Facilitated Modelling with Simulation: The SimLean Approach

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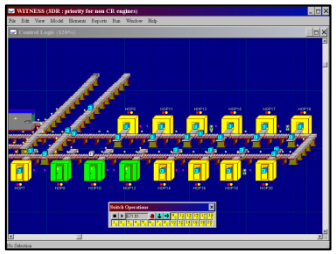
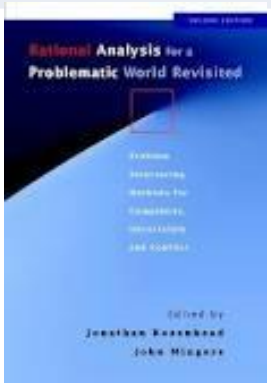
Facilitated Modelling

Franco and Montibeller [2010]

Expert Mode Sporadic client involvement	Facilitated Mode Clients involved throughout
Problem is real entity	Problem is socially constructed
Analysis needs to be objective	Subjectivity is inevitable
Optimal solutions wanted	Satisficing solutions wanted
Implementation follows from scientific rigour	Implementation follows from participation in the study

$$
\begin{aligned}
\min \quad & z \\
\text{s.t.} \quad & z \geqslant \sum_{k=1}^{N} (c_{ik} + \alpha c_{km}) X_{ik} + c_{mj} X_{jm}, \quad i, j, m = 1, \ldots, N \\
& \sum_{k=1}^{N} X_{ik} = 1, \quad i = 1, \ldots, N \\
& X_{ik} \leqslant X_{kk}, \quad i, k = 1, \ldots, N \\
& \sum_{k=1}^{N} X_{kk} = p \\
& X_{ik} \in \{0, 1\}, \quad i, k = 1, \ldots, N
\end{aligned}
$$





Previous Attempts at Facilitated Modelling with DES

Robinson (2001): user support help desk

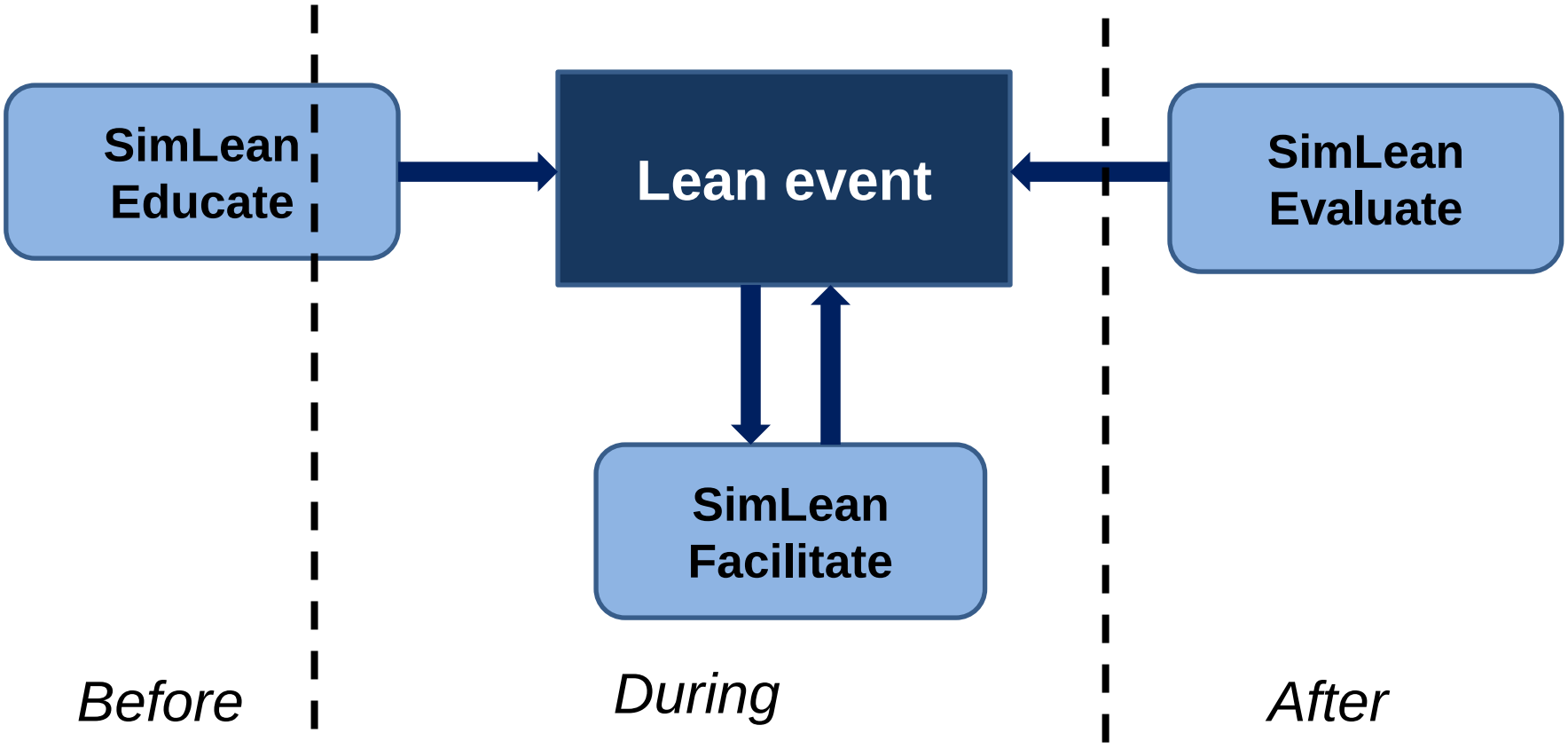
Adamides and Karacapilidis (2006): collaborative business process modelling

den Hengst et al (2007): cargo flows at a Dutch airport

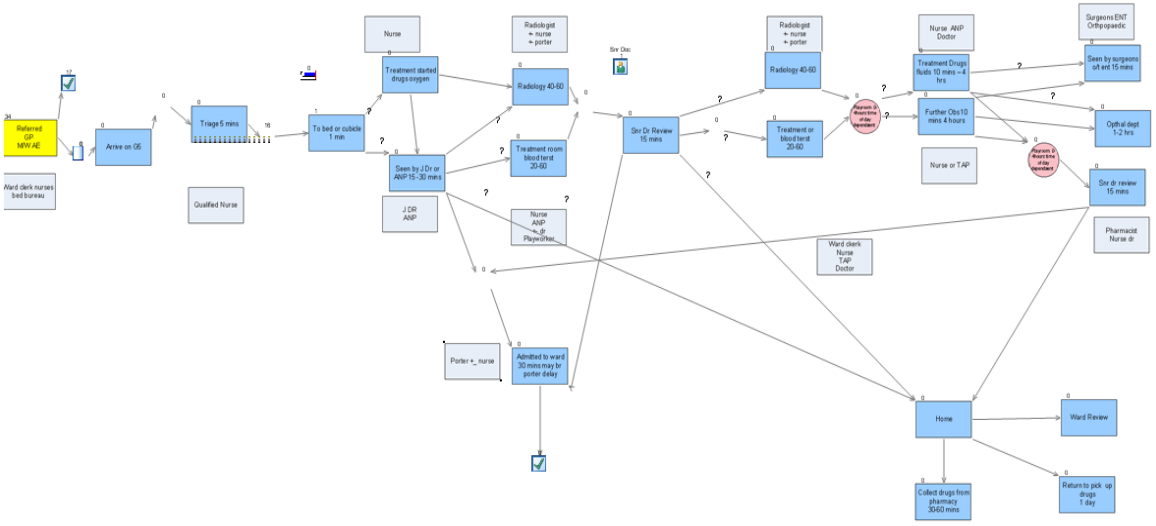
Tako et al (2010): PartiSim

Barjis (2011): collaborative, participative and interactive modelling

SimLean healthcare



SimLean Facilitate



SimLean Facilitate - Ophthalmology Clinic

Lengthy waits

Doctors arrive late for clinics

Nurses and admin. Staff overworked

Low morale

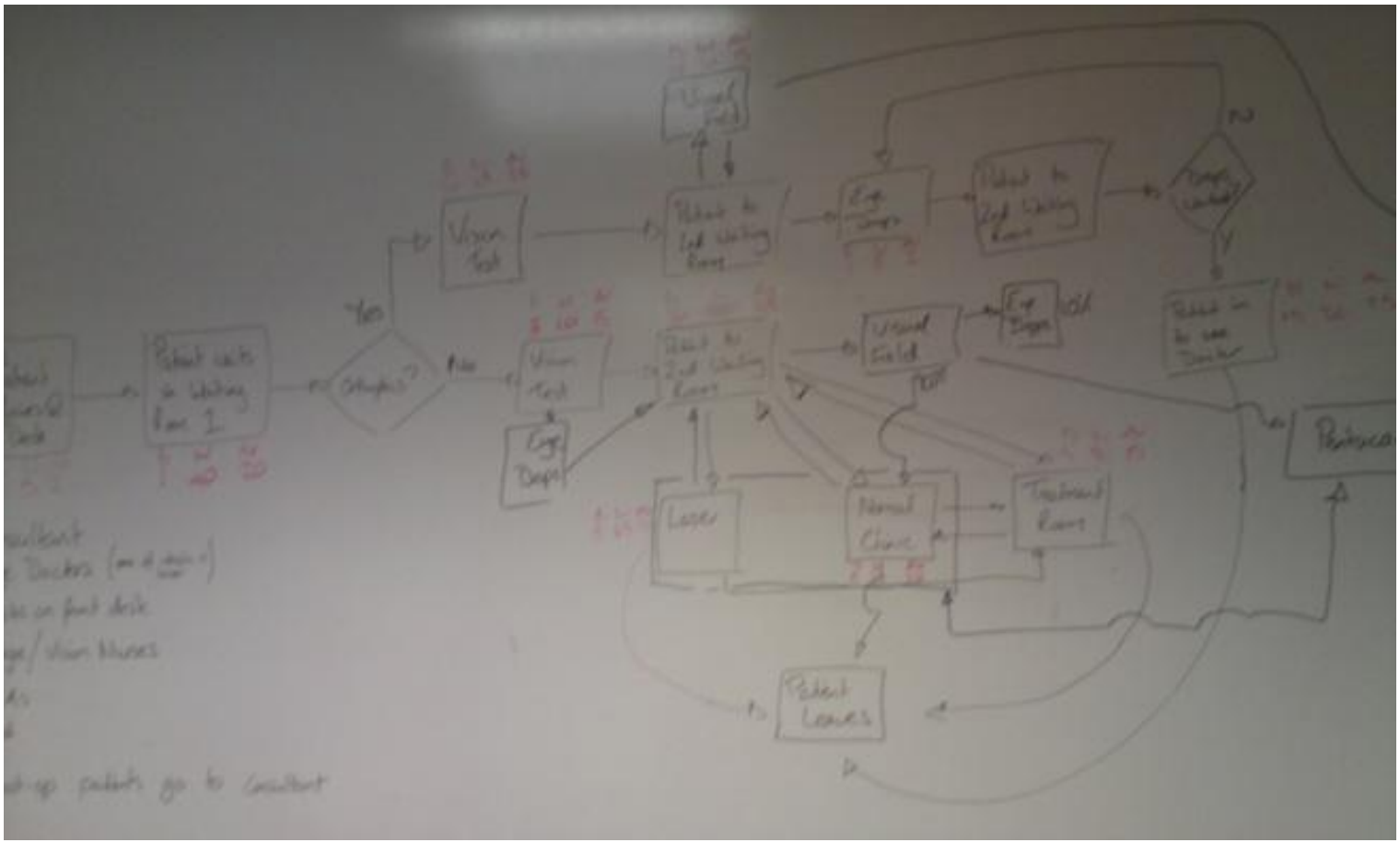
Lean Improvement Workshop

Step 1 – Go to the Gemba: go see/experience the place where the work is done

Time	Activity	Duration
10.40	Arrive at reception, no wait	
10.40 - 11.07	Wait in waiting room 1 (waiting room full)	27
11.07	Called for visual test, asked to read letters	0.5
11.08	Walk round to waiting room 2	0.5
11.09 - 12.07*	Wait in second waiting room (waiting room full)	58
12.07 - 12.20	Visual fields test	13
12.20 - 12.45	Wait (in waiting room 2)	25
12.45	Patient called, but she reports she has already had the scan	0.5
12.46 - 13.05	Patient returns to waiting room 2 and waits	19
13.05 - 13.10	Patient with Doctor	5
13.10	Patient goes to reception and there is now a queue…	
Total time in system		148.5
Total time waiting		129
Total time in activity		19.5

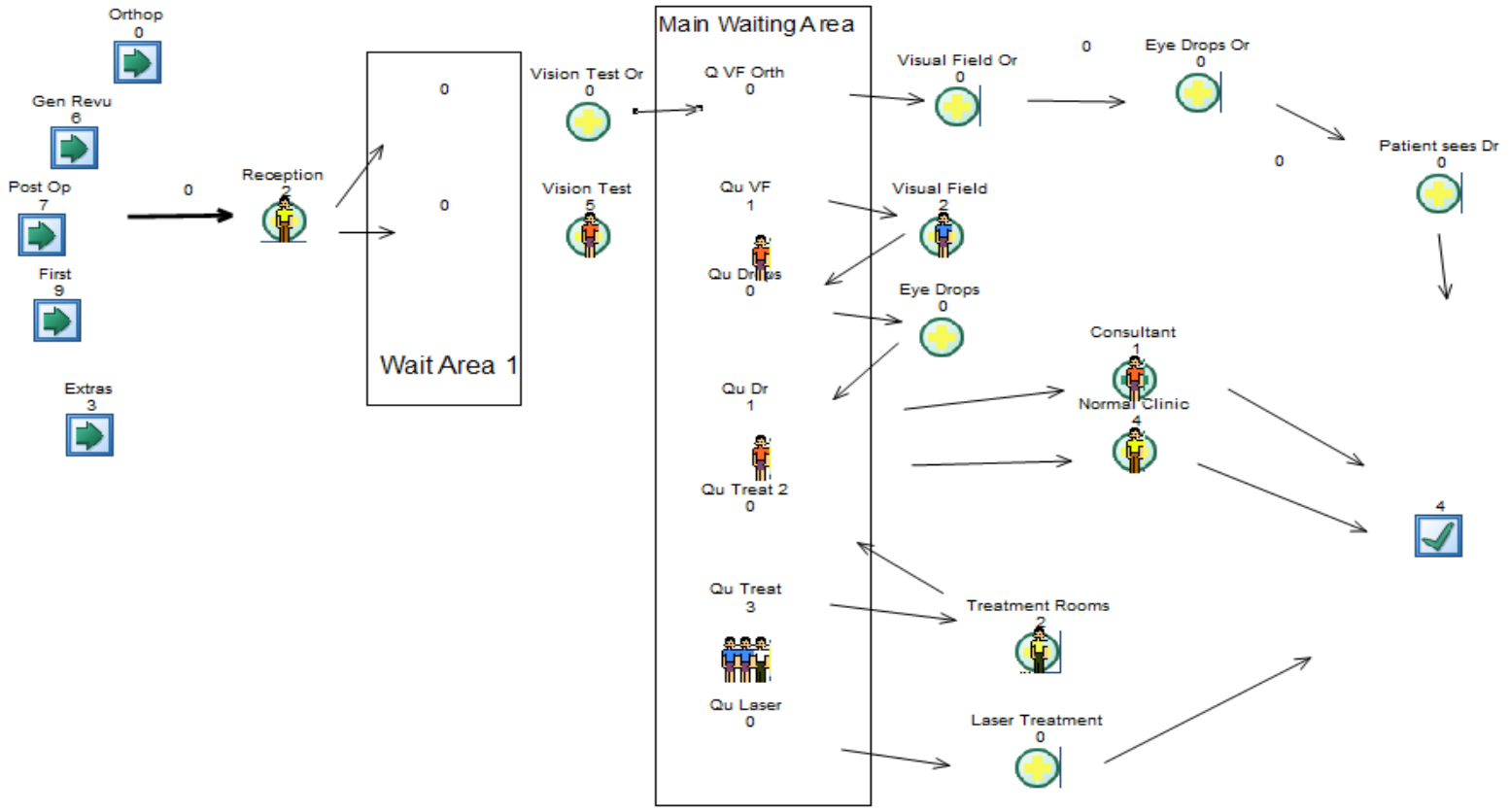
Lean Improvement Workshop

Step 2 – Map the Process



Lean Improvement Workshop

Step 3 – Build the Model Rapidly



Lean Improvement Workshop

Step 4 – Demonstrate and Discuss the Model (Day 2)

1. Model Understanding: what is the model doing?

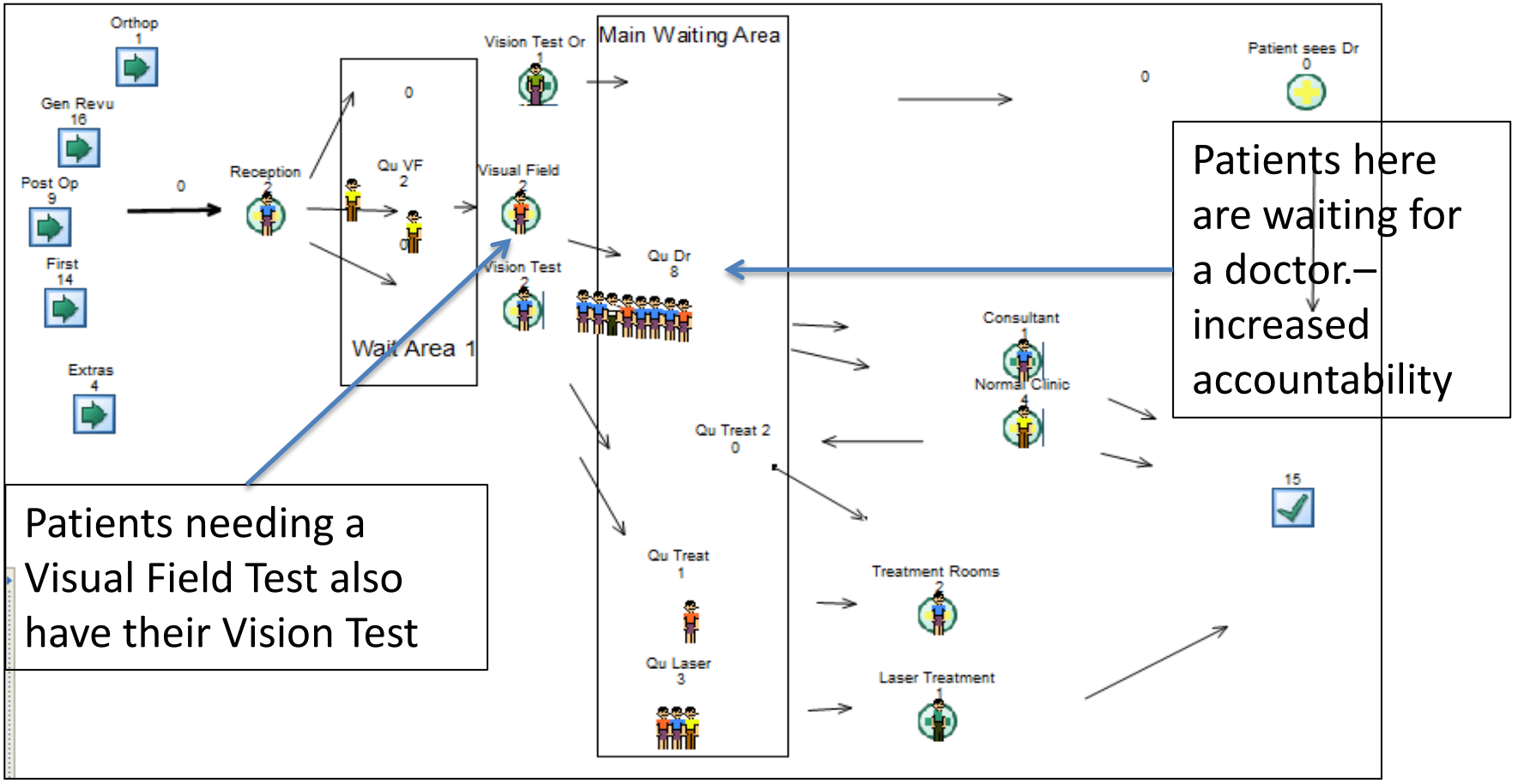
2. Face Validation: does this look like what happens in the ophthalmology clinic?

3. Problem Scoping: what is causing the problems in the ophthalmology clinic?

4. Improvement: what could we do about it?

Lean Improvement Workshop

Step 5 – Conduct Rapid Experiments to Test 'What if'.



Lean Improvement Workshop

The Outcome

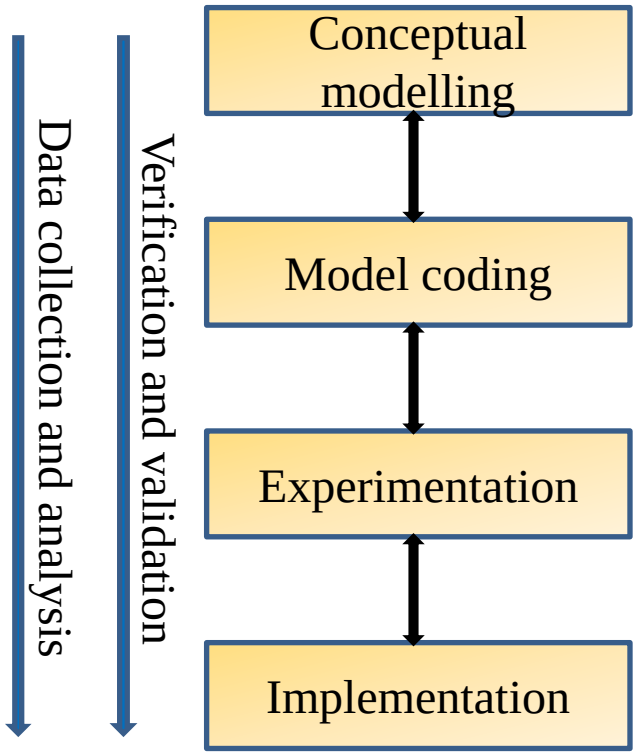
Actual physical measurements were taken of the treatment rooms to ensure that the vision test equipment could fit into the visual field test rooms

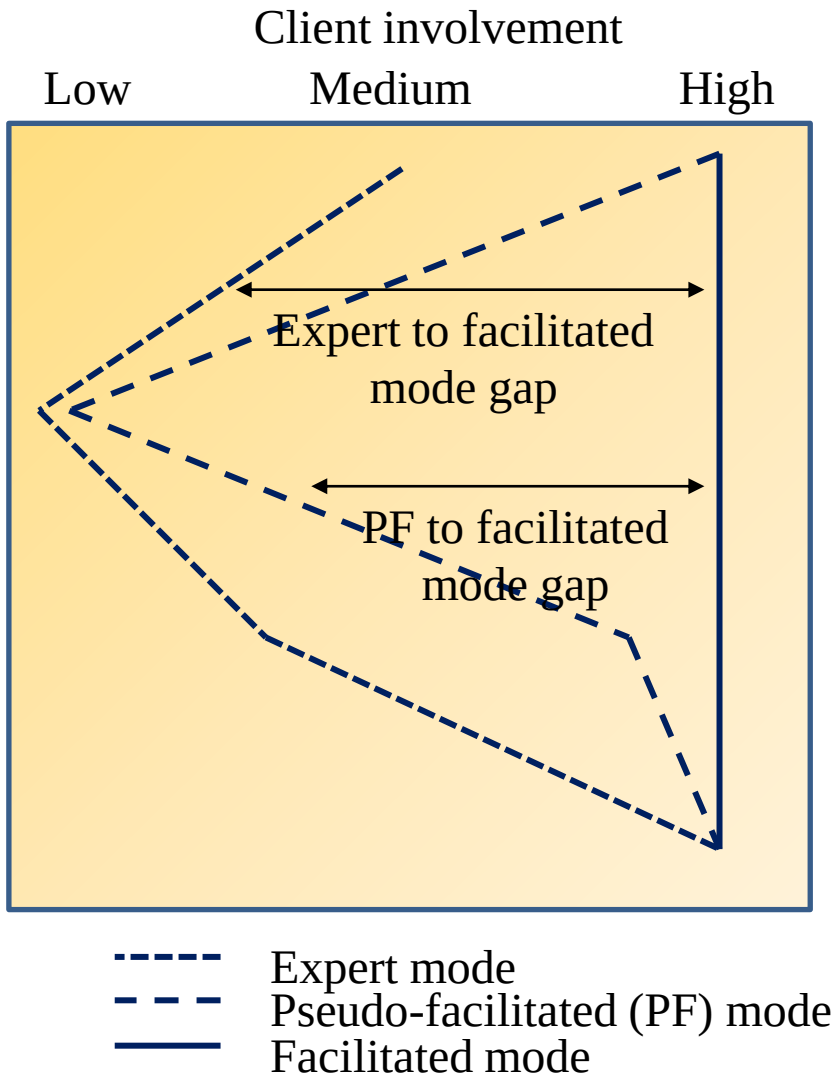
'It is good to see it [the process] pictorially... doctors don't see the effect on patients.'

'we talked a lot more about the model than about the map on day 1.'

'The simulation was the turning point in the discussion.'

Is This Facilitated Modelling?





Requirements for Rapid Modelling

Model Element	Detail	Complexity
Entities	Arrivals	Time based profile or appointment based
		Early/late/do not attend
		Batched arrivals
	Attributes	Patient type
		First/repeat patient
		Priority
Queues	Capacity	
	Queue discipline/priority	FIFO, LIFO, By attribute
	Minimum time in queue	Specify distribution
Activities	Number of	
	Time	Specify distribution or by patient type
	Routing	Percentage or by attribute
Distributions	Types	Fixed
		Negative exponential
		Triangle

Closing the Gap

The answer is not technological e.g. model reuse

Change of modelling worldview to:

- Problem is socially constructed
- Subjectivity is inevitable
- Satisficing solutions wanted
- Implementation follows from participation in the study

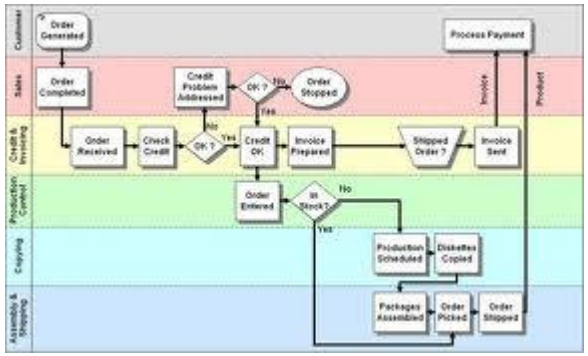
Avoid detailed complexity

Develop simple, low fidelity models with the client

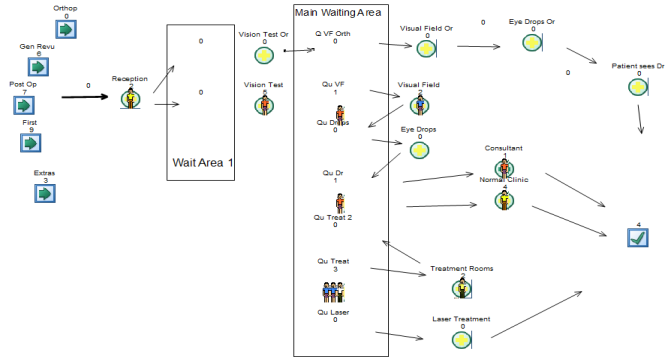
Closing the Gap

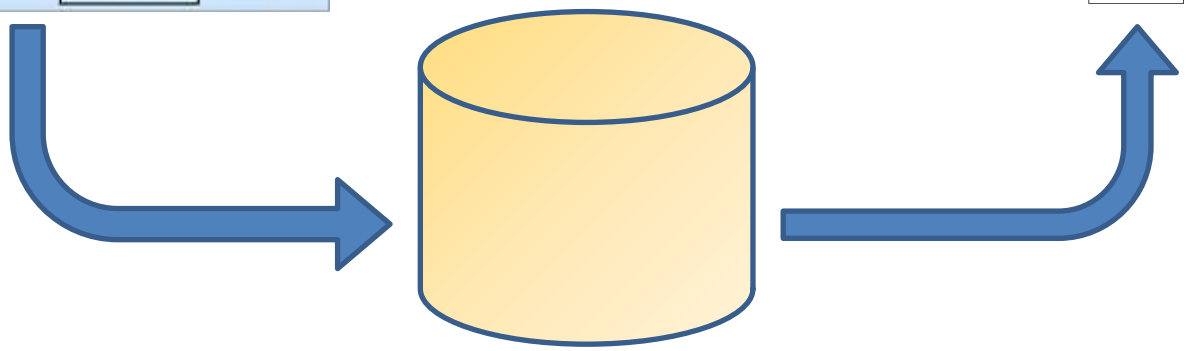
Where technology might help

Computer supported group process mapping



Automatic generation of simulation





Computer supported group data estimating

www.simlean.org