Software Quality Management

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Last QOT: Do CMMI level 5 companies produce software with higher quality than CMMI level 1 companies?

"Yes, because the CMMI 5 companies have a good and standard process."

"No."

"Process quality doesn't necessarily lead to product quality! But on average it does."

The answer is of course not a simple yes or no, but a "it depends". On average CMMI level 5 companies
tend to have higher quality, but considering the the whole range, this is not the case.

New QOT: "What is the most important principle in lean development?"

Quality measures

Visualisation

Review of last week's lecture.

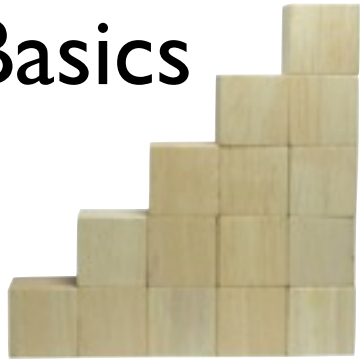
Post mortem analysis

ISO 9000

CMMI/SPICE

Review of last week's lecture.

Basics



Product

Quality

Metrics and

Measurement

Process

Quality

Quality

Management

Certifi-

cation

We are in the part "Process Quality".

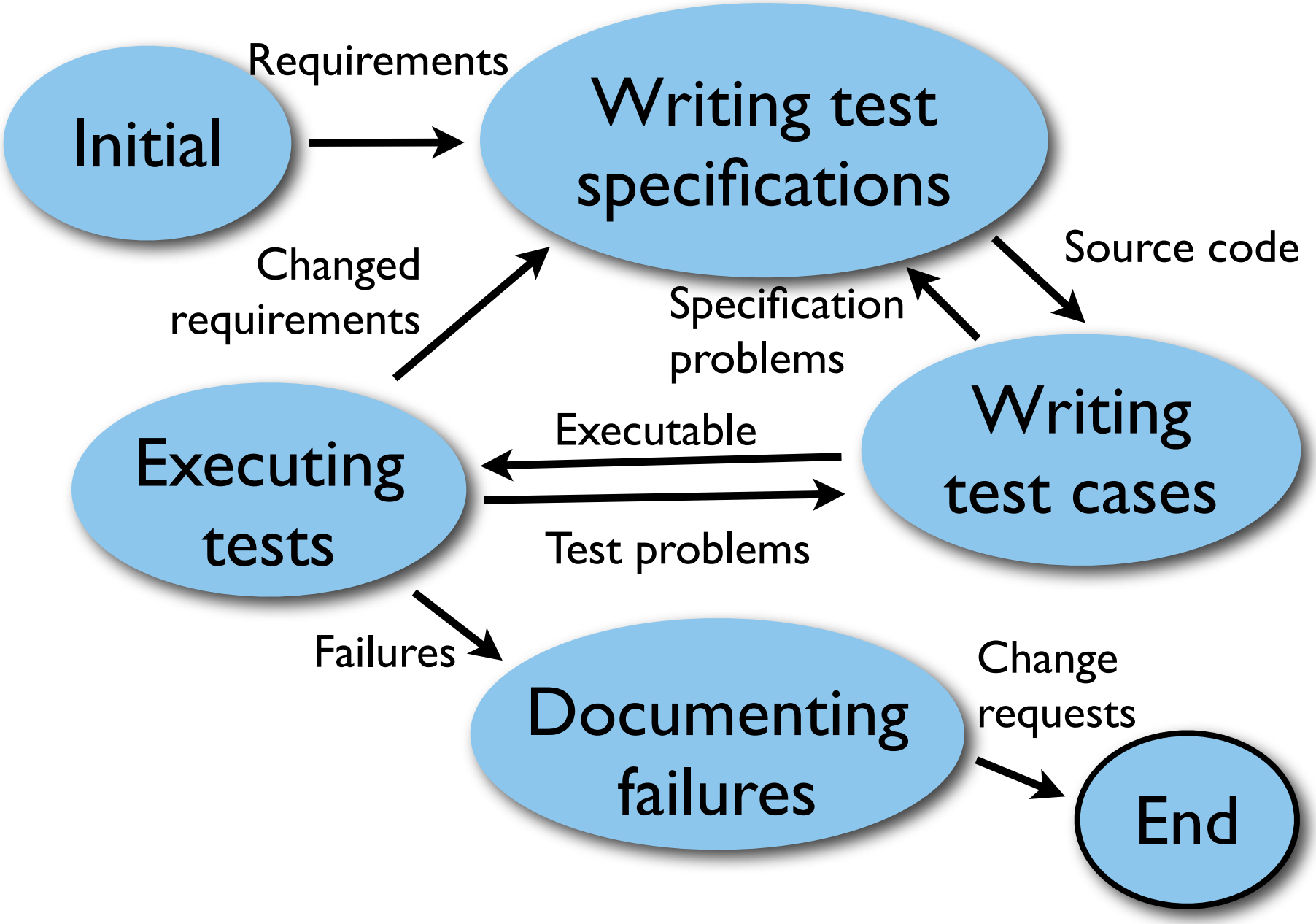
Process simulation

Lean development

Today, we cover simulating process and lean development.

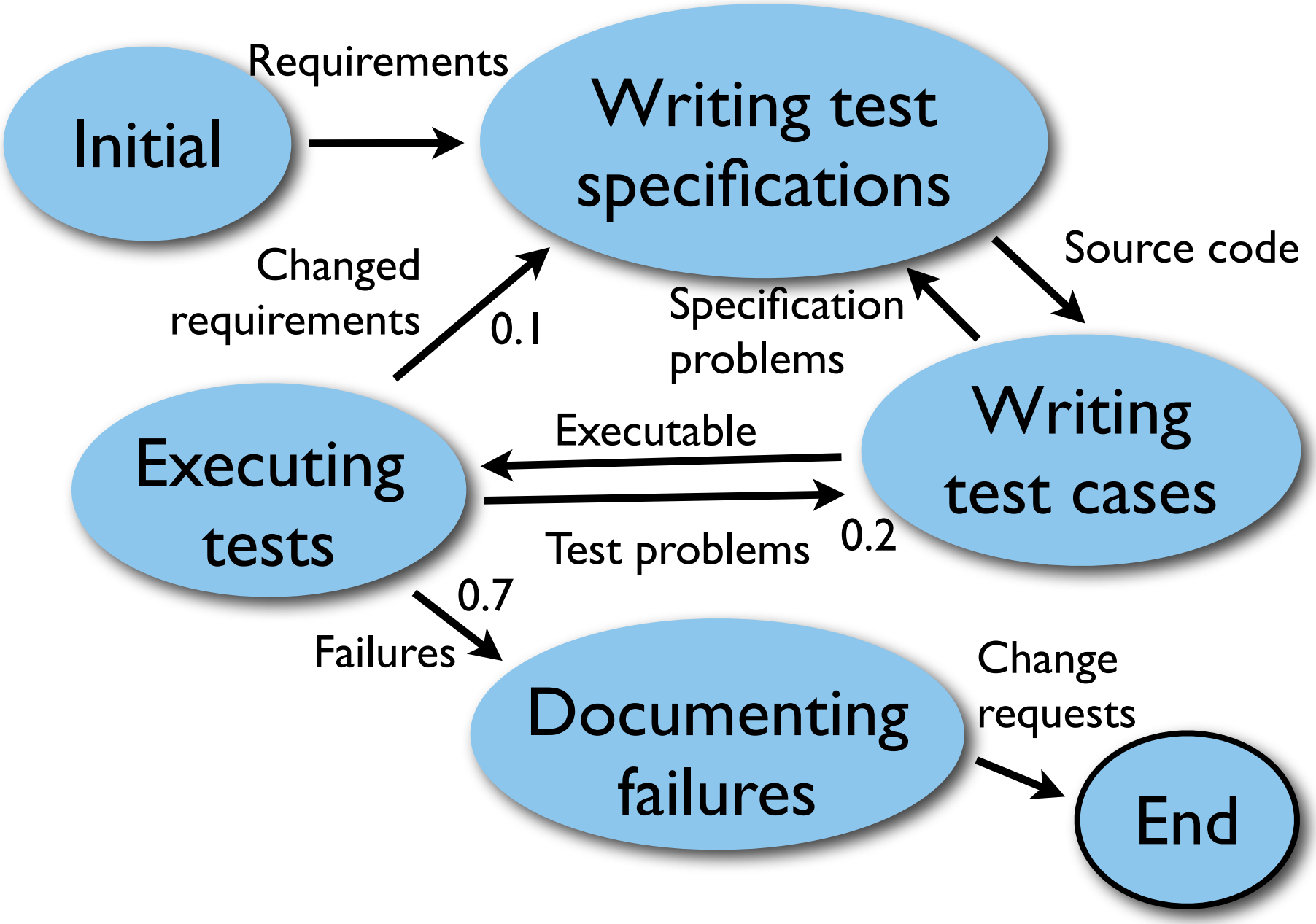
Process simulation

Test process model



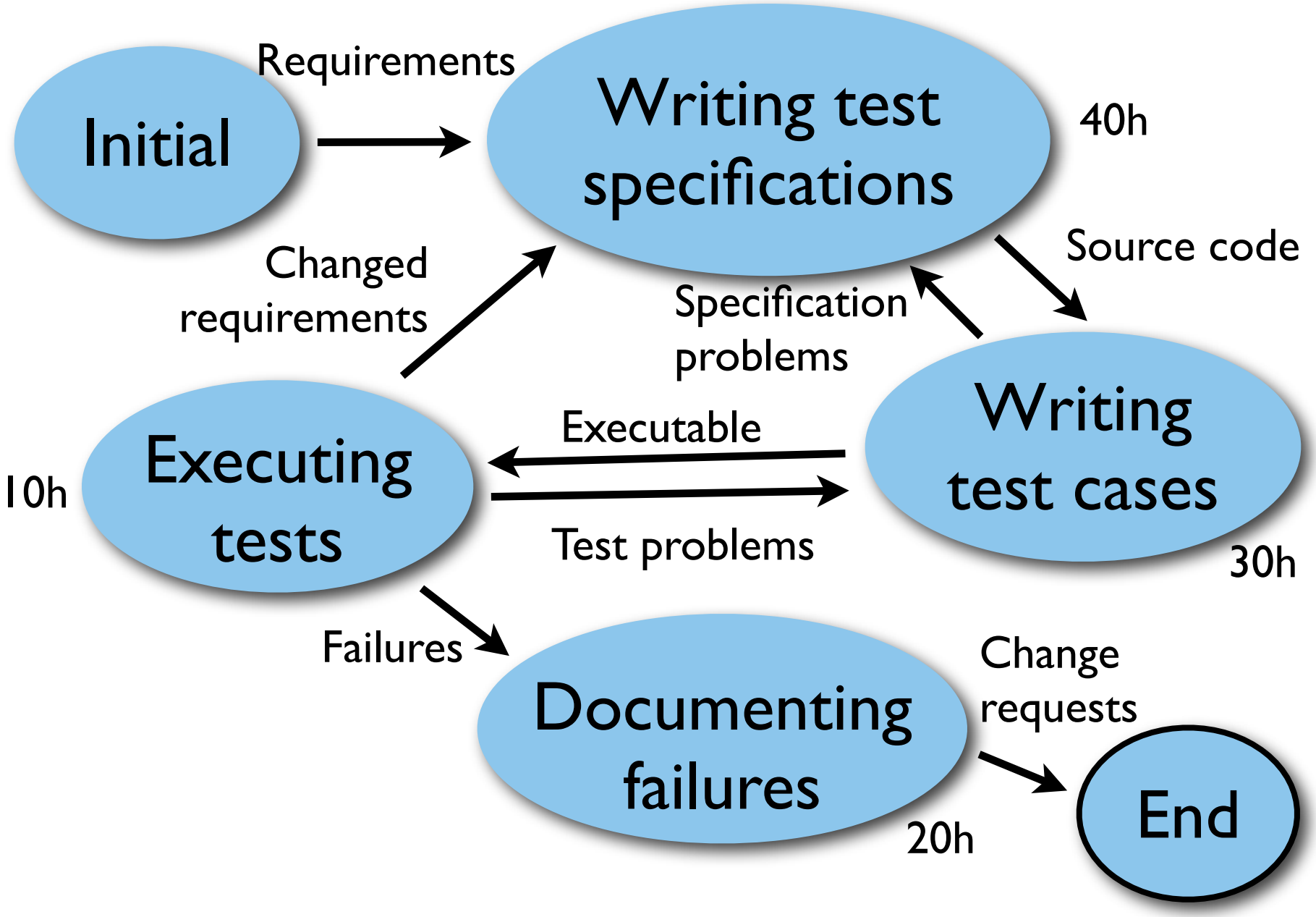
This is an extremely simplified state machine model of a test process.
It describes in which states the process can be and what is input and output at state transitions.

Test process model



One way to enhance the state model is to add probabilities.
In this example, the probability that the process goes from the state "executing tests" to the state "documenting failures"
is 70%, to the state "writing test cases" 20%, and to "writing test specifications" 10%.
Using this information, we can calculate the most likely path through the process, for example.

Test process model



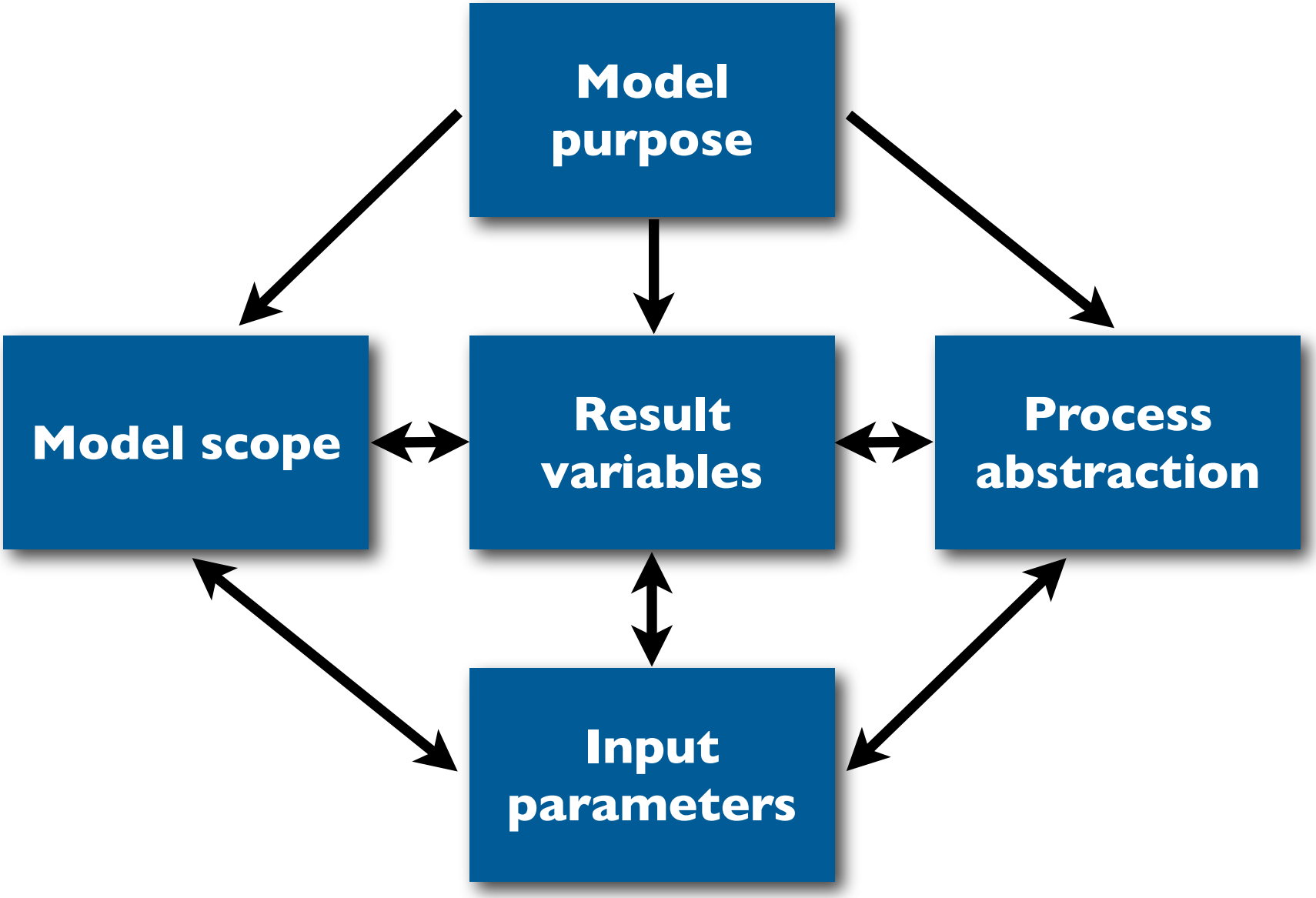
Another way to enrich the model is to add average durations to the states, for example, executing the tests
takes 10 hours.
We can calculate average or maximum durations of processes using this information.

Why simulate?

- Strategic management
- Planning
- Control and operational management
- Process improvement and technology adoption
- Understanding
- Training and learning

Kellner, Madachy, Raffo (1999)

Strategic management: Outsource/inhouse, distributed/one location, COTS/custom
Planning: Effort or schedule forecast, resource constraints, risks
Control and operational management: Tracking of key project parameters, decision making
Process improvement and technology adoption: comparison of process alternatives, what tool support
Understanding: understand process flow, flow of work products, animated simulations
Training and learning: practice project management, likely impacts of common decisions



Kellner, Madachy, Raffo (1999)

Model purpose: Key questions to address
Model scope: Organisational breadth, time span
Result variables: Metrics/model outputs designed to address key questions
Process abstraction: Level of process detail captured
Input parameters: Data and information needed to compute result variables

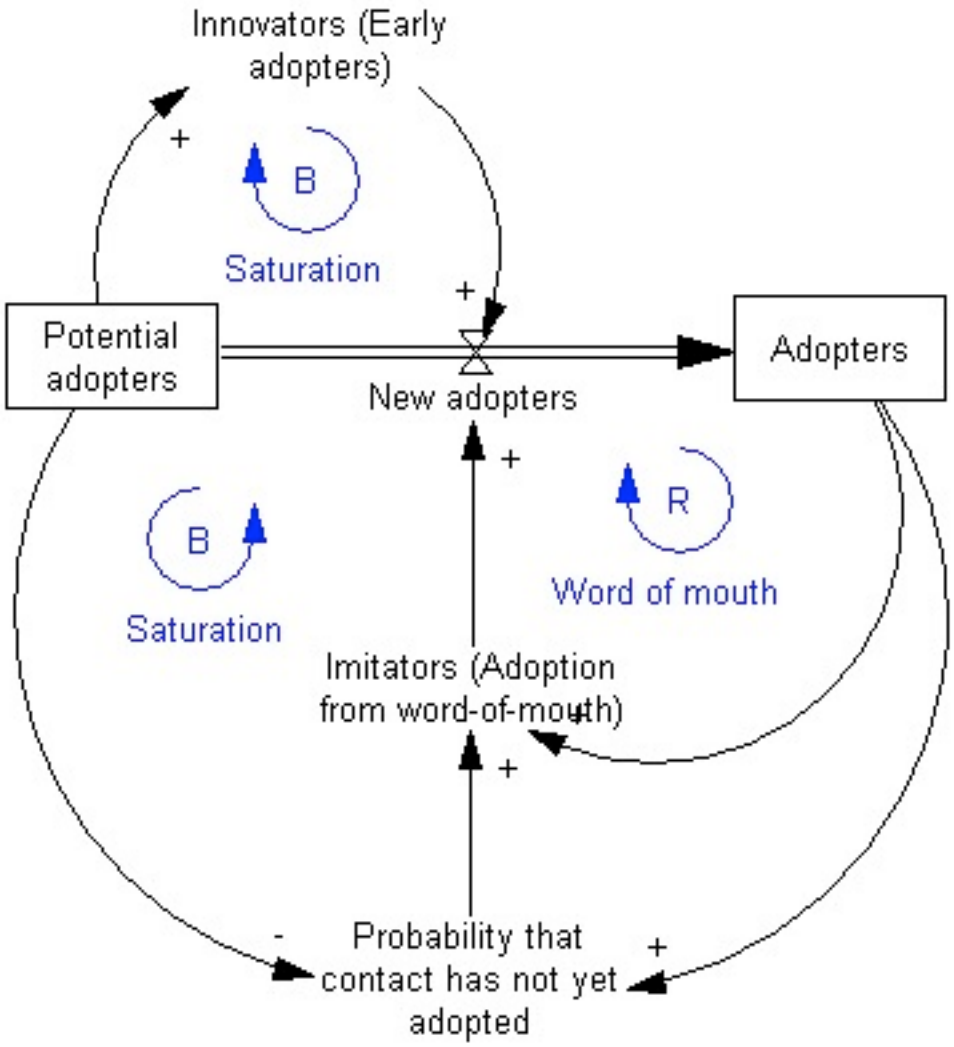
Simulation approaches

- State-based process models
- General discrete event simulations
- System dynamics (or continuous simulation)
- Rule-based languages
- Petri-net models
- Queueing models
- Project management (CPM, PERT)
- Scheduling approaches

Kellner, Madachy, Raffo (1999)

PERT: Program evaluation and review technique
CPM: Critical path method

System dynamics

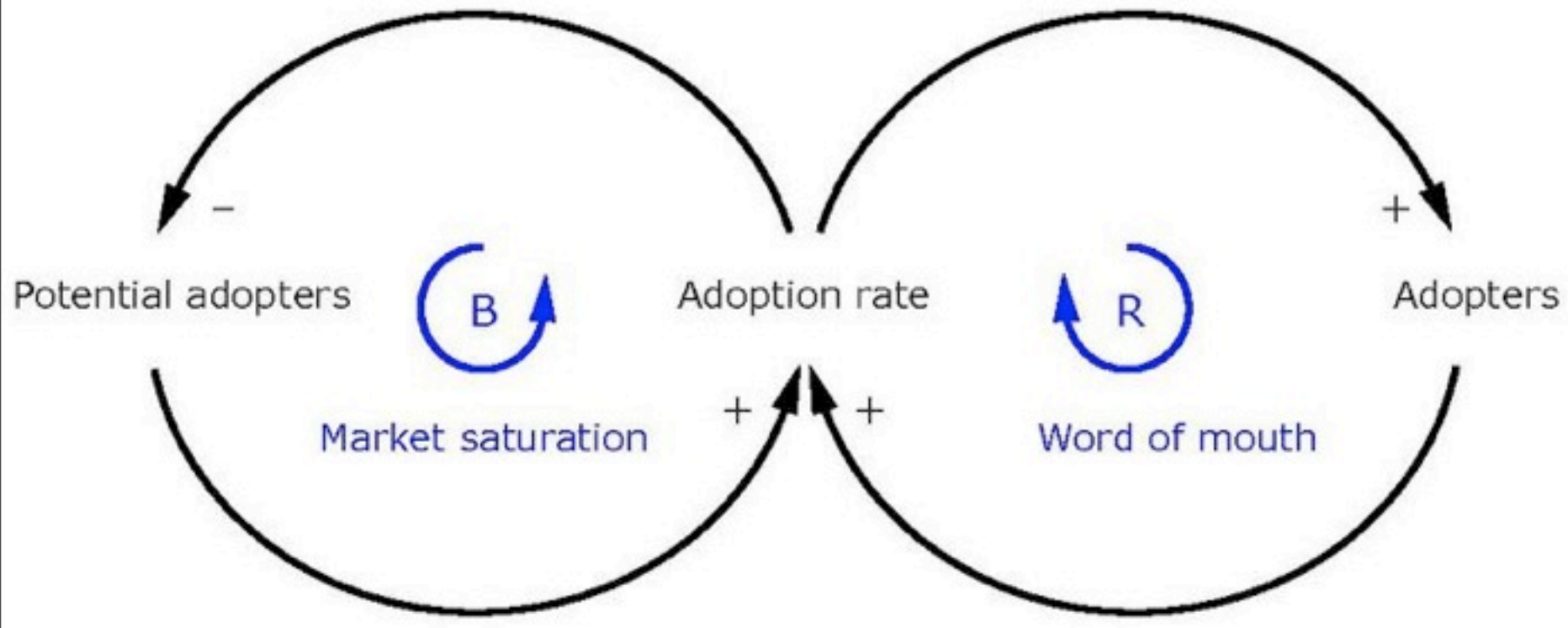


Jay Forrester (MIT) developed system dynamic in the mid 1950 to describe complex systems.
It consists of
- Feedback loops
- Stocks and flows

The example here shows how a new product is adopted.

Source: http://en.wikipedia.org/wiki/File:Adoption_SFD.gif

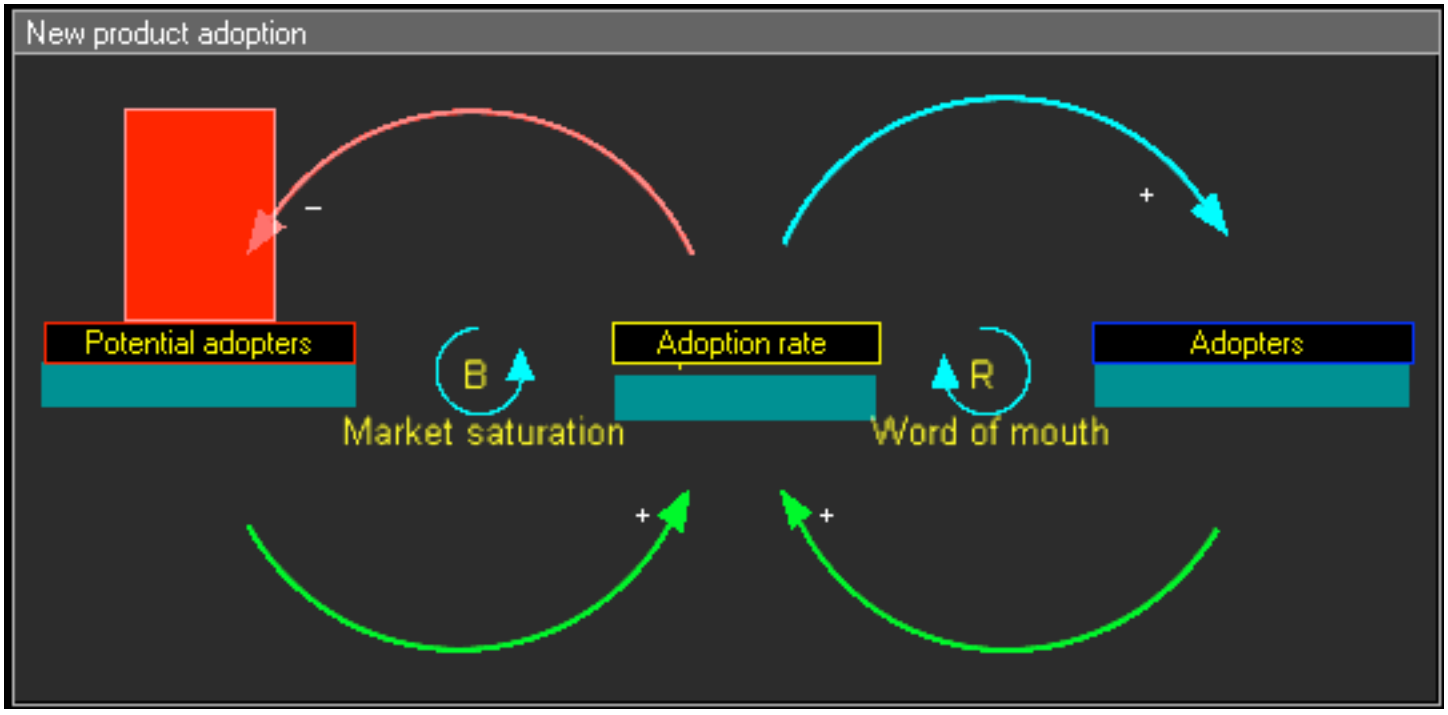
Causal loop diagram



The causal loop diagram specifies such feedback loops.
Here, the number of adopters is influenced by the adoption rate, but the number of adopters also influences
the adoption rate. Similarly, the adoption rate and the number of potential adopters influence each other.

Source: http://en.wikipedia.org/wiki/File:Adoption_CLD.gif

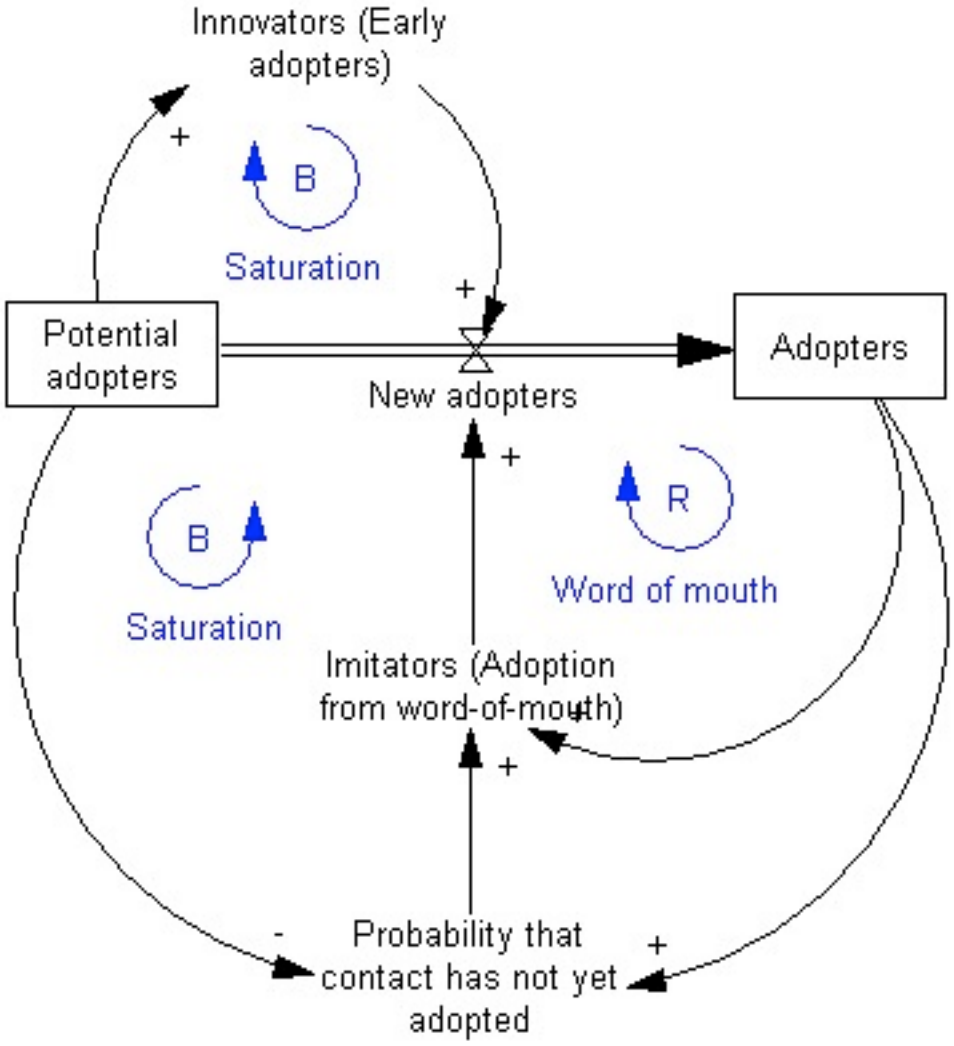
Causal loop diagram



This is the implementation of the causal loop in a software tool.

Source: http://en.wikipedia.org/wiki/File:Adoption_CLD_ANI.gif

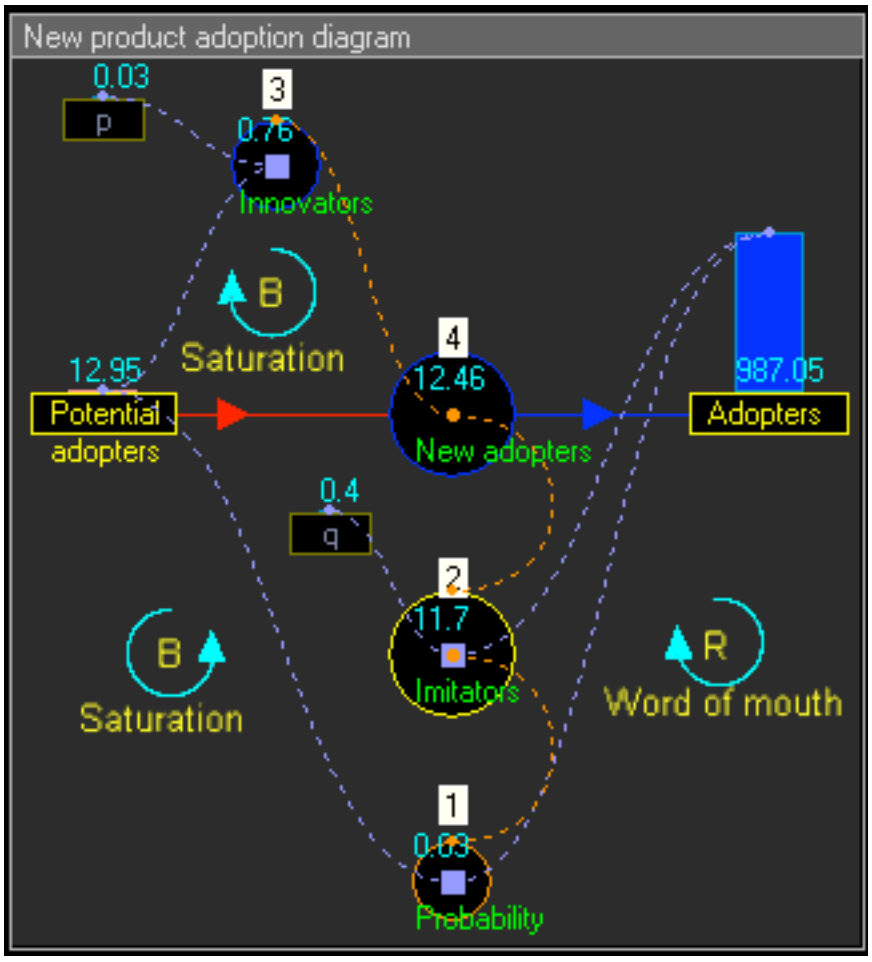
Stock and flow diagrams



The stock and flow diagram adds the actual numbers of available potential adopters, new adopters,
and adopters.

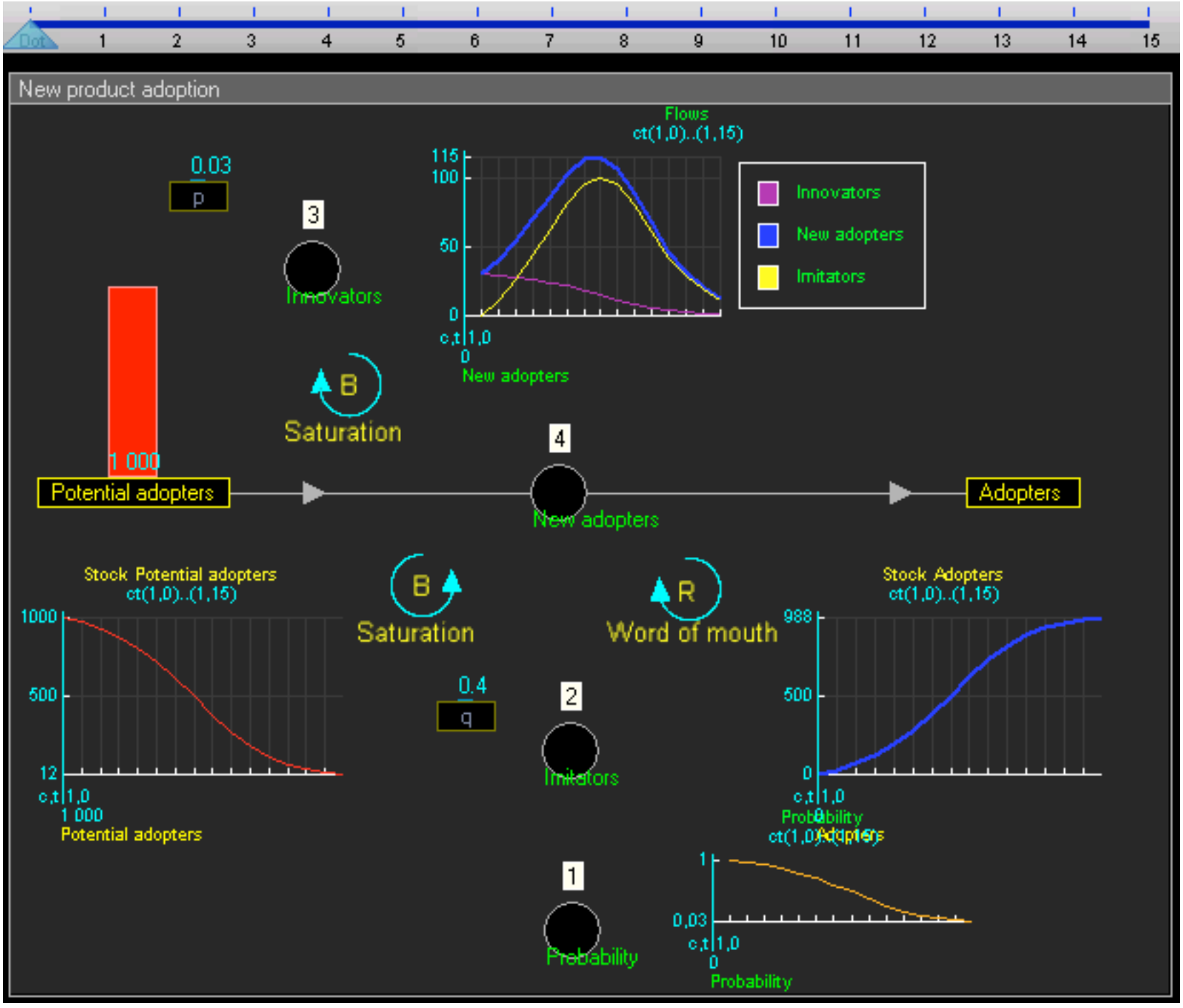
Source: http://en.wikipedia.org/wiki/File:Adoption_SFD.gif

Stock and flow diagrams



Again, the implementation in a tool.

Source: http://en.wikipedia.org/wiki/File:Adoption_SFD_ANI_s.gif



Here, we have the complete implementation with the generated curves for the factors, we are interested in.
For example, the curve for the stock "Adopters" grows following an S-shape.

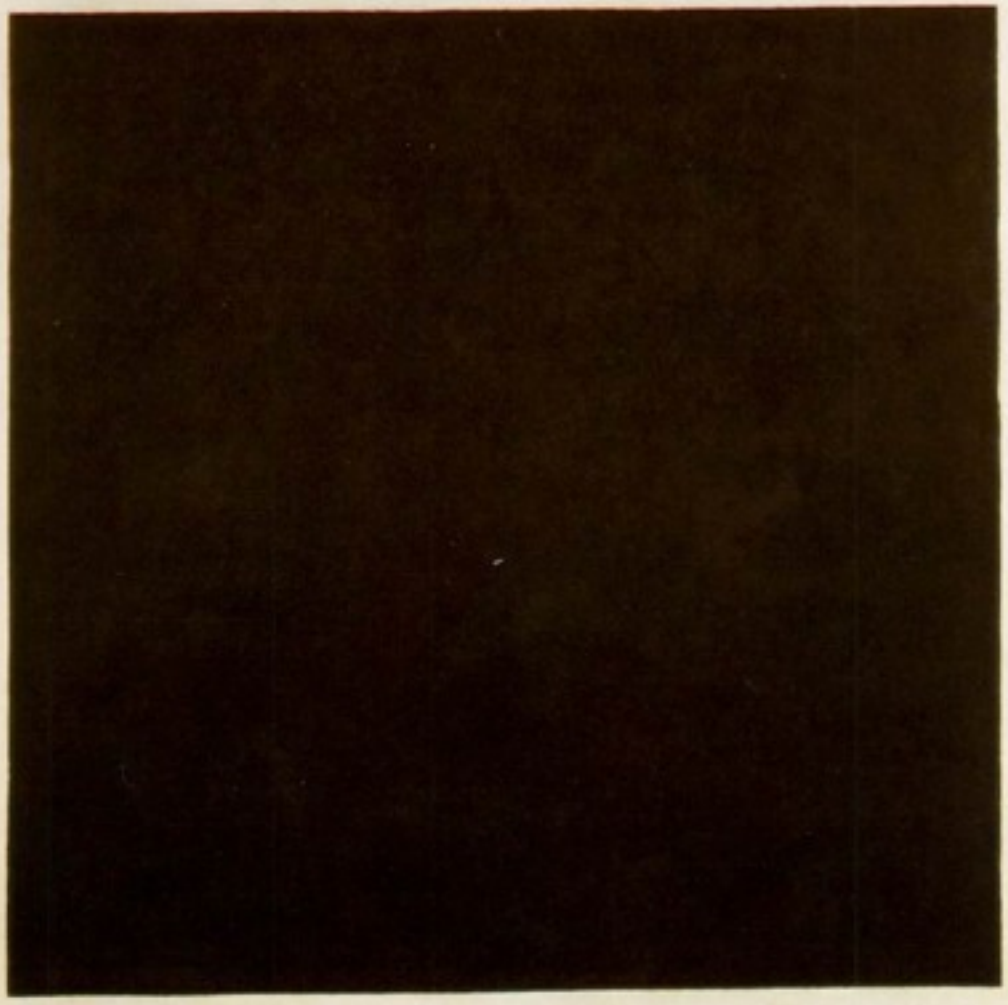
Source: http://en.wikipedia.org/wiki/File:Adoption_SFD_ANI.gif

Process simulation

Lean development

Lean development

Perfection is
not when there's nothing to add,
but when there's nothing to take away.



–Antoine
de Saint-Exupéry

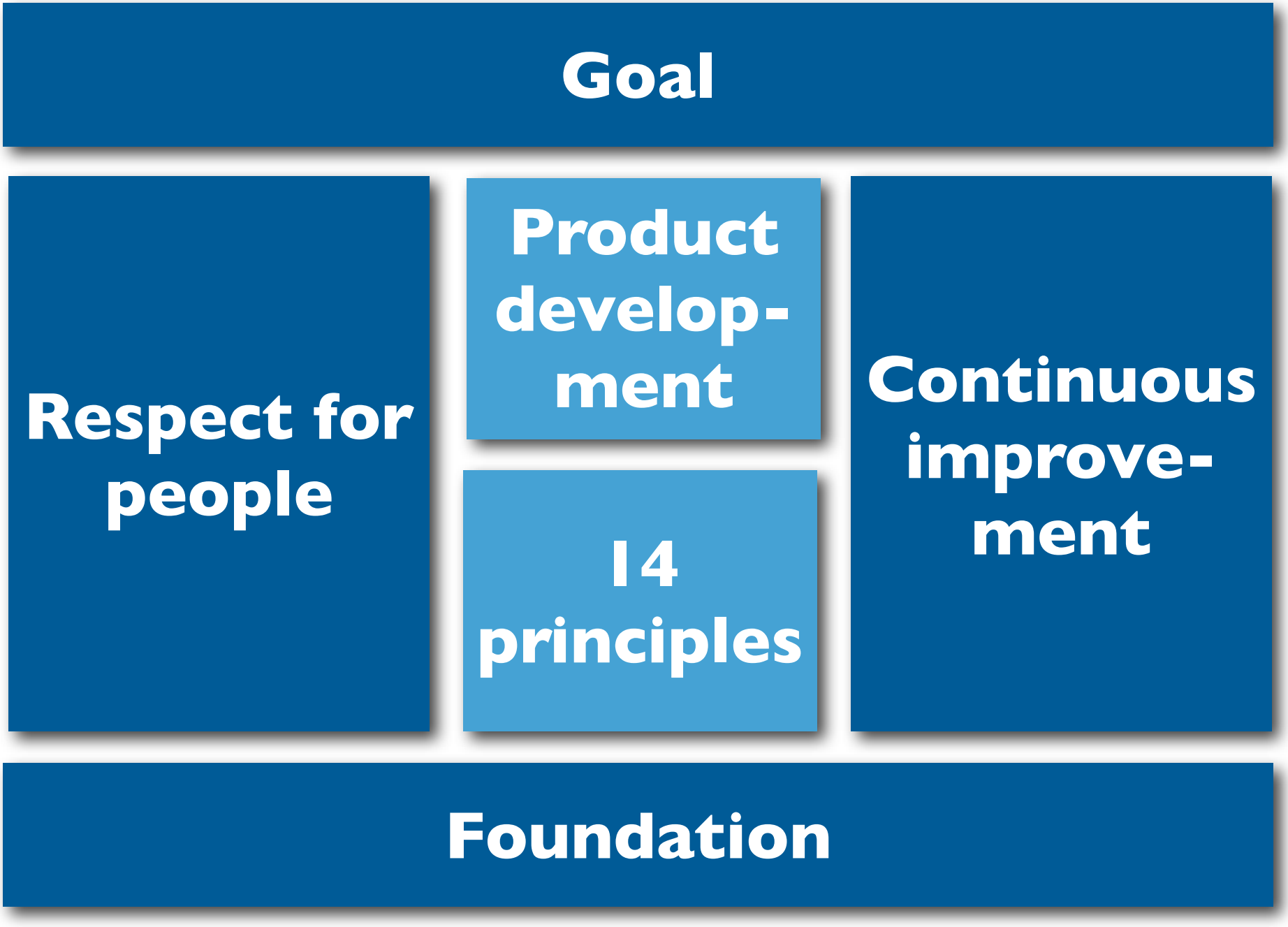
The painting is Black Square from Kazimir Malevich.

Continuous improvement

Respect for people

Lean development originates from the Toyota production system.

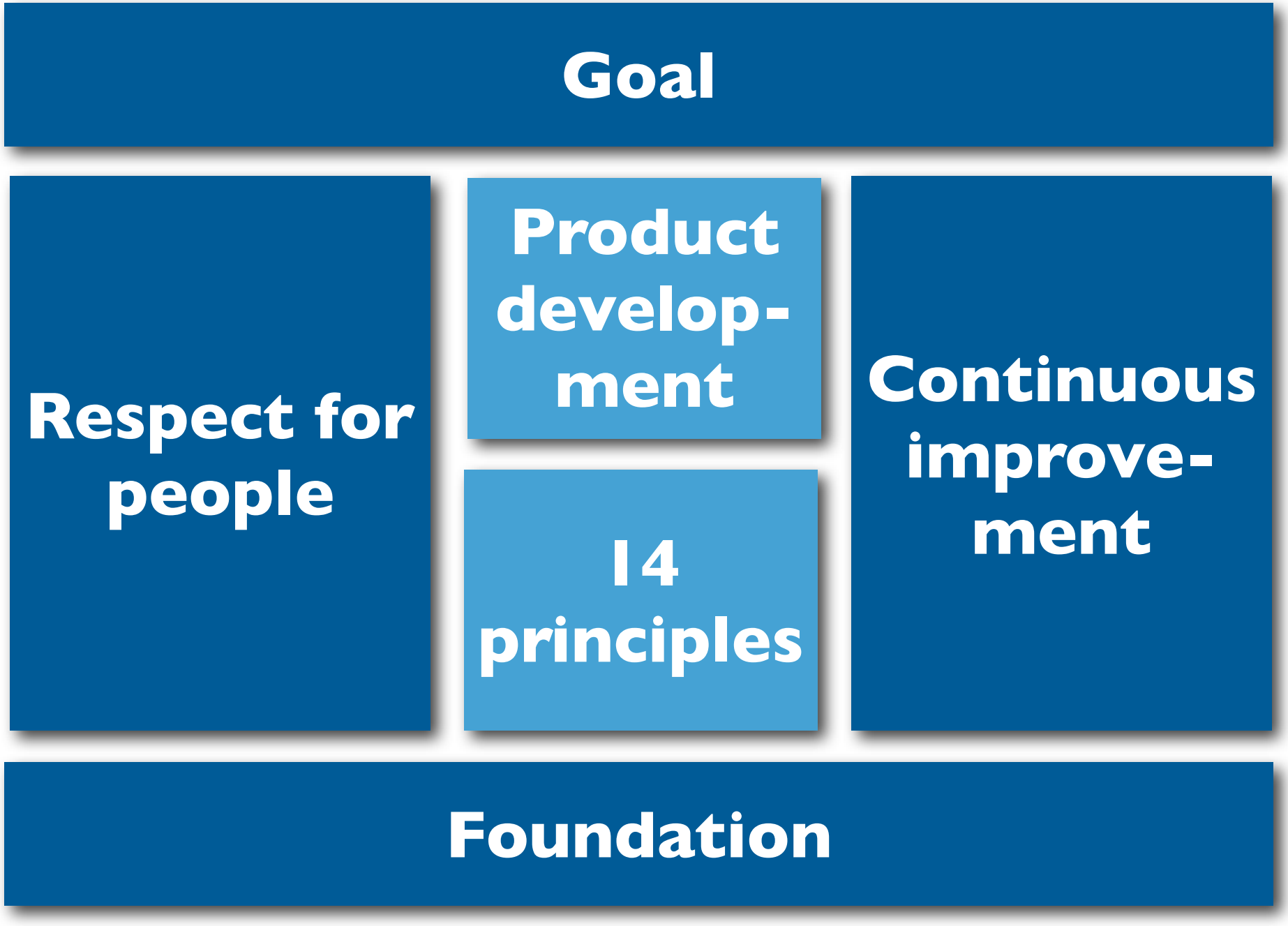
Two main principles in lean development are the two shown on this slide.



Lean thinking house from Larman, Vodde (2009)

Goal

Sustainable shortest lead time
Best quality and value (to people and society)
Most customer delight
Lowest cost
High morale
Safety



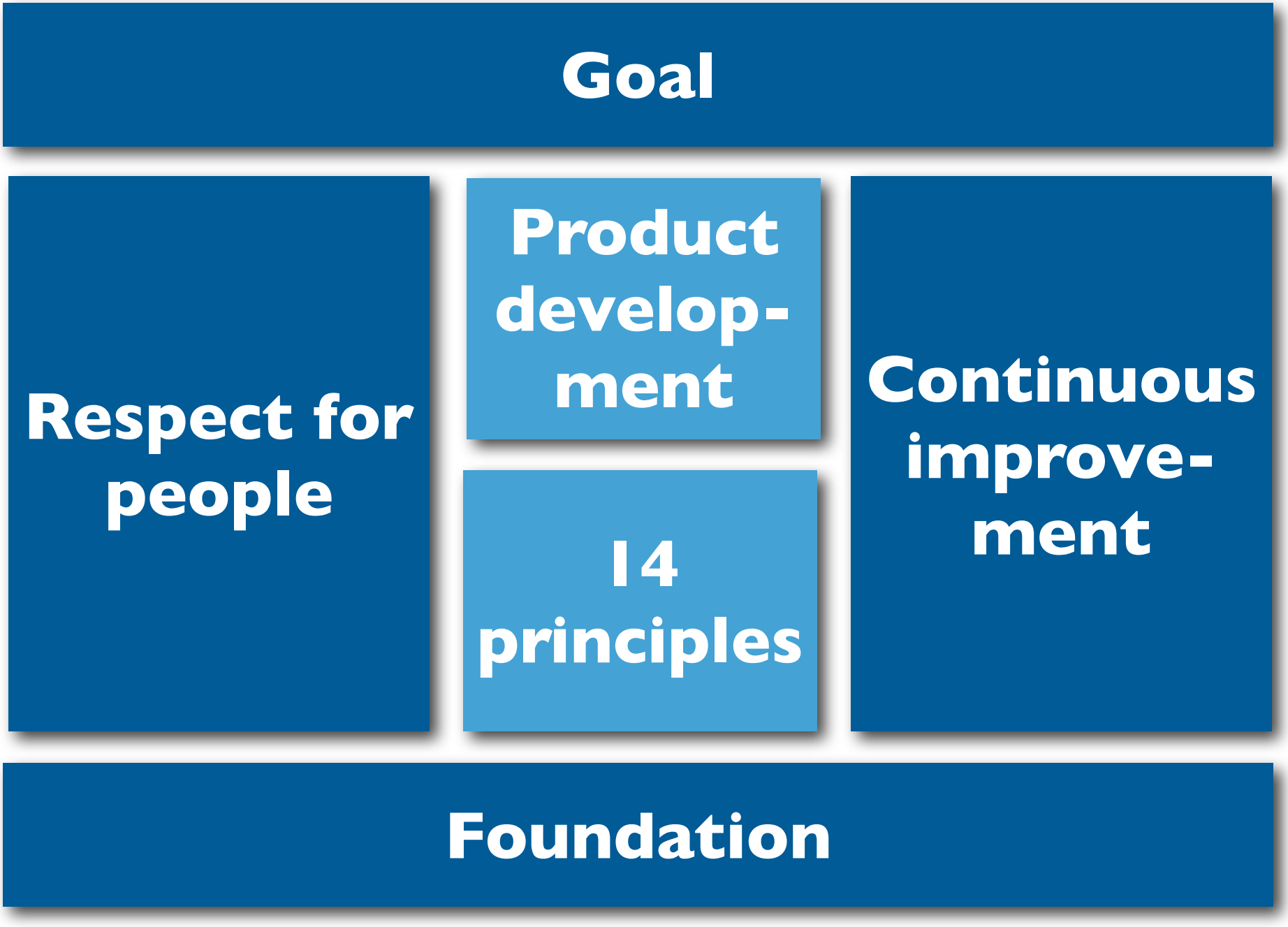
Lean thinking house

Foundation

	Expert knowledge of the work	Only general management knowledge
Bottom-up	Coach/mentor, builder of a learning organisation	facilitator
Top-down	Detailed task manager	Bureaucrat

Management applies and teaches lean thinking, and bases decisions on this long-term philosophy

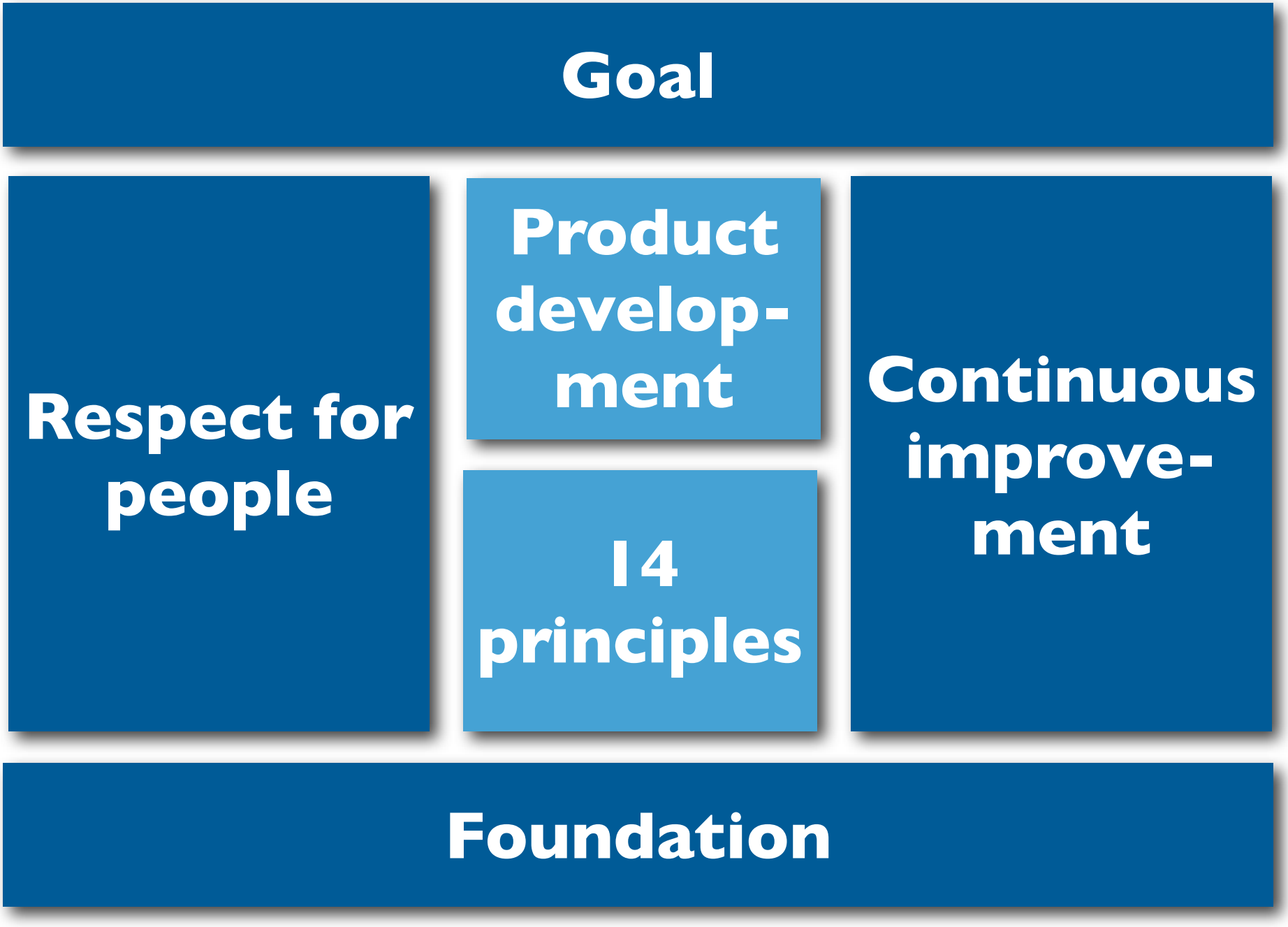
This principles says that you as a manager should not just sit behind a desk and give orders, but you need
to go and see the problems for yourself to understand them.



Lean thinking house

Respect for people

- Develop people and then build products
- Don't trouble your customers
- Managers "walk the talk"
- Teams & individuals evolve their own practices and improvements
- Develop teams
- Build partners



Lean thinking house

Continuous improve-ment

- Go see
- Perfection challenge
- No final process
- Kaizen

Also "go see".

Step 1—Choose and practice techniques the team has agreed to try, until they are well understood (master standardized work).
Steps 2 and 3—Small, incremental, relentless change of anything.

Kaizen events
5 Whys
Value and Waste

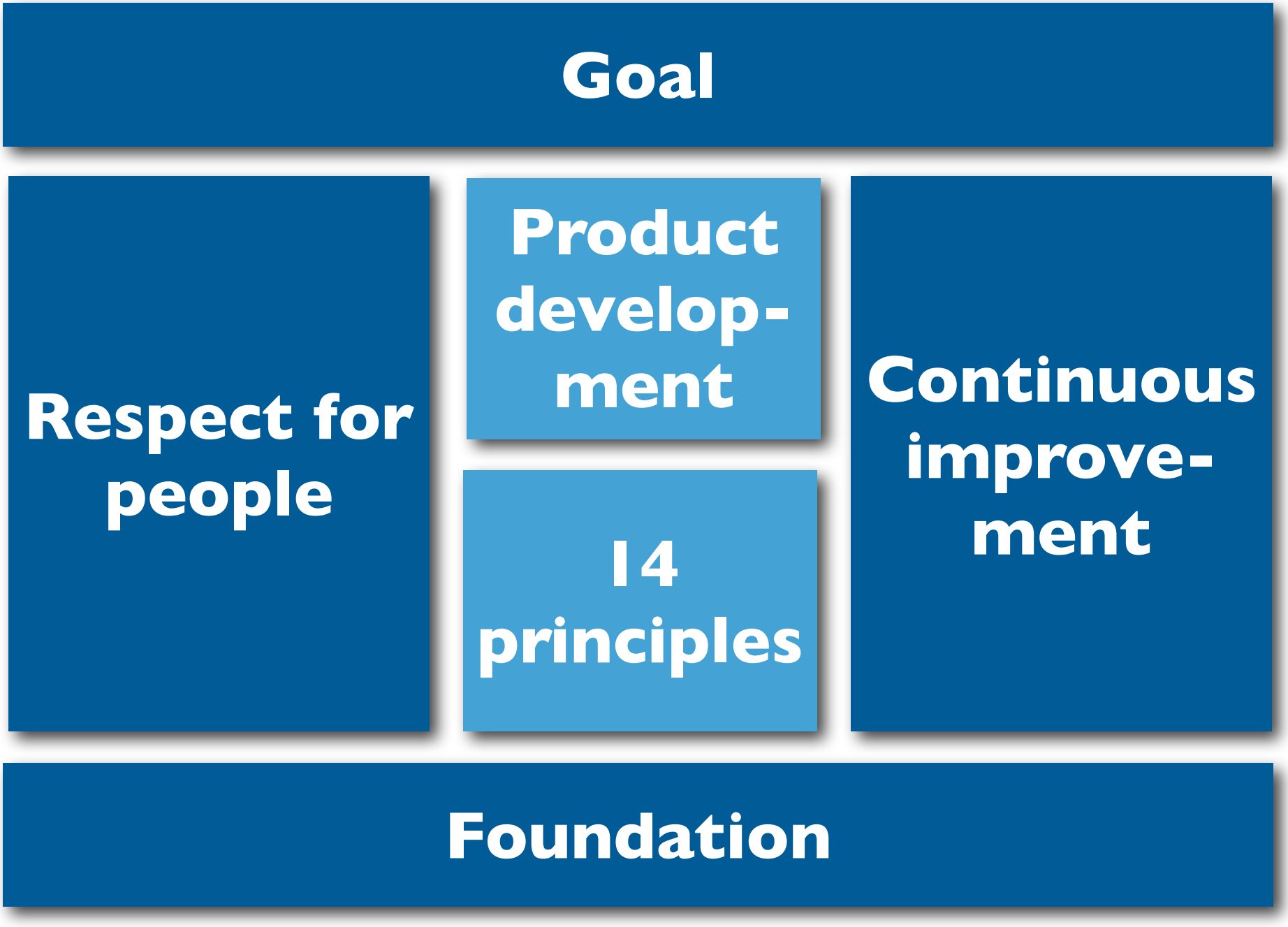
Reduce waste

Group work

- Find examples for wastes in software engineering processes!
- Types
  - Overproduction
  - Waiting
  - Handoff
  - Relearning/reinvention
  - Partially done work
  - Task switching
  - Defects
  - Under-realising people's skills
  - Knowledge loss
  - Whishful thinking

4 Groups
10 Minutes
1 Example for each type

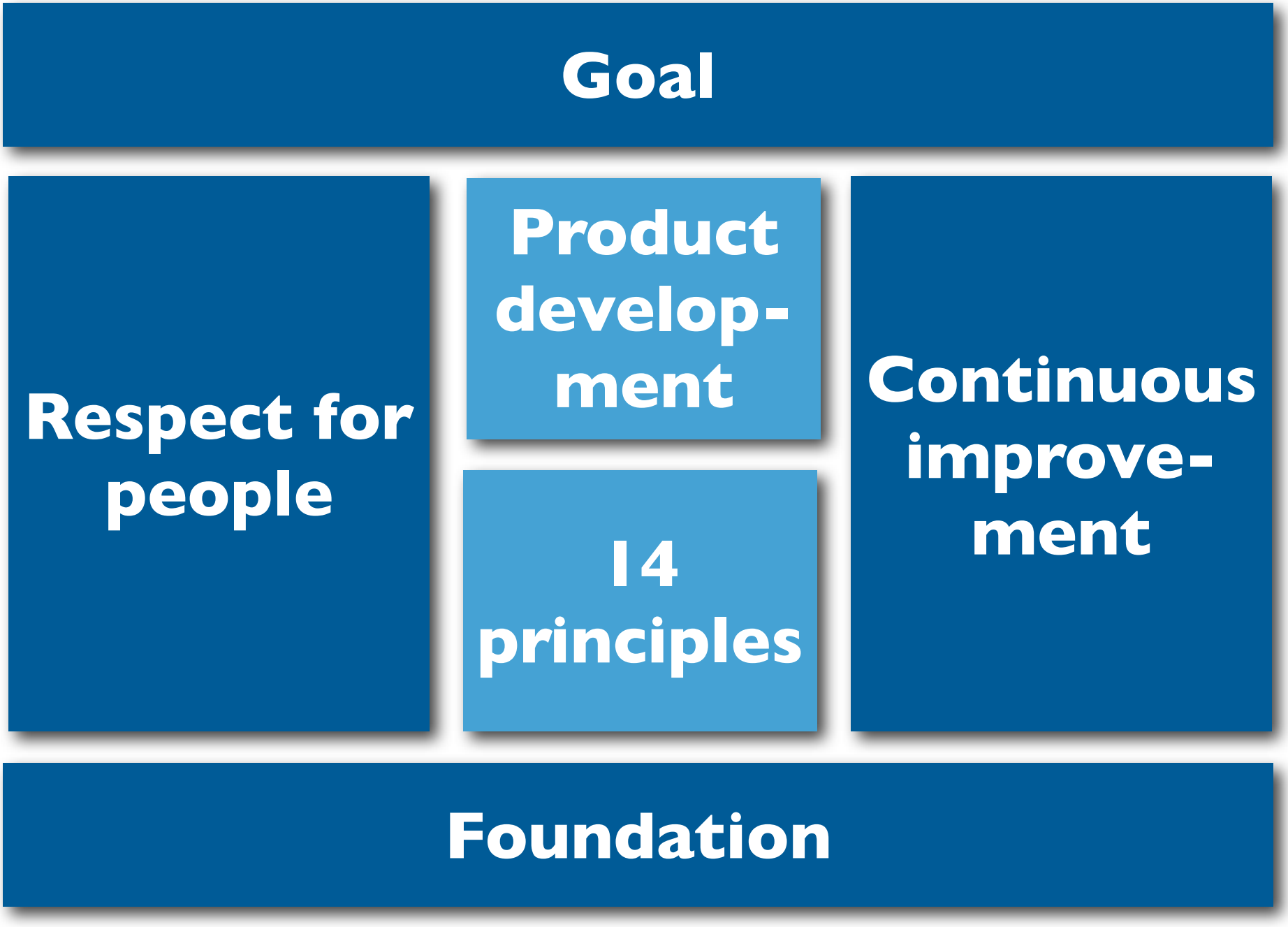

Overproduction
Waiting
Handoff
Relearning
Partially done work
Task switching
NO Parallelization
Bad Adaption of the process steps
Transportation
Learning time
Unclear Requirements
Time Boxing
Defects
Understaffing skills
Knowledge Loss
Wishful thinking
Defects not caught by tests
Code



Lean thinking house

1. Long-term philosophy
2. Flow
3. Pull systems
4. Level the work
5. Stopping and fixing problems
6. Master norms
7. Simple visual management
8. Well-tested technology
9. Leaders and teachers
10. Exceptional people
11. Helping partners improve
12. Go see
13. Slow decisions, rapid implementation
14. Relentless reflection, kaizen

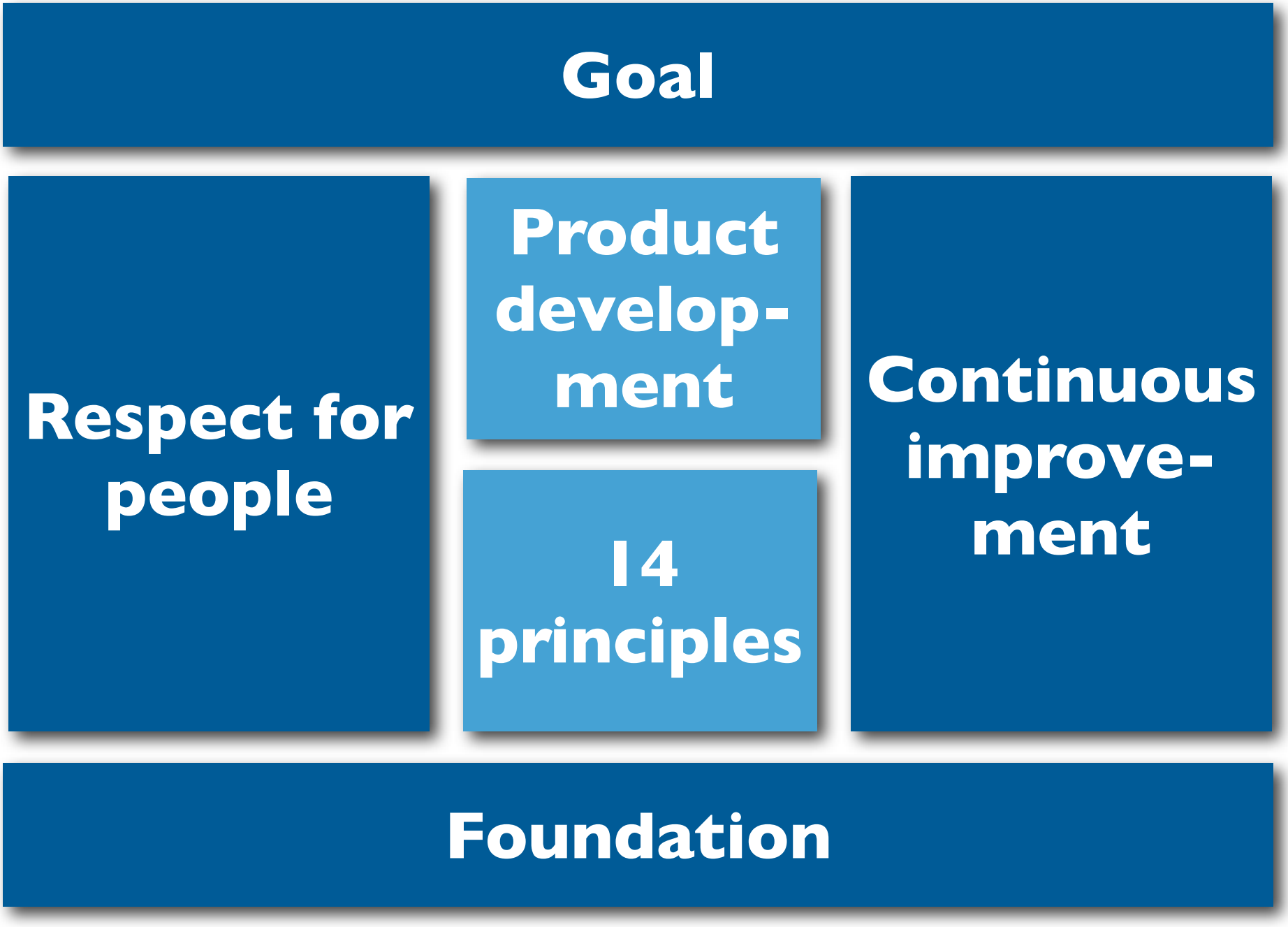
14 principles



Lean thinking house

Product develop-ment

Outlearn the competition!



Lean thinking house

Process simulation

Lean development