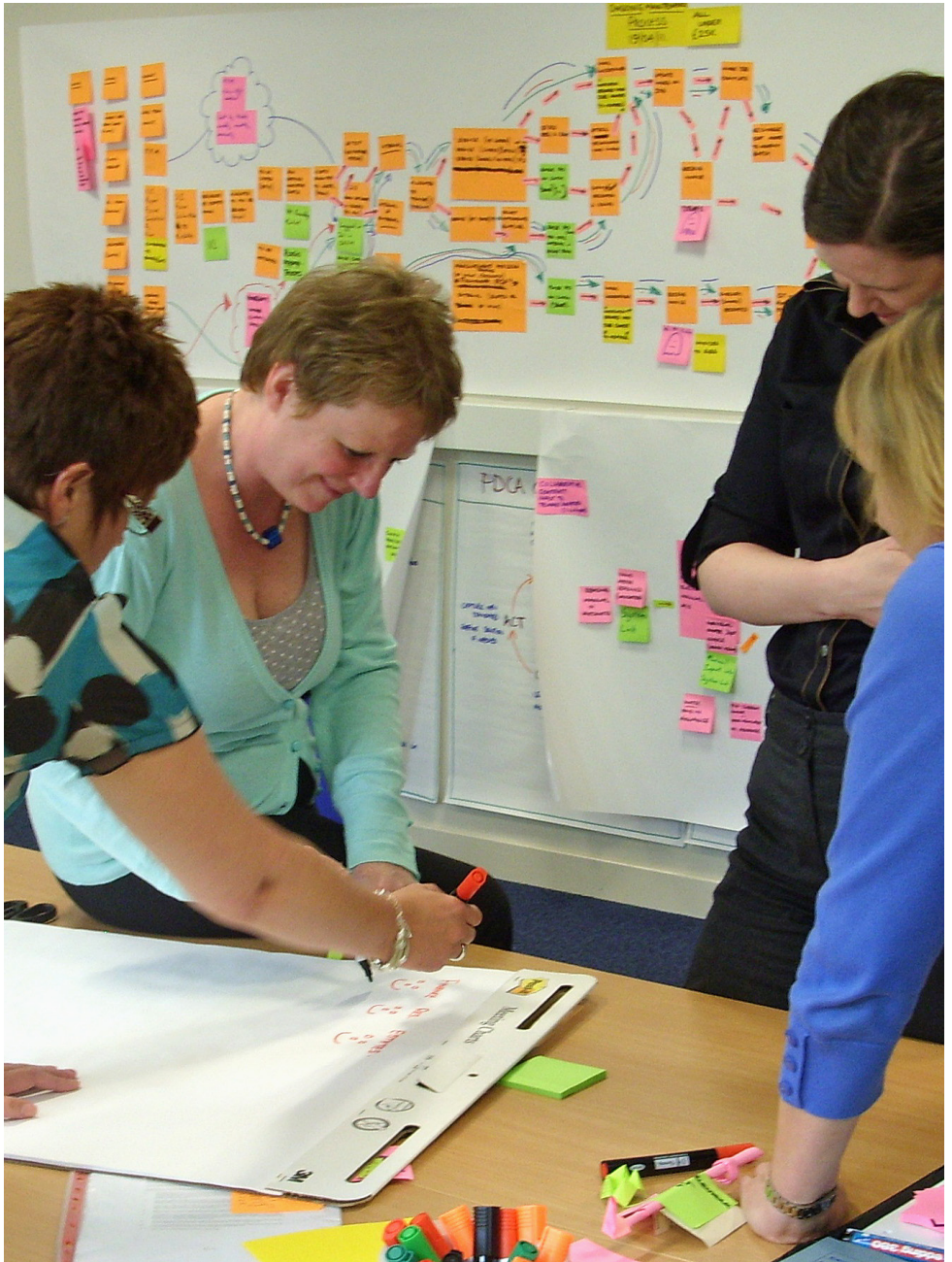




University of St Andrews | FOUNDED 1413

Becoming Lean Pocket Guide





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1. Introduction

Since 1773 The University of St Andrews has used the Greek motto “AIEN APIΣTEYEIN”, which in English means, “Ever to be the best”.

The University’s long cherished ambition of driving towards perfection is also the goal of Lean. With financial, political, and environmental pressures increasing, focussing on our purpose and ensuring we strive “Ever to be the best” is more vital than ever before.



As our Principal, Louise Richardson, said in her inauguration address: “The past, rich, resonant and inspiring as it is, is just the platform on which we have to build the future. We must forge a future worthy of our past in which our successors can look back with pride.”

With this in mind, this guide aims to:

- Give you an overview of what Lean is as a concept
- Explain how Lean relates to Higher Education
- Detail how Lean is being applied in the University
- Give you some ideas as to how you might approach implementing Lean in your area

Lean Team

2. Understanding Lean

The Lean Team challenges the University of St Andrews to become the best that it can be. We are dedicated to eliminating non value adding activity so that the University can focus its energies on Teaching and Research. As the University’s change management consultancy, we lead staff in creating a culture of continuous improvement and respect for people.

The Context of Lean

Lean thinking began with the Toyota Production System which transformed car manufacturing in post-war Japan. Lean is now being used in the public and private sectors around the world to improve:

- Customer service
- Quality
- Efficiency
- Staff morale
- Internal communication and cooperation

Lean concepts are simple but can be challenging to implement. The principles behind Lean are common sense and can be adapted to benefit a range of manufacturing and service environments. For example, in recent years both Tesco and the NHS have successfully used Lean to improve the quality of their service. The benefits they have seen include:

- Reduced waiting times
- Lower costs
- Improved customer experience

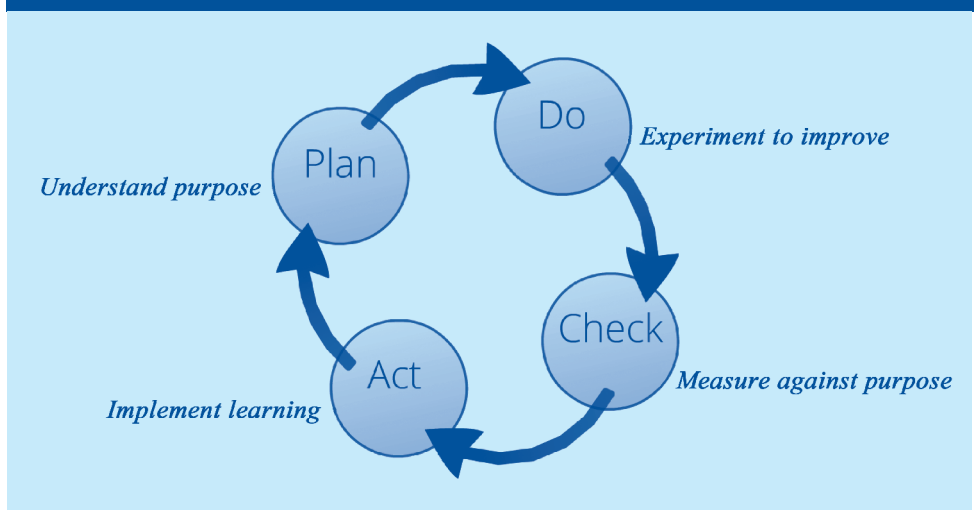
The University is also experiencing these and other benefits as a result of using Lean.

2 Principles of Lean

Lean is a philosophy of work. It is an approach that has grown from the application of two principles:

- **Continuous improvement**
 - Continuously looking at your work processes and striving to improve them (by, for example, using the Plan-Do-Check-Act improvement cycle [Figure 1]).
- **Respect for people**
 - Remembering that our staff are our greatest asset. It is, after all, the staff of an organisation who, in our experience, know what works well and what needs to be improved, and who have the ability to suggest and make the necessary improvements.

Figure 1: PDCA Improvement Cycle



5 Pillars of Lean

Where Lean has been implemented successfully, five key elements or pillars have emerged (Womack & Jones):

Five Pillars of Lean

- 1 Do what's needed (Pull)
- 2 Think of the process (The Value Stream)
- 3 Make it flow (Flow)
- 4 Add value & remove waste (Value)
- 5 Aim for perfection (Perfection)

Do what's needed

"Do what's needed" (the principle of Pull) means ensuring that the right thing is being delivered, at the right time, at the right quality, and in the right amount, to meet your customer's needs.

For example, we can apply this to the production of examination papers.

- Right thing: the exam questions should match the course objectives.
- Right time: the papers should be produced in no more time than is necessary for careful checking, external approval, etc.
- Right quality: no errors or unintended ambiguities.
- Right amount: should a larger number of exam papers be produced than required, this results in wasted paper and expense.

Doing what's needed by responding directly to customer needs is powerful. In HE this can be demonstrated by enabling students to access course materials at a time and a place to suit them. If we look at the example of the Open University, or the growth of our own Evening Degree Programme (MA General), this is clearly a strategy which is successful in generating student satisfaction.

Think of the process

Any task you do can be thought of as a series of linked steps i.e. a process. For example, during its lifecycle a book held in the University Library travels through a number of processes: request, acquisition, cataloguing, book processing, shelving, use, collection management and potentially repair, long term storage, or disposal. Linking together steps as a process can reveal opportunities to make improvements, as no step exists in isolation.

Most processes evolve over time in response to any number of events, and this evolution, ad hoc by its nature, often increases the number of steps in a process and hence process complexity. In turn, process complexity provides increased opportunities for error. In many cases, however, the reason for the development of the evolved step in the first place, the root cause, now no longer exists.

For example, as UCAS data is now received electronically into the University's Student Records System, there is no longer the requirement for paper files to be received, filed and amended; the golden copy is always online.

Make it flow

When a process flows, work happens steadily. When a process does not flow, work builds up, creating peaks and troughs of activity. These peaks and troughs can lead to delays for the customer and pressure points. Levelling out peaks and troughs gives customers what they need more quickly, while making better use of time.

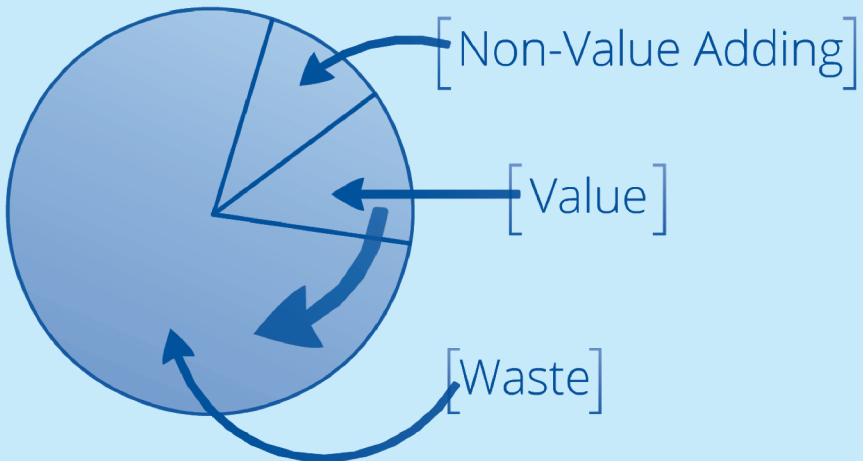
For example, when the Undergraduate teaching period ended, there used to be a significant increase in the number of Library items returned. When the Library moved to a shorter, four-week, loan period there was increased turnaround of items. This increased flow makes it easier to plan for staffing while making items more accessible to students and staff.

Add value (remove waste)

When work is adding value, that work meets customer need. All work that does not add value is waste, although some of it may be necessary.

The elimination of waste offers enormous advantages to staff running a process, and ultimately to the customer. As waste is removed, the organisation has more capacity to deliver value.

Figure 2: Elimination of Waste



There are some steps in a process which neither add value nor are they strictly waste. These 'non-value adding but necessary' steps are impossible to avoid and are often driven by compliance with the law or local geography. It may be, however, that some actions can be taken to mitigate the effects of these conditions, for example operating an internal mail delivery service may negate geographical constraints.

For a discussion of what constitutes waste, please see page 19, 'The 8 Wastes'

Aim for perfection

We can always do better. Aiming for perfection means continually striving to improve. One way to do so is continuously to apply the Plan-Do-Check-Act improvement cycle.

Each time an activity is undertaken it can be further refined. An example is the Matriculation process, which has moved from a lengthy face to face process to a comparatively swift online process. Matriculation continues to be refined in order to respond to changes in the external environment such as new student visa requirements and new technology.



3. Lean in the University of St Andrews

Why Lean?

Without changing the way we do our work, even without considering the additional pressures of the current financial climate, we will be unable to maintain our success, and our competition is always raising the bar.

The University is not alone in using Lean or other similar process improvement approaches. Many universities across the UK and the world are now implementing large-scale change programmes aimed at reviewing their processes and developing a culture of continuous improvement.

The goals

Lean has three main goals:

- Culture Change – to create a drive and appetite for continuous improvement.
- Effectiveness – to ensure that all business processes meet existing and emerging needs.
- Efficiency – to maximise the use of all resources in the delivery of services.

What has been happening?

Since October 2006, staff from every School and Unit have been involved in a Lean project in some way.

Key areas of Lean activity have been in Finance, the Library, Registry and Estates. Some examples of projects include:

Estates Job Tracking – Estates staff are now able to check work requests from any computer across the University, saving the need to travel back to base multiple times daily.

Student Status Letters – these letters (required to open a student bank account for example) can now be available on demand, rather than the student having to wait, at peak times, for five to ten days.

Library Re-shelving – items are now on shelves at the correct location within four hours of their return to the Library, significantly less than the 1994 group benchmark average of 21 to 210 hours.

Research Leave Committee – research leave applications are now handled in the existing staff annual review and school reporting procedures, removing the need for a senior committee that produced over 6,000 sheets of paper and met three times annually.

Job Vacancy Advertisement – job vacancies are now advertised within two weeks of notification, at an annual saving of £150,000, while continuing to recruit successful candidates.

Student Self Certification of Absence – students are now able to self certify absence from teaching online, enabling real time monitoring of absence and increasing levels of support where required.

By the end of the fourth year of Lean, staff in the University had released the annual equivalent of 24.63 FTE (FTE is the equivalent of a full-time position). More importantly than the time or money that may be saved is that processes are now more able to meet the needs of the customer, and staff are able to add more value.

How can I start to become Lean?

You can start to become Lean by thinking about your work and how it can be made better. Making improvements to your area may involve other staff in your School or Unit, or staff across the University, whose own work either has an effect on your activity, or who may be affected by your activity. Staff taking part in Lean projects say that good communication is key to implementing changes and making those changes stick.

If you have a good idea, take it to your Head of School or Unit in the first instance. The Lean Team offers an alternative route for ideas and suggestions about how the University can do what it does even better. Feel free to drop us an email or give us a call. We will make sure that your suggestion is taken seriously, and passed on to the most appropriate person.

Section 4 (see page 15) contains some of the tools and techniques that the Lean Team use which you may wish to try.

Training in Lean

The Lean Team offer training to frontline staff and managers, through the University's Centre for Academic, Professional and Organisational Development. Courses are bookable online (see the Current Staff, Professional Development section) individually, and are also a core part of the ILM accredited Passport to Management Excellence Programme. If you would like to find out more, do get in touch.

We additionally offer bespoke training, for example in Process Mapping using Microsoft Visio, and we also welcome informal discussions.

Working with the Lean Team

Requesting work with the Lean Team is as easy as calling us on 01334 46 1700 or emailing us at Lean@st-andrews.ac.uk.

The first step is usually to scope the project. It may be that once a request has been scoped it is determined that a Lean project is not required. Where Lean is able to help, a set of eight steps is normally followed.



Our eight step process is:

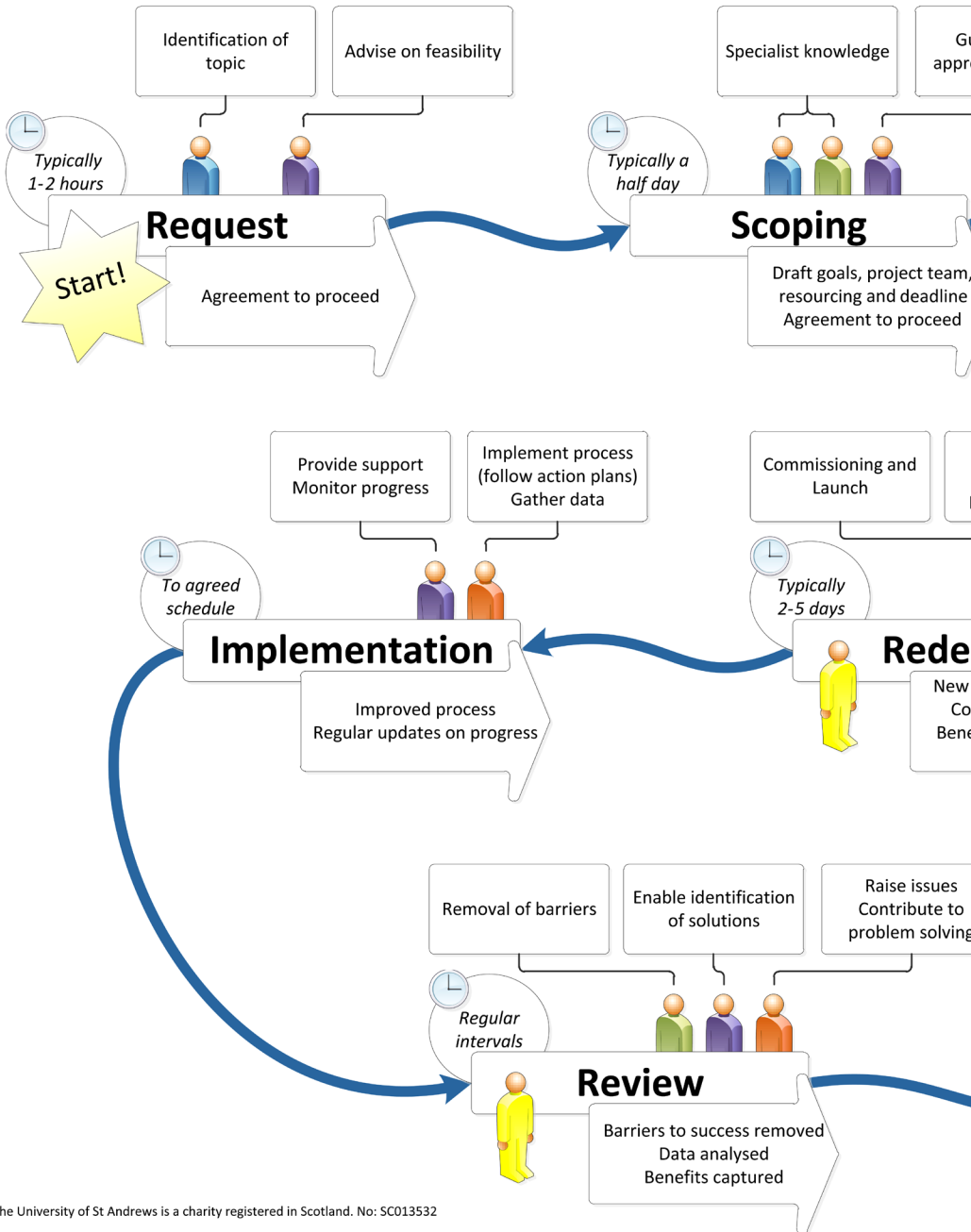
	Step	Description
1	Request	An area of work is identified
2	Scoping	Goals, project team and resources are agreed
3	Training	Training is undertaken if required
4	Planning	Project team reviews goals and agrees approach
5	Redesign	New process and action plan are created
6	Implementation	New process put in place
7	Review	Progress is monitored
8	Feedback	The project is signed off and feedback is taken

In the long term, and as part of each project, we aim to pass on our own experience and knowledge of Lean methods to you so that you can continue to implement Lean thinking in your work.

To enable you to get the most out of working with us, the table below details our responsibilities:

Lean Project Responsibilities		
Lean Team Responsibilities	Project Staff Responsibilities	Outputs
Management and leadership	Active contribution	A culture of Continuous Improvement
Facilitation to reach goals	Knowledge of the relevant area	Increasingly effective business processes
Expertise in Lean and Change processes	Openness to change and ideas for change	Increasingly efficient business processes
Appropriate tools	Commitment to continuous improvement	
Process improvement activity	Agreed deadlines and time commitments met	
Structure of sessions		
Support and challenge		
Provide logistical arrangements as required		

Lean Project: Process Overview



Guidance on appropriate scope

Delivery of training

Participation

Typically a half day

Training

Project team aware of Lean principles and techniques

Manage project team through process redesign

Focus on goals
Commitment to implement plan

Guidance on approach and data collection

Commitment to agreed approach and to gather data

Typically a half day

Design

Process, Action Plan, Communication Plan, Benefits realisation, Staff development

Planning

Agreed goals, approach, stakeholder consultation, timetable of activity and data collection plan

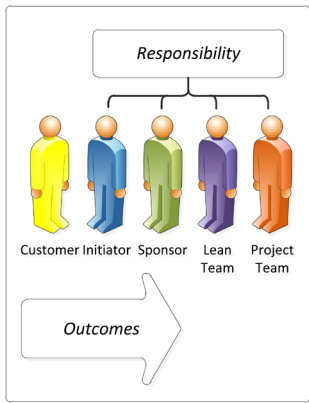
Feedback on Project
Feedback on Lean Process

Typically 1-2 hours

Feedback

Project closed
Further work identified
Improved Lean Team and staff performance

Return to Start!



The Lean Rapid Improvement Event

Introduction to the Lean Rapid Improvement Event

Like Lean initiatives in other organisations, our most productive outcomes have been as a result of rapid improvement events.

Costs and Benefits of the Rapid Improvement Event approach

In a rapid improvement event, the project team is removed from the workplace, typically for five days. Taking any significant amount of time out of the office is a challenge, however feedback from staff involved indicates taking this time provides significant benefits.

Projects can be undertaken in a series of smaller chunks of time, which makes it easier to fit work around existing commitments. However, momentum is lost between these small sessions, and significant amounts of time have to be spent catching up.

Working a solid chunk of time mitigates the risk of loss of momentum between activity and typically enables a problem to be solved using less effort. That effort then becomes more visible and savings made by the changes can be realised much more quickly.

Before a Rapid Improvement Event

- Clear goals are set, data is gathered, and the team prepare for the event.

During a Rapid Improvement Event

- The event begins with a management commission
- The current process is mapped using standard conventions
- Data about the current process is checked to ensure full understanding
- Options for alternative approaches to a process are identified and analysed
- A future process is designed and implemented
- An action plan is formulated for outstanding tasks
- The project team present their new process to management and colleagues at a feed out session

Following a Rapid Improvement Event

- Follow up events are held at least at 15, 30, 60, and 90 day periods

4. Tools and Techniques

Lean draws on many different tools and techniques and some that we have found useful are discussed below. If you know of a tool or technique that would be useful, please let us know.

Doing the initial analysis and goal-setting

Often a list or grid of key prompt words is helpful in ensuring that discussion is focused on relevant areas at the early stages of a project. BOSCARD, SIPOC and a Quad of Aims are three such tools. It is worth experimenting with different headings as circumstances might require.

We recommend completing these activities with the key staff involved in the process concerned, before making any changes to that process.

BOSCARD analysis (Figure 3)

BOSCARD analysis is helpful to get the broad picture of a situation.

SIPOC analysis (Figure 4)

SIPOC analysis is useful for identifying a high level process, key stakeholders and data requirements.

Quad of Aims (Figure 5)

A Quad of Aims is a clear and simple statement of goals, and is best used as a point of reference during a project to ensure that you remain focused.

Working with Data

Quantitative data is information based on measurement, which is numerical and is best represented graphically.

Qualitative data is not based on objective measurement, for example, whether a customer feels that they are satisfied with service they receive. Where a significant pattern emerges this is important feedback.

Figure 3: BOSCARD Analysis

Background
Objectives
Scope
Constraints
Assumptions
Reporting
Deliverables

Figure 4: SIPOC Analysis

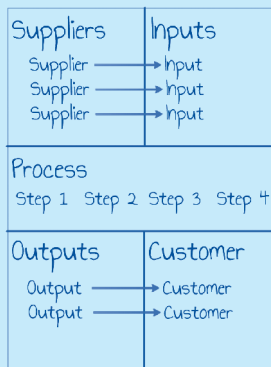


Figure 5: Quad of Aims

Purpose What is the ultimate reason for this?	Stakeholder Benefits Who'll benefit and how?
Deliverables What will be achieved?	Measures How will we know it's worked? By when?

Figure 6: Demand Record

		Request Type		
		Exam	Essay	Self Cert
Channel Used	Email	1	6	
	Phone	2	2	1
	Personally	1	2	
	Website			3

Date: Name:

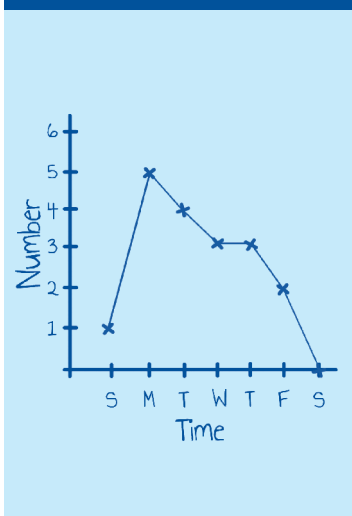
Individual judgement is important. Stories are useful to indicate where there may be issues for further measurement. Anecdotes however, can be misleading in identifying the underlying nature of a situation.

Being able to identify the current performance of a process is important if we are to be able to demonstrate improvement. There may be existing measures or key performance indicators used for this, or it may be that data has not yet been captured about the process concerned.

Demand Record (Figure 6)

Creating a demand record is an easy way of building a picture of the kinds of requests you receive or activity you are involved in. You can use a simple tick sheet, like the one adjacent, to log demand.

Figure 7: Run Chart



A nominal grouping exercise (see page 20) could be one way of identifying the categories for each tick sheet. By identifying the main demands made on an office, and measuring the frequency of those demands, existing customer pull can be identified.

Run Charts (Figure 7)

Once data has been gathered it can be used to create a run chart – a graphical representation of activity over time. This may indicate trends or clearly display busy times of the year and this can suggest where there may be barriers to process flow.

Following a Lean implementation, further data analysis can be undertaken to demonstrate anticipated improvements in flow, or to indicate where more action may be needed.

Working with the process

Runners Repeaters Strangers

Runners Repeaters and Strangers, or RRS Analysis is a tool for identifying which tasks in a process should have effort dedicated to their improvement, and which tasks are best dealt with on an ad-hoc basis.

- **Runners** are tasks that are constantly underway, and are of sufficient quantity to justify the effort required to put in place a dedicated solution.
- **Repeaters** are tasks that occur on a regular basis, but are not a constant part of the workflow. For these, it may well be worth putting in place a standard process.
- **Strangers** are tasks that occur infrequently, and are best addressed as they occur.

Strangers may well need special attention that a Runner would not merit, and often over-processing can come from applying the same process to a Runner and a Stranger.

Separating these three levels of activity can help focus improvements so maximum benefits can be realised.

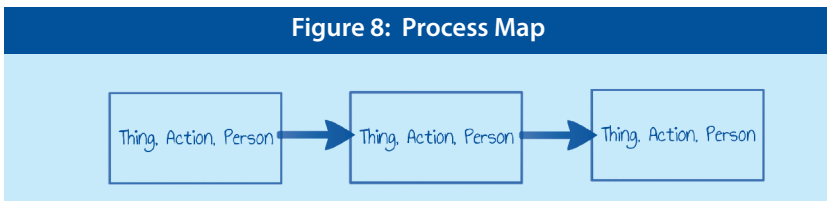
Process Mapping

Process mapping is a powerful way of understanding work. This is most effective if it is done in a group, by the people who do the work.

Process mapping software exists but for simplicity and to facilitate the active involvement of all of the project team, we find that the map is often more useful when it is hand drawn, or completed using Post-It notes, and uses simple flow chart conventions.

Mapping the Current State (“as-is”) (Figure 8)

When mapping the Current State, it is important that every step is included, no matter how small. Revealing a complete picture of how things really are rather than how things should be or how people think things are.



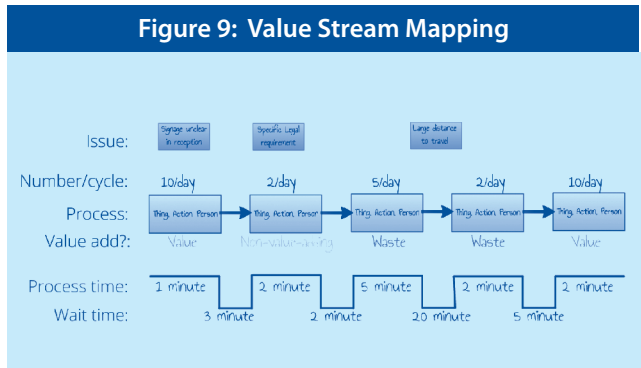
Making it a Value Stream Map (Figure 9)

Once you have a current state map of your customer journey, value adding, waste and non value adding steps can be identified.

Data regarding the number of times the process is run, the number of items coming through the process, or the number of defects in the process can be useful to add.

Finally, adding timing data, the number of times each step takes and the waiting time between each step, makes this a simple value stream map.

Value stream maps can assist us in identifying areas to target for process improvement, and the potential benefits of doing so.



Mapping the Future State (“to-be”)

After the data has been reviewed and ideas have been generated, a future state map can be created. This map uses the same principles as the current state map but to outline the new way of working.

The map acts as an easy way of building a shared understanding of the new process, and is usually simpler to follow than written documentation. It is often a good idea, though, to write accompanying procedure documentation for completeness.

Finally, for ease of distribution and clarity, it is at this stage that it may be useful to transfer the handwritten map to process mapping software.

Getting the good ideas going

Generating ideas for improvement can be a challenge. Investing time in thinking about new ways of working is often seen as a chore. However, with the right people, properly directed, this is key to process improvement.

Whatever approach taken, diversity and independence of thought are vital to bring about innovative solutions, and prevent bias.

The 8 Wastes

The 8 Wastes are used to provide an easy guide to identify improvements.

8 Wastes	
1 Transportation	Unnecessary movement of materials, people, information, equipment or paper.
2 Inventory	Excess stock, unnecessary files and copies, and extra supplies.
3 Motion	Unnecessary walking and searching, things not within reach or easily accessible.
4 Waiting	Idle time that causes the workflow to stop, such as waiting for signatures, machines, phone calls.
5 Overprocessing	Processing things that don't add value, e.g. asking for student details multiple times, excessive checking or duplication.
6 Overproduction	Producing either too much paperwork / information, or producing it before it is required.
7 Defects	Work that needs to be redone due to errors (whether human or technical).
8 Skills Misuse	Not using the full potential of staff, wasting the available knowledge, skills and experience.

One approach would be to identify as many wastes as possible in the process with a small team of staff, then to identify a solution or mitigation for each of the identified wastes.

While doing this, it is important to seek the root cause of the waste, so that any solutions deal with the waste at a deep level and avoid simply putting a sticking plaster in place.

Nominal Grouping Technique (Figure 10)

This technique allows for groups to generate a large number of ideas, and reach a consensus about the main themes within those ideas.

Firstly, working individually, each group member identifies a number of ideas. Each idea is transferred to a work space. The group rearranges the ideas with the aim of identifying themes within them. Where an idea occurs more than once, this is an indication that there may be a major process problem.

Nominal Grouping Technique allows the group to see where most of the shared ideas are, but also allows for divergence of ideas. The identified themes may link into actions, or determine factors that may affect the future state. Some ideas are taken forward and others are rejected.

Matrix Prioritisation

Once ideas or actions have been generated, using two factors to prioritise can be an effective way of allowing groups to come up with a considered list of priorities. To identify areas where change can be effected with maximum impact, factors of 'Ease' and 'Benefits' are used, to create an Ease-Benefits prioritisation matrix.

Step 1 is to rank each idea according to the two factors, on say, a scale of 1 to 5 (Figure 11).

Step 2 is to transfer the score into a matrix to determine a starting point in order to maximise impact (Figure 12).

Figure 10: Nominal Grouping Technique

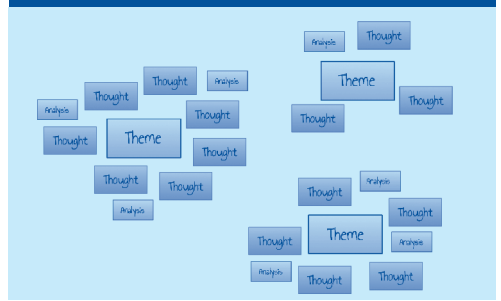


Figure 11: Matrix Prioritisation 1

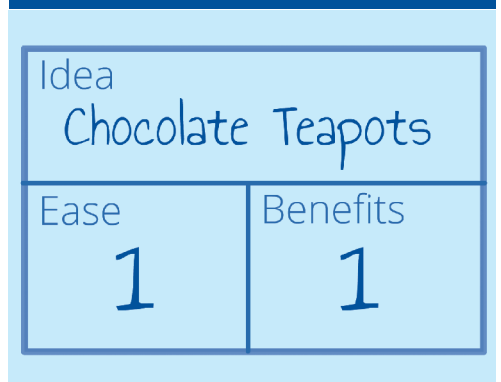
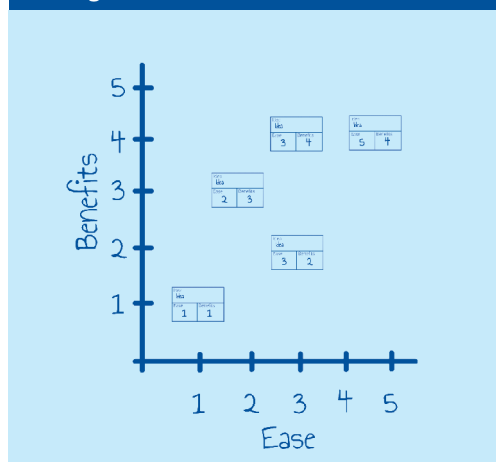


Figure 12: Matrix Prioritisation 2



Getting the workplace sorted

5 Whys

Solving a problem at its root cause is one of the principals of Lean. Asking “why” until the root cause of a problem is identified, typically five times, is one simple technique, and will be familiar to anyone who has experience of young children!

5S

5S is an easy and effective way for you to improve your workplace by tidying up and reducing waste. 5S helps prevent waste by ensuring that you have only those items you really need to do your work.

The five steps (5S), all beginning with ‘S’, are:

1. Sort

Look at your workplace to determine what you actually need to do your work – what equipment, how much space, etc. All unnecessary items are then removed.

2. Straighten

Once you have identified your necessary items, determine the right place for them. Consider visual identification, appropriate storage media, and location based on most used and least used.

3. Shine

Everything should be clean and fit for purpose. This step ensures that the right cleaning and maintenance schedule is in place to support the redesigned area.

4. Standardise

Do steps 1-3 regularly to ensure there is no build up of unnecessary items.

5. Sustain

Carry out regular reviews to monitor processes and make 5S part of your everyday work practices and that of your office culture.





Visual Management

Visual management is a means of displaying information so that it can be seen, read and understood easily. The information is often displayed graphically or as images. Displaying the information on a whiteboard or T-card system for example means that it can be updated easily (see photograph above).

The above photograph shows our Web Team's Visual Control Board. This assists the Web Team in managing tasks, assigning them to team members, and tracking the progress of activity along with key metrics.

Seeing the Benefits

Estimating Time Savings

The biggest benefits of Lean are in cultural change, however a powerful tool for making a business case is estimating the amount of time an initiative might release for more value adding activity. This requires the process to be a standard and repeatable one, and for there to be a schedule of process iterations, typically annually.

To do this, first we measure how many minutes of staff time it takes for one process iteration under existing practices. We do this a number of times and calculate the average of these.



Then a similar exercise can be undertaken for the new process, again producing an average process time.

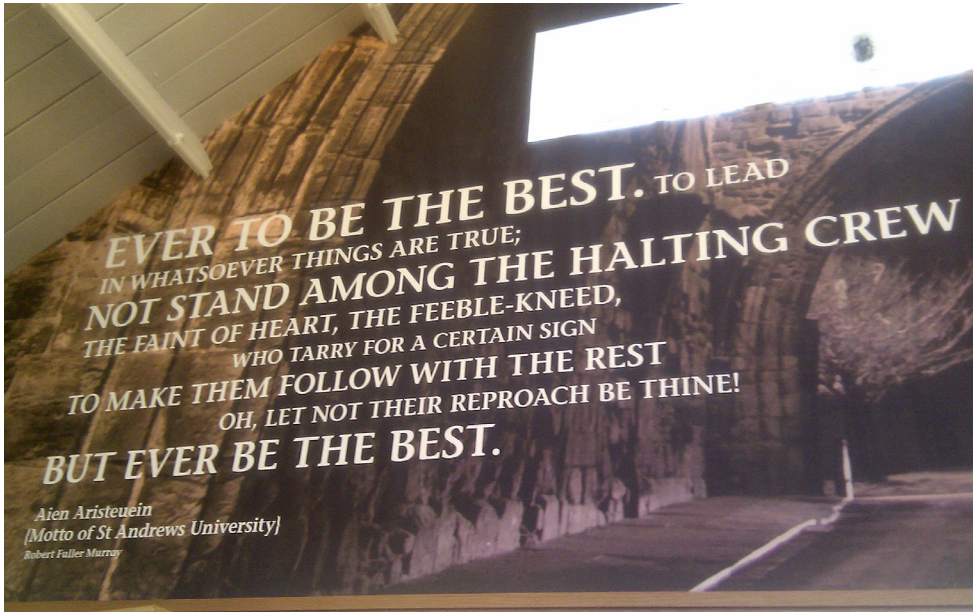
By multiplying the staff time taken for the old and new processes by the number of annual process iterations and then calculating the difference between these two figures we can estimate the amount of time saved by the new process. This can be converted to FTEs (Full Time Equivalent).

However, it is important to remember that the visibility of time saved in the workplace is often related to the individual chunks of time saved, rather than this total.

Financial Savings

Cost savings can be calculated by measuring the decrease in spend on goods and services required to service a process.

- a) **Where we remove physical items:**
For example volume of paper required
- b) **Where we take away the need to purchase services:**
For example the need to purchase expensive advertising space



Better Service

Cultural Change

Organisational culture is the “glue that holds together an organization through shared patterns of meaning” (Martin and Siehl, 1983).

As more staff get involved with Lean we are seeing connections between Units and Schools growing stronger, time and other resources being saved, and the University getting even better at what it does.

By working together, we can continue the journey “Ever to be the best”.

5. Further Reading

Print

Balzer, William K: *Lean Higher Education*

Bicheno: *The New Lean Toolbox*

Tapping & Shuker: *Value Stream Management for the Lean Office*

Womack, Jones & Roos: *The Machine that Changed the World*

Womack & Jones: *Lean Thinking*

Online

Lean Enterprise Institute

www.lean.org

The Lean Enterprise Academy

www.leanuk.org

Lean Enterprise Research Centre

www.leanenterprise.org.uk

The University of St Andrews Lean Team

www.st-andrews.ac.uk/lean

www.leanuni.com



Quotes from members of staff who have participated in Lean events

"We've achieved more in the past day and a half than in the five years I've been here!"

"It was very helpful to have the Lean Team playing devil's advocate from time to time, as it helped the group to stay focused."

"It was easy to get through the work because we were kept on track and quickly pulled out of pointless 'debate.'"

"It is very important to have an unbiased input and to have people who have no connection to a process."

"I've seen that Lean is bringing the University closer together. People talk to each other now in a way that they didn't before."

"Good to have chance for complete overview of a process/involvement of other departments."

"Good to leave with a future plan of action, rather than drawing a line under the process."

"Well-facilitated by Lean."

"The single most effective day's work I have ever seen . . . the day after it was finished we got exactly what we needed; when I had thought the chances of getting there were zero."

The University of St Andrews Lean Journey

"ΑΙΕΝ ΑΡΙΣΤΕΥΕΙΝ"
"Ever to be the best"

The journey never ends.
Remember above all;
respect for people and
continuous improvement

With project management
things really get going

When the unexpected
happens sometimes you
need to change direction

To proceed keep a
underlying strategy

Be prepared, many
initiatives result in the
implementation of technology

To overcome
obstructions you may
require resources or
senior championship

Don't play the same
games as everyone
else. To get through
the political quagmires
sometimes a different
approach is needed

Issues will arise
but by working
through them the
view of goal will
become clear

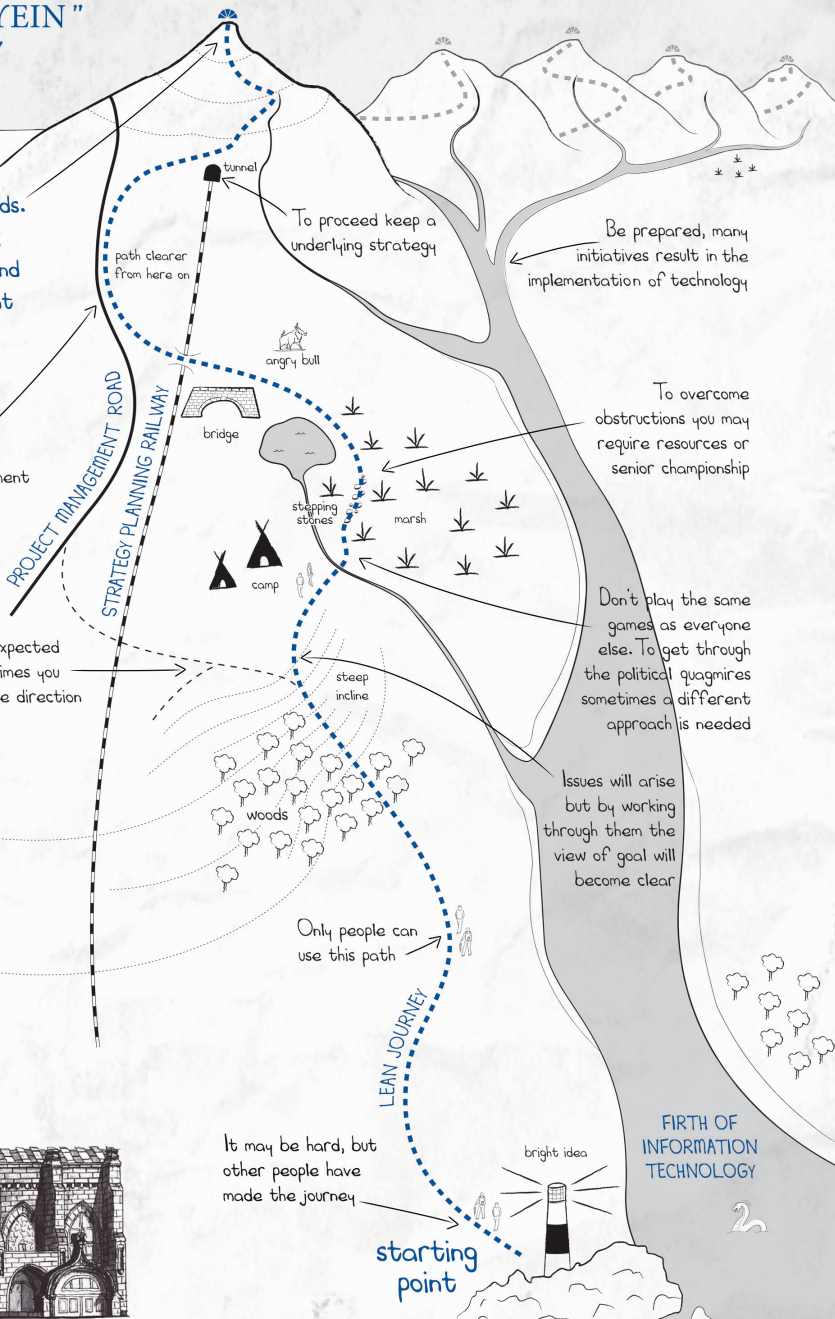
Only people can
use this path

It may be hard, but
other people have
made the journey

starting
point

FIRTH OF
INFORMATION
TECHNOLOGY

bright idea



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Lean in a Nutshell

2 Principles

- Continuous Improvement
- Respect for people

5 Pillars

- Do what's needed (Pull)
- Think of the process (The Value Stream)
- Make it flow (Flow)
- Add value & remove waste (Value)
- Aim for perfection (Perfection)

8 Wastes

- Transport
- Inventory
- Motion
- Waiting
- Over production
- Over processing
- Defects
- Skills



University of
St Andrews

This leaflet is available in Large Print, Braille or Audio on request to lean@st-andrews.ac.uk or 01334 461700.

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