisation and ideally within the industry to help us:

- ▶ communicate and manage stakeholder expectations
- ▶ analyse outcomes across projects, schemes and organisations
- ▶ avoid double counting
- ▶ monitor longer term transformation progress.

This guide draws on many sources as the subject matter has been addressed by academics, authors, practitioners and consultancies over the past 30 years. There has been a convergence of themes into what can now be considered ‘best practice’ for a ‘standard’ benefit realisation management approach but there is very little written about Lean benefits realisation management. This guide draws from existing thinking and, together with experience of delivering Lean benefits in the industry, attempts to build a clear and concise approach that is appropriate for Lean in a construction context.

Background to topic

Following the publication of C696 *Build Lean* (Terry and Smith, 2011) CIRIA has determined to create a set of detailed guides that focus on some of the main topic areas of interest to the construction industry and those responsible for the implementation of Lean. Benefits realisation has emerged as an important area requiring attention within the industry. This guide aims to clarify the subject, explore the issues of traditional wisdom as applied to Lean, while at the same time providing a useful ‘go to’ handbook that will assist with the planning, delivery and communication of Lean benefits.

CIRIA Lean guides

This guide is one of a series of publications and, together with an overview document, can be found at: www.ciria.org/service/lean

C725 Lean and BIM (Dave, B, Koskela, L, Kiviniemi, A, Owen, R, Tzortzopoulos, P)

C726 Lean and sustainability (Corfe, C)

C727 Lean benefits realisation management (Smith, S)

C728 Lean client’s guide (Chick, G)

C729 Selecting a Lean consultant (Fraser, N)

C730 Lean tools – an introduction (O’Connor, R and Swain, B)

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Project steering group

Terry Stocks (chairman)	Ministry of Justice
David Adamson	Sellafield Ltd
Chloe Chen	Highways Agency
Jai Dalal	Morgan Sindall
Colin Evison	BAM Nuttall
Lynne Hamilton	Anglian Water
Bill Heyes	Kier
Alan Hodges	BAM Nuttall/Construction Skills
Owen Jenkins	CIRIA
Jonathan Morris	Skanska
Ian Rehnard	Interserve

Author team

Gerry Chick	BRE/Collaborative improvement
Claire Corfe	BRE CLIP
Bhargav Dave	University of Salford
Nigel Fraser	West One Management Consulting
Arto Kiviniemi	University of Salford
Lauri Koskela	University of Salford
Richard O'Connor	Transform Business Ltd
Robert Owen	Institute for Future Environment
Stuart Smith	Bourton Group
Brian Swain	Brian Swain Ltd
Patricia Tzortzopoulos	University of Salford

Lead author

Stuart Smith

Stuart has been working in the field of business improvement for over 25 years and in the construction and infrastructure sector for over 12 years, applying Lean and Six Sigma approaches within large client organisations and their supply chains. A qualified accountant by profession, Stuart has held senior positions in several blue chip organisations before moving into consultancy and is now chairman of Bourton Group, a mid-sized management consultancy focused on performance transformation and building capability in operation excellence. Stuart regularly contributes a viewpoint article in the NCE and recently co-authored CIRIA C696 *Build Lean* in 2011 setting out the managerial and organisational challenges to implementing Lean transformation in the sector and detailing some useful approaches that can help overcome them. He has a wealth of experience in delivering and quantifying benefit realisation through improvement initiatives.

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Contents

Why read this guide?	iii
Background to topic	iii
Acknowledgements	iv
Boxes	vi
Figures	vi
Tables	vii
1 Introduction	1
1.1 What is Lean benefits realisation management (LBRM)?.....	1
1.2 Why is LBRM important?.....	1
1.3 Who should be interested in LBRM?.....	2
1.4 Format, structure and content of the guide – how to get the most out of it.....	2
2 Fundamentals, principles and considerations – what is important for effective benefits realisation?	3
2.1 Why is Lean different from other business improvement activity?.....	3
2.2 Step 1: creating the vision and strategy for LBRM.....	4
2.3 Stakeholder engagement.....	5
2.4 A consistent LBRM approach.....	5
2.5 Common language and terminology.....	6
2.6 An understanding of what qualifies as a ‘Lean benefit’ (and a disbenefit).....	7
2.7 Roles, responsibilities and governance of the LBRM process.....	8
2.7.1 Programme board/steering group/change management executive.....	9
2.7.2 Programme director/manager.....	9
2.7.3 Portfolio office/programme office.....	9
2.7.4 Sponsor/SRO/champion.....	9
2.7.5 Lean facilitator/project leader/black belt.....	9
2.7.6 Value stream manager/process owner/line manager.....	9
2.8 Lean benefit reporting.....	9
3 Benefits measurement	12
3.1 Lean benefit types and classification.....	12
3.1.1 By stakeholder.....	12
3.1.2 By organisation impact.....	12
3.1.3 By benefit category.....	13
3.1.4 By tangibility.....	13
3.2 Measurement issues and considerations.....	14
3.2.1 Stakeholder voice.....	14
3.2.2 The importance of data.....	15
3.2.3 Measuring the embedded improvement.....	16
3.2.4 Overcoming resistance to change.....	16
4 Application of best practice Lean benefit realisation management in the construction environment	17

4.1	The Lean benefit realisation management process – a systematic approach to deliver and measure benefits	17
4.2	Level 1: Organisation, programme or project	18
4.2.1	Strategic objectives and stakeholder engagement	18
4.2.2	Establishing high level current performance	20
4.2.3	How will we know when we get there?	20
4.2.4	What are our core value streams and where should we focus?	20
4.3	Level 2: Value stream	21
4.3.1	Value stream analysis or mapping	21
4.3.2	What is the Lean improvement potential?	23
4.4	Level 3: Lean improvements	24
4.4.1	Types of Lean intervention	24
4.5	Key Performance Indicators and benefit reconciliation	26
4.5.1	The two stage approach to reconciliation	26
4.5.2	Value stream measurement	27
4.5.3	Measurement at different levels	28
4.6	Reconciling from top to bottom	31
4.6.1	‘Fuzzy reconciliation’ review	31
4.6.2	‘Hard reconciliation’ review	32
4.7	Useful tools, techniques and templates	33
4.7.1	Policy deployment	33
4.7.2	Benefits capture form template	33
4.7.3	Benefits realisation plan	35
4.7.4	Business case	36
4.7.5	Risk register and mitigation actions	38
5	Typical challenge and top tips	40
6	Sustaining the benefit of Lean	42
7	Conclusion	43
8	Examples and case studies	44
8.1	Case study 1: Hghways Agency	44
8.1.1	Background	44
8.1.2	M6 extension puts Lean on the map	46
8.2	Case study 2: BAA/CBI Heathrow Terminal 5 Satellite C	53
8.3	Case study 3: Ministry of Justice	55
	References	56
	Websites	57
	Boxes	
Box 1.1	The guiding power visions	4
Box 2.1	Highways Agency Lean improvement scheme	11
	Figures	
Figure 2.1	The strategic cascade	4
Figure 2.2	The financial benefit relationship	8
Figure 2.3	A 5S improvement example on a construction site storage area	10
Figure 3.1	Benefits classification by business impact using Cranfield Grid	13

Figure 3.2	Enablers for change	16
Figure 4.1	Overall approach to adopting best practice LBRM	18
Figure 4.2	Quad of aims scoping matrix template	19
Figure 4.3	Quad of aims example – drainage laying	19
Figure 4.4	Stakeholder analysis grid	20
Figure 4.5	Current state map of house building process	23
Figure 4.6	Future state map of house building process	23
Figure 4.7	Example of visual management – a dynamic display used at work team level	26
Figure 4.8	The two stage approach to reconciling and tracking benefits	26
Figure 4.9	Example of a balanced scorecard	28
Figure 4.10	Extract of a working daily performance management board	31
Figure 4.11	Example of a working daily performance management display	31
Figure 4.12	Fuzzy reconciliation – process for reconciling Lean improvements to value stream	32
Figure 4.13	Hard reconciliation – process for reconciling value stream benefits to organisational performance	32
Figure 4.14	Example of policy deployment X-matrix	32
Figure 8.1	Lean deployment model	45
Figure 8.2	Ease–benefits matrix for the construction phase	47
Figure 8.3	Ease–benefit decision matrix	49
Figure 8.4	Project tracker	50
Figure 8.5	Benefits realisation capture form (BRCF)	50
Figure 8.6	Daily overall cost, baseline exercise	51
Figure 8.7	Improvement from one of the trial sites	52
Figure 8.8	Graphical output from one of the work sections	53
Figure 8.9	Heathrow Terminal 5	53
 Tables		
Table 3.1	Benefit classification by tangibility	14
Table 3.2	Example of a Lean team’s development of potential ways to quantify stakeholder voice ..	15
Table 4.1	Stakeholder/benefits matrix example	19
Table 4.2	Analysis of the values streams in a house building	21
Table 4.3	Key elements of VSM	24
Table 4.4	The value stream box – example of tracking VSM	28
Table 8.1	Lean project scoping document	48

Introduction

1.1 WHAT IS LEAN BENEFITS REALISATION MANAGEMENT (LBRM)?

Lean benefit realisation management (LBRM) is a systematic way of ensuring that the outcomes of a Lean improvement programme deliver benefits that are advantageous to stakeholders. However, this definition begs secondary questions of what is meant by terms such as systematic, outcome, benefits and stakeholders. These terms will be discussed in some detail in the guide as it addresses:

- 1 How we can put a benefits realisation process in place at the organisation, programme, project and activity level.
- 2 How we can define and classify the types of benefits from Lean to help prompt identification and standardise reporting.
- 3 What we mean by Lean improvement.
- 4 How we may engage with the multiple and varied stakeholders throughout the industry who are interested in benefits.

It will consider:

- ▶ the benefits gained on individual Lean improvement interventions
- ▶ the transfer of improvements to other construction projects
- ▶ implementation of a Lean continuous improvement culture throughout the company/organisation

Before delving into this guide it is assumed that the reader has prior knowledge of the basic concepts and terminology of Lean (see Terry and Smith, 2011).

1.2 WHY IS LBRM IMPORTANT?

Lean is increasingly becoming the preferred business improvement approach within both public and private organisations within the construction sector. Organisations do not undertake Lean for its own sake – we do it because we want to improve the way our businesses operate. We want to remove waste, increase customer satisfaction and add value to our organisations in a sustainable way. Great Return on Investment (ROI) claims for Lean are now evident (benefits of 20 times the cost of implementation have been achieved in the Highways Agency totalling over £60m) and the challenge now is to sustain the drive for benefits by moving from the capture of isolated improvements towards the systematic delivery of a Lean culture.

In the increasingly difficult and complex global environment the mantra of ‘more for less’ is now business as usual and it is becoming increasingly difficult to make the simple attribution

that was once achieved by a traditional cost/benefit analysis. Many managers undertake Lean based on faith, ie they know that working in a Lean way delivers the sort of business benefits that ensure success. However, for many 'willing believers' something more is needed – evidence that the expected benefits are actually being delivered. In addition, clients are seeking benefit evidence from their suppliers. LBRM is the best way of providing that evidence, but more, it can change the way we set about implementing Lean by providing a common focus, a motivating and collaborative goal and an impetus to maintain continuous improvement. Far from being just a way of counting benefits, if we put benefits realisation at the heart of our Lean investments it can help to drive business success and manage our portfolio of change initiatives. We must not leave this to chance, we have to manage it well to achieve and sustain competitive advantage. If we fail to get it right we may drive our business in entirely the wrong direction. LBRM offers the approach, methodology and tools – all you need to provide is the commitment to make it happen.

1.3 WHO SHOULD BE INTERESTED IN LBRM?

LBRM is an organisational approach so you will not be surprised that those stakeholders who want to see their organisation succeed have the most to gain and should have the greatest say. Later in the guide we will explore how to identify the stakeholders involved, but those actually responsible for putting in place a LBRM structured approach will need to have sufficient seniority to make it happen.

Many studies have been undertaken into the success of change initiatives and it is commonly accepted that (Bradley, 2010):

- ▶ most change initiatives (Lean included) deliver between 10 to 25 per cent of the potential benefits and this can be considered a waste
- ▶ only about 35 per cent of organisations effectively track benefits.

Bradley (2010) claims that it is possible to increase benefit realisation across a portfolio of projects from around 20 per cent to 80 per cent by the application of benefits realisation management to reduce the risk of failure, deliver benefits earlier, achieve higher levels and sustain them longer. We know from experience that this is feasible.

So who would be interested in achieving this kind of ROI? Directors, senior managers, Lean sponsors and teams? But also clients (both government and private) who will benefit from supply chain efficiency, employees who want to see their organisations thrive and provide secure employment, members of the public who want to see construction projects completed safely, on time, within budget. The truth is we should all have an interest in seeing our Lean improvement programmes succeed in delivering benefits.

1.4 FORMAT, STRUCTURE AND CONTENT OF THE GUIDE – HOW TO GET THE MOST OUT OF IT

This guide is a 'how to' aid designed specifically to assist organisations in the construction sector to consider the issues and optimise the benefits from their Lean initiatives. The nature of the industry is fluid, with players one day collaborating and the next competing. Shared supply chains across private and public clients with the need to have a common language and approach means that it is timely to adopt a unifying best practice approach that everyone can buy into. This guide offers that approach – it sets out the fundamentals that we should all agree on. It considers the issues we all face and offers some solutions. Having collated much of the work done on this subject, combined with application experience, this guide provides a pragmatic methodology, tools and templates that the industry can adopt. Examples and case studies have been collected where LBRM has been applied, at least in part, by construction organisations.

Fundamentals, principles and considerations for effective benefits realisation

2.1 WHY IS LEAN DIFFERENT FROM OTHER BUSINESS IMPROVEMENT ACTIVITY?

There are many ways that an organisation can seek to improve the way it operates and generate benefits. The principles of benefit realisation management apply to any activity that generates benefits and LBRM can draw from the body of existing thought on the subject.

But Lean is different, it is not a cost reduction programme and treating it as such will leave you disappointed. Also, Lean is founded on improving value streams often through many incremental improvement activities. If we are to try to verify every little improvement and link it to quantifiable financial effects we will need a very good tracking system and need to apply a great deal of effort. Many organisations look to deliver ‘quick wins’ by using Lean tools, especially when starting out on their Lean journey – and Lean can often deliver great results quickly because waste is so endemic. Lean projects are inevitably the way that most organisations get started so the initial attribution of benefits to intervention activity is relatively simple. As organisations mature in their application of Lean it becomes more complex and difficult to attribute specific savings to specific Lean interventions.

So what is different about applying traditional benefits realisation principles to Lean in the construction sector?

- 1 Many improvement activities are intended to deliver known solutions to known problems. These we can call implementation projects, eg ‘we are implementing a new project management system’. Lean, however, is a process of continuous improvement where the solution (and sometimes the exact problem) is not known until the improvement activity is started. This means that the benefit expectations often emerge during the improvement activity and are sometimes difficult, often impossible, to define precisely at the start.
- 2 The undertaking of a Lean approach often requires or leads to a significant cultural change within an organisation. The benefits of this can be far reaching and lead to improvements that appear unrelated to the original activity. When Lean becomes ‘business as usual’ relating benefits to actions becomes even more challenging.
- 3 In the construction environment there is a contractual, often adversarial, approach to managing construction schemes. This is often evident in the relationships between clients, contractors, subcontractors and many other players within the supply chain when it comes to ‘settling the account’. Current contractual relationships do not cater well for the equitable

sharing of benefit (and disbenefit) so we should not be surprised that the declaration of benefits are often coloured by vested interest.

So, in our LBRM model we have to ensure that we pay particular attention to these specific challenges presented not only in measuring Lean but in applying it at the organisation, programme and project level.

2.2 STEP 1: CREATING THE VISION AND STRATEGY FOR LBRM

Vision and strategy are often much overused words in construction, but rarely do they convey the guiding power of the words Lord Coe used when bidding for the 2012 Olympics in Singapore in July 2005 or John F Kennedy’s moon landing speech (Box 1.1).

The guiding power visions	<p>Sebastian Coe’s Olympic vision</p> <p>“To make an Olympic champion takes millions of young people around the world to be inspired to choose Olympic sport. We can no longer take it for granted that young people will choose sport. Some may lack the facilities or the coaches and role models to teach them. Others, in an age of 24-hour entertainment and instant fame, may simply lack the desire. We are determined that a London Games will address that challenge.”</p> <p>“So London’s vision is to reach young people all around the world. To connect them with the inspirational power of the Games. So they are inspired to choose sport.”</p>
	<p>John F Kennedy’s moon landing vision</p> <p>“I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth.”</p> <p style="text-align: right;">JFK, Man on the Moon Speech, Joint Session of Congress May 25, 1961</p> <p>All seven key components for a vision are there: who (the nation), what (land on the moon), how (land a man on the moon), the promise (return him safely), geographic focus (the USA in particular, but the message was to the world), the goal (land a man on the moon and return him safely), and when (by the end of the decade).</p>

Irrespective of their ambition, visions need to be measurable. What would we need to do to drive such visions into measurable activities?

No matter how well defined the top level vision is, it needs to be SMART (Specific, Measurable, Achievable, Realistic, Time bound), if it is ever to be achieved. The task is to cascade the vision down into strategy and operational performance that deliver the vision step by step as described in Figure 2.1.

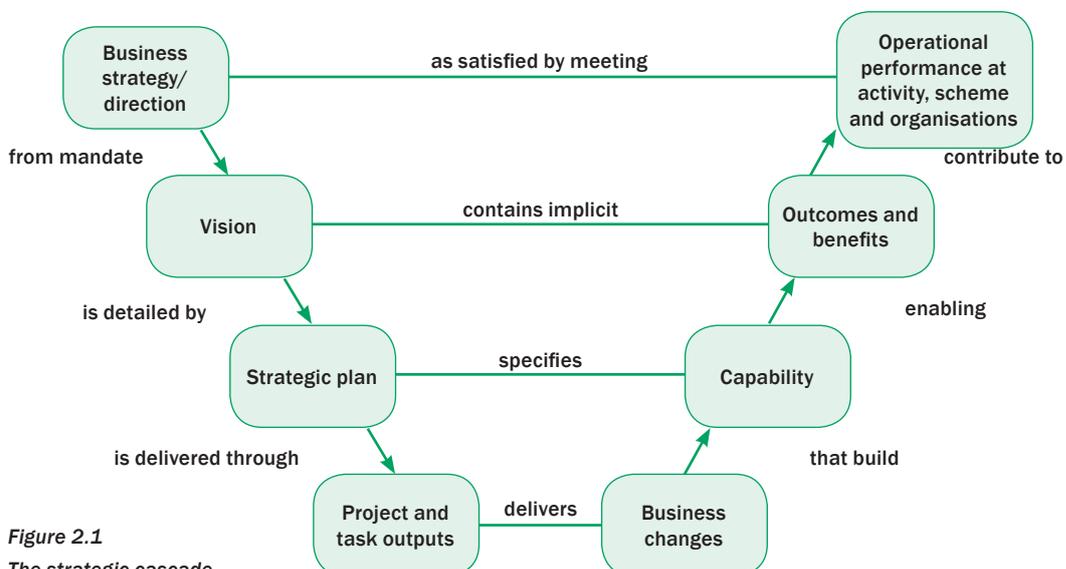


Figure 2.1
The strategic cascade

Benefit realisation should be part of the overall business strategy. 'Lean' can be described as a business strategy. If we are to avoid the pitfall of being busy fools we must maintain focus on delivering towards the organisational strategy. If we work on the principle that every activity should move the organisation towards the vision then we should be able to measure progress on our Lean journey and maintain momentum by:

- ▶ establishing where we are today – the current state
- ▶ defining where we want to get to – the future state
- ▶ setting out the best way to get there – our Lean improvements
- ▶ managing the process of change – governance, methodology and tools
- ▶ demonstrating and agreeing that we have arrived – KPIs, benefits reports.

This distinction between current state and desired future state is a key principle that we will revisit throughout the guide.

Using an alignment framework such as policy deployment (see Terry and Smith, 2011) is a great way to ensure that our Lean programme is fully aligned and supportive of the overall business strategy. More details of policy deployment (also known as Hoshin Kanri) are provided in Section 4.3.1.

2.3 STAKEHOLDER ENGAGEMENT

Stakeholders are much more than people we need to communicate with from time to time when adopting Lean. Stakeholders are the people who actually own benefits – they decide what benefits we should deliver and when they need to be realised. So, we need to engage with stakeholders right from the start of our Lean improvement activity to ensure that we are focusing on the right issues. Failure to engage well with stakeholders is one of the main reasons that projects and programmes do not deliver potential benefits.

Stakeholders can be individuals, groups or organisations that are affected by, or can influence the outcome of the Lean change. Construction sector activity can be highly impacted by political and financial governance intervention and stakeholders will normally include a range of people such as:

- ▶ customers
- ▶ end users of the asset under construction
- ▶ clients
- ▶ suppliers
- ▶ joint-collaborators
- ▶ functions in each organisation in the chain, eg procurement, finance and maintenance
- ▶ the project manager or consultant appointed by the client
- ▶ designers
- ▶ public authority legal departments etc.

Identifying stakeholders, their requirements and managing their concerns is fundamental to the success of any Lean programme. It is also essential that we close the loop by regular checking to ensure that stakeholders are actually experiencing the benefits we think we have delivered. Some useful tools to assist are explained in detail in Section 4.3.

2.4 A CONSISTENT LBRM APPROACH

The construction sector is made up of many different organisations – public and private sector clients, consultants, contractors, subcontractors and manufacturers. They form working relationships, disband and reform again around construction projects that have a finite life.

Also, these relationships change over the life cycle of the project, from tender through design, build and into operation of the asset. A common ‘currency’ in which to express all benefits would greatly improve comprehension across the different parts of the construction sector but is it possible? Is it desirable that a ‘one size fits all’ approach to benefits management can be applied across this fragmented industry? Can LBRM be applied in the same way for ‘bottom up Lean’ and ‘top down Lean’?

Currently it is doubtful whether benefits management is done consistently even within an organisation let alone across the sector. To adopt a consistent approach within the sector would undoubtedly require effort and commitment, so what is to be gained and would it be worthwhile?

- 1 **Increased confidence in the benefits claimed:** many organisations have their own independent sign off procedures, typically involving their finance function. However, there is much debate about what should be counted and how it should be valued and reported. There is a natural conservatism and where pain/gain mechanisms are in operation there can be conflicts of interest in declaring benefits. A consistent approach to LBRM would offer a way forward if senior management in each of the organisations would agree. This would also allow for the aggregation of benefits to industry level.
- 2 **More efficient application of the approach:** no need to reinvent the wheel. Many organisations use spreadsheets and collect data (mainly financial) in different ways. These have had to be designed, implemented and operated. It would not be a difficult task to have a standard tool (albeit customisable) that everyone could use.
- 3 **Facilitated comparison between different programmes and projects:** the use of cloud based e-rooms and tools would facilitate industry comparison and benchmarking – contributing to industry knowledge.
- 4 **Support for any existing independent assessment:** a consistent approach would allow for independent validation – something that would be of value, eg to the NAO for government funded schemes.

There is a danger that an overly burdensome LBRM approach would ‘smother’ many small Lean improvements. In Lean terms this would be classed as a waste. So, we must be able to accommodate a consistent way of encouraging, not stifling, Lean at the ground level. However, a common understanding of the issues, terminology and approaches to measuring and delivering benefits is desirable.

2.5 COMMON LANGUAGE AND TERMINOLOGY

The language and terminology of benefits realisation is not well defined and used. To allow us to gain the most from this guide, set out here is a common vocabulary for some of the main terminology.

Objective: the aim and purpose. Usually written with the word ‘to ...’. Often tested by using the SMART criteria, eg to reduce errors on design drawings from 10 per cent to one per cent within six months.

Target: a quantifiable level of a measured attribute, eg rework of one per cent.

Baseline: a measurement of the current state (‘as is’ situation) before any improvement activity, eg 10 per cent error rate.

Outcome: the result of a business change as experienced by a stakeholder, eg more reliable quality.

Benefit: a change for the better as perceived by a stakeholder, eg less delay (see Section 2.6 for further information).

Disbenefit: a change for the worse as perceived by a stakeholder, eg a building façade that cannot be cleaned.

Realisation: the delivery of an enabler into an actual benefit, eg fewer process steps translate into shorter project completion time.

Stakeholder: anyone who is affected (positively or negatively) by, or who can influence a business change. They can come from inside or outside the organisation, eg colleagues, customers, suppliers, managers, organisational or public users.

Deliverable: the specific output of an improvement activity, eg a new blacktop laying process, a new drawing or spec.

Measure: a characteristic that is regularly reported to determine the scale and direction of performance, eg lead time to complete the drainage.

Metric: specific data for a measure, usually expressed as a number, eg xx km of drainage laid per day.

Enabler: an input, condition or activity that must be present before an output can be achieved, eg improved capability or process, different equipment or resources.

2.6 AN UNDERSTANDING OF WHAT QUALIFIES AS A 'LEAN BENEFIT' (AND A DISBENEFIT)

There are many things that we do in our working environment that can be seen as beneficial for the organisation. Most people take pride in improving the way they work. Does LBRM set out to measure everything, and in terms of pound notes? The instant answer is no!

So, let us focus on what we mean by a Lean benefit by referring to the five Lean principles (see Terry and Smith, 2011):

- ▶ value – understanding and agreeing exactly what your customer values
- ▶ value stream – understand how value is delivered to customers through end to end processes
- ▶ flow – smoothing the flow of activity and value through the stream
- ▶ pull – value delivered at the demand of the customer
- ▶ perfection – striving for continuous improvement.

Typically benefits are achieved through delivering more/better output for less input – a combination of improvement in outcomes that are traditionally categorised as cost, quality and time. In the construction sector safety is paramount and is often added to these categories, although it could be argued that it falls under the umbrella of quality, being a specified parameter that is deemed of critical importance to a process stakeholder. We may also consider risk reduction as an important outcome category by creating more robust, predictable processes. Also, there are environmental, social and wider stakeholder benefits to take into consideration.

While we may be able to deliver improvements in cost, quality and time by investing in a new, faster, more accurate piece of equipment, unless we address the waste, variation and capability inherent in the process we should not claim this is a Lean improvement. For example, when new equipment is introduced into a process to remove a constraint that has been identified. Complications may arise in assessing benefits where we make both Lean and non-Lean improvements at the same time but let us not get hung up on precision at the expense of effectiveness.

So, if a Lean benefit is something that improves cost, quality, time or some other measurable dimension in the eyes of the customer a Lean disbenefit is the opposite, eg something that increases cost and time or reduces quality, even temporarily. Investment in equipment and resources that do not deliver at least an equal weight of benefits are by definition a disbenefit. Disbenefits are typically new negative impacts on stakeholders as a result of the 'improvement'

initiative and are often perceptions backed by emotions, although rooted in reality. Good stakeholder communication and involvement can often minimise the negative effect of disbenefits.

Let us now consider the trend towards trying to quantify all benefits in a single currency – money. While this is clearly important at the organisation/business level it can be dysfunctional to try to measure everything in terms of bottom line at the operational level. Financial benefit is a result not a driver. This not only focuses attention on a single measure but also concentrates solely on outputs rather than inputs (sometimes referred to as enablers) – not a sensible thing to do if we want to manage and sustain our process improvement activity to become business as usual. While we cannot ignore output measures, input measures tend to be timelier, more actionable and are more useful in helping us maintain operational performance within the work environment.

Figure 2.2 explains how, through a Lean improvement, we seek to deliver value using less resource. We can use this resource saving to generate growth and increase revenue or we can eliminate the saved resources giving bottom line benefits. So the change in resource as measured by the before and after KPIs can only approximate the financial effect, depending on how the savings are applied. However, if we eliminate from our organisation (people) resources that are freed by Lean improvements, then there is every chance that it will undermine our Lean programme. So, realising Lean benefits into actual financial savings can be a complex linkage of resource use and policy decision.

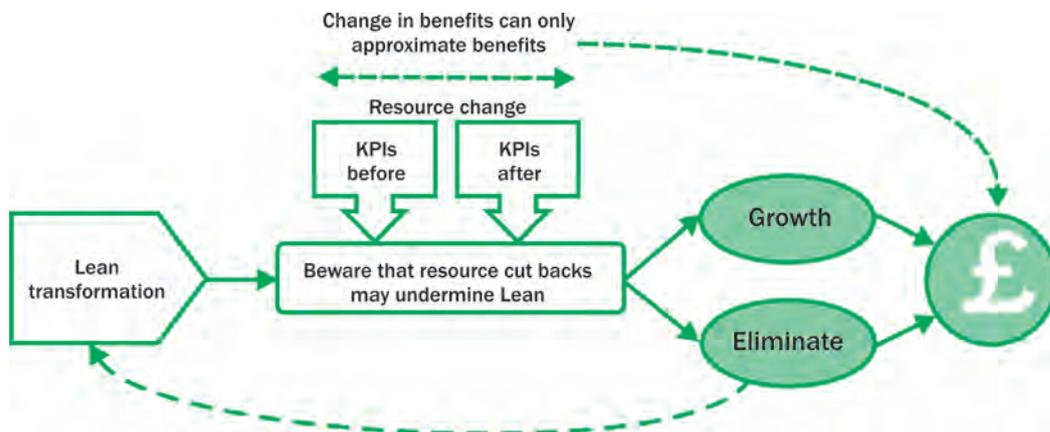


Figure 2.2 The financial benefit relationship

2.7 ROLES, RESPONSIBILITIES AND GOVERNANCE OF THE LBRM PROCESS

Benefits realisation is too important to leave to chance, however, if we do not put in place the management processes that is exactly what happens. We identify potential benefits early in the improvement activity, we work on our improvements establishing the future state, we make the changes we planned. But if these are not translated into something that a stakeholder values, which we can measure and that sustains, then all our hard work is in vain. Experience shows that when roles and responsibilities are well defined and a good governance process put in place the likelihood of success is significantly increased. The size and scale of the governance process and roles will be different depending on whether we are managing an organisation wide change portfolio, a programme or a project. Sometimes these roles may be merged and undertaken by one person. These roles/activities are often carried out by existing people in existing management positions and are not additional layers of resource. Typical roles and responsibilities (not organisational positions) described in Sections 2.7.1 to 2.7.6 indicate the traditional requirements appropriate for each.

2.7.1 Programme board/steering group/change management executive

This senior level board is responsible for the organisation's investment in improvement by maximising realisation of benefits and the deployment of resources to achieve the strategic goals. This role is usually fulfilled by meeting monthly to review and drive the overall direction, resources and plan.

2.7.2 Programme director/manager

Reporting to and part of the programme board the programme manager is responsible for the day to day delivery of the Lean programme, often as full time head of the programme office.

2.7.3 Portfolio office/programme office

Supporting the programme director in the delivery of their role the programme office will be staffed by experts in Lean deployment. They will have the capability to support individual interventions while managing the overall progress of the programme and ensuring consistency of approach.

2.7.4 Sponsor/SRO/champion

The champion will be a senior person responsible for driving an initiative or prioritising a group of improvement initiatives as part of their line responsibility. Typically they will have provided or sanctioned the funding and resources and be ultimately responsible for the delivery of the operational improvement and benefit realisation.

2.7.5 Lean facilitator/project leader/black belt

A recognised expert in the implementation of Lean improvement activity they fulfil their role by leading, facilitating and coaching Lean improvement teams to deliver and sustain all types of Lean improvement interventions using a variety of Lean tools. This role is typically full time.

2.7.6 Value stream manager/process owner/line manager

This is the person responsible for the value stream, process or functional operation that delivers a service or product output. There is an increasing recognition that a value stream orientated organisation is better able to maintain focus on customer requirements and also facilitate the implementation of a Lean organisation across the whole enterprise.

2.8 LEAN BENEFIT REPORTING

Most people in organisations are proud to promote the benefits they have achieved through Lean – for many the recognition alone is reward enough.

Issues to consider when reporting benefits are:

- 1 **What:** make sure you make the benefit report appropriate to the stakeholder recipient. At work team and value stream levels, reporting operational benefits is far more meaningful than a financial number that they cannot relate to. While at organisational and senior management levels, macro business benefits backed up by tangible results (often financial) are more relevant.

- 2 **When:** timely feedback is essential. Enabling actions precede output results and, particularly in long lead time environments in the construction arena, this can result in a disconnect between action and impact, which has a discouraging effect on the Lean programme.
- 3 **How:** simple benefit graphics, visual displays and obvious improvements have much more impact than balance sheets. The beauty of many Lean improvements such as 5S is that they speak for themselves. In Figure 2.3 a 5S improvement in a site storage area shows an obvious improvement – more accessible, quantities more visible, safety benefits, space use benefits. It is simply not necessary to quantify and report on this improvement to the key stakeholders who work in this environment.

Sort: taking out unwanted materials

Set: a place for everything and everything in its place

Shine: clean place to work

Standardise: built a standard to follow

Sustain: introduced audit and score sheets



Figure 2.3 A 5S improvement example on a construction site storage area

- 4 **Who:** these are the stakeholders who will experience the benefits that flow from Lean. Reporting of benefits must accord with their perception. For example, it would be detrimental to report improvement in delivery when customers are experiencing more delays, likewise reporting financial improvements when the bottom line shows increasing losses. Typically Lean teams self-report within a standard framework that is provided by the deployment office. Often these documents are scrutinised and audited by the finance function but regrettably they are rarely signed off by stakeholders (ie the intended beneficiaries). There is great merit in reporting on a three level basis – building from:
 - ▶ individual Lean improvements
 - ▶ value streams
 - ▶ organisation, programme or project level.

Trying to jump directly from bottom to top involves too many linkages, too much bureaucracy and can erode credibility. See Box 2.2.

Box 2.2 Highways Agency Lean improvement scheme	<p>In a recent Highways Agency scheme there was a Lean improvement on the drainage laying process. The improvement activity delivered direct benefits in the form of:</p> <ul style="list-style-type: none">▶ quicker construction rates▶ less labour and plant▶ fewer joints, so fewer opportunities for defects▶ less transportation – to site and on site so lower cost, increased safety and environmental benefits. <p>As the subcontractor had agreed a fixed price contract there was no direct financial benefit to the scheme, however, the rolled up time saving did have a beneficial effect on the overall scheme timescale showing savings in the end to end scheme process (the value stream in this case) and leading to financial savings in prelims that did not show up at the direct intervention level. When the new ways of working were embedded and transferred to other schemes (at the client and contractor organisation level) the savings were multiplied even further.</p>
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3

Benefits measurement

3.1 LEAN BENEFIT TYPES AND CLASSIFICATION

Currently, there is no universally accepted way of describing and classifying benefits from Lean within the construction sector. The reporting and communication of benefits is a key factor in the success of benefits realisation. It follows that we need to have a clear way of describing benefits to stakeholders within an organisation and ideally within the industry to help:

- ▶ communicate and manage stakeholder expectations
- ▶ analyse outcomes across projects, schemes and organisations
- ▶ avoid double counting
- ▶ monitor longer term transformation progress.

Ways that we can start to build a consistent classification are by:

- ▶ stakeholder
- ▶ organisation impact
- ▶ benefit category
- ▶ tangibility.

These classifications are not meant to be prescriptive but rather models and ideas that can be used to help consider the types of benefit, how they can be recorded, reported and used to improve benefits management.

3.1.1 By stakeholder

This is a useful way of looking at benefits and disbenefits because it focuses on the recipient of the benefit, eg client, business, user, business function. It will also enable us to assess and manage the stakeholders that will gain benefits and those that will suffer disbenefit and may require motivation. See Section 4.2.2 for more information.

3.1.2 By organisational impact

Assessing the impact on an organisation must be specific to the subject in question. The Cranfield Grid offers a way of classifying benefits that allows organisations to ensure the appropriate balance of Lean improvements across its portfolio. There is no right and wrong balance as each will depend on the organisation's strategy and attitude to risk.

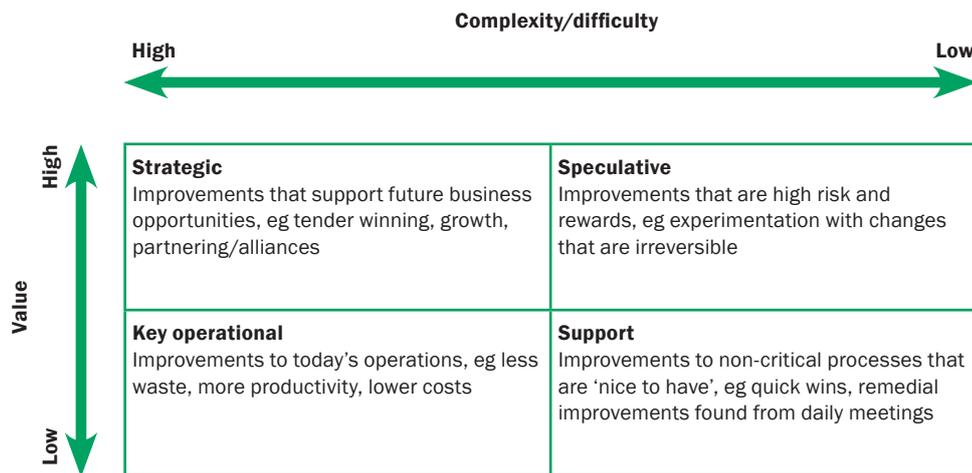


Figure 3.1 Benefits classification by business impact using Cranfield Grid (from Bradley, 2010)

3.1.3 By benefit category

Many organisations have created a benefits categorisation that suits their business or industry. An example of classes that may be useful in the construction sector is:

- ▶ meets legal requirements – mandatory, health and safety
- ▶ reduced costs – materials, plant, labour, temporary works, prelims
- ▶ increased competitiveness – new work won as a result
- ▶ reduced risk – probability of cost overrun, quality failure, time overrun, safety
- ▶ improved productivity – more outputs for less inputs
- ▶ improved capability
- ▶ improved capacity
- ▶ increased client/customer service
- ▶ better staff motivation
- ▶ improved image
- ▶ more flexibility to make and achieve engineering change.

Although these are all valid benefit types, the danger of such a list is that some benefits may be included in more than one category leading to duplication, eg improved productivity could result in reduced costs and/or increased revenue.

3.1.4 By tangibility

A common failure in any benefits realisation programme is to count only those benefits that are tangible and financial. This happens because of the need to demonstrate short-term success in monetary terms and to justify investment in Lean. A useful model that can help to ensure that all benefits are captured is shown in Table 3.1.

Table 3.1 Benefit classification by tangibility (Bradley, 2010)

Value type		Definition	Financial	Non-financial
Tangible	Definite	Value may be predicted with certainty	Reduced costs	<ul style="list-style-type: none"> ◆ fewer steps in a process ◆ less site movements ◆ reduced mean time between failures.
	Expected	Value may be predicted based on historic trends and high levels of confidence	Increased sales	<ul style="list-style-type: none"> ◆ quicker performance of construction tasks ◆ lower levels of defects.
	Logical	The benefit is anticipated and may be measured but its value is not predicted	Improved management of risk of overrun	<ul style="list-style-type: none"> ◆ greater customer satisfaction.
Intangible		May be anticipated but difficult to substantiate. 'Proxy' measurement of other casually-related benefits may give evidence of realisation		<ul style="list-style-type: none"> ◆ improved image (proxy – increased number of positive testimonials) ◆ improved staff morale (proxy – more positive answers in staff survey).

By identifying and capturing benefits that can be measured and reported in other than financial terms we are more likely to communicate the real effect that stakeholder's value.

3.2 MEASUREMENT ISSUES AND CONSIDERATIONS

The measurement and valuation of benefits is often problematic for the following reasons:

- ▶ stakeholders don't express what they care about in measurable terms, ie there is no clear 'voice'
- ▶ gathering evidence of ongoing performance is often poorly done, and many organisations do not collect the right data in the right way. In the construction sector there is a often fear of data because it can be used in a negative contractual way
- ▶ Lean benefits derive from business change that, if not embedded, can easily reverse requiring continuous re-measurement
- ▶ Lean is founded in many small improvements that are difficult to attribute to a realised benefit. Often the only way to aggregate to a measurable benefit is at value stream level, ie the end to end process in which the individual improvement sits. This could be the method statement, a key stage in the overall construction project or indeed the overall construction scheme.

These issues are considered here in more detail.

3.2.1 Stakeholder voice

Understanding what stakeholders want requires us to focus on the key characteristics that our organisation's value stream delivers to them. We need to translate their requirements into measurable outputs (sometimes called critical to quality aspects or CTQs). Typically, contract documentation and works information does not capture the real CTQs, which are often 'unspoken requirements'. Organisations must be able to translate their stakeholder's voice so that they can express their value stream outputs in a way that can be measured.

For example, on a recent construction scheme the number of engineering change requests was giving cause for concern and was the subject of a Lean intervention. The measures that were set up had to reflect each of the stakeholder's requirements and the team 'brainstormed' these in Table 3.2. Using a tool such as this ensured that the team thought about the stakeholder 'care abouts' and how they could measure the benefits of improvement in the eyes of the stakeholders.

In this case nine individual measures were identified and experience shows that even apparently unquantifiable ‘care abouts’ can be measured when a little creativity is applied by the Lean teams. Not all measures need to be used, or if they are, can be used on a temporary basis to demonstrate that an improvement has occurred. How many, if any, of these measures are adopted as permanent KPIs within the business will be determined and agreed by the improvement team.

Table 3.2 Example of a Lean team’s development of potential ways to quantify stakeholder voice

Process	Deliverables	Stakeholders	‘Care abouts’	How to measure
Identify and evaluate change	Change requests accepted/rejected Drawings updated and issued	Designers	Minimise number of changes	Proportion of change requests resulting in change
			Justified and authorised	Proportion of change requests submitted without authorisation/justification
		Contractor	Does not affect quality	Number of rejected design iterations due to quality
			Does not affect delivery	Time to complete change or waiting for issue if new drawings
			Does not increase cost	Cost impact of changes
			Minimum number of changes	Delay to project through implementing change
		Client	Certainty of cost	Number of drawing status issues at handover
			Certainty of time	Number of changed implemented that are detrimental to users
			All changes are captured on as-built drawings	
		Public	Change implemented if improves user experience	

When an improvement activity has been completed the team should always recheck with the stakeholders that the benefits to them have been realised. Often a time delay will mean that this conversation needs to continue for some time after the improvement has been carried out.

3.2.2 The importance of data

The benefit potential of a Lean initiative is the difference between the current and future state value stream. Lean seeks to understand how our current value streams operate (the baseline) and what the future will look like. It is essential that good data at the correct level is used to establish the potential.

Good data typically:

- ▶ is collected in a rigorous and standard way
- ▶ is representative of the true process, especially if sample data is used
- ▶ focuses on those parts of the process with a strong relationship to the outcome (this may require testing statistically)
- ▶ is rich in information (eg continuous data is richer than discrete or descriptive data)
- ▶ reflects both centrality (eg mean) and spread (eg std dev)
- ▶ is collected at the right time intervals in the process, ie it reflects the process pace

- ▶ clearly identifies any related conditions at the time of collection (eg weather conditions wet/dry, temperature).

With good data we can be confident that the measures we use to assess the changes in the process will reflect closely what is actually happening ‘on the ground’ and will be a good indicator of benefits generated.

3.2.3 Measuring the embedded improvement

Once an improvement has been made it is essential that key measures are continued at the appropriate level in the process and organisation. This is particularly significant where the improved ways of working are transferred within and across the client and contractors involved in the original Lean intervention. All too often an organisation will have islands of excellence that have not been adopted as best practice because of a failure in knowledge management. The measures may be new to the organisation and careful stakeholder management will be required or this may be seen as a chore (disbenefit). Embedding new measures, whether they are input (leading) or output (lagging) measures, into the organisation’s KPIs will focus ongoing attention to the process as part of ‘business as usual’. As part of the ‘lessons learned’ on a scheme all Lean improvements should be transferred to future schemes as part of the knowledge transfer process. In this way benefits may be multiplied to a far greater value than just the scheme or project that initiated them.

3.2.4 Overcoming resistance to change

All improvement activity requires change – to people, organisation and process. Figure 3.2 shows how the elements of creating vision, building skills, creating incentives or dissatisfaction, providing resources and an action plan need to be managed to achieve successful change. When any one of these is missing unintended consequences ensue. Without a vision there is often confusion about where we are going. Without the change management skills and tools people do not know how to successfully make change happen leading to pressure and anxiety. Without a clear reason, incentive or dissatisfaction with the current state of affairs people will prefer the status quo and change won’t happen. Without sufficient resource people will be unable to deliver and become frustrated. Without a clear action plan there will be many false starts and very slow progress. By recognising any missing elements from your Lean improvement programme you can take the required action to create them. For example if there is no dissatisfaction with how things are currently done perhaps taking your people to see best practice in another comparable business would generate an understanding of the need to improve.

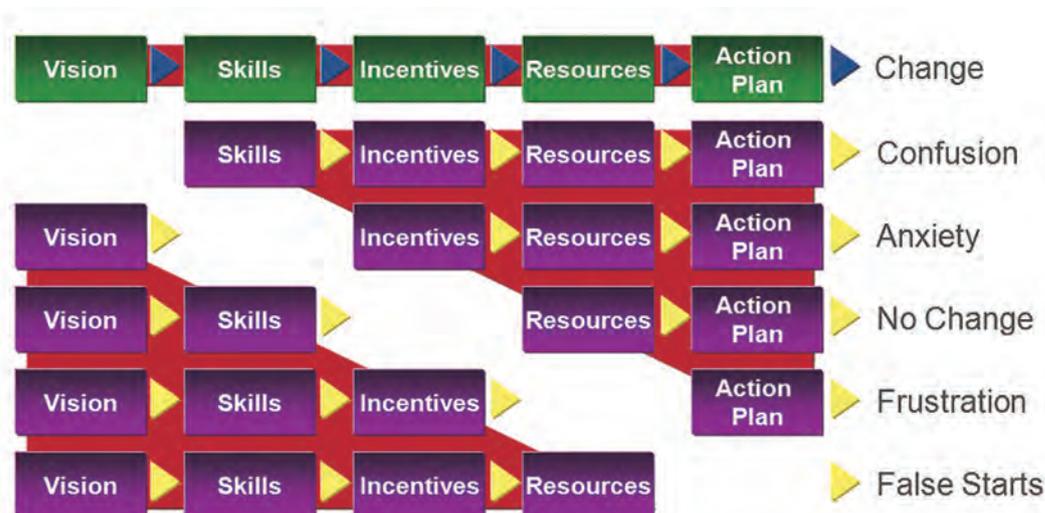


Figure 3.2 Enablers for change

Apply best practice Lean benefit realisation management in the construction environment

4.1 THE LEAN BENEFIT REALISATION MANAGEMENT PROCESS – A SYSTEMATIC APPROACH TO DELIVER AND MEASURE BENEFITS

Having considered many of the fundamental concepts and principles of benefits realisation let us now integrate these into a coherent best practice approach that can be applied for Lean within the construction industry.

To create this systematic approach there are four important inter-related elements of LBRM that need to be put in place within the organisation. These main elements are:

- ▶ setting strategic objectives and engaging with stakeholders
- ▶ value stream thinking
- ▶ implementing Lean improvement activity
- ▶ installing benefit measurement and ongoing KPIs.

Also, the concept of delivery reconciliation, both ‘hard’ and ‘fuzzy’, is introduced as a way of tying together the three levels of measurement recommended at the:

- ▶ organisation, programme or project level
- ▶ value stream level
- ▶ individual Lean improvement level.

Figure 4.1 shows this overall approach and in the following sections we will explore each of these elements in detail.

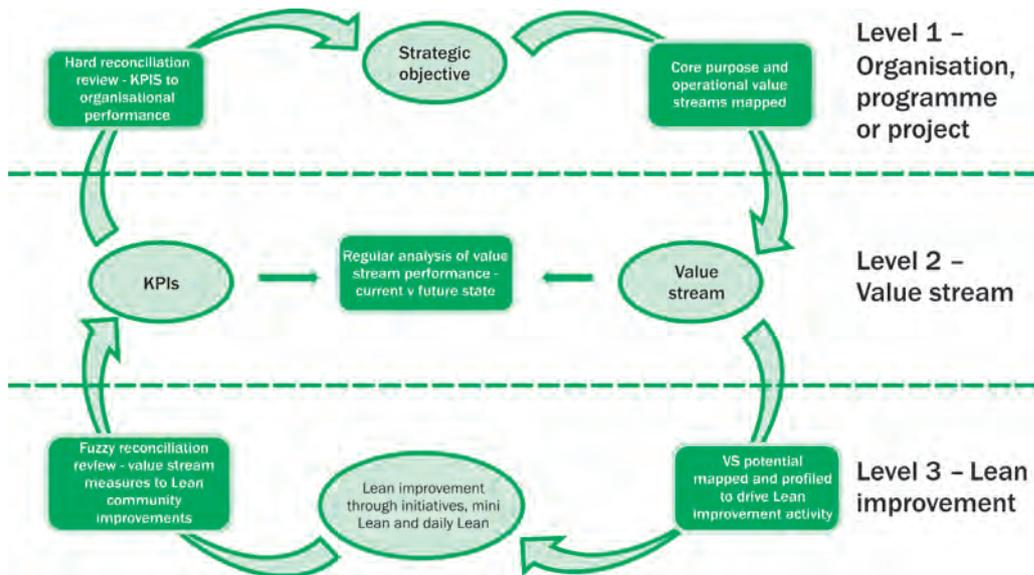


Figure 4.1 Overall approach to adopting best practice LBRM

4.2 LEVEL 1: ORGANISATION, PROGRAMME OR PROJECT

4.2.1 Strategic objectives and stakeholder engagement

We cannot establish what is important to our organisation, programme or project without understanding who are our key stakeholders and what they value. So start with the end in mind. A workshop with senior managers is usually the best way to set the strategic objectives of a Lean programme. Building consensus around ‘why’ we need to change is an important first step and will involve being honest about current performance and required performance. Often when working closely with clients it is seen as a weakness to admit that a supplier organisation needs to improve. Or indeed for clients to admit that they also can improve the way they work. But this is at the heart of all improvement programmes and the willingness to undertake radical change for the better is increasingly being seen as an ‘order winner’ during construction tendering.

Stakeholder mapping is started by listing all the groups of people affected by or influential on the organisation under review. This approach can be carried out at any level – organisation, programme, project or work team activity. By identifying what each stakeholder group cares about we can assign desired benefit outcomes to our objectives. Documenting and agreeing these at this stage enables management to promote buy-in to the programme through ongoing stakeholder management.

A few useful tools that can help in answering and capturing objectives and developing your stakeholder management strategy are shown in Figures 4.2 and 4.3.

The quad of aims sets out clearly on a single page the four main items required at the start of an improvement project. It is a useful communication document that can be agreed with the stakeholders and the project sponsor at the start and can be used to check direction and delivery throughout.

Objective Set out here your specific objectives using the format 'to...' The objective should be SMART, concise and simple to communicate	Stakeholder/benefits List each key stakeholder and the benefit to them of achieving the objective
Deliverables List here the actual outcomes that will be delivered, eg a new operating process, a redesigned structure	Success criteria Define how you will know that the improvement has happened – this will cause you to think about measures

Figure 4.2
Quad of aims scoping matrix template

Objective To increase m/day of drainage laid and reduce cost/m of drainage, while maintaining a safe working environment	Stakeholder/benefits <ul style="list-style-type: none"> ◆ reduced cost of plant and labour ◆ reduced risk ◆ increased predictability of programme.
Deliverables <ul style="list-style-type: none"> ◆ specification compliant drainage system ◆ quality right first time ◆ control plan for maintenance of improvement. 	Success criteria <ul style="list-style-type: none"> ◆ no accidents ◆ reduced rework ◆ saving achieved on cost per metre ◆ reduce overall drainage programme time ◆ no increase in materials wastage.

Figure 4.3
Quad of aims example – drainage laying

A stakeholder/benefits matrix expands on the top right quadrant of the quad of aims and considers how each benefit or disbenefit and stakeholder is linked. This matrix enables the team to manage the communication process and provided a framework for verifying benefits while ensuring that focus on benefits delivery is maintained.

Table 4.1 Stakeholder/benefits matrix example

Key stakeholders, benefits and disbenefits		Board	Client	End users	Process owners	General public	Partners	Suppliers	Staff groups
		Benefit	Faster completion of contract						
Safer working environment									
Easier to maintain and operate									
Lower risk of cost overrun									
Better planning									
Less waste									
Less stress									
Less material use									
Less disruption									
Disbenefit	Extra effort								
	Slower start								
	Sharing of data								
	Delegation of control								

The stakeholder analysis grid (Figure 4.4) provides a guide based on your stakeholder groups, their level of power and the impact that the planned changes will have on them. Some grids also include a third dimension relating to whether the stakeholders are deemed positive or negative towards the planned change – very useful for project managers and sponsors to focus their activity. Note that a stakeholder’s position may change during the benefit realisation process.

High power	Satisfy	Manage
	Opinion formers. Keep them satisfied with what is happening and review their position and perceptions regularly	Key stakeholders who should be fully engaged through communication and consultation throughout the programme
Low power	Monitor	Inform
	This group may be informed periodically but are not affected significantly	Keep informed by regular communication and active consultation. Pay particular attention to potential perceived disbenefits
Low impact		High impact

Figure 4.4
Stakeholder analysis grid

4.2.2 Establishing high level current performance

Creating a baseline scorecard at the start of a Lean programme will allow you to measure where you are now and so track performance as you progressively implement Lean improvements. Having undertaken your stakeholder analysis and set the organisational level objectives there are several areas to consider about baselines:

- ▶ you may not currently measure what you now know stakeholders care about. This discovery, although initially frightening, could be a first step along the road to Lean. Think creatively about what to measure and how to measure it consistently
- ▶ decide what is a representative baseline period – a week, a month, a year? How long should this be for your organisation? Your measurement period should be long enough to be meaningful but short enough to avoid being too historic. Reference should be made to the nature of contracts ongoing at the time and should reflect seasonal and economic cycles
- ▶ be honest about ‘one-off’ events – sometimes called ‘special causes’. If a ‘once in a century’ flood or hurricane is distorting your baseline then adjust for it otherwise accept that there will always be attributable reasons for performance variation in construction. Creating an ongoing set of ‘shadow’ measures is not only wasteful but open to manipulation
- ▶ how long should you hold onto your baseline? This depends on the gestation period of your benefits realisation plan. Baselines at the process improvement level are usually short-term, at the project they are medium-term and at the organisation level long-term. In construction a three to five year time scale would be reasonable at the organisational level – beyond that so much will have changed that all but the basic financial trends will be meaningless.

4.2.3 How will we know when we get there?

The simple answer is we never will ‘get there’ because that is the nature of continuous improvement. However, having a target level of performance and tracking our path towards it is essential if we are to maintain focus. Often, the improvement activity timeframe is determined by the job duration and when the work phase is complete you take whatever improvement you have achieved by then. The challenge is to take the improvement level at the completion of one job and build this as the baseline for the next through knowledge transfer. This is one example of how construction can be different from a static process, which repeats on a regular cycle and can be revisited. When working at the value stream level we refer to the ‘future state’ (see Section 4.3.1). At the organisation level it is more usual to track performance on a balanced scorecard using RAG (red, amber, green) indicators.

4.2.4 What are our core value streams and where should we focus?

At the strategic workshop one of the main outputs will be a high level understanding of what are the value streams. This could be for the whole organisation, a programme or at the project level.

In manufacturing the value stream represents the end to end flow of materials and information through a sequence of activities to deliver a product or service to customers. This usually involves defining product or service families and tracking the way they flow. In the construction process the product is static and resources generally flow to the stages in the build process. On the face of it this fundamental difference may make value stream analysis inappropriate. However, it is a valuable approach that should still be applicable so, if you cannot identify a process flow, one way to segment the work is by looking at build stages in the construction process.

Table 4 shows the overview analysis of a house building process in the USA broken down into five build stages. Each stage has a start task and an end task. Analysis of the current build process shows:

- ▶ several sub tasks
- ▶ the average stage duration
- ▶ a measure of variation
- ▶ a comparison against schedule.

Here it is possible to prioritise the improvement potential by, for example, looking at the largest difference to schedule, which in this case is Stage 1. Improvement in this area would lead to a shortening of that build stage and in the overall build lead-time.

Table 4.2 Analysis of the values streams in a house building (from ASCE, 2009)

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
	Lay foundation	Build	Interior and siding	Prefinals	Finishing
Start task	Stake out	Framing	Verandahs, smart board and rear deck	Plumbing prefinal and water test	Tile flooring
End task	Drill and place piles	Roofing	Drywall taping	House clean and vacuum	House possession
Number of tasks	11	11	11	12	14
Actual duration average – days	73	31	54	42	26
Standard deviation	35	14	20	14	7
Coefficient of variation (%)	48	45	37	33	27
Scheduled duration (days)	20	25	22	18	16
Difference (actual – schedule)	53	6	32	24	10

4.3 LEVEL 2: VALUE STREAM

4.3.1 Value stream analysis or mapping

Value stream mapping (VSM) is the discipline of mapping the material and information flows that are required to co-ordinate the activities performed by suppliers, contractors and subcontractors to deliver assets to the client. Sometimes, it is defined as a collection of all actions (value-added and non-value added) that are required to bring a construction project from the concept stage to final commissioning. VSM helps to identify all types of waste in the value stream and target specific areas for improvement. It helps to see the big process picture and improve the whole flow. VSM is often a pencil-and-paper tool, which is created using a standard set of icons. VSM looks at the full end-to-end process. It helps map visually how information and materials flow through all of the activities that occur from the concept phase to the time the construction is complete.

Generally a VSM exercise contains both a current state map and one or more future state maps that represent progressive improvements. Although the map can appear complex, it is a way of combining a flow chart or process map with associated performance metrics.

Before drawing a current state map, a particular activity must be chosen as the target for improvement. The current state map represents the baseline condition of how the organisation, programme or project processes work. The map solves no problems nor delivers realised benefits, and its purpose is to point to problems in the organisation's work streams. The current state map is a snapshot capturing how things are currently being done. This is accomplished by following the selected activity from beginning to end, observing every process. The second aspect of the current state map is the information flow that shows how each process knows what, and how much, to build. Every process box will display both value-added time and non-value added time for the given step. The value-added time represents the sum of the processing times for each process, while non-value added time is the time that is taken, for example, in waiting and backlogs (see the box on TIMWOODS). After the completion of the map a timeline is drawn below, showing both the value added time and non-value added time for the complete process. An example current state VSM is shown in Figure 4.5.

The final step in VSM is to create a future state map (Figure 4.6), which is a picture of how the process can look after the wastes have been removed. The purpose of value stream mapping is to highlight target areas for improvement. The future state map is an implementation plan that indicates the Lean tools that are needed to eliminate waste in the value stream. Creating a future state map is done by answering a set of questions on issues related to efficiency, and on technical implementation related to the use of Lean tools. This map then becomes the basis for making the necessary changes to the process. A similar method is used for drawing the future state map as with the current state map.

TIMWOODS

Transport: moving people, products and information

Inventory: storing parts, pieces, documentation ahead of requirements

Motion: bending, turning, reaching, lifting

Waiting: for parts, information, instructions, equipment

Over production: making more than is immediately required

Over processing: tighter tolerances or higher grade materials than are necessary

Defects: rework, scrap, incorrect documentation

Skills: under-using capabilities, delegating tasks with inadequate training

By comparing the two diagrams, it can be seen that by elimination of non-value added activities and changing the flow of work the potential benefits were identified. The total duration for the process is reduced from 65.5 days to 38.5 days and the value add percentage increased from 17 per cent to 26 per cent.

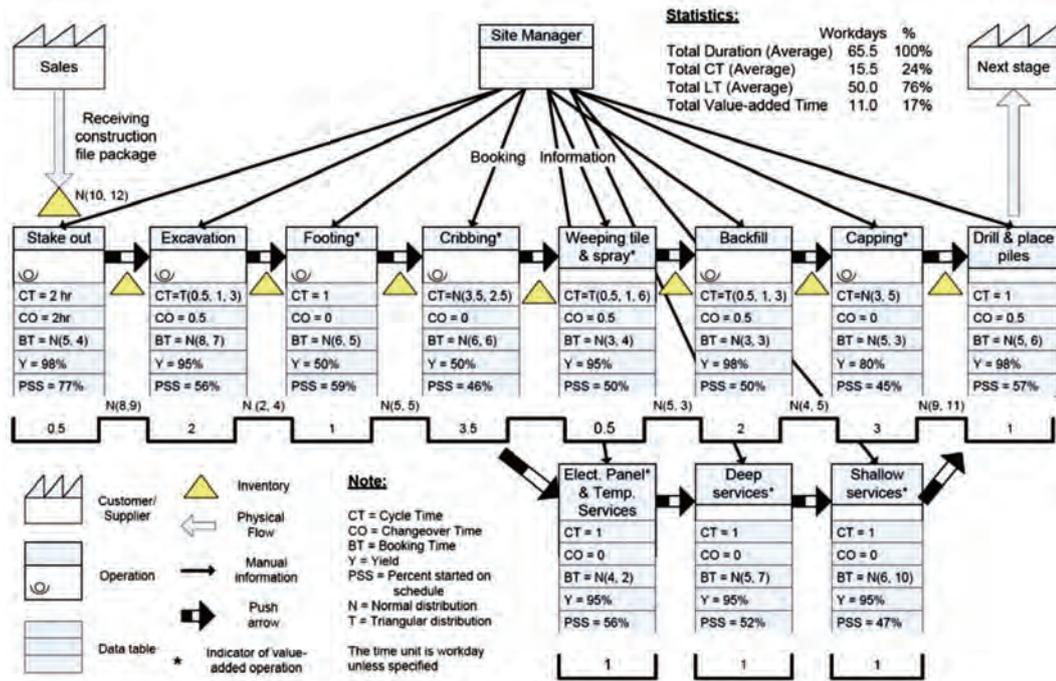


Figure 4.5 Current state map of house building process (from ASCE, 2009)

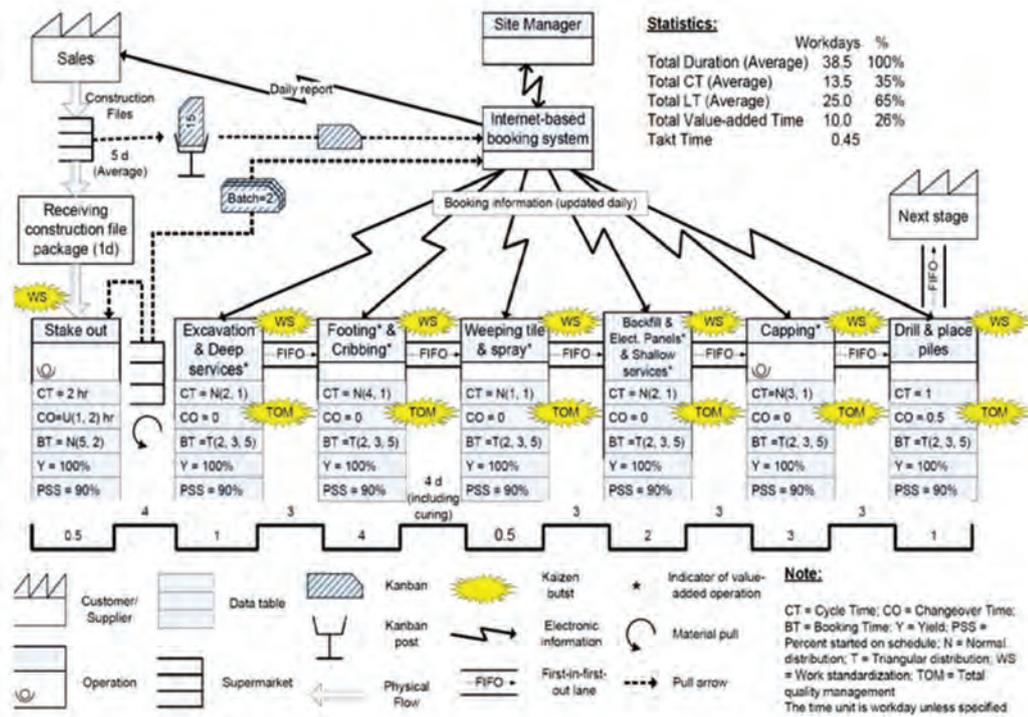


Figure 4.6 Future state map of house building process (from ASCE, 2009)

4.3.2 What is the Lean improvement potential?

When looking at an organisation, programme or project through the lens of a VSM it is possible to compare the current state and future state KPIs and derive the Lean improvement potential. The actual realised benefits will be delivered through the vehicle of Lean improvement intervention (see Section 4.4) but by periodically reassessing the value stream measures we can track the aggregated improvement effect at the value stream level. Our Lean improvement activity will be focused on the areas highlighted in the future state maps.

Typical value stream measurement concepts are shown in Table 4.3 and will cover Lean measures such as:

- ▶ not right first time (%)
- ▶ plan achievement (%)
- ▶ ratio of value add time to non-value added time (VA/NVA%)
- ▶ people productivity
- ▶ value of work in progress (WIP) – materials on site, work fronts open but not complete
- ▶ earned value
- ▶ space use.

By tracking a basket of measures (that ultimately affect cost, quality, time and other stakeholder ‘care abouts’) it is possible to produce a much richer picture of performance that has more relevance to people working at the operational level. These are some example measures that could be used.

Table 4.3 Key elements of VSM (adapted from ASCE, 2009)

Key vs. measurement concepts	Definition	Formula
Cycle time (CT)	The duration that a subtrade needs to complete its work package	CT = actual finish date – actual start date
Schedule duration (SD)	The time that a subtrade needs to deploy its crew to given job	SD = confirmed start date – booking date
Float (F)	The time that elapses between one task being complete to the next task being started. In a Lean system, float serves as a time buffer to shield downstream crews from upstream variability	F = actual start date of task i + 1 – actual finish date of task i
Percent started on schedule (PSS)	A measure of the proportion of start date promises made by subtrades that are delivered on time, in percentage	PSS = number of tasks started on schedule/total number of tasks
Changeover time	The time that a crew needs to switch from working at one location to another, including demobilisation and mobilisation	
Uptime	A measure of the proportion of available production time (APT) that is actually used on construction, in percentage	Uptime = (APT – bad weather days – changeover time)/APT
Work in process (WIP)	Number of uncompleted work packages in the value stream, including the work packages in construction and those standing idle waiting for the start of next activity	Inventory count or value
Yield	The percentage of activities that go through an operation correctly, without any rework	Count of failures and rework loops
Takt time	The rate at which a home builder must build the house to satisfy customer demand	Net time available (APT)/units demand
Resource use (labour)	The number of people or hours of input within the value stream per unit of output	Requires an appropriate definition of a standard unit of output suitable for the value stream in question
Resource use (materials)	The amount of materials used in the value stream per unit of output	

4.4 LEVEL 3: LEAN IMPROVEMENTS

4.4.1 Types of Lean intervention

Many organisations have set up tracking systems that require every Lean improvement to deliver a quantifiable benefit that they can link to the bottom line. This results in the following difficulties:

- ▶ quantifying every small improvement may not be realisable, eg saving 10 hours per week of resource input may not translate into 'bankable' benefits
- ▶ bureaucratic tracking systems may result in failure to claim all improvements
- ▶ there is often a time delay between making an improvement and seeing its financial effect on the organisation
- ▶ improvements in quality, time and other stakeholder 'care abouts', while being highly valued by stakeholders sometimes do not translate well into financial benefits.

At best, we can report the effect that improvement activity has had at the operational level and then reconcile the cumulative effect at the value stream level by reassessing the value stream metrics. This 'fuzzy' reconciliation will compare the sum of the improvement activities with the improvement in value stream measures to make sure that the direction and scale of change accord. Any major discrepancies would be investigated, eg if the individual improvements are claiming significant resource or time savings and when the value stream is reassessed the improvement is not evident.

The role of value stream manager in conjunction with the Lean facilitators and the Lean deployment office would seek to understand why differences occur and resolve the conflicting information. This activity should be seen as positive and not negative auditing. It is an opportunity to ensure that benefits are realised at the value stream level.

Consider the types of Lean improvement approach as each will deliver different benefits and will present different measurement issues:

Lean improvement projects

- ▶ these are interventions targeted at resolving known problems with unknown solutions by reducing waste, variation and errors. Often interventions are generated 'top down'
- ▶ the problem/process under review often crosses functional boundaries and can extend outside of the scheme, programme or organisation, up and down the supply chain
- ▶ a team based approach is deployed involving factholders and stakeholders connected with the process or problem under review. Part time input is often required over a period of weeks/months depending on the size of the problem and the size of the prize
- ▶ PDCA or DMAICT (Define, Measure, Analyse, Improve and Control) methodologies are used to manage the Lean project to a successful conclusion within a finite timescale. A Lean facilitator/black belt will often lead the improvement project
- ▶ a range of Lean tools can be used to suit the nature of the problem
- ▶ a significant quantifiable improvement can often be evaluated in terms of cost, quality and time

Kaizen Blitz/rapid improvement events/mini Leans

- ▶ interventions are generated 'top down' or 'bottom up'
- ▶ the problem/process under review often sits within a functional area or stage of construction or geographical site
- ▶ a team based approach is deployed involving 'fact-holders' and stakeholders connected with the process or problem under review. The problem is addressed during short but intense periods of full time input – known as a 'blitz'
- ▶ the Lean blitz will be managed to a successful conclusion within a finite timescale by an experienced Lean facilitator
- ▶ a range of simple Lean tools can be used to suit the nature of the problem
- ▶ quick wins – many small improvements can often be quickly generated that are difficult to quantify in terms of cost, quality and time

Daily Lean

- ▶ this phrase encompasses Lean activity that is undertaken as part of 'business as usual'
- ▶ issues are generated 'bottom up' by the work team as part of their daily routine
- ▶ the problems identified mainly sit within a functional area or stage of construction or geographical site
- ▶ a team based approach is deployed involving people directly involved in the problem at the operational level
- ▶ a range of simple Lean tools can be used by the operating work team to suit the nature of the problem often including collaborative planning and working
- ▶ ongoing visual management is established within the work team (see Figure 4.7)
- ▶ many solutions and countermeasures are generated and carried out over time making it difficult to attribute benefits to individual actions.

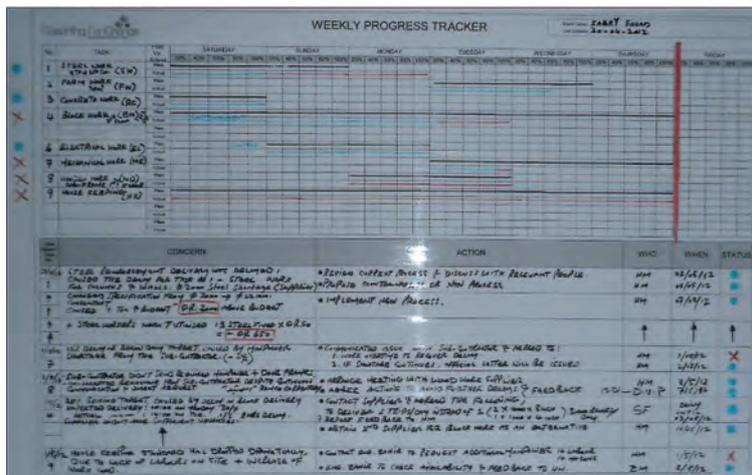


Figure 4.7
Example of visual management – a dynamic display used at work team level

No matter what type of improvement activity we undertake there is a generic cycle of establishing how much we can improve by:

- ▶ identifying the need
- ▶ estimating the size of improvement
- ▶ delivery of the improvement activity or enabler
- ▶ measuring and capturing the change
- ▶ reporting.

4.5 KEY PERFORMANCE INDICATORS AND BENEFIT RECONCILIATION

4.5.1 The two stage approach to reconciliation

Many organisations that are implementing Lean will have put in place a form of benefits capture at the individual improvement level and may be adding these up and claiming the overall benefit. However very few in the construction sector have succeeded in linking the individual interventions to the organisational performance indicators in the way outlined in this guide through a value stream approach.

The final element of the LBRM model relates to how we capture and reconcile Lean improvements with value stream performance and on to organisation, programme and project level benefits through the two stage approach.

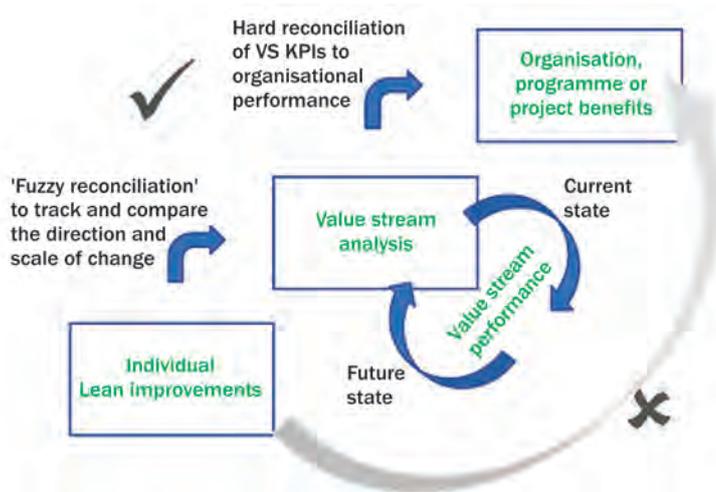


Figure 4.8
The two stage approach to reconciling and tracking benefits

The two stage approach helps ensure we:

- ▶ don't stifle bottom up improvement effort with bureaucratic benefit reporting
- ▶ don't make erroneous benefit claims by oversimplifying the complex benefit linkages from operational to organisational level
- ▶ do recognise that the value stream is the core process to deliver value to stakeholders
- ▶ do strive to align our operational value streams to deliver strategic objectives.

4.5.2 Value stream measurement

We need to establish a set of value stream KPIs that we can measure:

- ▶ when we create the original current state map – the baseline
- ▶ when we create the future state map
- ▶ on an ongoing basis when we reassess value stream performance.

An excellent way of tracking value stream performance over time is to set up a value stream box where an appropriate basket of measures is tracked at the baseline and the current position. A long-term goal is shown in Table 4.4, which provides a useful template that can be adapted to your organisation.

Table 4.4 The value stream box – example of tracking VSM

Measure		Week 1	Week 2	Week 3	Week 4	Goal
Operational	Meters per person	214	194	241	235	272
	Achievement of promise	97%	86%	90%	92%	98.50%
	First time pass	72%	82%	80%	85%	95%
	WIP days	25	35	30	35	15
	Ave cost per unit (eg cube)	£3.50	£4.00	£3.80	£3.00	£2.40
	Performance to plan	70%	65%	75%	80%	98%
Capacity	Value add	17%	20%	18%	23%	30%
	Non-value add	83%	80%	82%	77%	70%
	Available	13%	5%	3%	10%	25%
Financial £m	Revenue	1.650	1.610	1.660	1.700	2.000
	Material cost	0.330	0.322	0.332	0.340	0.400
	Sub-contract cost	0.578	0.564	0.581	0.595	0.700
	Plant and labour cost	0.116	0.113	0.116	0.119	0.140
	Prelims	0.202	0.197	0.203	0.208	0.245
	Inventory value	0.040	0.039	0.041	0.042	0.049
	Variations cost	0.071	0.069	0.071	0.073	0.086
	Variance to Tender	0.014	0.014	0.014	0.015	0.000

4.5.3 Measurement at different levels

What and how we measure and report will be different depending on the level in the organisation. Measures should be appropriate to the people using them whether they are senior managers, project managers or operating teams. Using a cascade approach to measurement will establish the necessary link and alignment up and down the organisation. Using a policy deployment approach can ensure this link and alignment.

Organisation level measures

Typically following a basket of strategic measures as explained in the balanced scorecard section below, most organisational measures are output measures (lagging) and based on aggregated performance across the whole business. Two common failings in establishing measures at the organisation level are:

- ▶ too slow to react to performance trends
- ▶ rely on aggregation of data.

For example, when driving your car how useful would it be to know the average tyre pressure across all four tyres? Compare this with having the knowledge that one tyre is low on pressure, which would be far more useful.

In Lean we know that the amount of waste in our organisation is a major factor in how we perform, yet how many organisations have a business level measure tracking their ‘value add’ and ‘non-value add’. Organisations that are output focused to the exclusion of important inputs are missing an opportunity to improve the way they manage.

So, careful consideration is needed about what we measure and how to make it useful without information overload.

A balanced scorecard approach

The scorecard allows an organisation to look at its performance from four important perspectives:

- ▶ how do customers and other key stakeholders see us (customer perspective)
- ▶ what must we excel at (internal perspective)
- ▶ can we continue to improve and create value (innovation and learning perspective)
- ▶ how do we look to financial shareholders (financial perspective).

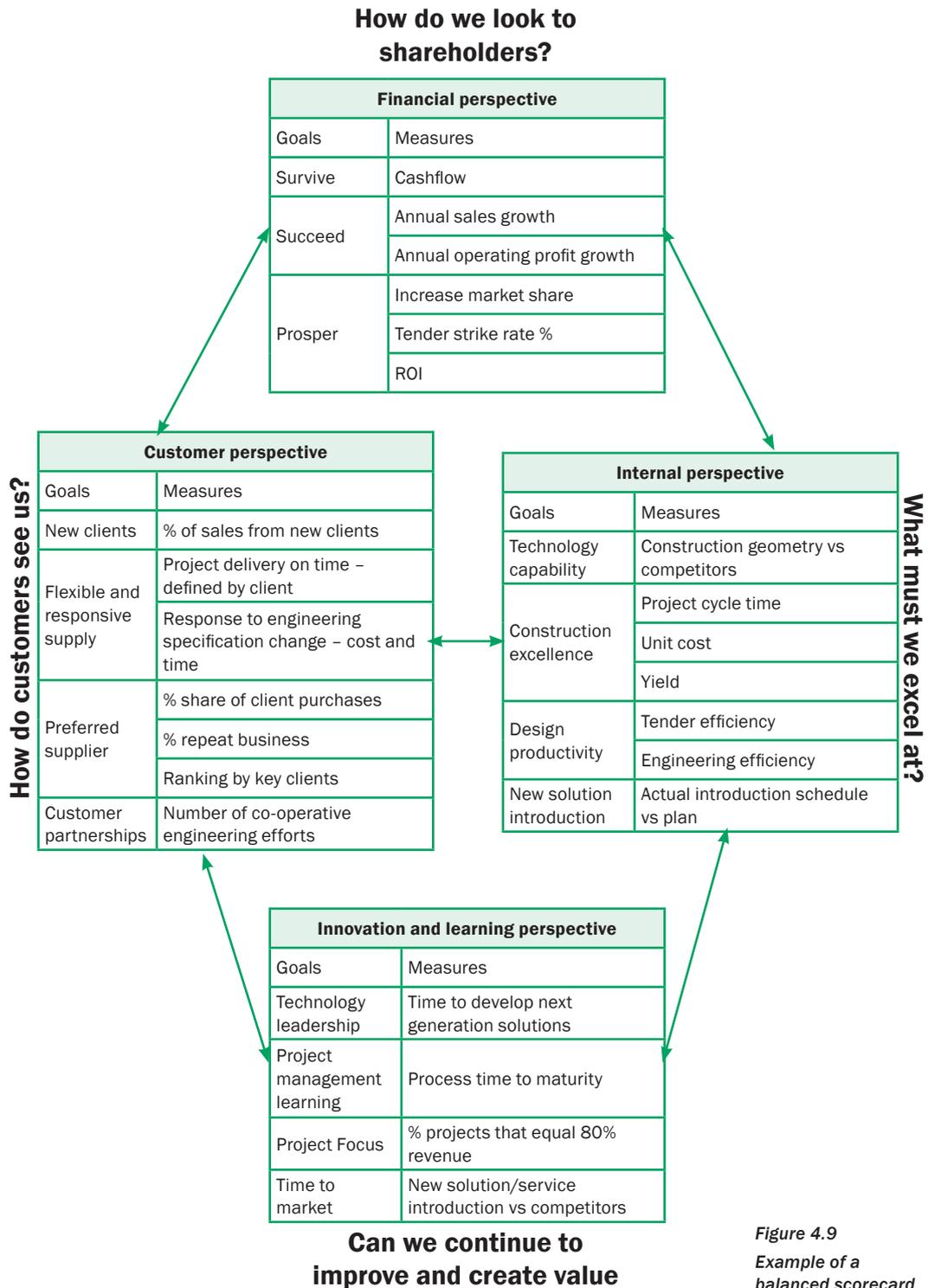


Figure 4.9
Example of a balanced scorecard

The balanced scorecard approach fits well with the PDCA Lean cycle at the business level and if adopted as a dynamic tool can assist to embed an improvement ethos into the organisation by:

- ▶ encouraging leaders to focus on a handful of measures that are most critical for achieving strategy
- ▶ bringing seemingly disparate elements together in a single report
- ▶ beginning the diagnostic process for prioritising most important improvement areas in the organisation
- ▶ eliminating information overload
- ▶ guarding against sub-optimisation.

Project/programme level measures

Many projects use a form of economic value added (EVA) to track performance but this typically only measures schedule, cost and scope. Here are seven elements of best practice project measurement that can be used to measure benefit realisation.

- 1 **Schedule:** how is the project performing against client/planned schedule? Do we have a clear idea of how good our planning process is and a contingency to manage risk?
- 2 **Scope:** is there a clear definition of project scope that everyone understands at the start? What level of variations (number and value) are we experiencing?
- 3 **Budget:** regardless of the nature of the contract, budget is always important. Failure to manage costs within the budget is not sustainable performance. Do we have accurate and timely cost data that we can rely on?
- 4 **Team satisfaction:** for the duration of a project, team members often work closely and under pressure. Building a transparent team ethos with a continuous improvement mind-set will be valued by the client.
- 5 **Client satisfaction:** helping your client to articulate exactly what they want to make sure they are happy with the end asset is fundamental to understanding customer value. Using the concept of 'critical to quality' (customer care abouts) is a useful starting point. Regular client communication and feedback helps stop issues escalating.
- 6 **Quality of work:** in construction the quality of one project often affects another, so it is important to define what you mean by the word and devise a way of measuring it continuously. Recommendations are like free advertising. If you deliver quality work your client will tell people about it, which generates future work.
- 7 **Supplier satisfaction:** project supply chains are a fundamental way of delivering projects – often through long-term partnering. Strong collaborative working on a project can make the difference between super-pleasing your client or just getting the job done. Do you squeeze suppliers when the going gets tough or do you regularly seek their feedback on your performance?

Work team level measures

These should be focused on a few, clear and easy to collect measures that the work team can easily relate to and effect. The key feature of work team measures is that they are reported regularly, ideally daily, so that work can be driven by them.

There are no rules about what should be measured and how it should be displayed but here is how to go about it:

- ▶ choose Key Performance Indicators (KPIs)
- ▶ agree some realistic targets
- ▶ measure actual results against targets
- ▶ cross (X) conditions are investigated and actions taken to convert X to green 

In the real example shown in Figure 4.10 you can see how the factors that are important to the team performance have been measured on a daily basis. The status of items requiring attention is clearly shown and the team can set about introducing countermeasures to turn these indicators green. So by addressing the input issues of steel delivery and workers on site we can directly affect the output measure of project weekly progress percentage.

Performance Management Board															Author: Hany Mahmoud	
RAWDAT AL-HIEL APARTMENTS (2B+G+7)															Location: 03-05-2012	
No.	Key Performance Indicators	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Week Plan	Week Actual	Status					
1	Number of Accident	0	0	0	0	0	0	0	0	0	0					
2	Number of Workers on site	77	77	76	77	77	74	74	462	450	X					
3	Number of NCR / SOR / SON (SI)	0	0	0	0	0	0	0	0	0	0					
4	Number of Open WIR	0	0	1	1	1	0	0	9	0	0					
5	Project Weekly Progress (%)	100	100	100	100	100	100	100	100%	74%	X					
6	Materials Delivery (Cement)	0	0	500	500	0	0	0	500	500	0					
7	Materials Delivery (Steel)	0	0	0	30	20	0	0	38	34	X					
8	Materials Delivery (Concrete)	110	110	0	0	24	24	0	134	134	0					
9	Materials Delivery (Block)	2000	2000	2000	2000	3000	0	0	10,000	10,000	0					
10	Budget Cost	0	0	0	0	0	0	0	?	?	?					
11	Additional Cost	0	0	0	0	0	0	500	0	500	X					
12	Number of Document (Submitted)	3	3	3	3	3	3	3	28	30	0					

Figure 4.10 Extract of a working daily performance management board

This type of visual display is part of the increased transparency and focus on continuous improvement that accompanies all Lean culture change at work team level. Each team will develop the measures and a way of displaying that suits their work style. Another real example of daily work team performance measurement is shown in Figure 4.11. This simple but effective method covers five key areas and serves to highlight issues quickly so that countermeasures can be developed.

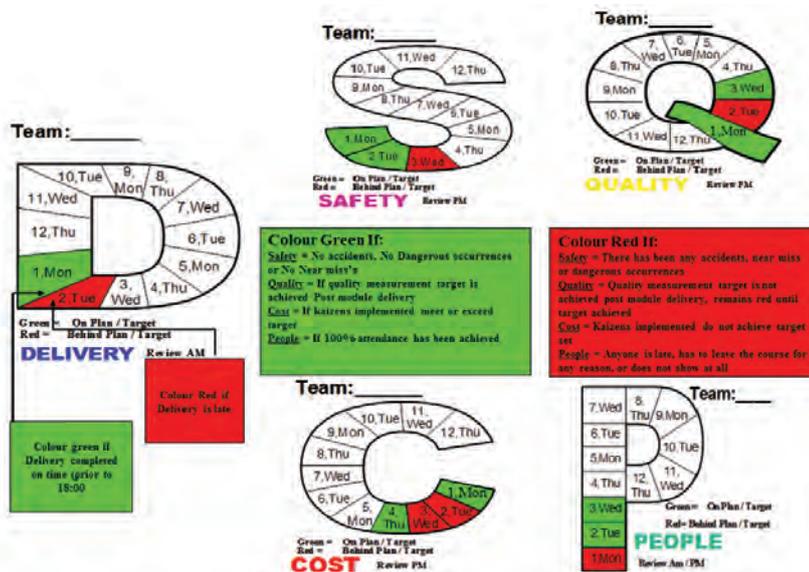


Figure 4.11 Example of a working daily performance management display

4.6 RECONCILING FROM TOP TO BOTTOM

4.6.1 'Fuzzy reconciliation' review

Here we are seeking to be 'roughly right' rather than 'precisely wrong'. By comparing the aggregated Lean improvement benefits by type (time, cost, quality, safety) to the higher level value stream performance we can validate the link in terms of direction and scale of improvement. For

example if the total of the individual improvement activities are claiming a 20 per cent reduction in time for the parts of the process they are addressing and this represents 50 per cent of throughput time we would expect to see a ~10 per cent improvement at the value stream level. If there is a significantly different change, or indeed a deterioration at value stream level, we would need to investigate.

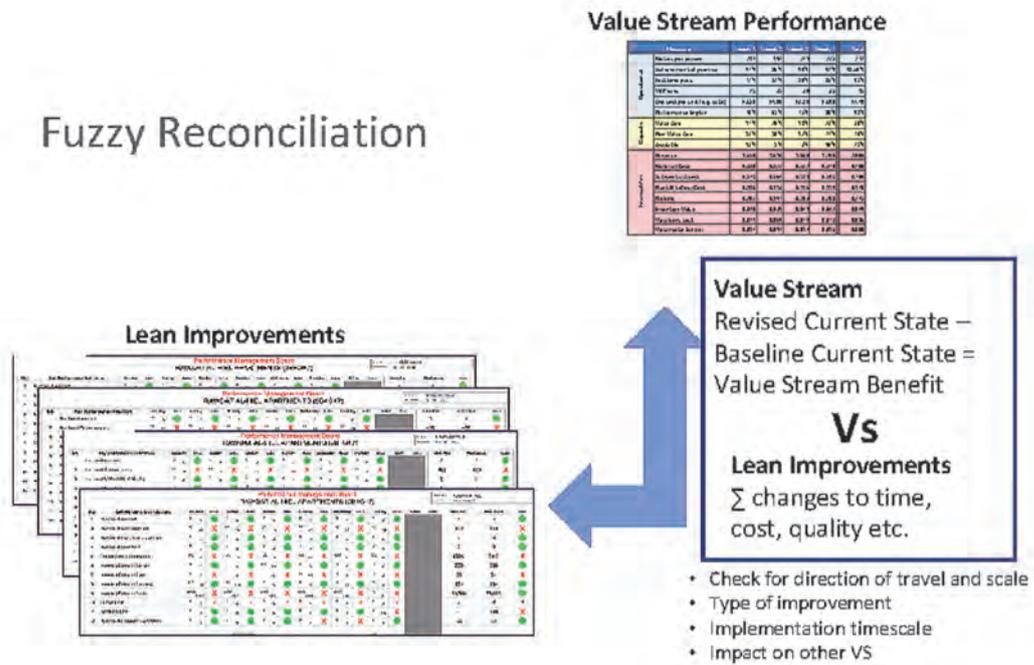


Figure 4.12 Fuzzy reconciliation – process for reconciling Lean improvements to value stream

4.6.2 'Hard reconciliation' review

This reconciliation compares the sum of the value stream performance benefits with the next level of reporting that could be project, programme or organisation. There should be a relatively close agreement in terms of scale and direction of change. Significant differences should be investigated.

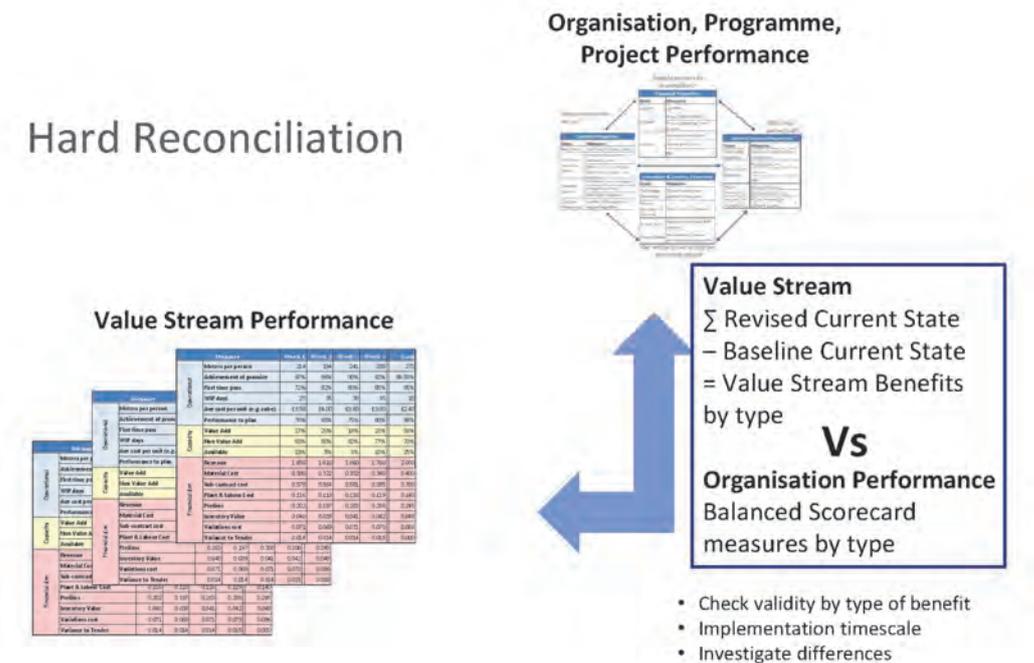


Figure 4.13 Hard reconciliation – process for reconciling value stream benefits to organisational performance

This matrix will facilitate the cascade, alignment and link of objectives and measures within the organisation and at programme and project level. Used in this way as part of a LBRM approach it will help ensure that improvement activity is aligned to strategic objectives and that benefit delivery is aligned to stakeholder requirements.

4.7.2 Benefits capture form template

A standardised format for capturing benefits at the ‘Lean improvement’ level such as the one shown here that is used by the Highways Agency provides a simple way of ensuring that improvement activity is recorded and evaluated.

<i>This information has no commercial or contractual status. It provides an estimate of the benefits and demonstrates value delivery of the lean project</i>		
This form should be used with reference to the benefits realisation guide, which is available to download from the HA Lean portal		
Section A – general details		
Unique ID ref:	Project name:	
Description:		
Lean practitioner:	Date:	Revision:
Lean project champion/sponsor:		Scheme/MAC/business:
Source of benefit (please tick):		
Reduction in material: Use of alternative material: Reduction in plant: Use of alternative plant: Reduction in labour: Reduction in land: Other benefit:	Reduction in transportation: Improvements to end user benefits: Reduction in activity duration: Reduction in number of defects: Reduction in number of reportable accidents:	
Section B – planned benefits (estimated at project start)		
Category	Insert text description	Estimated benefits
Cost:		
Time:		
Quality:		
Safety:		
Sustainability:		
Culture:		
Other benefit:		
End user benefits:		
Anticipated date for benefits to be realised:		

Section C – realised benefits			
Category	Insert text description		Realised benefits
Cost:			
Time:			
Quality:			
Safety:			
Sustainability:			
Culture:			
Other benefit:			
End user benefits:			
Lean practitioner: (name and signature)		The purpose of requesting this signature is to confirm that the claimed benefits are an accurate reflection of the outcomes from the Lean Improvement project based on the circumstances which prevailed at the time.	
Role			
Date:			
Lean project champion/sponsor (name and signature)		The purpose of requesting this signature is to confirm that the claimed benefits have been reviewed and are an accurate description of the efficiencies that were realised as a result of the Lean improvement project.	
Role			
Date:			

Benefit source	Calculations	Value
Total cost savings (£)		

4.7.3 Benefits realisation plan

This template has been used within the NHS to document the details of planned benefits deriving from a programme of activity and could be applied to a construction programme or scheme.

Project/programme name	
SRO (sponsor)	
Date benefits realisation plan created	
Date last updated	
Benefit	Brief description of the benefit
Owner	Person accountable for delivery
Target	The desired level of benefit, the unit of measure and the timing. If the benefit will gradually build up over a period of time, then a set of values should be provided
Method of measurement	The processes, tools, techniques and resources that will be required to measure achievement of the benefit
Responsibility for measurement	The person/role responsible for measuring achievement of the benefit. Unlikely to be the owner
Timing of measurement	May be a repeated event (eg every three months) or a one-off exercise, eg as part of a post-project review
Outcome	The outcome of the measurement. This will often be a summary of a more detailed report/statistical analysis. The need for further/different measurement might be identified

4.7.4 Business case

To justify significant investment of resources or cash it is usual to prepare a business case. In Lean the business case would usually be prepared at the organisation or programme level. Only in special circumstances where a Lean improvement intervention identified a need for significant further investment would a business case be prepared at the individual improvement level. An example of a business case template as recommended by BIS is shown here:

Business case template

The template and guidance notes are designed to help you construct or update your business case and decide the content and level of detail necessary. The template can be used when developing a new business case, updating it during the project or when assessing benefits realisation.

Business case template

Project/programme details			
Project/programme name			
Sponsor			
Project/programme manager			
Group		Objective no.	
Start date		Completion date	
Document details			
Document ref		Version no.	
Status	Approved/draft	Approved by	
Issued date		Last update date	
Business case			
Background	Background – describe the potential change, idea, and problem. Why it should be done now and what are the implications of not doing it.		
Strategy			
Scope	In this section you need to describe what the scope of the project is, its key objectives, deliverables and purpose. What business benefits will accrue? Are there any events, work or other projects that are either dependent on the outcome of this project or that the project will depend on.		
Objectives	Objectives – these are a summary of what you want the project to achieve when it has been completed. So, it may start “Completion of this project will result in...”. Your objectives should be SMART (Specific, Measurable, Achievable, Relevant and Timely). Avoid words like improve, optimise, clarify, help etc. These are vague words that mean you cannot measure your result. Objectives should be linked to strategy and actions using a framework such as policy deployment.		
Strategy	How does this project fit with strategy? What objective delivery plans are supported?		
Options	<p>In this section you need to describe and evaluate the different options and give reasons why the preferred option was chosen. There will often be a ‘do nothing’ option that can be used as a baseline against which to measure the costs and benefits of the other options.</p> <p>The criteria used to decide which is the best value option should be clearly stated as should be as objective and measurable as possible. Benefits should be valued as viewed by the stakeholder ‘care abouts’ and in financial terms wherever possible.</p> <p>Even if it is not possible to value all the benefits of a proposal, it is still important to consider valuing the differences between the options, including the ‘do nothing’ option.</p>		
Proposed solution	Identify the selected option and how you propose to implement the change. This should cover any feasibility issues not covered elsewhere (project management principles, next steps etc). The rest of the business case should be based on the identified solution (see <i>Benefits</i>).		

Benefits	<p>Summarise the main benefits, who is responsible for them and how will they be realised.</p> <p>Where possible try and give them a value so that they can be properly quantified. This will make it easier to measure whether they have been realised. The purpose of valuing benefits is to consider whether an option's benefits are worth its costs, and to allow alternative options to be systematically compared. Even if it is not feasible to value a benefit, it is still important to consider valuing the differences between the options. Where there are significant elements that cannot be valued in money terms, eg they are social rather than financial, these still need to be brought out in your assessment. You should take into account, if possible all the tangible and intangible benefits that you believe will accrue.</p> <p>You should also outline the benefits realisation plan, method of evaluation, timing of the benefits coming on stream, the scope of coverage and who will be responsible for delivery.</p> <p>Typical benefits of Lean projects:</p> <ul style="list-style-type: none"> ◆ cost savings ◆ avoided costs ◆ efficiency improvements ◆ time saved ◆ staff motivation with consequent reductions in sickness and improved recruitment and retention ◆ elimination of waste ◆ transfer of knowledge from consultants ◆ opportunities to disseminate the results across the wider organisation.
Risks	<p>In this section, you should identify the key risks that might impact on the project and the achievement of desired benefits. Remember to identify opportunities and how you will exploit them as well as things that may go wrong.</p>
Dependencies	<p>Dependencies – are there any events or work that are either dependent on the outcome of this project or that the project will depend on.</p>
Affordability	<p>What resource will be required, including staff resources and where will this resource come from? (eg will anything be stopped?) No project should go forward without adequate understanding of resourcing requirements. Those responsible for providing resources must indicate they have approved the undertaking (stakeholders).</p>
Analysis of costs and phasing of expenditure	<p>Project expenditure should be shown separately for each financial year of the project. Any costs that have already been incurred should be ignored, what matters are costs about which decisions can still be made.</p> <p>If it is helpful show separately a sheet identifying the costs vs. the benefits gained in each financial year. This can be discounted to show the 'present value' of the entire project.</p>
Critical success factors	<p>Use this section to outline the things that must go right to ensure the success of the project. For example, does the project need to deliver all its objectives and benefits to be successful?</p>
Procurement procedures (if applicable)	<p>Use this section to explain your proposed procurement route, eg is it under a framework agreement or via the OJEU process. If you are intending to use single tender action, the reasons for doing so should be fully explained here.</p>
Additional Information	<p>Other details you may need to include will depend on the size and type of project.</p>
<p>Sponsor signature.....</p>	

4.7.5 Risk register and mitigation actions

Identifying risks, understanding their impact and planning to manage them is an important part of any programme or project management activity, so it will be no surprise that we should also apply this thinking to the implementation of Lean and the realisation of benefits. There are several risk management techniques that could be deployed including full FMEA (failure modes and effects analysis). The following template employs this basic approach and would normally be completed by a team of people so as to increase the chance that all risks will be considered.

Risk register template

Project/programme name			
SRO (sponsor)			
Manager			
Group		Objective No.	
Start date		Completion date	

Date risk log opened	
No.	
Risk description	This should describe the risk in terms of a possible future event that will have some impact on the programme/project. Risks may be either threats to the achievement of project objectives, or opportunities that may be available to the project.
Date raised	
Originator	Who raised the risk
Impact	An analysis of what will be impacted upon if the risk happens. This may include impact on benefits, quality of outcome, costs, timescale, reputation, stakeholders and other projects/programmes. For each area of impact an indication should be given of the degree of impact (eg using high, moderate, low). Your assessment of the overall impact on the project should be shown in the next column.
Overall impact	H/M/L
Probability	H/M/L
Countermeasures	Describe the action(s) you propose to take to mitigate or eliminate the risk (reduce impact, reduce probability, transfer to third party, prevent). Also describe any contingency arrangements that will be invoked to deal with the risk should it occur. If the risk represents an opportunity then describe how you intend to ensure that the opportunity is fully exploited.
Status	Open/increasing/reducing/closed
Date	Review date
Owner	Person responsible for monitoring the risk and ensuring that actions are working as intended. The owner should report to the project manager on the status of the risk at regular intervals and at key events.

5

Typical challenges and top tips

As with any change management or business improvement programme, often the practice is not quite the same as the theory. Even well-planned programmes can encounter challenges or make assumptions regarding the information held by or the preparedness of an organisation. The following table provides an illustration of some of the challenges you may encounter, together with tips on how to overcome them.

Challenges	Tips
The Lean improvement teams are not identifying and delivering the benefits required	<ul style="list-style-type: none"> ◆ ensure that improvements are linked to your overall business drivers and objectives using a policy deployment framework and value stream mapping to identify opportunities ◆ use tried and tested Lean methodologies.
Value stream analysis has not been done within the organisation	<ul style="list-style-type: none"> ◆ you may end up with 'island' improvements that don't address the overall value stream and deliver benefits to the customer. VSM is not difficult but does require discipline and expertise to do it properly. Start with a simple area of the business first.
Lean is being done 'bottom up' only	<ul style="list-style-type: none"> ◆ aim to build awareness and ownership at a senior level in the business ◆ focus on delivering benefits that you can use to gain credibility and engage with opinion formers.
Stakeholder requirements have not been communicated	<ul style="list-style-type: none"> ◆ identify your key stakeholders using the stakeholder benefit matrix and establish what they care about using Lean tools to elicit what is critical to quality ◆ do not start improvement activity without a clear engagement and understanding of stakeholder requirements.
All partners on the project are not working together in a Lean way	<ul style="list-style-type: none"> ◆ make sure you build Lean awareness at the partnering meeting ◆ demonstrate the benefits to all of working in a Lean way ◆ involve people in collaborative planning and Lean projects.
We are not seeing the benefits in our organisation's overall performance	<ul style="list-style-type: none"> ◆ there may be other factors affecting performance outside of your Lean programme – try to identify these first. You may be making improvements but they are not being realised ◆ follow the three stage approach and reconcile through the value stream up to the organisation level.
If we make an improvement the client takes all the gain	<ul style="list-style-type: none"> ◆ ensure that you set the ground rules for benefit sharing at the start of the contract.
We don't know how to evaluate benefits	<ul style="list-style-type: none"> ◆ engage with stakeholders of the process under review and establish their 'care abouts' ◆ brainstorm with your team how your process delivers outputs that meet stakeholder requirements ◆ use tools like 'more of/less of analysis' ◆ engage with an experienced Lean practitioner who can help.
Conflicting client/business/department KPIs driving disbenefit or preventing improvement	<ul style="list-style-type: none"> ◆ establish KPIs for the value stream that you can all agree on ◆ work together in a collaborative way to create a win-win situation ◆ use 'enablers to change' framework to ensure all elements are in place.

Contractual arrangements (typically with subcontractors) preventing improvement/not promoting the requirement for change	<ul style="list-style-type: none"> ◆ make sure you choose like-minded organisations that are favourably disposed to Lean at your tender ◆ ensure that your contracts allow for improvement and the sharing of benefit (why would you want one that didn't?)
We need evidence of benefits to show our audit board as proof that we are delivering benefits.	<ul style="list-style-type: none"> ◆ make sure that you put in place a rigorous LBRM plan that not only captures the individual examples of improvement but is capable of tracking these through to value stream level and up to the organisation's KPIs.

6

Sustaining the benefit of Lean

The benefits of Lean improvements are rooted in the behaviours and ways of working right through the organisation. Lean is primarily a strategy, a culture, and a philosophy as well as a methodology and set of tools to deliver value and continuous improvement. So, sustaining Lean in an organisation requires commitment and change throughout the organisation and the wider supply chain family. Adopting Lean properly in any organisation requires commitment and effort until a natural tipping point is achieved. In the construction sector there can be added complications:

- ▶ short-term contractual relationships at project level mean that long-term goals are sometimes relegated
- ▶ partnering with different organisations, each with their own culture, objectives and ways of working
- ▶ Lean is seen differently by different parts of the industry
- ▶ construction teams and trades (clients, designers, contractors, PMs, QSs, subcontractors etc) are peripatetic, ie forming, dissolving and reforming around different schemes and projects in different geographical areas.

How can Lean benefits be sustained within an organisation and, more importantly, across the industry? The answer must lie with the commitment of two groups – clients and senior managers in the supply family. Clients are the main beneficiaries of embedding Lean as they will be able to consistently achieve more for less. So, their drive and investment as catalysts for change in the industry cannot be underplayed. It is no accident that most of the push for change has come from the large public sector client base. Senior managers in the supply family are undergoing conversion. Initial involvement because clients were requiring Lean is now giving way to the realisation that significant benefits can accrue within the supply organisations, not least the ability to deliver client value profitably and be able to bid successfully for future work. So, top down commitment is building but sustaining the benefits of Lean means sustaining Lean within the organisation. This requires a move from ‘doing Lean projects’ to address problem areas to ‘being Lean’. Adopting and embedding daily Lean into business as usual is now the challenge for many organisations.

This will require a fundamental review of how organisations are structured, the roles and responsibilities and how we align the organisation with value streams rather than the current functional situation. Is the industry ready to radically change the way it works by, for example, implementing a value stream organisation and Lean accounting? The construction sector has started on the journey of adopting Lean, much good work has been done and people are now learning to see how Lean can bring benefits. Lean is a different way of thinking and the journey will continue for years to come.

Conclusion

This guide has explored many of the considerations that affect how the industry can improve the way it delivers benefits. By elevating LBRM to a central plank of Lean rather than a 'bean counting' exercise after the event, we hope to help senior managers and Lean practitioners alike to plan and execute Lean in a better way, one that considers stakeholder value first and foremost. In tracking Lean benefits by a three level approach we aim to make it more transparent, more credible and engage people in thinking at the value stream level. In times when the industry is experiencing famine or feast there is always room for Lean to deliver significant benefits. Clients' priorities may change but one constant is the desire to keep doing things better. Isn't that the real benefit of Lean?

8

Examples and case studies

The following case studies illustrate the way Lean has been promoted within public sector and private sector projects.

8.1 CASE STUDY 1: HIGHWAYS AGENCY

8.1.1 Background

In 2009 the Highways Agency (HA) launched structural and operational changes to enable it to better deliver its organisational strategy, policy, purpose and objectives. The HA and the broader 'highways community' is a multi-stakeholder and cash constrained environment with very high levels of scrutiny and governance. The task was to create a strategy for the deployment of Lean throughout the Agency and its supply chain. This was a significant task in terms of both importance and scale as it set out how the HA will adopt Lean in one of the UK's major construction and infrastructure sectors.

This Lean strategy was in response to The Nichols Review, and commissioned by the Secretary of State for Transport, which highlighted the need for the HA to improve the delivery of value capability from schemes and that it needed more pace and focus in prioritising and delivering its improvement initiatives.

This Lean deployment strategy set clear objectives, both for the immediate future and the long-term as follows:

- ▶ delivery of increased value for money (VFM) to road users
- ▶ time compression to enable major schemes and other key HA processes to be delivered faster
- ▶ realisation of tangible and auditable benefits in terms of cost, quality and delivery
- ▶ delivery of capability across the highways community
- ▶ delivery of measurable efficiency improvements
- ▶ significant cultural shift towards continuous improvement
- ▶ development of an industry standard for Lean construction
- ▶ generation of a talent pipeline
- ▶ evolution of the HA to become a more agile and responsive organisation.

To meet these objectives, the HA took a strategic approach to drive organisational change covering the structure and role requirements, performance management and culture at organisation, team and individual capability levels. They also set out a comprehensive program to build organisational effectiveness through engaging with and building staff capability – both inside the HA and within the supply chain.

This approach consisted of four strategic phases:

- 1 Getting started:
 - ▶ program set-up and mobilisation through the creation of an HA Lean deployment office
 - ▶ senior management and key stakeholder engagement
 - ▶ diagnostic and scoping of areas to focus for improvement
 - ▶ raising awareness of Lean within the HA and its supply chain.
- 2 Building capability:
 - ▶ a program of development for leaders, teams and individuals to enable them to understand the concepts, language, tools and techniques of Lean and their role in the change
 - ▶ roles and responsibilities were developed for members of the deployment team and for the wider improvement community
 - ▶ a governance structure and process was created to manage the overall deployment showing how improvement teams would be formed and sponsored and what the key reporting lines would be together with coaching and mentoring roles
 - ▶ training and development was put in place covering a range of levels in the organisation.
- 3 Creating an improvement engine by generating a range of improvement activities to solve the problems encountered within the industry as follows:
 - ▶ bottom-up, work team based improvements involving creating daily work team meetings, visual management, collaborative planning and basic problem solving
 - ▶ Lean Sigma project interventions to resolve end to end process problems that often cross functional boundaries
 - ▶ blitz activities to resolve known problem areas by concerted efforts over a short timescale
 - ▶ top-down, strategic change issues that require dedicated central teams for major step change programs.
- 4 Program management through strong day to day deployment and regular governance review was established as a key part of the strategy:
 - ▶ a steering committee was created, made up of key stakeholders from each of the HA functions, the highways community and supply chain
 - ▶ key deliverables and benefits were identified and written into the strategy. As well as the obvious cultural, quality and time benefits, significant financial returns were planned into the strategy based on an initial cost-benefit analysis.

A key output of the strategy development was the creation of the HA's own Lean deployment model, see Figure 8.1.

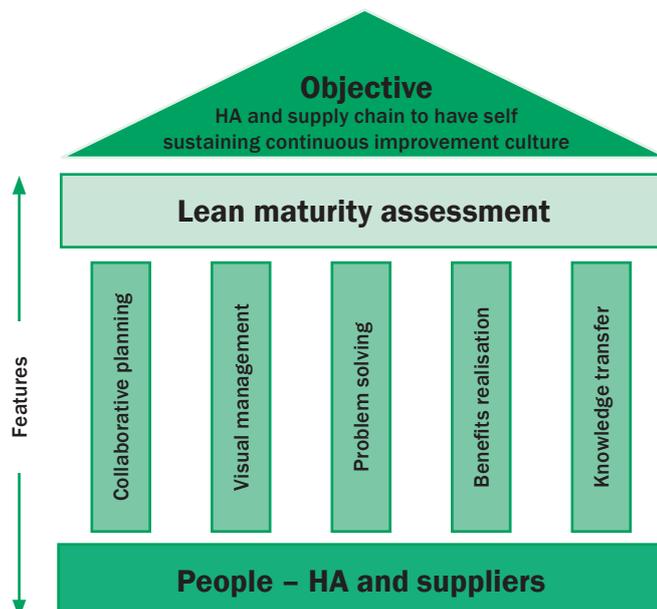


Figure 8.1
Lean deployment model
(courtesy Highways Agency)

This provides a framework to describe the means by which Lean would be deployed and the HA's objective, which is for the HA and supply chain to have a self-sustaining continuous improvement culture, would be met.

The model consists of several main elements:

- ▶ three core deployment methodologies: collaborative planning, visual management, and the use of Lean problem solving tools such as DMAICT
- ▶ a robust benefits realisation and tracking process
- ▶ the proactive transfer of knowledge, learning and best practice throughout the HA and its supply chain
- ▶ the use of a Lean maturity assessment tool (HALMAT) to assess the degree with which supply chain organisations adopt Lean working practices.

To date, over £64m in savings, signed-off by independent HA financial scrutiny, has been banked by the HA – excluding the valuation of benefits to road users through better journey time reliability. This has come from a combination of increased capacity, shorter project completion times, removal of waste and variation in processes. Overall ROI on individual projects has frequently exceeded 20:1.

The accompanying case study (Section 8.1.2) gives a specific illustration of how the benefits realisation process works in practice on a real HA sponsored improvement. This case study describes the integration of Lean improvement in the £175m major projects scheme to upgrade the A74 between Carlisle and Guards Mill undertaken by one of the HA's leading supply chain partners, Carillion.

8.1.2 M6 extension puts Lean on the map

The A74 between Carlisle and Guards Mill was the 'missing link' in the motorway network between London and Glasgow. Stretching 9 km, the road carries 42 000 vehicles a day. The scheme to upgrade the dual carriageway to motorway also included two new major structures crossing the River Esk and West Coast Main Line, demolition of the Mossband Viaduct and provision of a new all-purpose road.

The Lean improvement methodology was employed to help bring the project in on time and significantly under budget.

The approach

The programme focused on efficiency improvements in the approval, design and construction processes. As with all large and complex improvement programmes, the management team needed an approach that would:

- ▶ introduce and deploy a structured approach to process improvement
- ▶ enable analysis and measurement of performance
- ▶ deliver tangible benefits that improved programme delivery
- ▶ enabled the organisation to be self-sufficient in addressing future opportunities. The approach adopted was a pragmatic one, combining the need to equip people with the capability to undertake improvement projects in the short-term, with the desire to have expert support working alongside them to guide, mentor and deliver benefits in the long-term.

Getting started

An early step was to identify and train champions drawn from the core construction team to provide internal leadership for the programme. A steering group was established to oversee the programme and to ensure ongoing alignment with operational goals.

Managing for success

The next step was to identify the most appropriate business processes deployed within the scheme that would benefit from a Lean approach. These needed to be high profile, achievable and capable of reaping significant benefit to gain early credibility.

Key members of the organisation were assembled for a 'recognise workshop' with the purpose of identifying and prioritising business areas/processes that could most benefit from Lean intervention. Using the team's experience and knowledge, several potential Lean projects were then prioritised based on their ease of implementation and the size of the potential benefits they could deliver.

An ease–benefits matrix for the construction phase is shown in Figure 8.2:



Figure 8.2 Ease–benefits matrix for the construction phase

Potential projects placed in quadrant 1 (high benefits and easy solution) were selected for further scoping. Through stakeholder interviews and high level analysis of available data an estimate of the potential problem and associated benefits was established.

One of the projects identified concerned the earthworks process within the scheme. The following sections illustrate the approach taken to identify, ratify, realise and track benefits resulting from the Lean improvement exercise conducted on earthworks.

The identification of benefit type begins with the production of a project scoping document. The earthworks project scoping document is shown in Table 8.1.

Table 8.1 Lean project scoping document

Project title Earthworks logistics	Project Ref: H77 Date: 14/08/09 Draft/final: Final
Workstream/business unit: Groundworks	Project proposer: Shane Betts
Proposed champion: Steve Kennedy	Proposed expert support: Keith Bennett
Proposed Lean practitioner Iain Russell	Pilot Location (if relevant): Mossband Bridge
<p>Draft problem statement:</p> <p>The cost of earthworks for M6 is about £19.5m groundworks (excluding piling). Most of the processes involved are repetitive and rely heavily on the transport of material from one site to another.</p> <p>Historical evidence would suggest that inefficiencies exist within these processes leading to programme overruns and over budget spend.</p> <p>It is believed that efficiency improvements can be gained through process and cycle time analysis of the more repetitive processes associated with earthworks.</p> <p>Project objective:</p> <p>To improve earthworks processes by identifying the key issues that affect time, cost and quality.</p> <p>To develop solutions to ensure the required quality is delivered on time and within budget.</p>	

At this stage, the project team are identifying the benefit focus on time to complete earthworks activities, the cost of the process and the quality of the process outputs.

Using the knowledge gained from the scoping phase an ease–benefit matrix was completed and submitted to the steering group for approval to proceed. The use of an ease-benefit matrix (see Figure 8.3) acknowledges the absence of sufficient hard data to enable a quantifiable assessment of benefit potential. The matrix allows the opportunity to identify whether there is sufficient broad benefit potential, through a scoring mechanism to invest in this particular Lean improvement opportunity. The matrix also allows the assessment of the relative ease of undertaking the improvement activity.

The outputs of the completion of the justification matrix are two scores:

- ▶ benefit score (max 50)
- ▶ ease score (max 7).

These scores are then plotted on an ease–benefit decision matrix (see Figure 8.3), which effectively provides a framework for a ‘go’ or ‘no-go’ assessment.

Highways Agency Lean Processes Ease Benefit Process V 2.0 Lean improvement – process prioritisation scoring matrix

Process name: Earthworks Logistics

Proposed by: Shane Betts

Scored by: Keith Bennett

Please enter a score each row below from drop down lists				
Benefit criteria	Weighting	Impact <i>Low=1 Medium=3 High=5 Nil=0</i>		TOTAL
Customer satisfaction:	1.5	5		7.5
Efficiency:	2	5		10
Time saved:	2	5		10
Safety:	1.5	1		1.5
Compliance with the process:	1	1		1
Employee engagement:	1	3		3
Quality:	1	1		1
	N/A	N/A	Total	34

Ease criteria	Harder (0) Easier (1)
Number of stakeholders affected	1
Number of handoffs	1
Reliance on systems and technology	1
Political environment (vested interest from parties not to do it)	0
Legislative requirements	1
Availability of data	1
Champion support	1

If you are completing this form electronically, you can view the decision results on the *Decision chart* worksheet.

Ease-benefit decision matrix (from Lean process priority score)

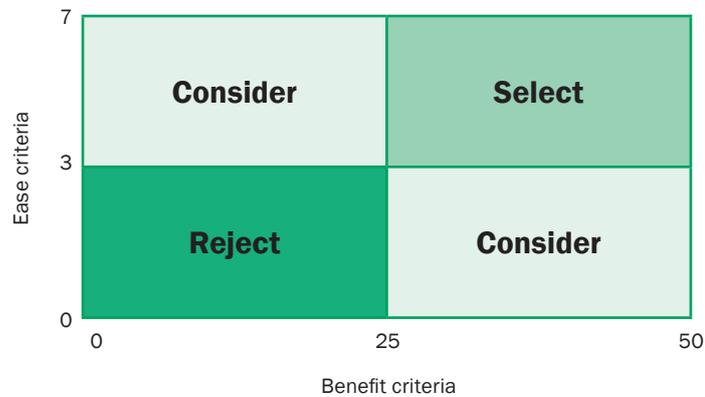


Figure 8.3 Ease-benefit decision matrix

In the case of the earthworks opportunity, there was a clear recommendation to proceed, ratified by the Lean programme steering committee.

Once approval from the steering group was gained an improvement project team was assembled.

The primary project objective was then agreed with the management team and focused on reducing plant and labour costs associated with the earthworks activity while also achieving the programmed completion date. The secondary project objective was to increase the daily volume of material removed and/or deposited.

The project was then entered into a project tracker and benefits realisation capture form (BRCF) so progress could be monitored, current issues captured and benefits tracked.

A section of the tracker and BRCF is shown in Figures 8.4 and 8.5.

Project ref	Project title	Project objective	Champion	Tech support	Project leader	Team members (company)
A1D2L01	Earthworks Efficiency	To transfer existing controls and knowledge and make further efficiency improvements where applicable	Chris Hayton	Keith Bennett	Deborah Bucknal (Carillion)	Paul Cross (JV) Alan Day (Blackwells) Becky Oldroyd (JV) Steve Hamill (Cemex)

Figure 8.4 Project tracker

THIS INFORMATION HAS NO COMMERCIAL OR CONTRACTUAL STATUS: IT PROVIDES AN ESTIMATE OF THE BENEFITS AND DEMONSTRATES VALUE DELIVERY OF THE LEAN PROJECT

This form should be used with reference to the Benefits Realisation Guide which is available to download from the HA Lean Portal.

Section A – General Details		
Unique ID Ref: B77	Project Name: Earthworks Logistics	
Description: Improve the efficiency of Earthworks Operations		
Lean Practitioner: Jane Russell	Date: 15/03/09	Revision: 0
Lean Project Champion/Sponsor: Steve Kennelly	Scheme/Unit/Business: 145-17000 Projects	
Source of Expected Benefits (add):		
Reduction in material: Use of alternative material: Reduction in plant: Use of alternative plant: Reduction in labour: Reduction in land:	Reduction in transportation: Improvements to end user benefits Reduction in activity duration: Reduction in number of defects: Reduction in number of reportable accidents Reduction in CO2 emissions	
Section B – Planned Benefits (estimated at project start)		
Category	Insert Text Description	Estimated Benefits
Cost	Increased efficiency resulting in reduction of plant and labour costs per unit of processed material	£900k
Time	Increased output leading to a reduction in the duration of the task and the associated costs	£400k
Quality		
Safety		
Sustainability	Reduction in CO2 emissions less vehicle movements and idling time	
Culture		
Other Benefit	More predictable outputs resulting in more consistent planning and the ability to achieve plan	

Figure 8.5 Benefits realisation capture form (BRCF)

The earthworks Lean improvement project followed the six phases of the DMAICT approach. Progress was reviewed by the project leader and the project champion at key stages of each phase throughout the life of the project.

A brief description of each of the phases is outlined as follows:

Define: defining and agreeing the project objectives and boundaries.

Measure: assessing current performance which improvements can be measured against.

Analyse: identification of process waste and verification of the causes of poor performance.

Improve: generation and implementation of solutions.

Control: development of measures and controls for sustaining the improvement.

Transfer: capture and transfer of learning from the Lean improvement project.

Initial assessment

Current performance was measured at two different work locations. The conclusions drawn from this activity were:

- ▶ the average cost to remove, deposit and fill one cubic metre of material was more than twice the budgeted rate
- ▶ baseline performance suggested that 60 per cent of earthworks activity would exceed budget and planned duration.

The graphical output from the baseline exercise is shown in Figure 8.6.

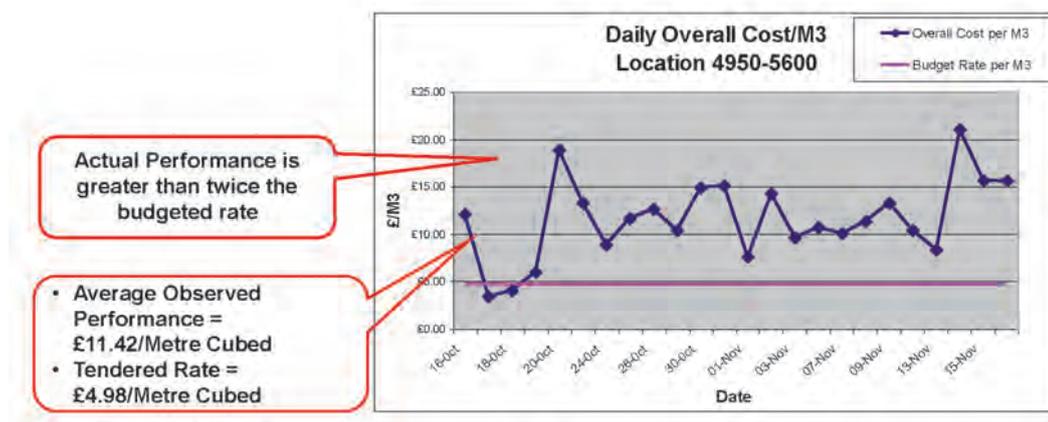


Figure 8.6 Daily overall cost, baseline exercise

After establishing current performance the team then developed a tracking and monitoring sheet to capture the following:

- ▶ daily output
- ▶ plant costs
- ▶ labour costs
- ▶ type of activity.

Once the team had gained an understanding of the current process and collected sample data the team set out to identify the root causes of poor performance in terms of process waste and defects.

Process improvements

Based on the conclusions drawn from the 'analyse phase' the team developed solutions to increase the efficiency of the remaining earthworks activities.

Process improvements were carried out and performance captured in the monitoring and tracking worksheets. Graphical analysis was then performed and the quantification of benefits estimated based on the sustained improvement as shown in Figure 8.7

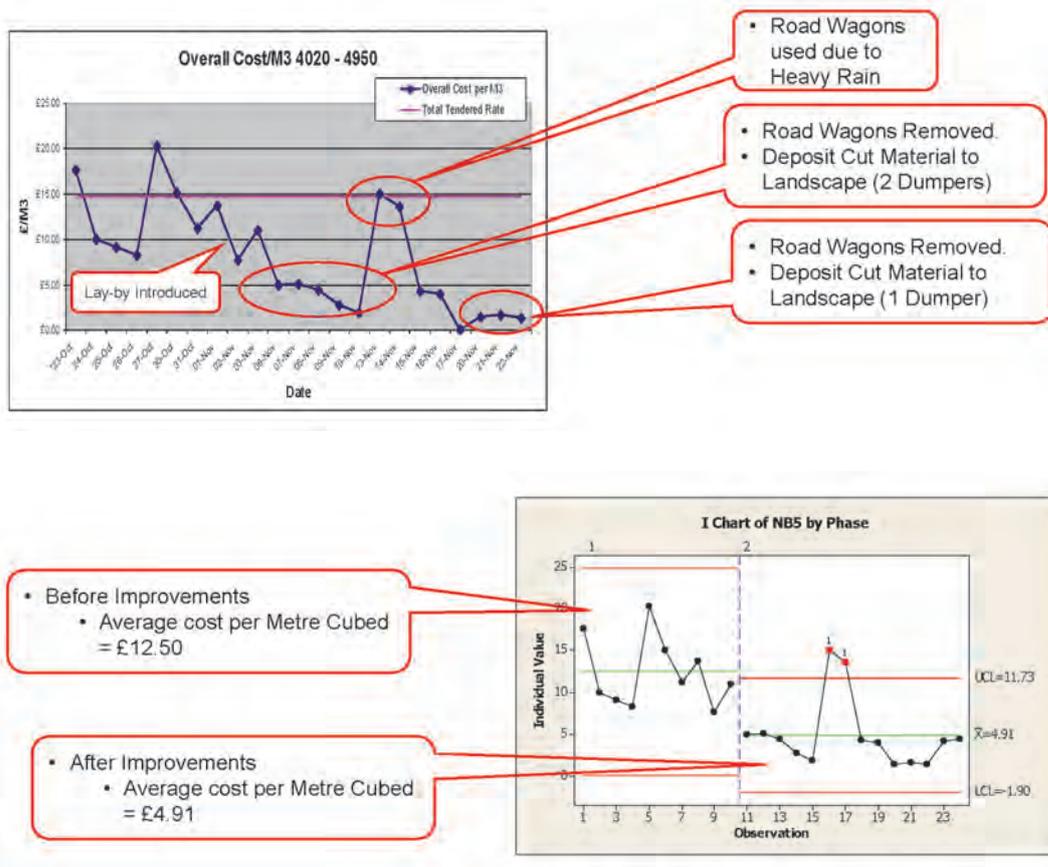


Figure 8.7 Improvement from one of the trial sites

Using the data collected the projected savings were calculated based on the quantity of material left to be processed.

Calculations are shown as follows.

If the improvements were to be applied to the remaining earthworks processes the projected savings are in excess of £1m for the scheme alone.

These savings were entered into the project tracker.

	Before improvements	After improvements	Total volume affected	Projected cost before imps	Estimated cost after imps	Estimated saving
Fill	£2.12	£0.99	398 563	£844 954	£394 577	£450 376
Cut	£4.71	£3.46	152 993	£720 597	£529 356	£191 241
Combined	£11.68	£3.97	52 972	£615 209	£209 108	£406 101
				£2 180 760	£1 133 041	£1 047 719

Control phase

Controls and checks were then developed for the process owners to implement to ensure sustainability over the scheme duration.

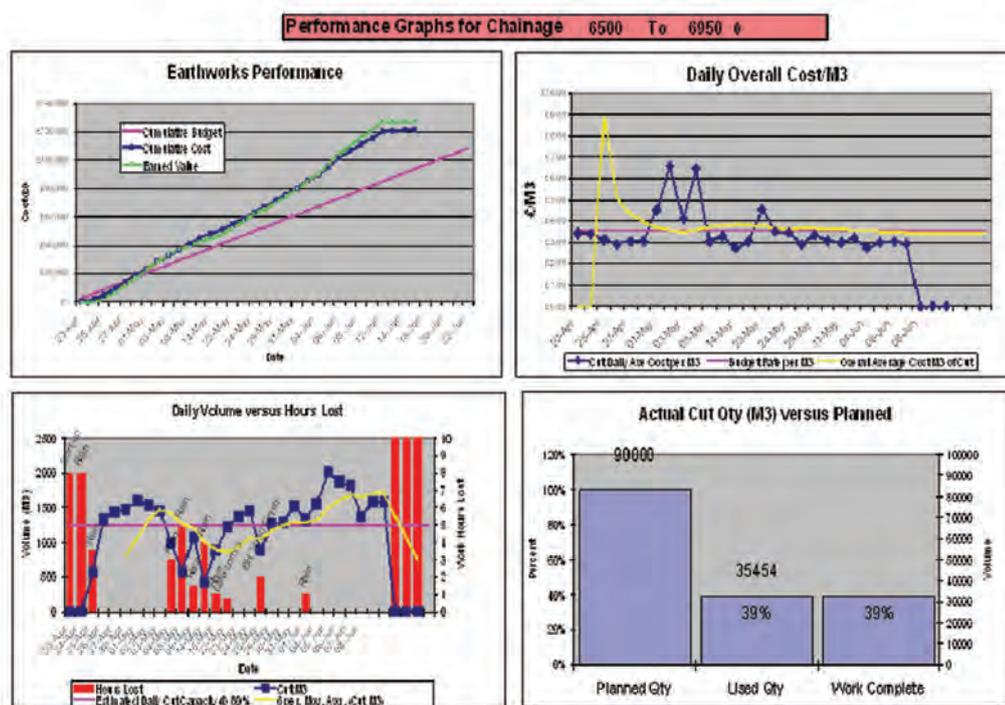


Figure 8.8 Graphical output from one of the work sections

Once the activity was completed the project team used the graphical output from the tracking and monitoring spreadsheets to calculate the realised saving over the scheme life (Figure 8.8).

The realised benefits were then added to the benefits realisation capture form and a meeting arranged with the scheme project finance director to gain sign-off of the realised benefits before reporting these to the main stakeholders to obtain project closure.

8.2 CASE STUDY 2: BAA/CBI HEATHROW TERMINAL 5 SATELLITE C



Figure 8.9 Heathrow Terminal 5

Background

BAA took the opportunity with Terminal 5 Satellite C to take a fundamental look at the way it undertook a major capital programme. One of the approaches adopted was the application of Lean to the design and construction project. BAA took the role as the intelligent client, with a vision of what they wanted to achieve from Lean and crucially, how they would engage with the construction and manufacturing supply chain. Key outcomes sought were:

- ▶ the application of Lean to the whole supply chain to gain benefits of shorter programme duration
- ▶ bringing the facility on stream earlier contributing revenues ahead of timeline
- ▶ minimum disruption to Heathrow operations during the construction
- ▶ fit-out and operational readiness phases and better maintainability of the facility throughout its life cycle.

Cost reductions were also a factor, albeit considered alongside the other benefits.

How Lean was applied

The initial brief issued by BAA contained a requirement for Design for Manufacturing, Assembly and Commissioning (DfMAC) and this was made part of the contract. The principal contractor selected, Carillion, prepared a DfMAC strategy that outlined how they would use Lean techniques to deliver a solution that not only met the technical and design performance standards, but also identified and showed how the Lean benefits would be realised. The key features of the DfMAC strategy were:

- ▶ developed against the 14 tools in the BAA brief
- ▶ identified the optimum balance of offsite and onsite work, which would achieve the objectives
- ▶ developed the most effective methods for onsite work to minimise disruption and reduce timescales on the ground
- ▶ collaboration of disparate suppliers throughout the Carillion supply chain at the crucial design stage, ie when costs are determined
- ▶ developed innovative solutions for modular offsite work, to minimise onsite requirements
- ▶ regular communication/consultations with the BAA to confirm the direction and progress

Examples of the type of Lean improvements driven into the programme were:

- ▶ comprehensive review of steel work tolerances to allow manufactured parts to be fastened to pre drilled anchor points, eliminating costly and time consuming 'fitting on site' and the attendant rework
- ▶ offsite production of toilets modules that required significantly less trades to install on site and the modular design provided improved access for service/maintenance through life
- ▶ modular and flatpack design for nodes, with factory predictability, which enables minimal stand closure and disruption to the airfield
- ▶ fixed links that were designed with early definition of the interfaces, manufactured to exacting tolerances (+/- 4 mm) and installed with improved right first time performance.

Benefits realisation

This case study demonstrates that the benefits cited are very 'rounded', with through life benefits seen as important as one-off cost benefits. In some cases, the capital cost of materials/equipment was more expensive than the traditional approach but the overall benefits case through life was positive. The main rolled up financial benefits seen from the Lean approach were as follows:

- ▶ programme delivered three months early, allowing earlier revenue generation from the facility, and a benefit of £2.5m in opex
- ▶ £15m to £24m of capex saved through improved ways of working, better design and earlier finish

Some individual benefits from specific projects were:

- ▶ **façade:** 15 week reduction in lead time and £3m reduction in capex including a 50 per cent reduction in design cost
- ▶ **toilets:** 30 per cent reduction in lead time, improved maintainability and 11 per cent reduction in capex
- ▶ **nodes:** 100 week reduction in lead time (85 per cent), £2.5m benefit to opex and 11 per cent reduction in capex
- ▶ **services:** 30 per cent to 70 per cent reduction in lead time and £0.5m capex reduction
- ▶ **fixed link:** several weeks reduction in lead time, improved maintainability and capex avoidance.

8.3 CASE STUDY 3: MINISTRY OF JUSTICE

The MOJ has a large eclectic estate. Their estates project delivery unit has in excess of 100 live projects per annum. They have a small in-house ‘intelligent client’ function, who manage delivery through their out sourced supply chain. In January 2009 the MOJ embarked on a programme of improvement to systemise their approach to project and programme management. Their strategy was to develop and implement a Lean delivery tool set, embed its use within its own organisation and that of its supply chain. This led to the gathering of a rich stream of data that was used to inform the second stage approach, which was cultural change. The MOJ used its own staff with a ‘light touch’ consultant support to develop their system. They also involved their supply chains early on. This approach built ownership and knowledge right from the start. The MOJ’s aims are to:

- ▶ procure projects efficiently, with an increasing percentage of the budget being spent on the construction of the asset, rather than its procurement and delivery management
- ▶ construct the asset at a diminishing cost/m²
- ▶ achieve high levels of delivery predictability, accurate programming and expenditure forecasting
- ▶ deliver projects, safely and right first time.

In pursuing these goals, the MOJ insisted on a collaborative approach to delivery. Buffered project programming is used, with programmes being developed to a depth that helps an accurate understanding of project progress. Standard reporting templates are used to capture weekly performance data. The data is captured in a form that easily assisted effective problem solving. The MOJ’s second phase Lean implementation is to affect a cultural shift in the way their supply chains deliver the projects and engage with their subcontractors. The MOJ are training the supply chains to:

- ▶ behave collaboratively
- ▶ use the data to improve delivery in a focused and improved way
- ▶ build a knowledge and growing expertise in problem solving techniques, mini Lean events, Kaizen, daily Lean etc

These, supported by other MOJ corporate initiatives including the introduction of Building Information Modelling (BIM), new BIM standard libraries, improved project and post occupancy learning integration, have served to develop an holistic approach to the MOJ’s delivery improvement programming, effecting its own staff and processes along with its supply chains. A real end to end improvement process that has reaped improvements with:

- ▶ 17 per cent reduction in non asset construction expenditure
- ▶ on track to achieve 20 per cent reduction in cost/m²
- ▶ 70 per cent on time project completion rate
- ▶ 95 per cent completion of projects to budget
- ▶ circa £154m project cost savings over around a four year period.

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