What do we mean by ‘Lean’?

P. Grant Rule,

Managing Director, SMS

As a founder of the UK Rightshifting Network, with over 38 years experience in the field of softsystems, I am committed to leading firms in learning how to be more effective at creating value and achieving desired outcomes for all stakeholders.

What do we mean by 'lean'?

Lean applied as a buzz-word to a cost-cutting or process improvement exercise at best achieves very little. At worst, it actually detracts from the effectiveness of the organisation, resulting in more waste and higher costs in the medium to long term.

A Real Lean transformation is the "once and for all" business change that enables your organisation to flex and respond to future changes.

In this presentation, we will consider the basic principles of Lean Thinking as it has developed over centuries and how these principles can be applied to the software development process. We will consider the similarities and differences between Lean and Agile practices, and how Lean and Agile can work together to support a value-first Agile Enterprise.

Lean Production or Lean Systems Thinking

The term 'Lean Production' was coined in 1988 by John Krafcik, a quality engineer in the Toyota-GM NUMMI joint venture in California, in his MIT master's thesis, "Triumph of the Lean Production System".

It was later popularised in the seminal book, "The Machine that Changed the World", authored by Jim Womack, Dan Jones and Daniel Roos in 1990.

Henry Ford
Mass production
c. 1910

Standard parts, prefabrication, assembly lines

c.241 BC Carthaginian & Roman Ship Building

Pliny boasts that "in the First Punic War the fleet was on the water within 60 days after the timber left the tree, while the 220 ships that fought against King Hiero sailed on the 40th day after the timber had been felled."

William Johnstone deduced the precise order in which the ship's builders had originally fitted its parts together. He concluded it was likely that several sections had been pieced together before construction of the vessel as a whole and were joined as prefabricated units.

The precocious Punic shipbuilders must have worked from a model, shaping the wood to fit it. This explains the extraordinary ability of the shipbuilders of antiquity to raise a fleet within weeks. As archeologist Honor Frost remarked, it "adds up to a degree of industrial organization not again recorded until the Industrial Revolution."

Ref: “The Punic Warship”, written by Daniel Morneau, Aramco Services Company, Nov/Dec 1986 Volume 37, Number 6

Standard parts, assembly lines, mass production

1104 Venice begins construction of the Arsenal
1320 The Arsenale Nuovo replaces the original

In the early sixteenth century, the Arsenal employed some 16,000 people who apparently were able to produce nearly one ship each day, and could fit out, arm, and provision a newly-built galley with standardized parts on a production-line basis.

Specialisation, standardisation, simplification

1588 Elizabethan navy defeats the Spanish Armada

The story begins with the location of a wreck half a mile off the tip of the Channel Island of Alderney, where an Elizabethan ship, heavily armed with cannon, was reported lost in 1592. Raised from the sea bed four centuries later, the guns and shot led Mensun Bound, a marine archaeologist and Fellow at St Peter's College, Oxford to propound a theory that could rewrite English naval history. Examining the shot in 1993, Mr Bound found that, unlike the ammunition on the Mary Rose, which he had worked on as a student, the shot was all uniform: the same weight and material, the same size cannonballs to within a millimetre.

In the mid-16th century, a clergyman in the Weald had pioneered a way of casting cannon in iron, instead of the bronze which was in short supply. Instead of a system of "making do" that had prevailed under her father, Henry VIII, Queen Elizabeth's fleet had sets of smaller, uniform cannon, all cast identically and taking the same size shot. They could be fired reliably, by trained gunners, in unison, creating a deadly and devastating broadside barrage that could penetrate the oak hull of the enemy. The gun carriages were innovative too: the muzzles could be pushed through the gunholes, minimising the risk of fire, and the recoil kicked the cannon back far enough for reloading — which was consequently two or three times faster than previously.

The initials FW were clearly etched on one of three canno retrieved from the sea bed, leading to the supposition that the guns could have been commissioned by the Queen's spymaster, Sir Francis Walsingham.

Automated production lines

1802 Automated block-making machines

In 1799, Marc Brunel arrived in London, carrying plans for his revolutionary block making machinery, which he wanted to put before the Royal Navy.

Why he chose to offer his talents to Britain, rather than to the Americans is not quite clear, but it certainly did not take the Admiralty long to appreciate his value, and by 1802 the world's first automated production line was more or less ready to start working in Portsmouth dockyard, although the number of machines was increased further over the next few years, until there were a total of 45, producing 130,000 blocks per year.

Sakichi Toyoda
'Jidoka' ... autonomation or 'mistake proofing'
c. 1902

"Flow production starts with the sales department and extends throughout the whole organisation."

"The ideal of continuous flow must be present from the design and raw material stages up to and even beyond the sales stage."

Frank G. Woollard, General Manager, Morris Engines Ltd. 1925

Kiichiro Toyoda
'Just in time'
1937

Taiichi Ohno
Father of the Toyota Production System
1948-1975

The first large-scale mass production assembly line at the Ford Motor Co. - the magneto assembly line in 1913

Mass production cf. Lean production

Ford had the benefit of the more or less unlimited demand represented by the large, relatively prosperous US population prior to the First World War.

Both Morris Motors and Toyota faced more constrained, post-war demand, and more restricted access to resources. Austerity was the order of their day.

Principles of Lean Systems Thinking

- Understand value from the stakeholders' perspective
- Identify all the steps in the value stream
- Enable value to flow smoothly
- Respond to the pull of stakeholder demand
- Continuously seek perfection

Definition
A stakeholder is a party that can affect or be affected by the actions of an individual, team or business.

John H. Patterson, Founder of the NCR Company, 1887

Process steps are not all equal
Distinguish process steps that add value, from those that represent waste.

Economy of flow
Waste is minimised when value is pulled by customer demand in smooth single-piece continuous flow.

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waste - noun

1. useless consumption or expenditure; use without adequate return; an act or instance of wasting: The project was a waste of material, money, time, and energy.

2. neglect, instead of use: waste of opportunity.

3. gradual destruction, impairment, or decay: the waste and repair of bodily tissue.

4. devastation or ruin, as from war or fire.

5. a region or place devastated or ruined: The forest fire left a blackened waste.

6. anything unused, unproductive, or not properly utilized.

7. anything left over or superfluous, as excess material or by-products, not of use for the work in hand: a fortune made in salvaging factory wastes.

7 wastes of production

- over-production
- waiting
- transporting
- over-processing
- inventory
- moving
- making defective parts & products

7 wastes of software development

- partially done work
- delays
- handoffs
- extra features
- relearning
- task switching
- defects

8th waste

- loss of human creativity

Frank Woollard talks about…

"The discipline of the unforgiving minute."

Time is a non-renewable resource.

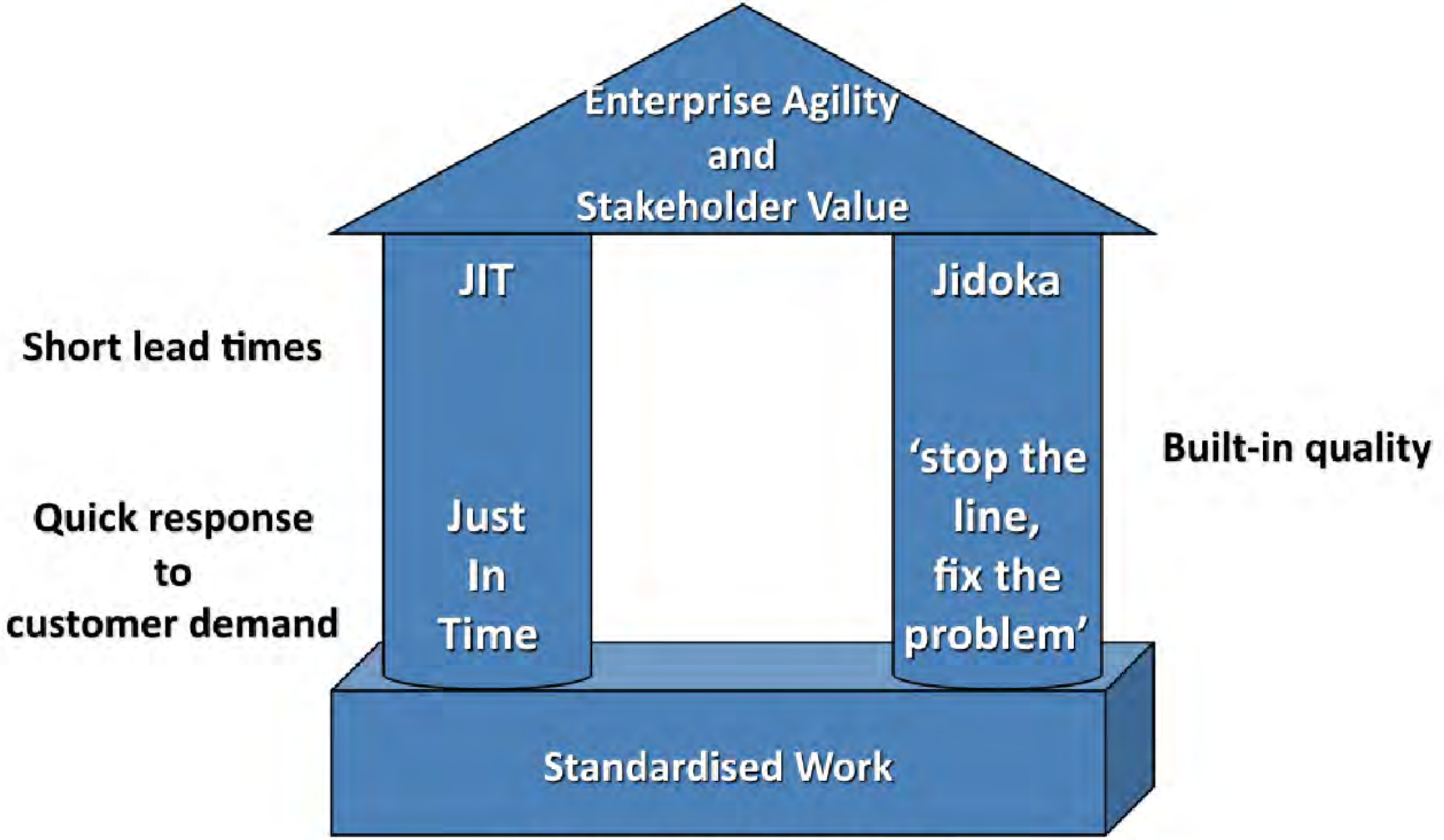
Economy of flow

Waste is minimised when value is pulled by customer demand in smooth single-piece continuous flow.

In Lean (i.e. flow production) the focus is on…

- Value - from the stakeholder's viewpoint
- Time - delivering as rapidly as possible
- Waste - avoiding unnecessary consumption

Just-In-Time delivery & mistake-proofing are the two pillars that support Lean Systems Thinking



Documented processes
Repeatability with low variation
Easier training
A baseline from which to improve

Principle of Lean Product Development

- Learn as quickly as possible how to make & deliver products that end consumers consider to be of value

"Lean Product and Process Development", Allen C. Ward, 2007

Compare this to the conventional approach to development, which is built around getting people to follow orders.

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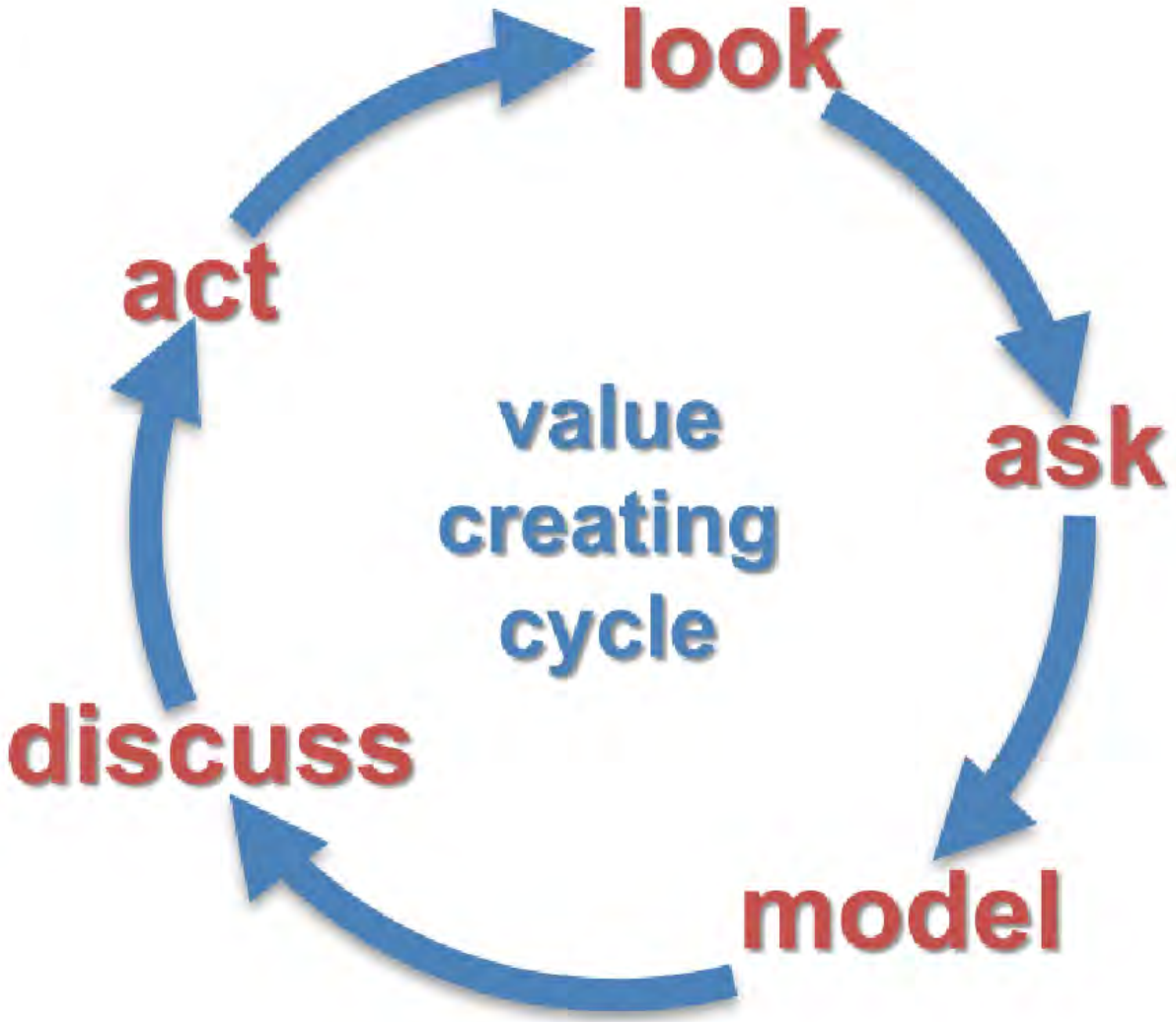
people learn by exploring, through trial and error

this is the scientific method



The most important waste in product development is the waste of knowledge

Scatter

- Communications barriers
- Poor tools

Hand-offs

- Useless information
- Waiting

Wishful thinking

- Testing to specifications
- Discarded know-how

"Lean Product & Process Development", Allen C. Ward, 2007

Consumers don't derive value from product designs or software code

- Consumers derive value from services delivered
- Service delivery is enabled by operational value streams
- The operational value streams increasingly rely on software

Principles of Lean Consumption

- Solve my problem completely
- Don't waste my time (minimise my total cost of consumption, which is the price I pay plus my time & hassle)
- Provide exactly what I want
- Deliver value where I want it
- Supply value when I want it
- Reduce the number of decisions I must make to solve my problems

"Lean Solutions", Jim Womack & Dan Jones, 2005

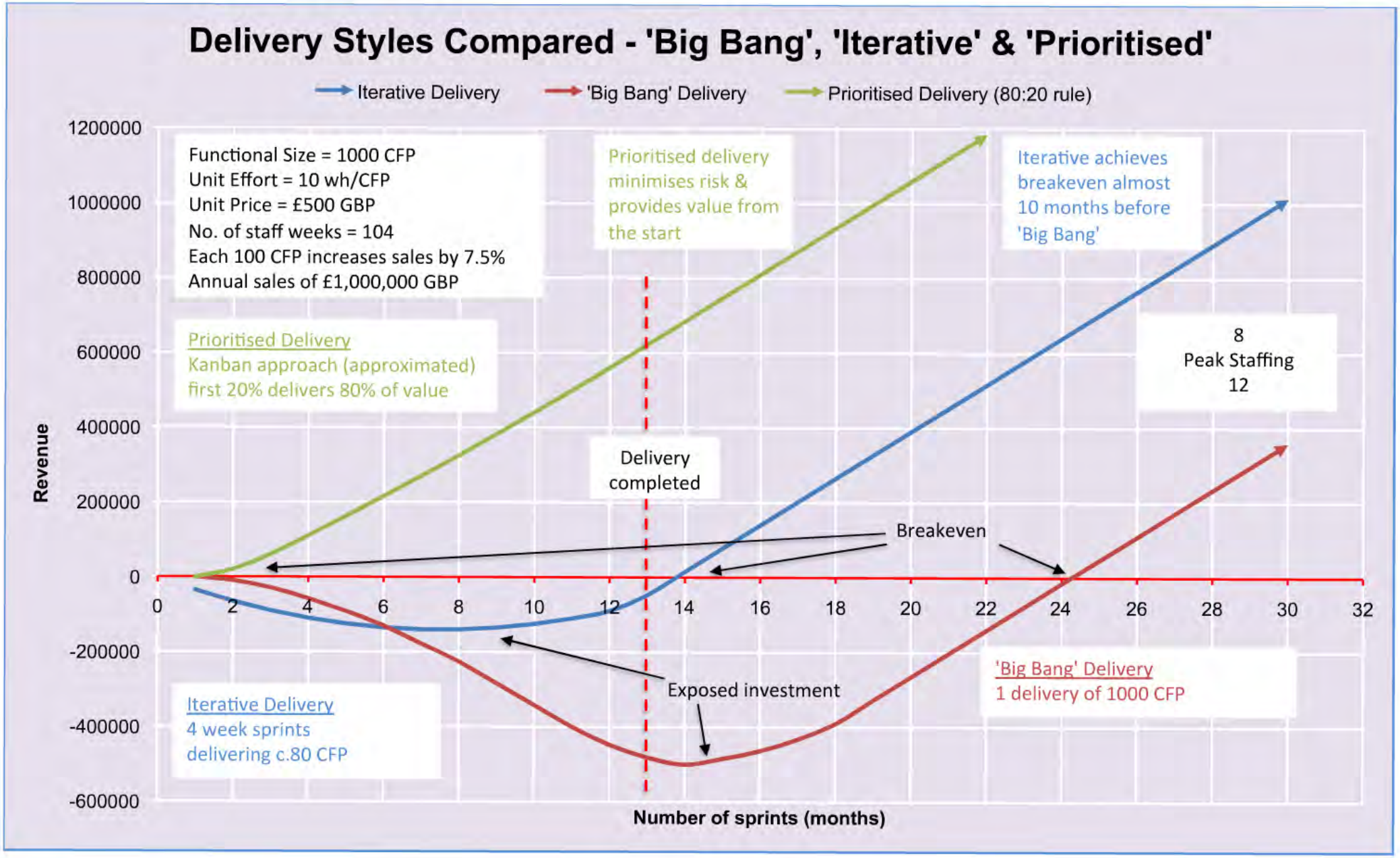
The goal of Lean Product Development is to create both valuable product designs and profitable operational value streams

"Lean Product and Process Development", Allen C. Ward, 2007

Who are your stakeholders?

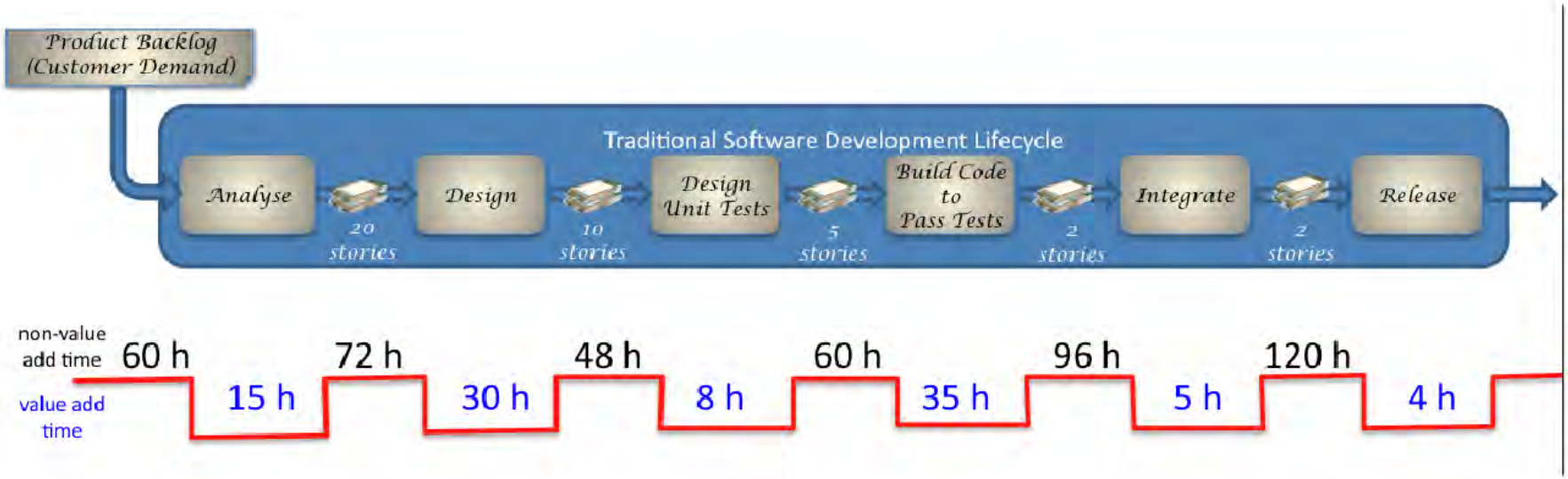
What do they value… what are their desired outcomes?

Financial implications of incremental delivery



Value Streams

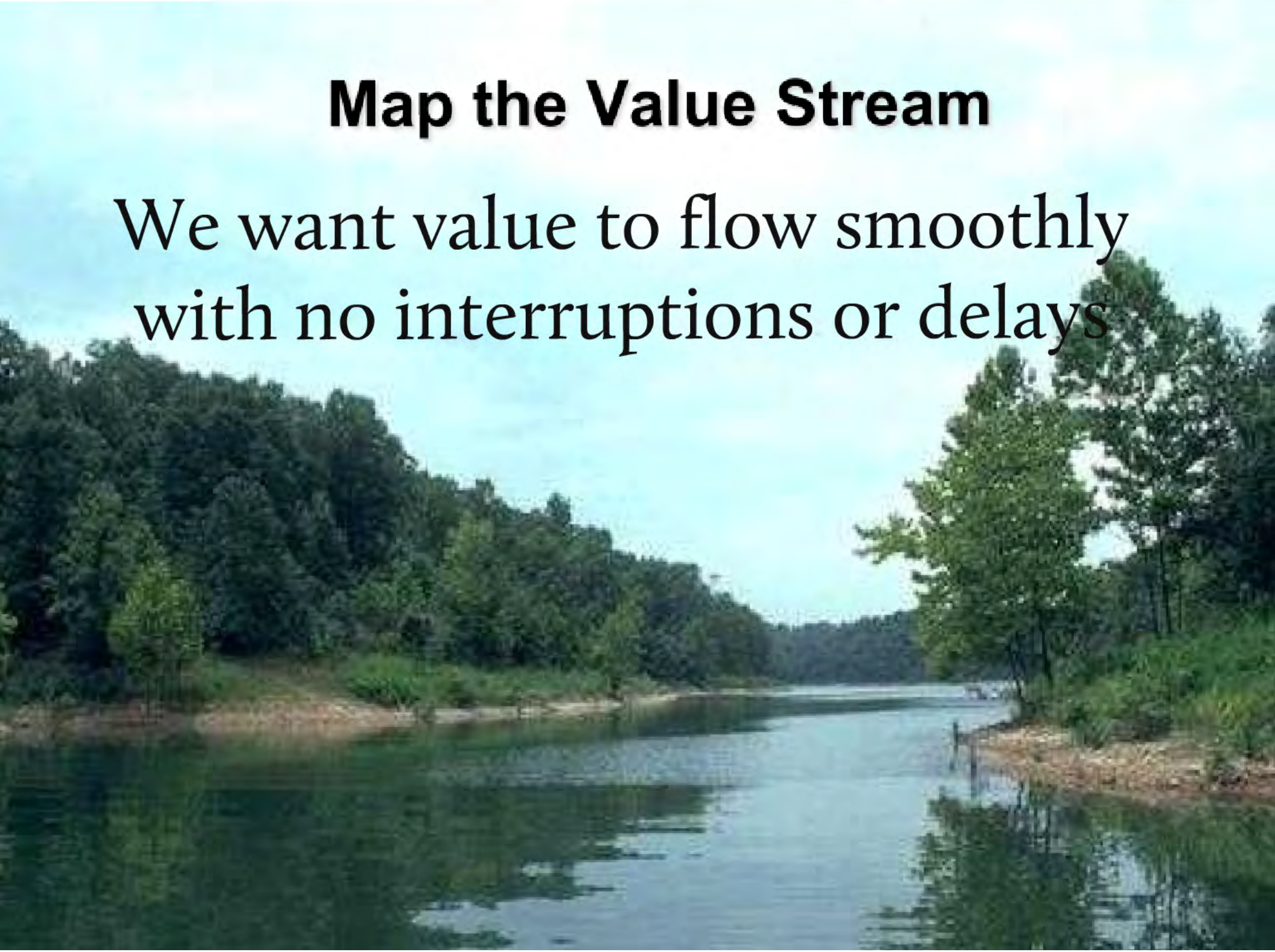
Software development value stream



Lead time = 553 hours
Processing time = 97 hours
Process efficiency = 17.5%

Map the Value Stream

We want value to flow smoothly with no interruptions or delays

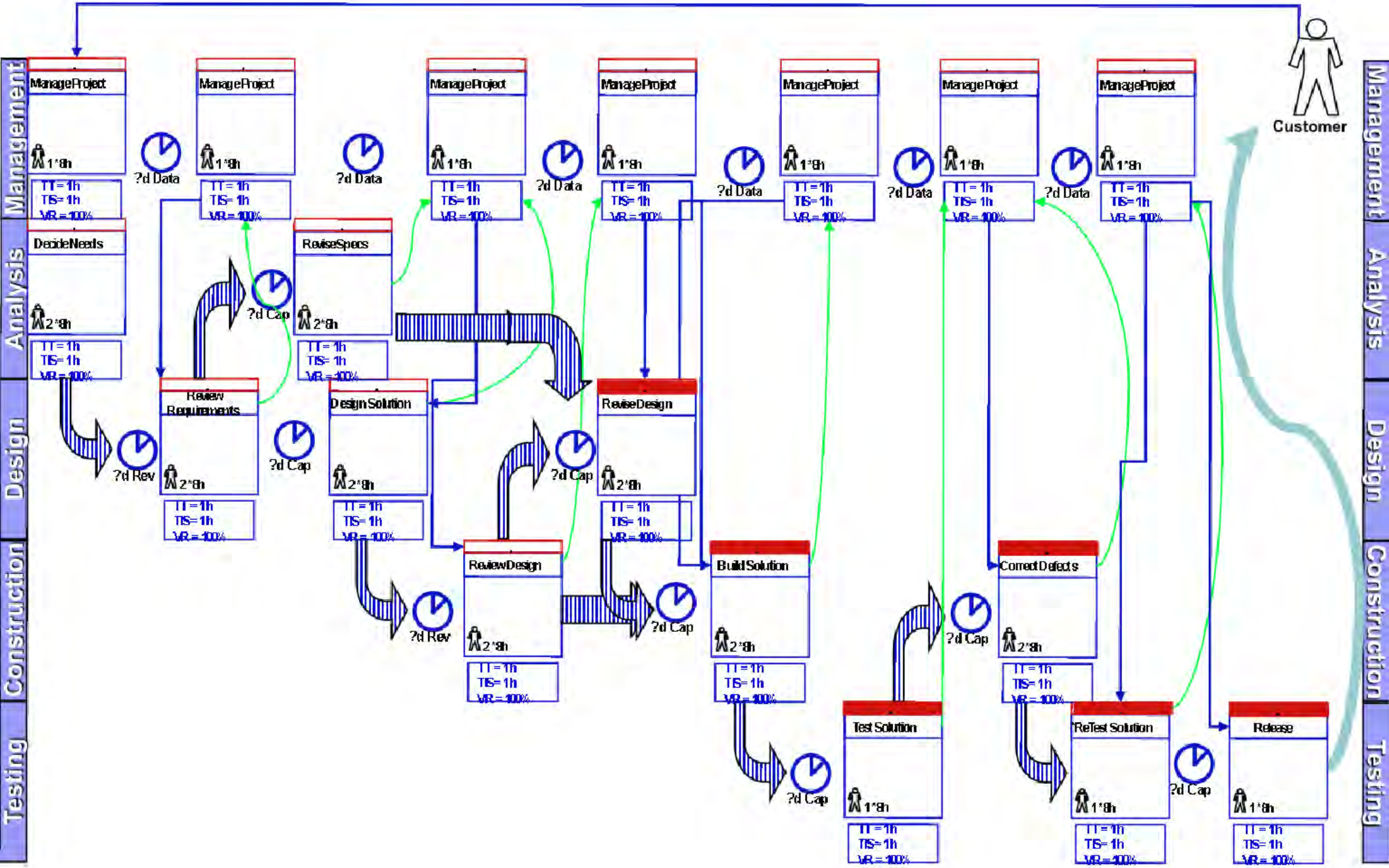



The product development value stream is like a braided Alpine river

Loss-less handoffs

Delivering value Just In Time and avoiding waste leads to the need for 'single minute exchange of dies' or switching between operations in manufacturing...

...which in knowledge-work (such as software development) equates to fast, effective, hand-offs between successive workers without loss of information.


Management
Analysis
Design
Construction
Testing
Customer
ManageProject
1*8h
TT = 1h
TIS= 1h
VR = 100%
?d Data
DecideNeeds
2*8h
?d Cap
ReviseSpecs
?d Rev
Review Requirements
Design Solution
ReviseDesign
ReviewDesign
Build Solution
Correct Defects
Test Solution
ReTest Solution
Release

Software Product Development Value Streams

- Involves coordination & collaboration of multiple groups working in parallel
- Handles knowledge work with many-dimensional requirements
- Must design & develop both the product and the operational value stream in which the product will be used to deliver service (value) to the consumer

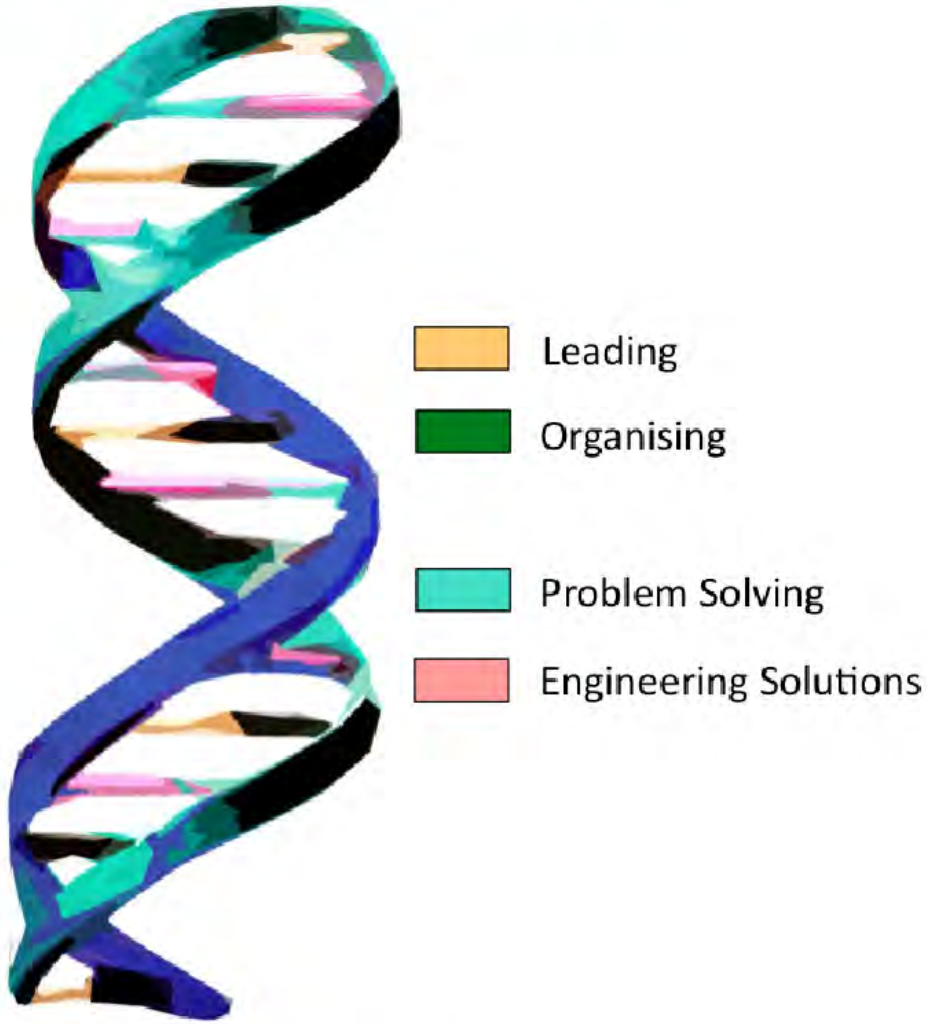
The DNA of Lean Product Development

LEADING involves creating, communicating & implementing a compelling, feasible vision while inspiring & enabling cross-competency innovation & commitment focused on delivering value to all stakeholders.

ORGANISING involves employing responsibility-based planning & collaborating to achieve results efficiently.

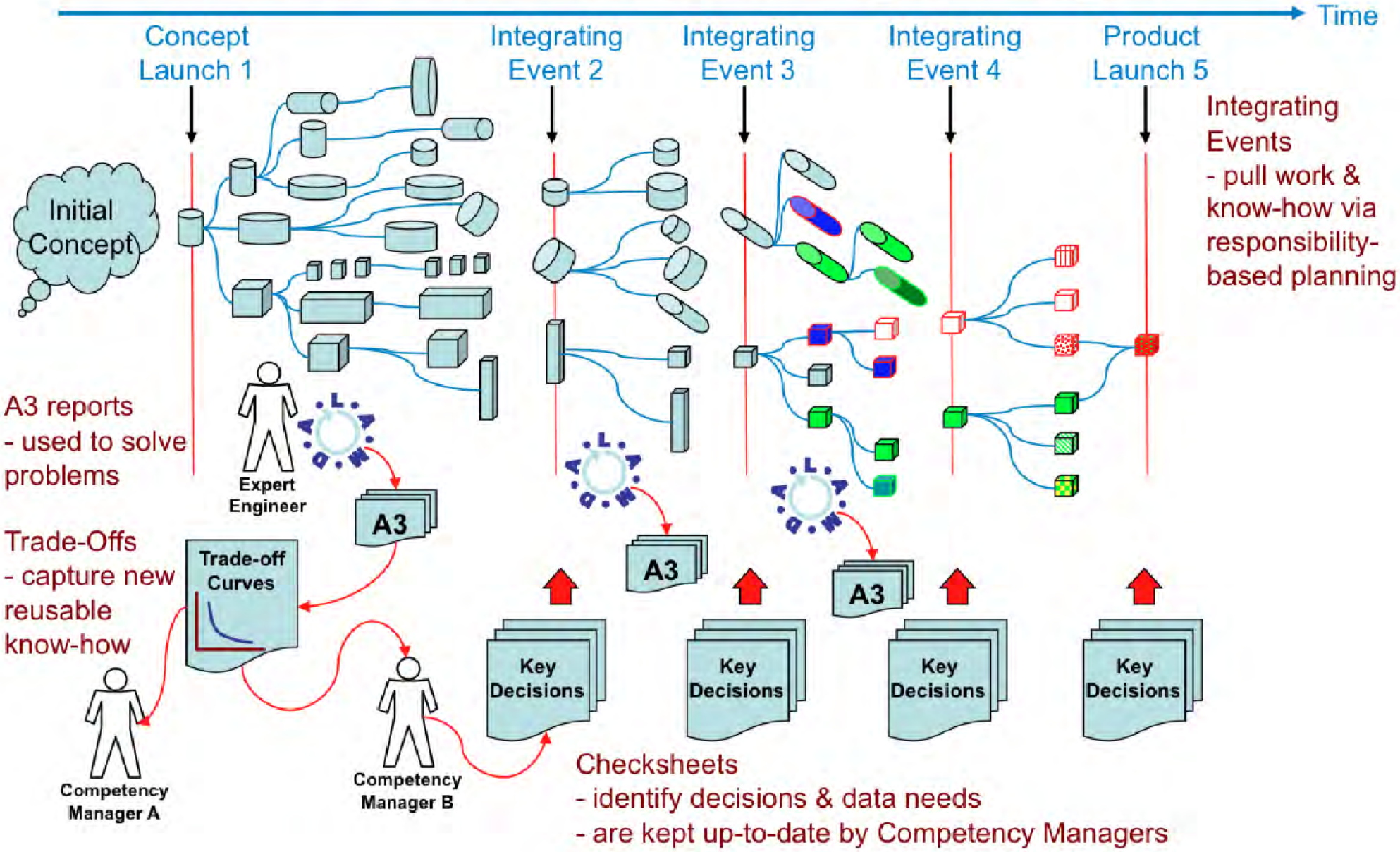
PROBLEM SOLVING involves everyone at all levels in the organisation using a systemic, experiment & evidence-based approach to decision-making.

ENGINEERING SOLUTIONS involves innovating via a set-based, value- & outcome-oriented design approach



Prof. Allan C. Ward, "Lean Product & Process Development"

Set-Based Concurrent Engineering



Cadence, Flow and Pull

Top Ten Agile Practices

1. Iteration Planning
2. Measuring & Tracking 'Velocity'
3. Sprint/Iteration Backlog
4. Daily Stand-up/Team Meeting
5. Self-Organising Teams
6. Estimation by the team (Points)
7. Scrum Master Role
8. End of Sprint/Iteration Review/Demo
9. Timeboxing
10. Product Backlog

Jurgen Appelo, May 2009, www.noop.nl

Ten 'Lowest Confidence' Agile Practices

1. Lead Time & Cycle Time
2. Value Stream Mapping
3. Personas
4. System Metaphor
5. Usage Scenarios
6. Root Cause Analysis / Five Whys
7. Class Responsibility Cards
8. Defer Commitment
9. Kanban Board (limiting WIP)
10. Behaviour Driven Development

Jurgen Appelo, May 2009, www.noop.nl

Top Ten Agile Practices mapped to Lean Product Development

Cadence, Flow & Pull
- Timeboxing
- Iteration Planning
- Measuring & Tracking 'Velocity'

Responsibility-based Planning
- Self-Organising Teams
- Sprint/Iteration Backlog
- Estimation by the team (Points)
- Daily Stand-up/Team Meeting

Focus on Customer Value, Priority & Delivery
- Product Backlog
- End of Sprint/Iteration Review/Demo

Manager's Role - to work on the system of work
- Scrum Master Role

Entrepreneurial Leadership (Chief Engineer)
- cf. Product Owner Role

Jidoka & Mistake Proofing
- cf. Test First Development

Set-Based Concurrent Engineering
- cf. Serial Fix-On-Fail design & Refactoring
- Concept of 'Ready'

Single-Piece Continuous Flow
- cf. Small Batches (Sprint Backlog)
- Concept of 'Done'

When a task is relatively obvious and the path to the desired condition is clear (as in manual labour), then managing by target-setting, using extrinsic motivators (such as bonus payments) can work well enough.

The leaders need not concern themselves with ensuring that people are employing a systematic, scientific approach for achieving the target.

'Why Lean Programs Fail' by Jeffrey Liker & Mike Rother, Lean Enterprise Institute, January 2011

When a task is a challenge, when it is not clear how the desired condition can be achieved, when cognition and exploration are needed to discover the path, then setting targets and extrinsic carrot and stick motivators can be counter-productive.

Intrinsic motivation often delivers better results.

HOW people solve problems is important and something with which leaders need to concern themselves.

Lean systems thinking … a new definition

Lean is a process by which managers, working as leaders and coaches, develop people so that desired results can be achieved effectively, again & again.

Conclusion

- Lean Thinking & Flow Production has evolved over millenia, yet only widely adopted in 20th century
- Agile Practices evolved partly from Lean and partly independently
- Similar ambitions & problems lead to similar solutions

The keys are:

- Leadership by Entrepreneurial System Designers
- Organising work to focus on stakeholder value
- Problem-solving & evidence-based decision-making
- Engineering cability to explore solution options

Questions ?

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If you have been…
thanks for listening

Grant (PG) Rule
MD, SMS Exemplar Ltd.
E: g.rule@SMSexemplar.com T: +44 8432 895 174

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