AN ENHANCED METHODOLOGY FOR REDUCING TIME CONSUMPTION IN DISCRETE EVENT SIMULATION PROJECTS

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Agenda

- **Research group**
- Introduction
- Methodology
- Requirements
- Examples

Productivity Development in Manufacturing Systems

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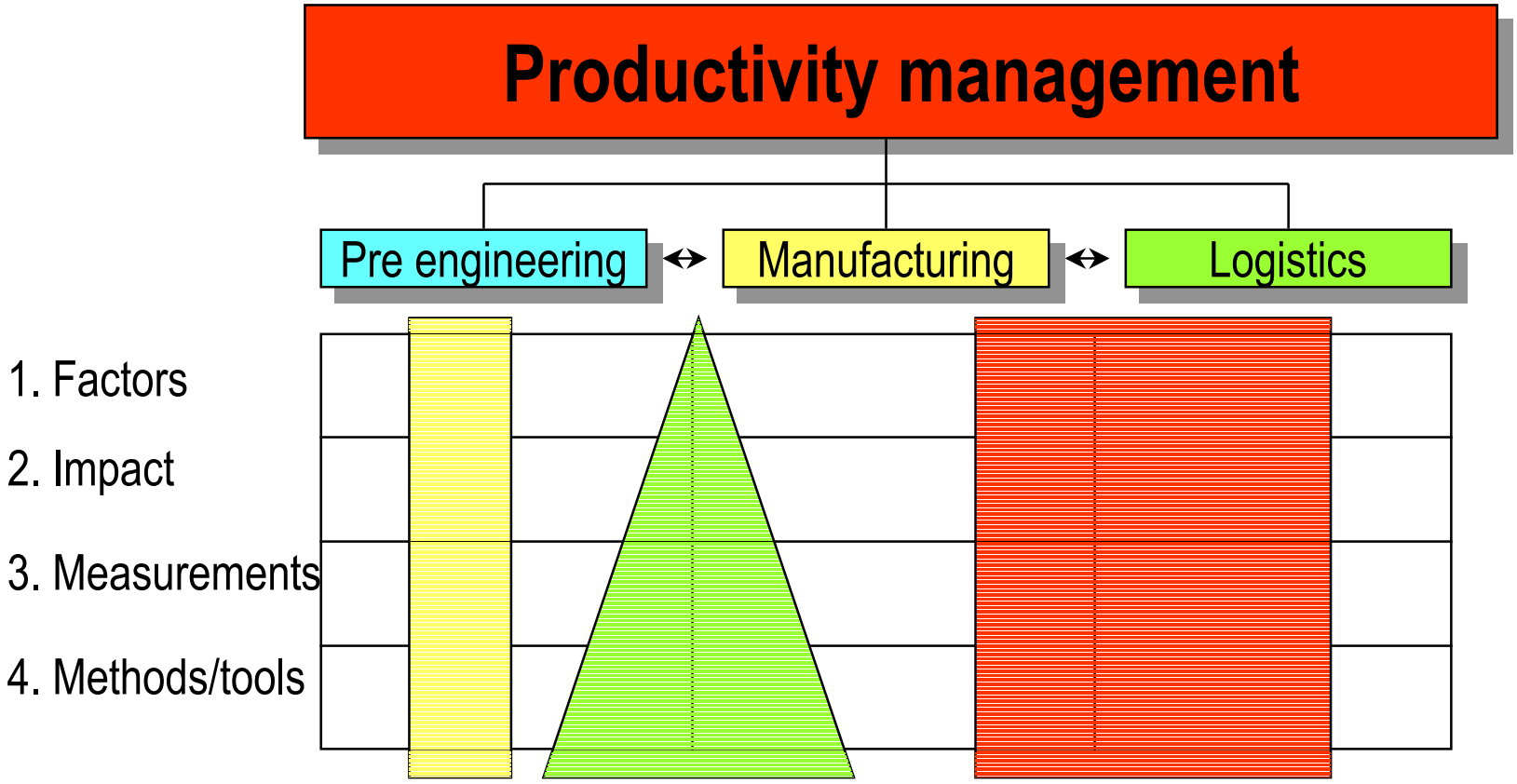
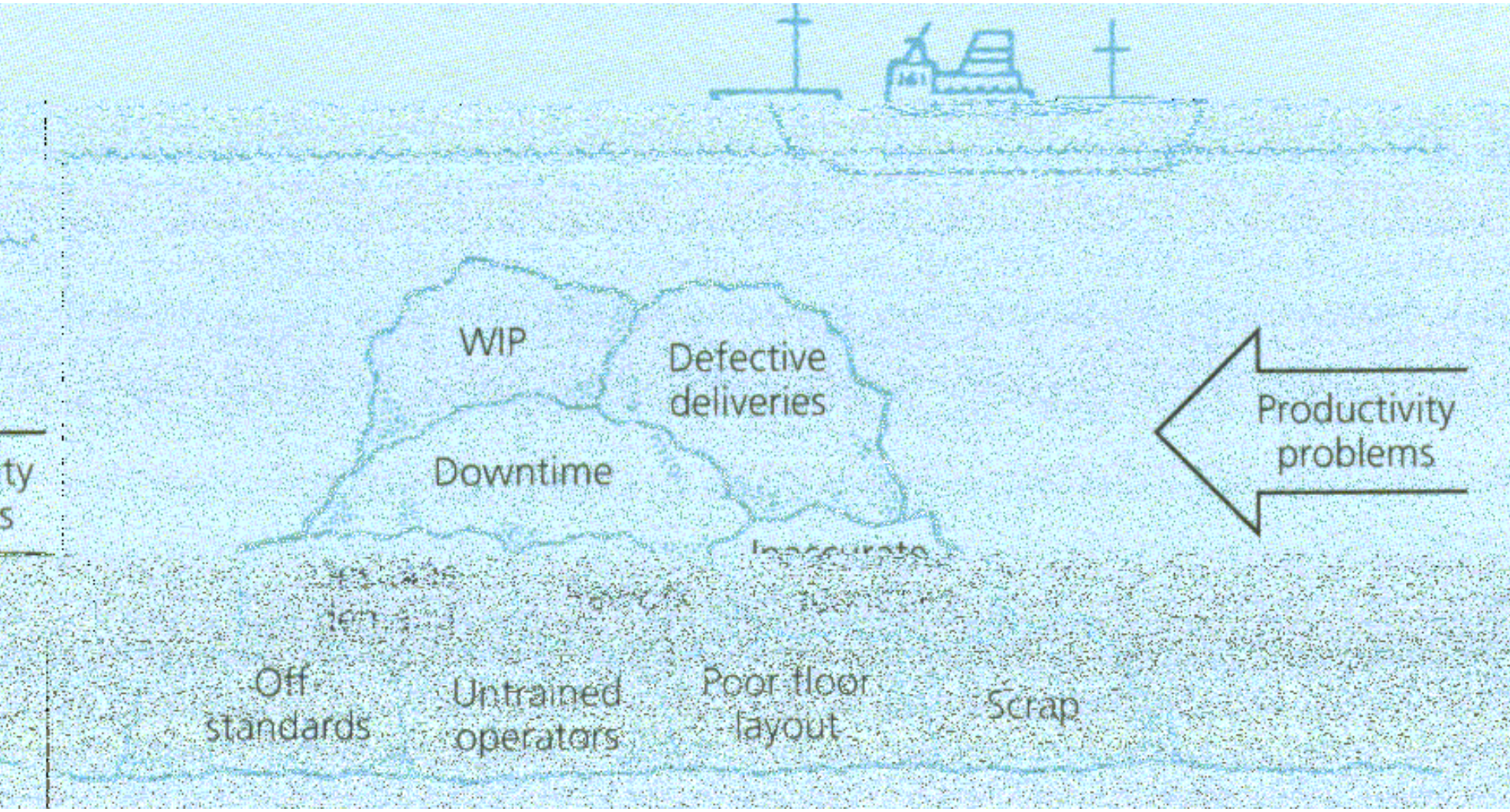
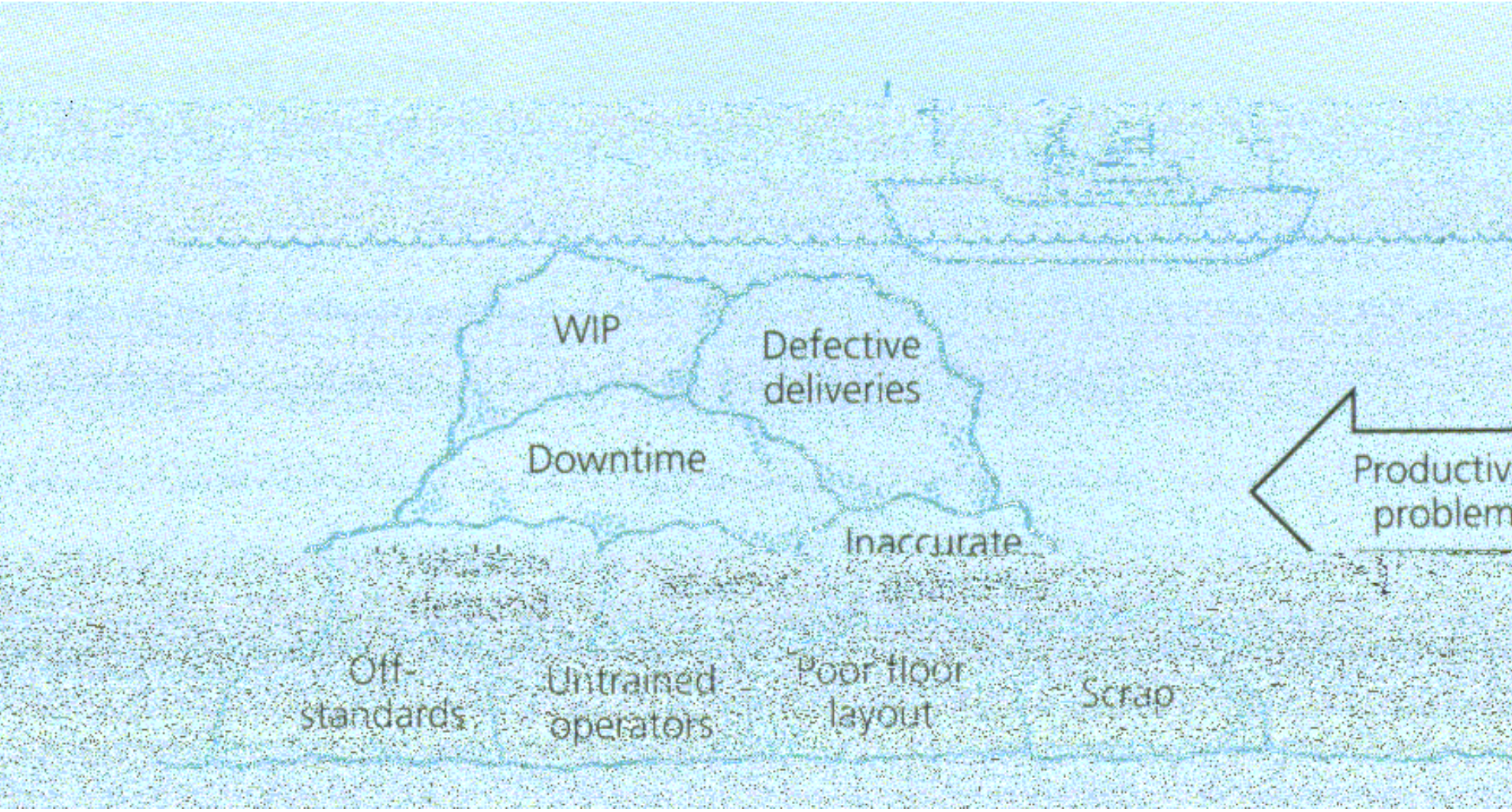
Subprojects



Not optimised



More optimised



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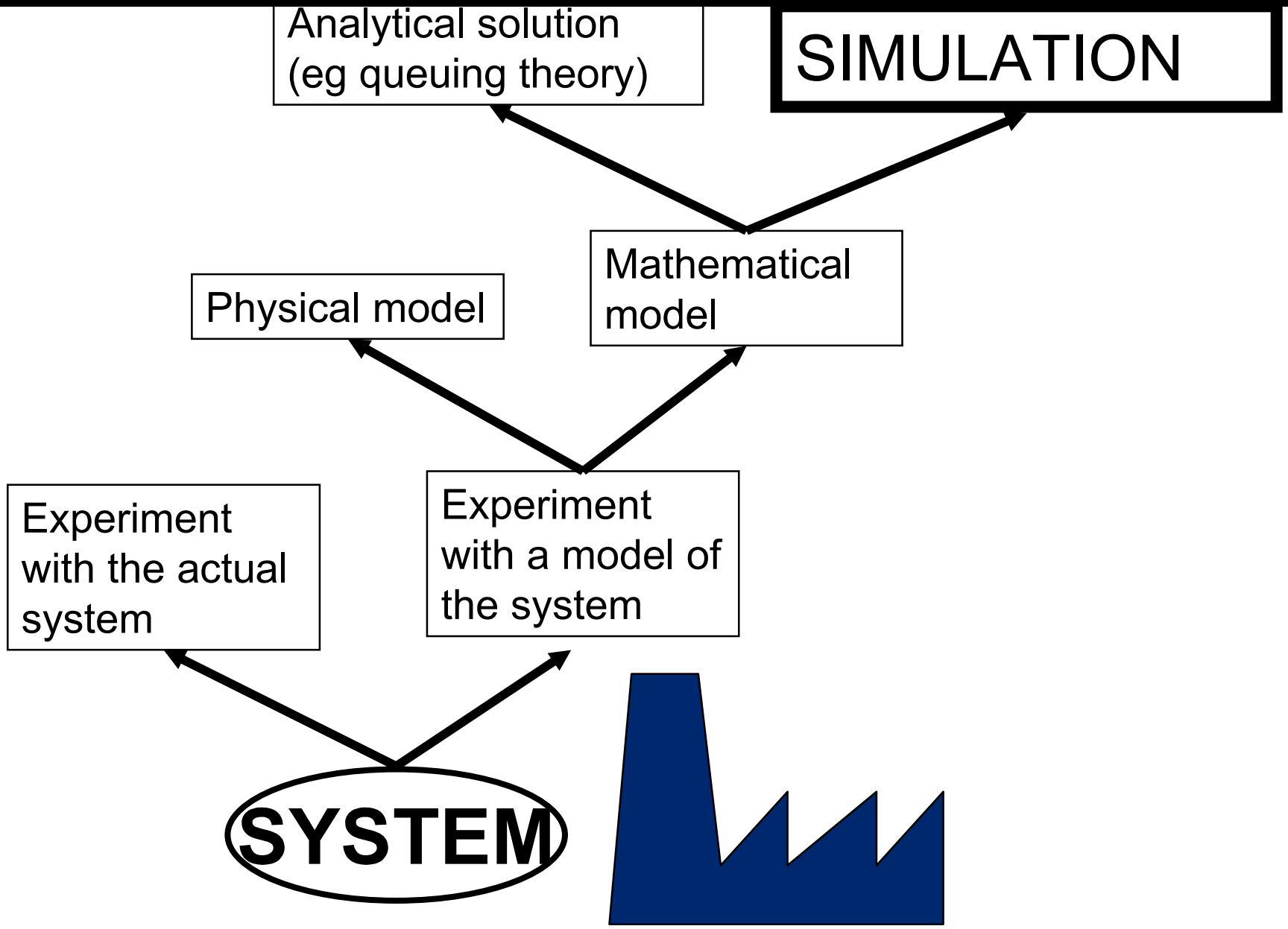
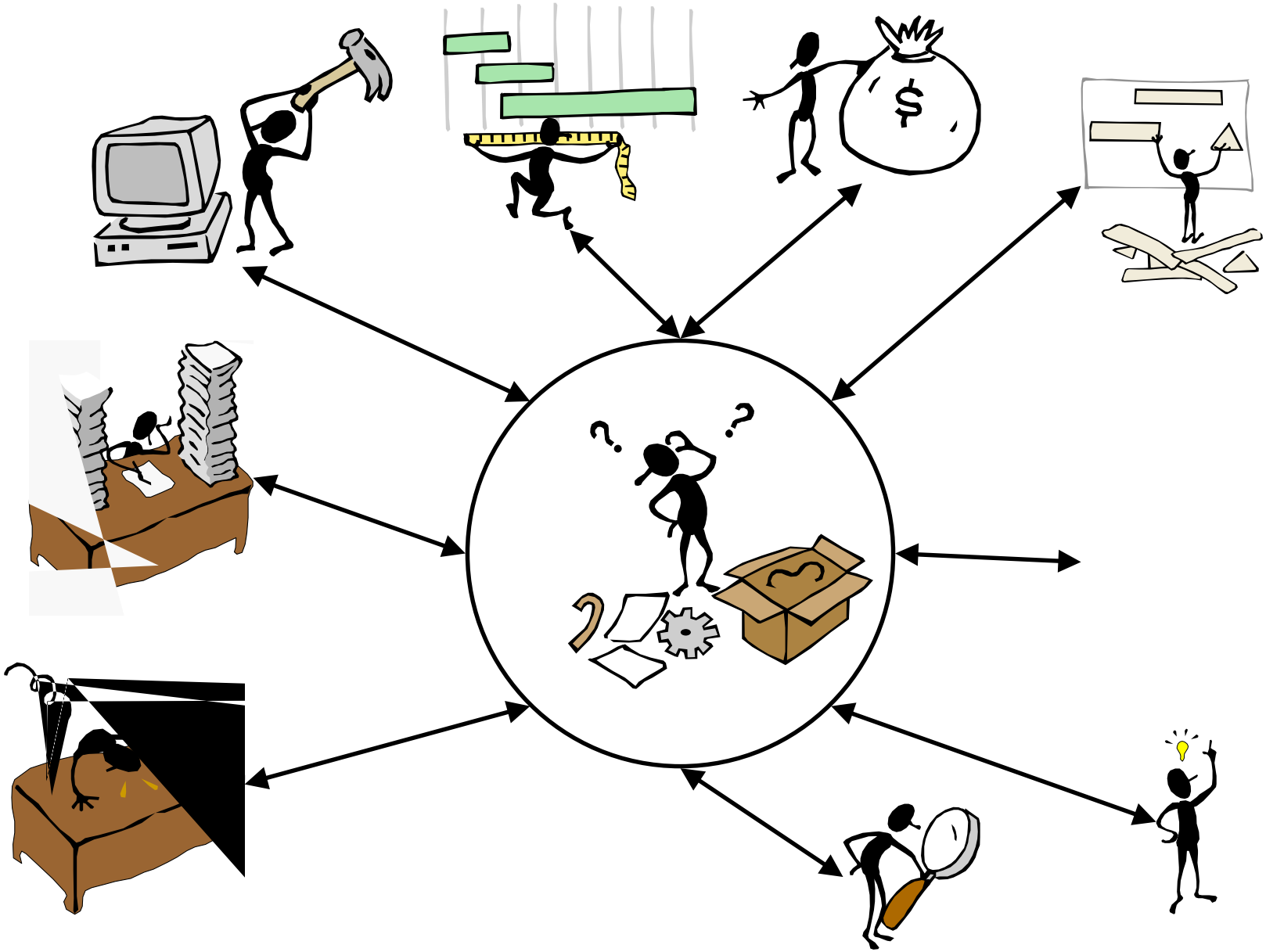
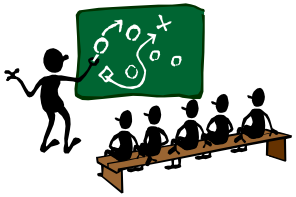

Analytical solution
(eg queuing theory)
SIMULATION
Mathematical
model
Physical model
Experiment
with the actual
system
Experiment
with a model of
the system
SYSTEM



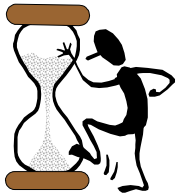
Why Simulation?

- Keep one's things in order



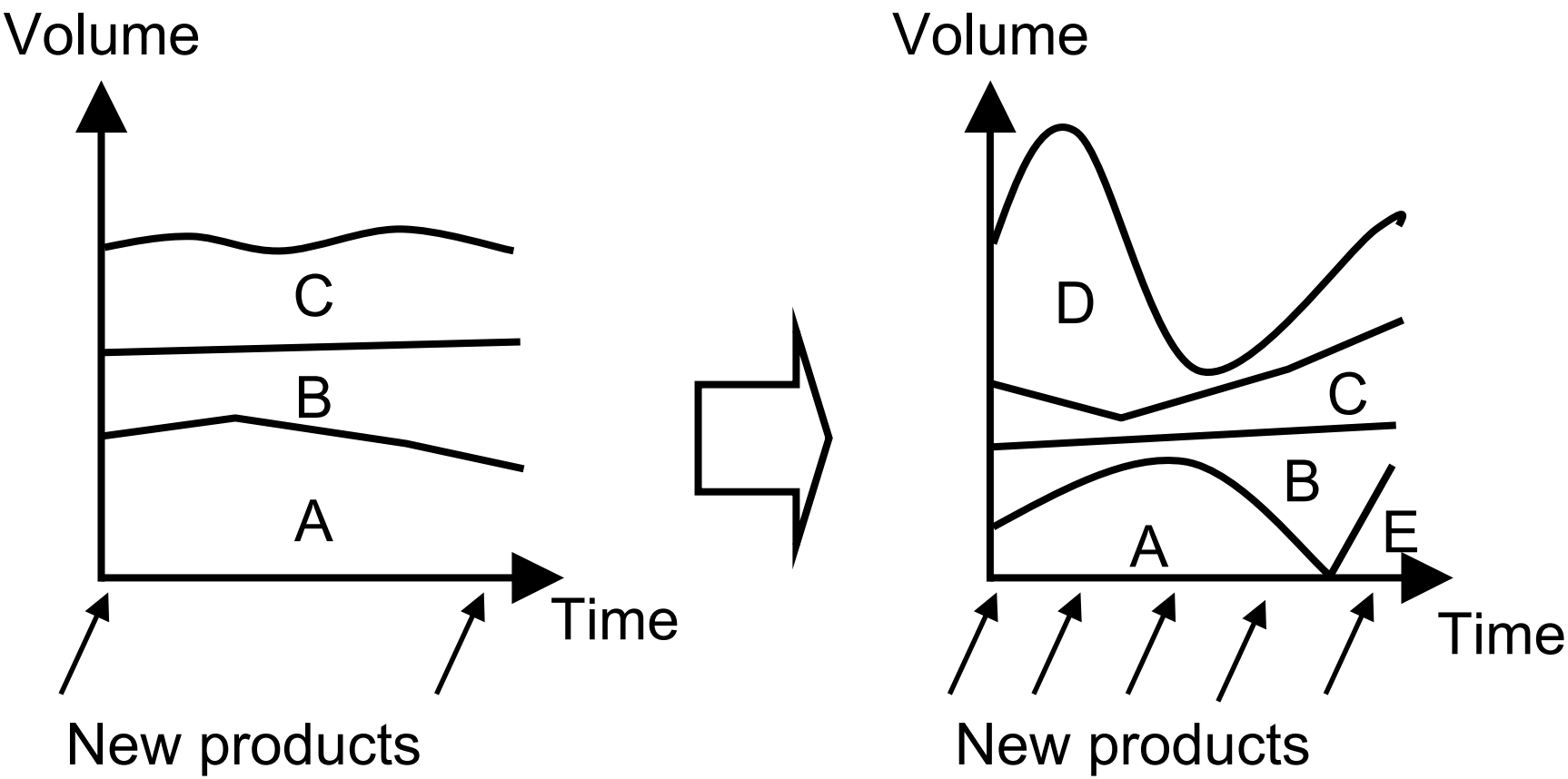
- Base for decision support

- *Points towards the right direction*

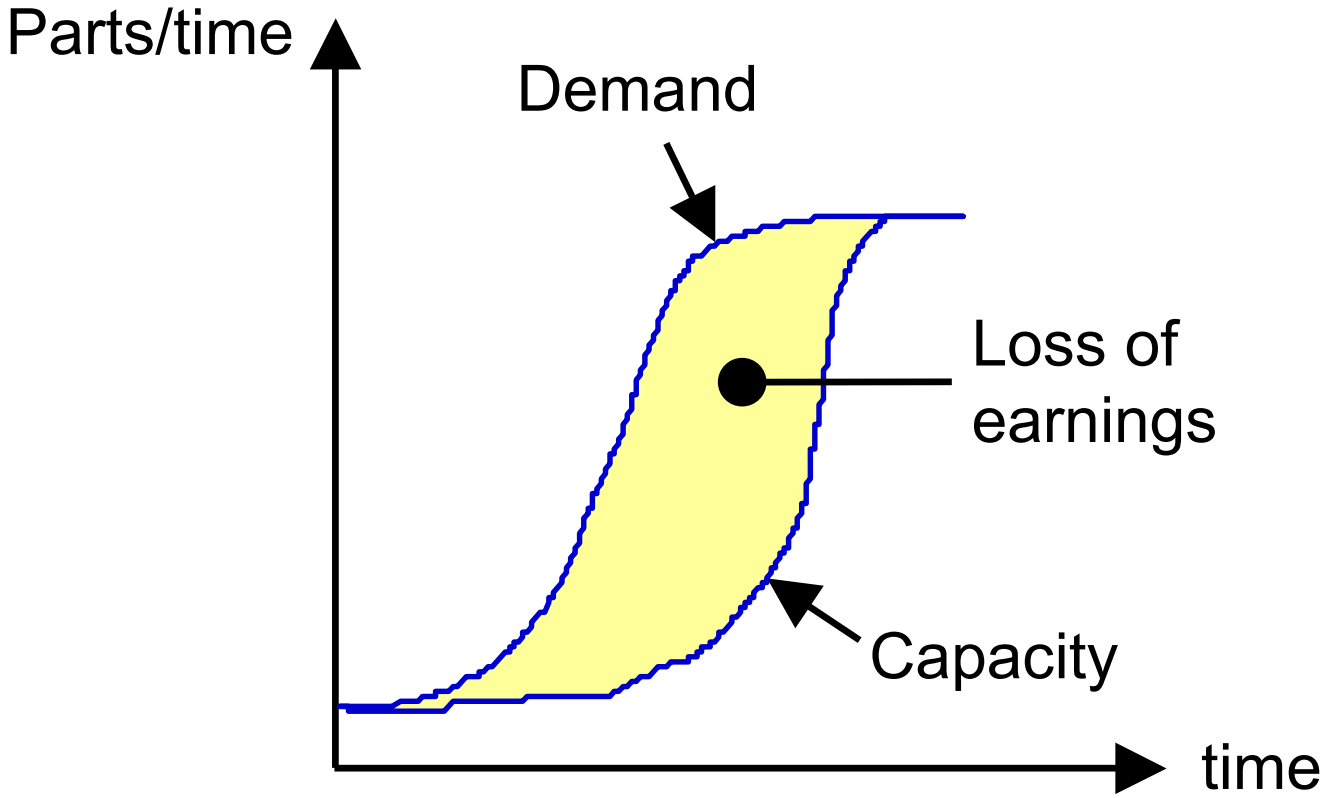


- *Time saving*

Product lifecycle times



Loss of slow ramp up



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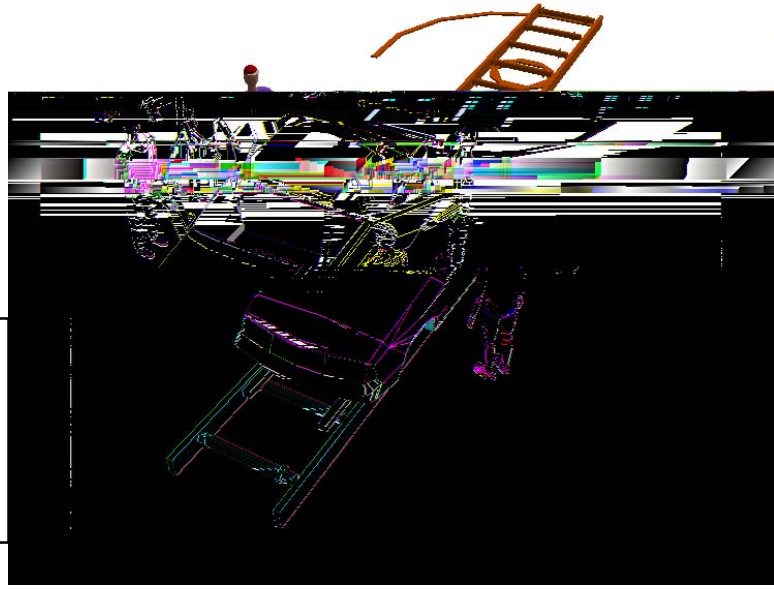
Simulation Project

Preparations

Modelling



Analysis

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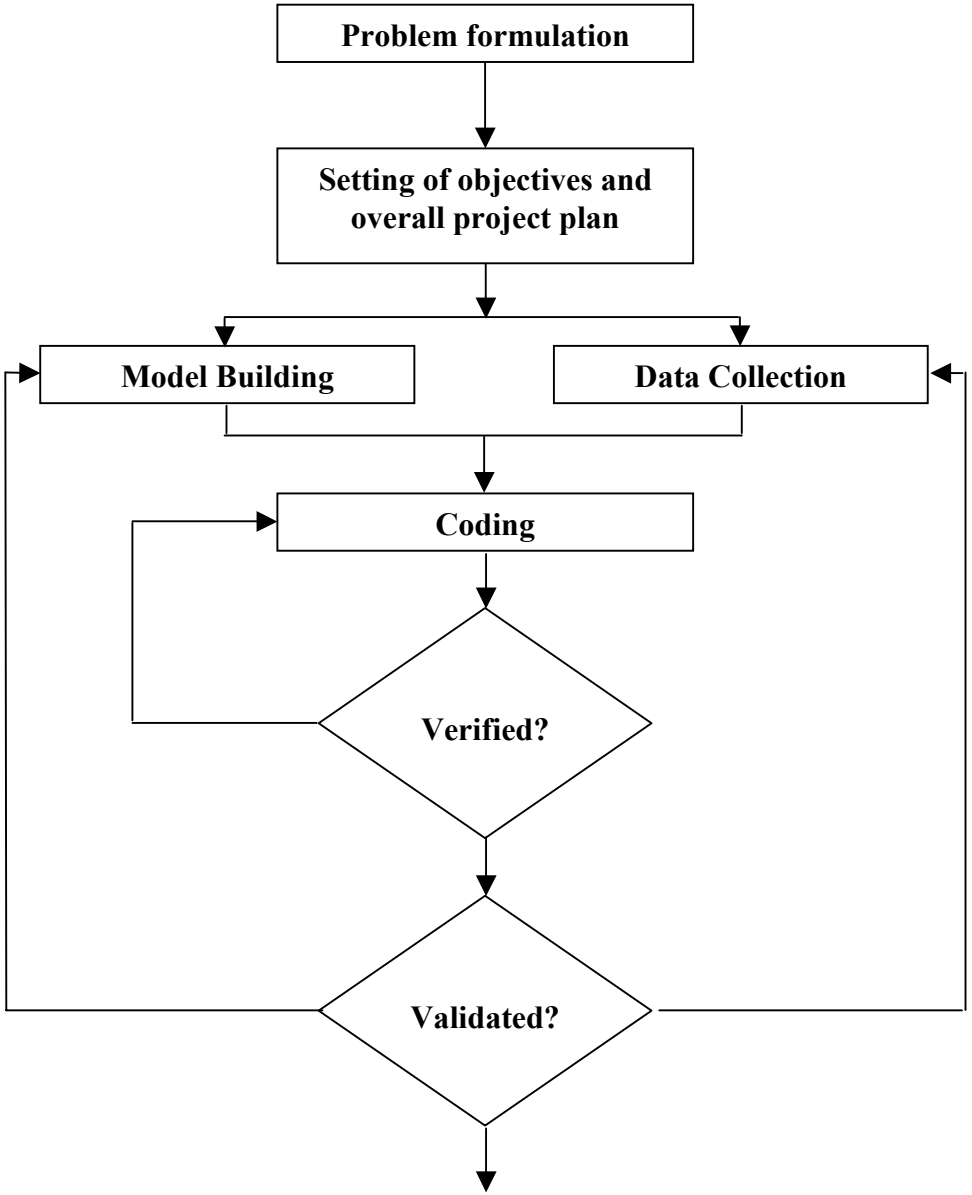
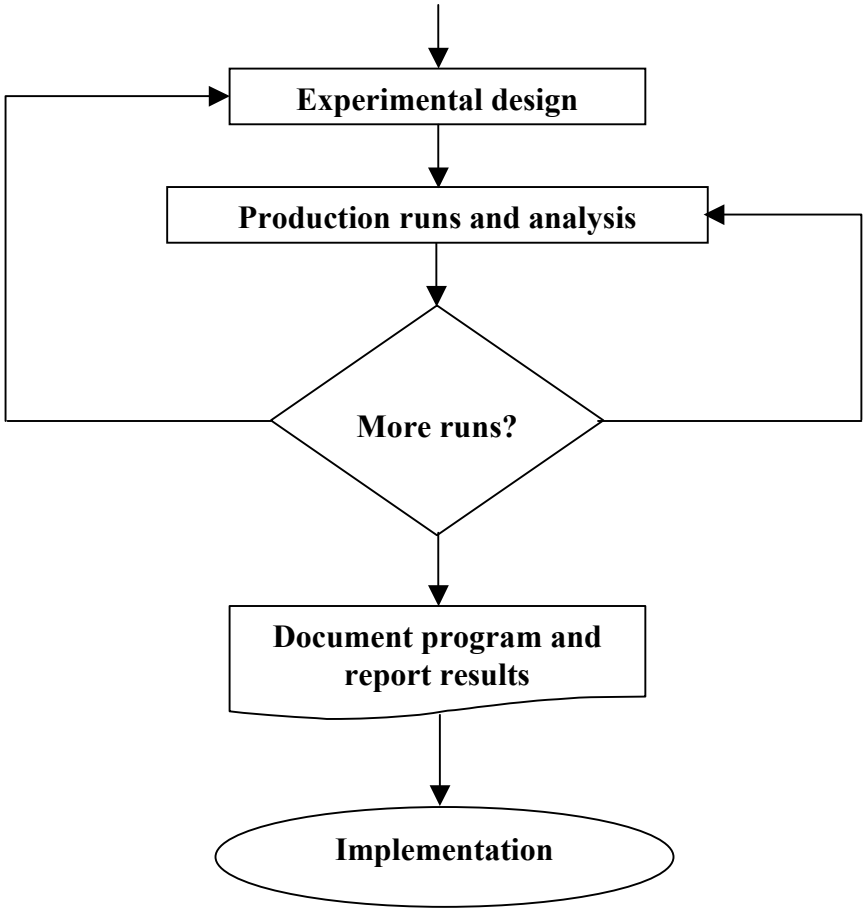




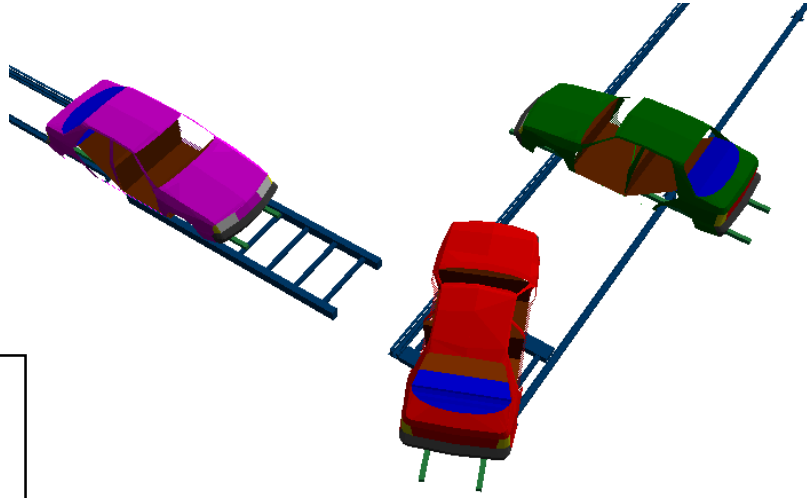
Banks et al, 1996

Preparations

Problem definition / Goal

Level of detail

Data collection



Problem formulation, goal

- Clearly specified problem
- Time
- Delimitations
- Consultants
- Concrete, specific goals makes the following steps easier!

Level of detail

- Specification of parameters
- Setting level of detail
  - Layout
  - Input data
  - Times
  - Batching
  - Geometries

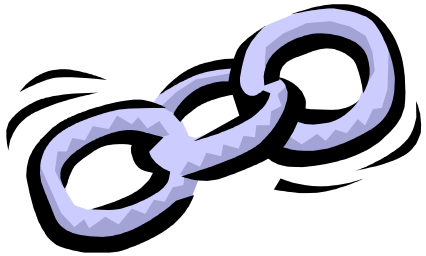
- Choosing output data:
  - ✓ Easy to interpret
  - ✓ Easy to control
  - ✓ Easy to affect

45sek

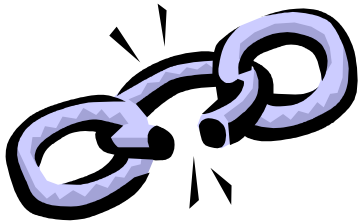
645 h

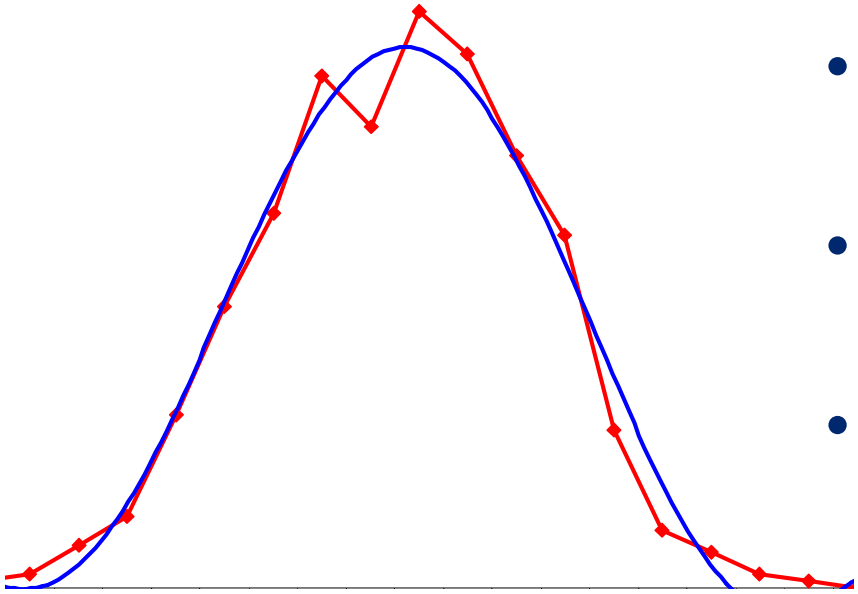
782m

763mm



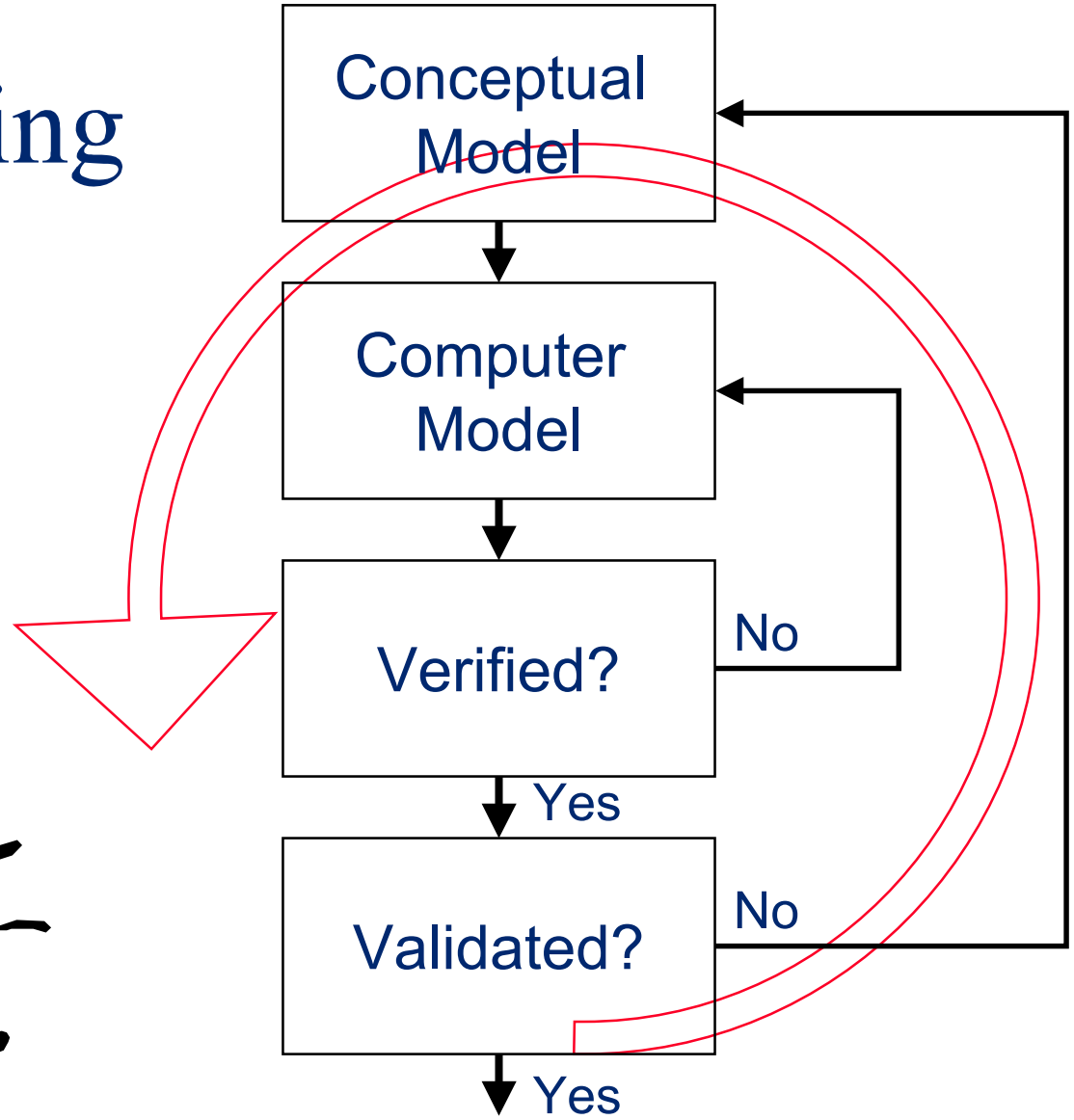
Data collection



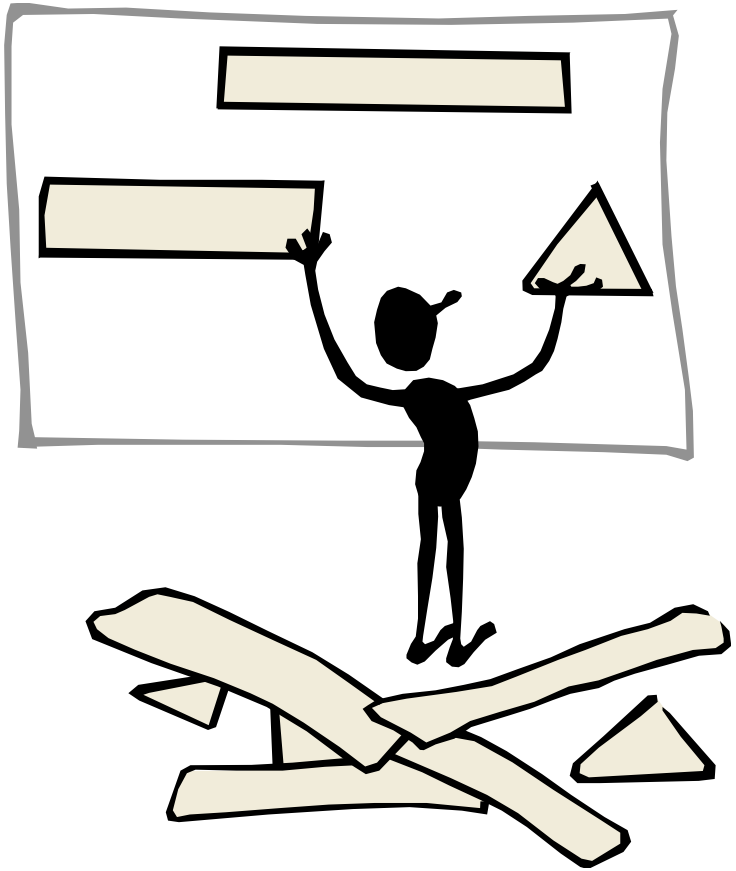


- The most unconfident data is the weakest link in the model
- Compare distributions with the original data
- Use data in existing form
- Avoid personal assumptions

Modelling

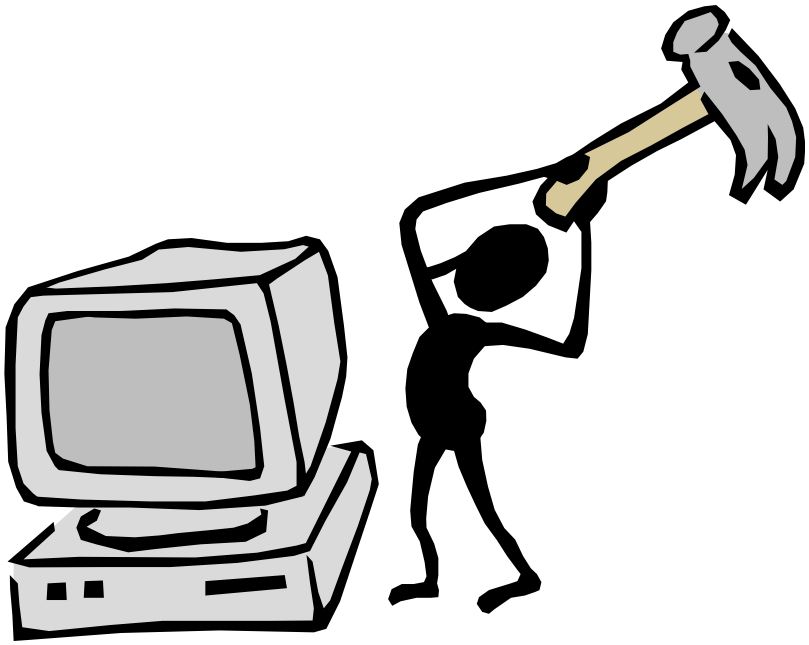

Conceptual Model
Computer Model
Verified?
No
Yes
Validated?
No
Yes

Conceptual Model



- Simple model.
- Show logical couplings between resources.
- Sketch or outline.
- Discussion base to create understanding of the system and the problem.

Computer model



- The simulation model is coded into the computer

- Conceptual model
- Input data
- Level of detail

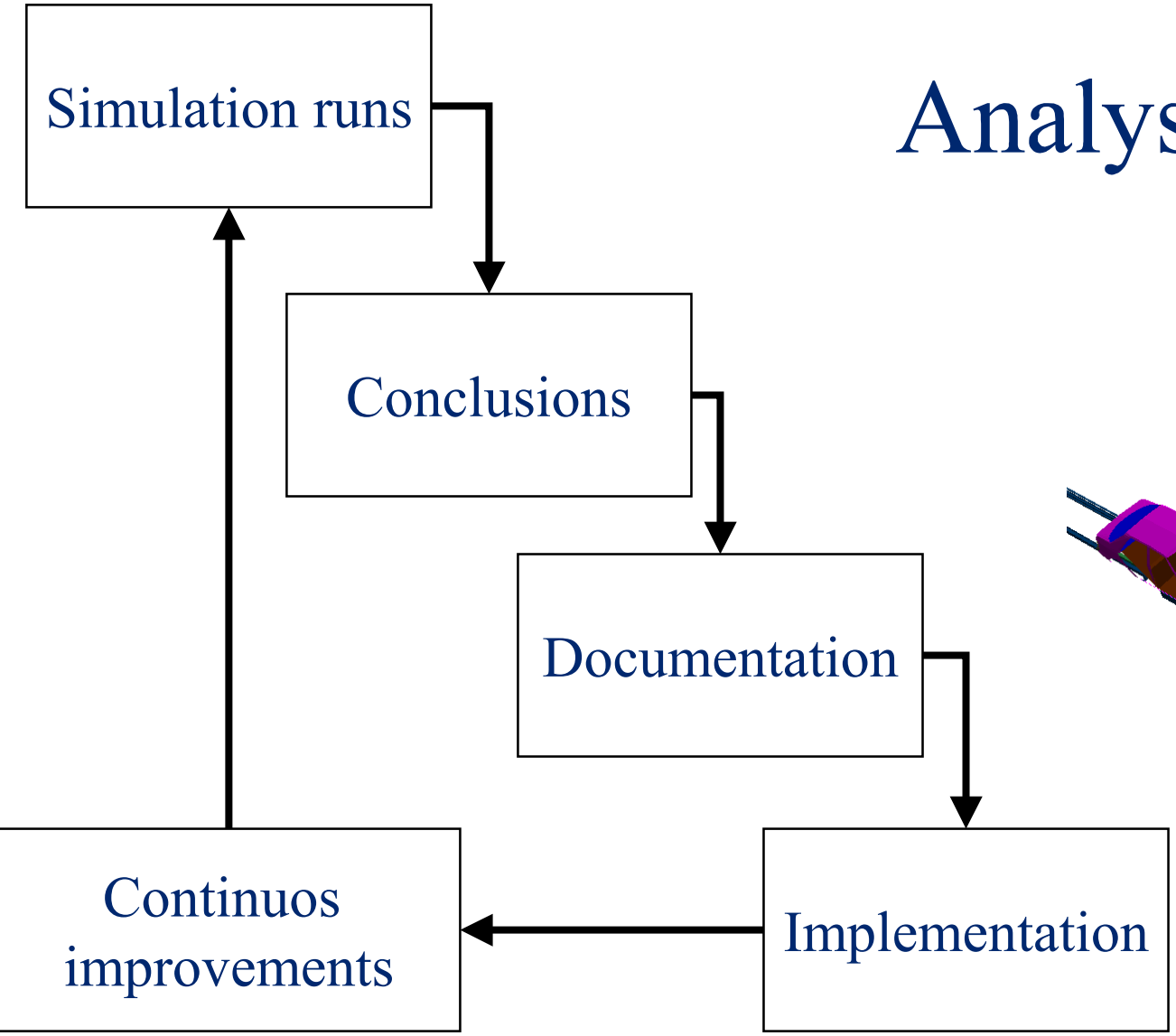
Verified?

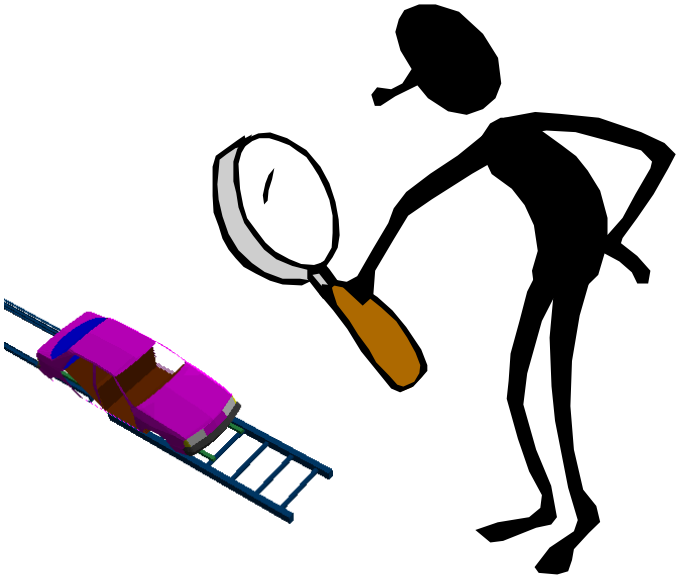
- VERIFICATION → Guarantee the correct behaviour of each element in the model, ensuring that the code is correct

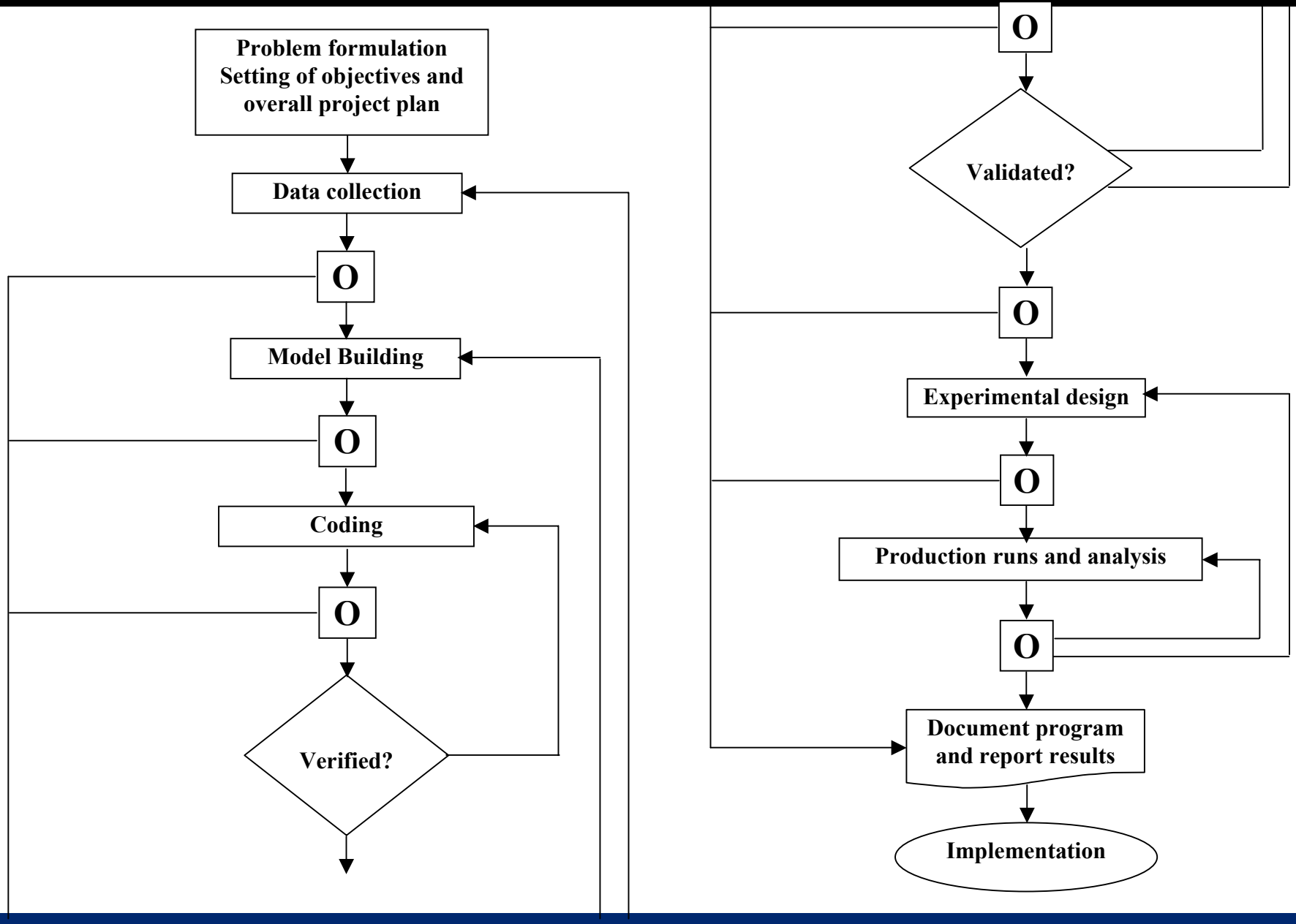
Validated?

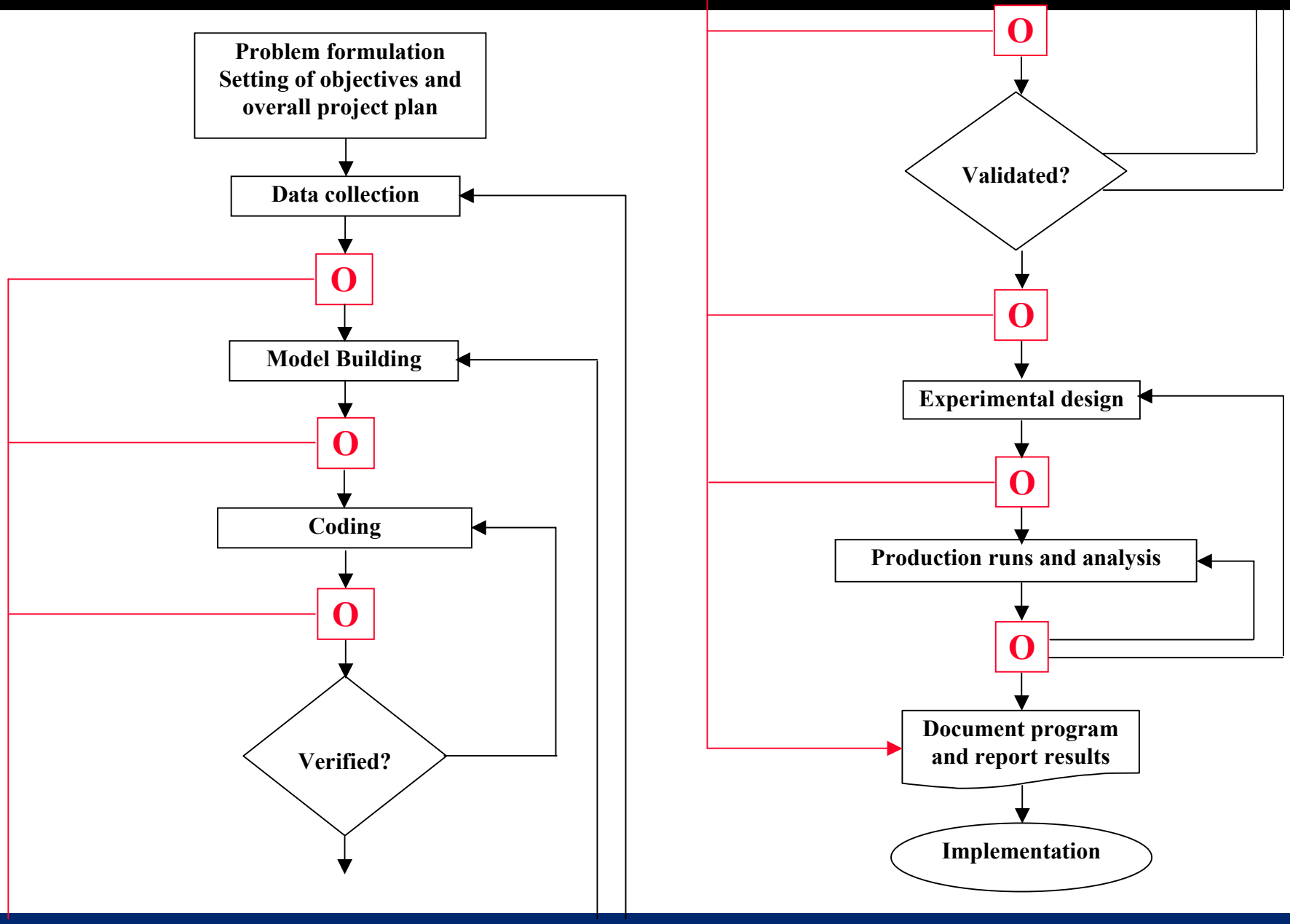
- VALIDATION → The overall behaviour of the model is representative of the real world.

Analysis


Simulation runs
Conclusions
Documentation
Implementation
Continuos improvements




Problem formulation
Setting of objectives and
overall project plan
Data collection
O
Model Building
O
Coding
O
Verified?
O
Validated?
O
Experimental design
O
Production runs and analysis
O
Document program
and report results
Implementation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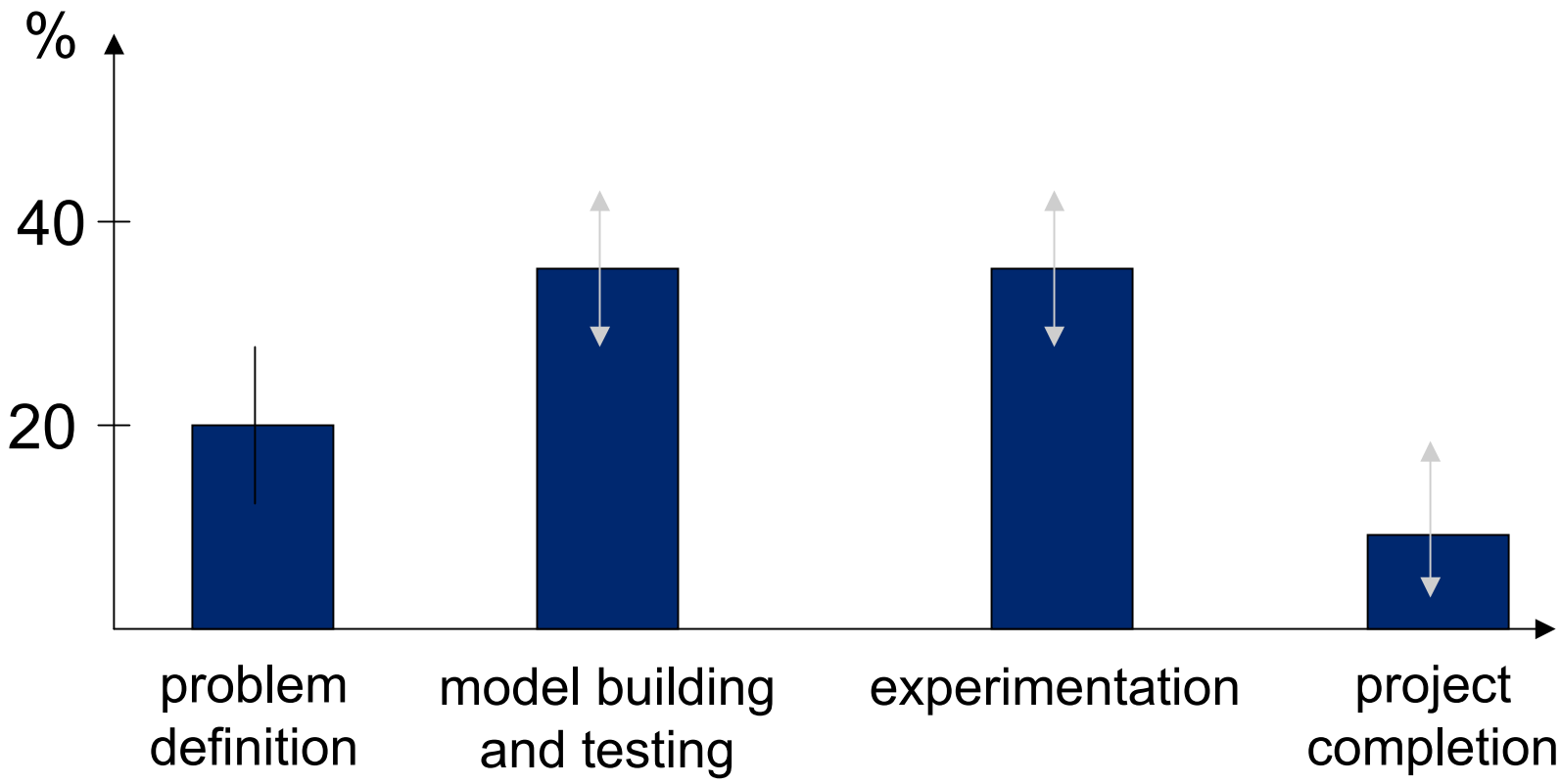
Objective, concrete or abstract?

Time / Objective	Shortest possible	Set to a date	Infinite
Concrete	+	+	+
Abstract	+	0	0
"Best possible"	0	0	0

Sudden project completion

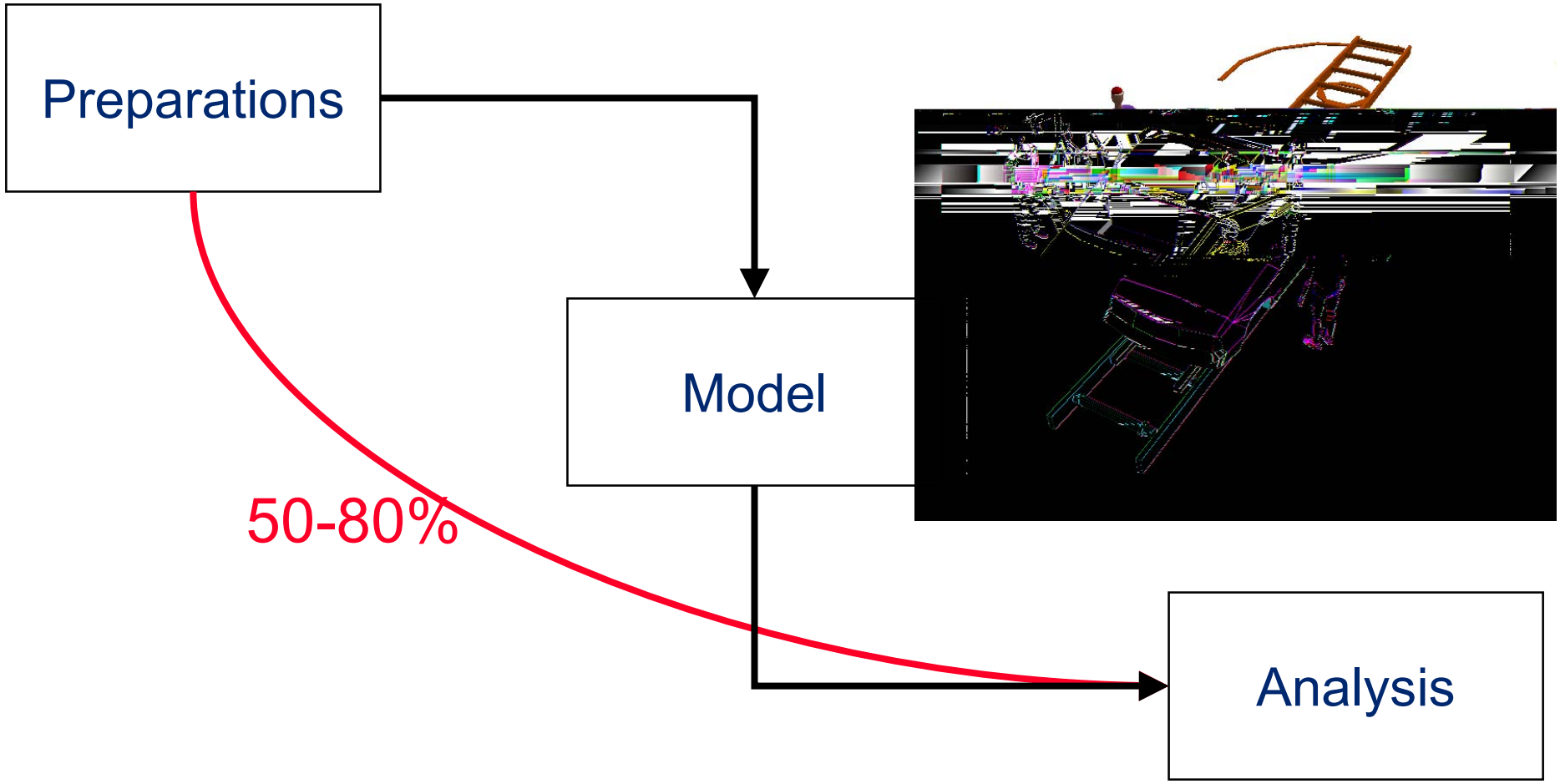
- Feeling of incompletion
- Strive for the optimal system
- Fun to make simulation runs
- Consultants

Project time scales



Robinson, 1994

Simulation project



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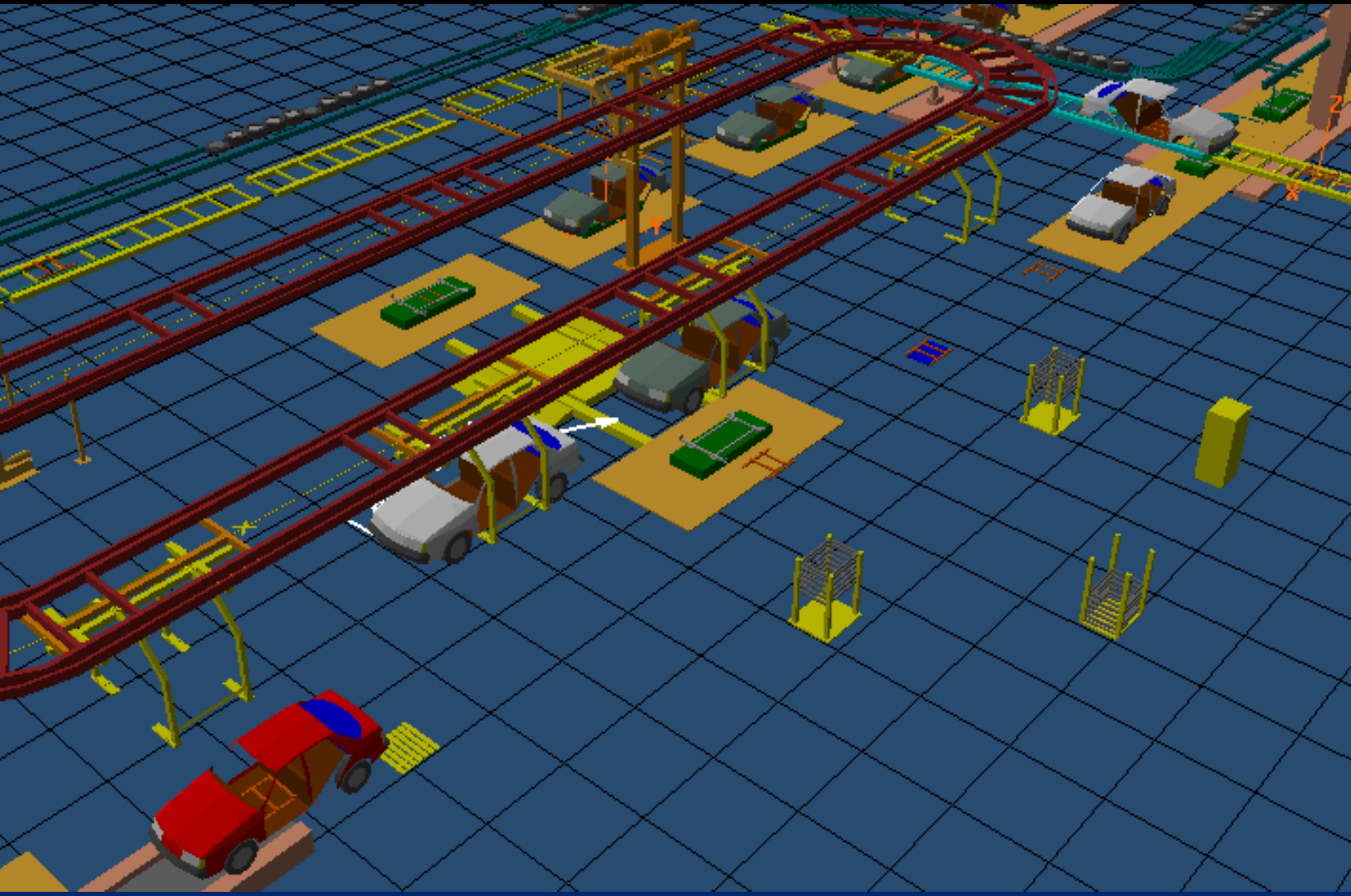

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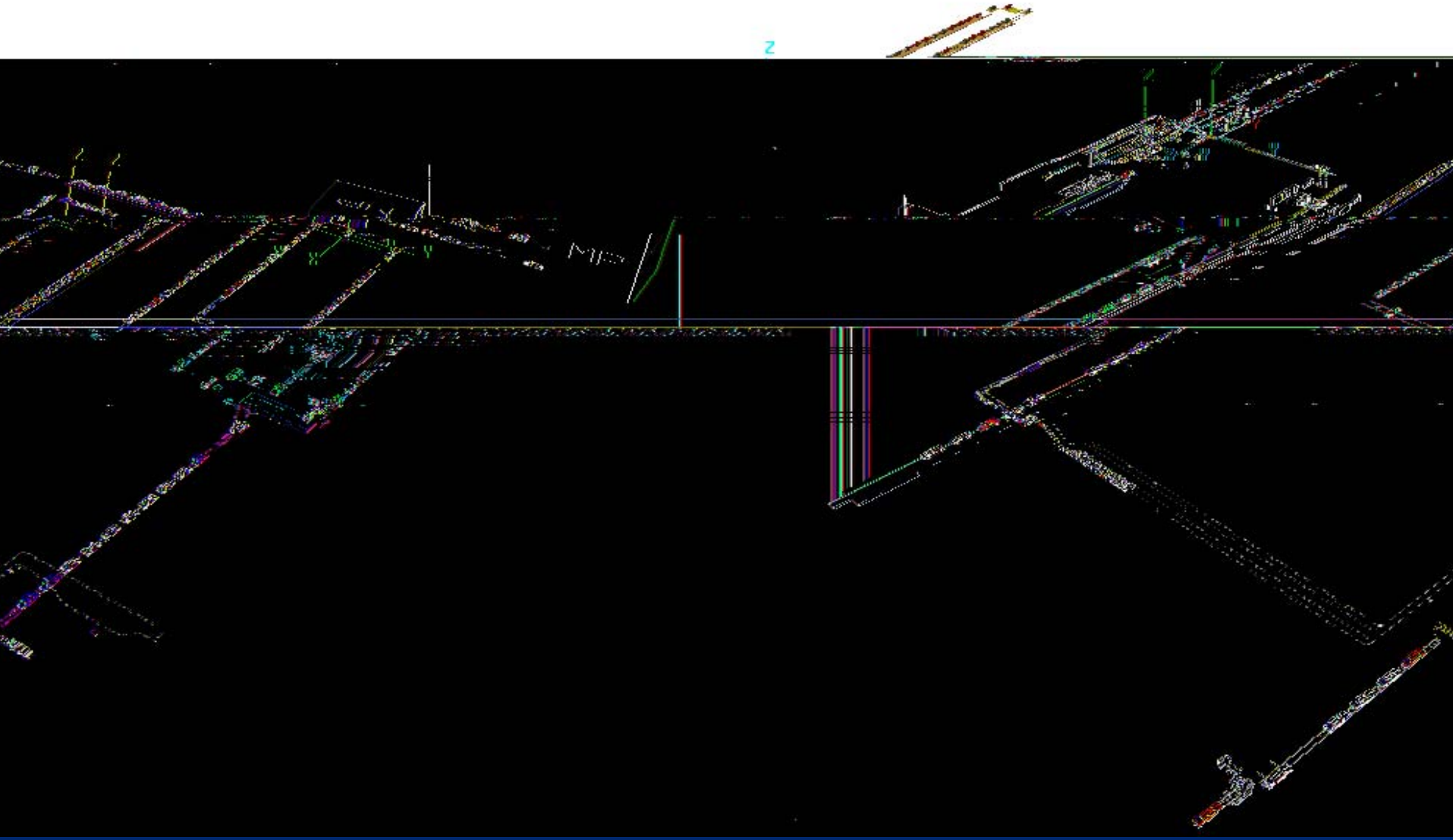

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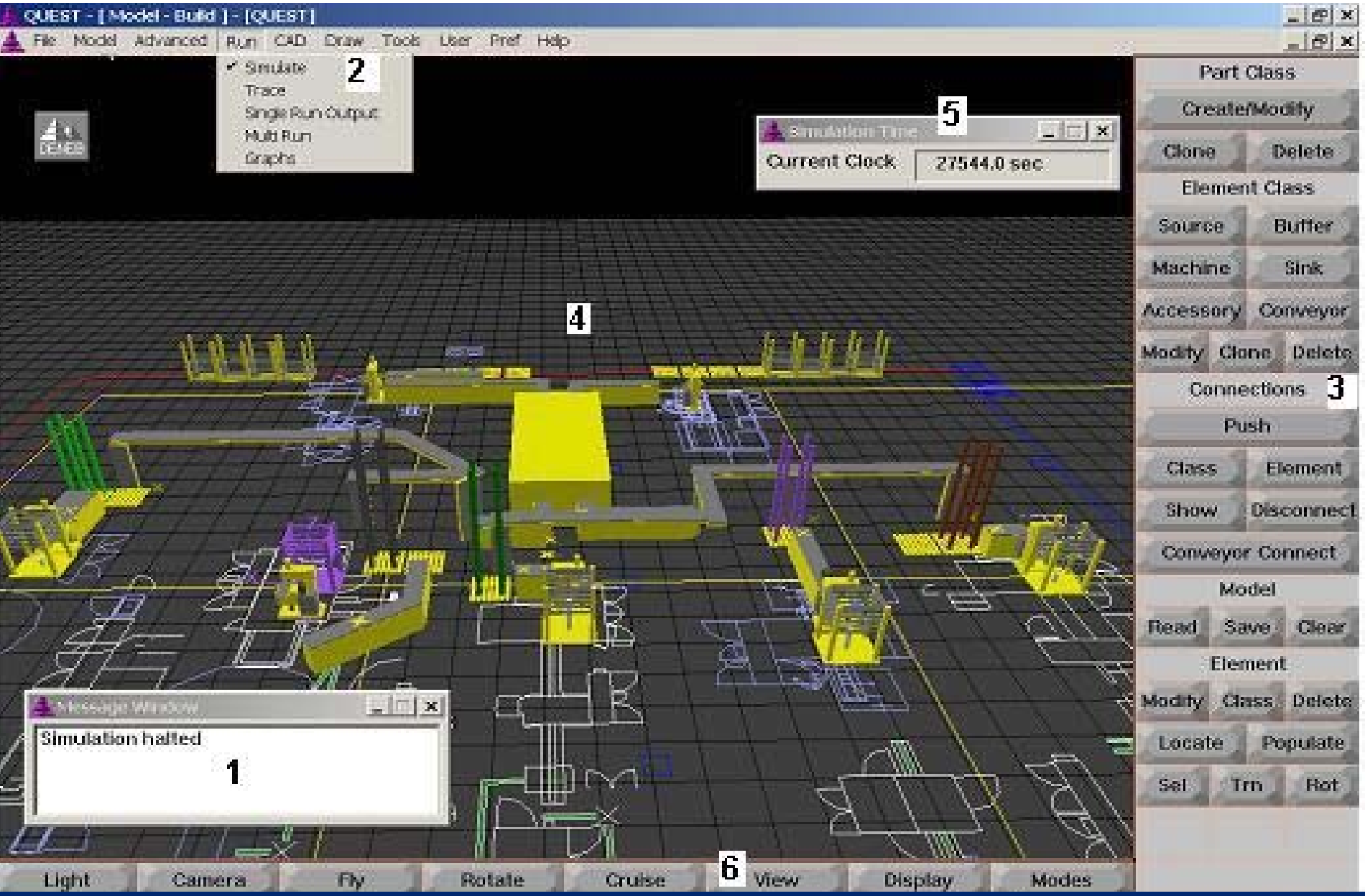
QUEST - [Model - Build] - [QUEST]
File Model Advanced Run CAD Draw Tools User Pref Help
Simulate
Trace
Single Run Output
Multi Run
Graphs
2
5
Simulation Time
Current Clock
27544.0 sec
4
Part Class
Create/Modify
Clone Delete
Element Class
Source Buffer
Machine Sink
Accessory Conveyor
Modify Clone Delete
Connections
3
Push
Class Element
Show Disconnect
Conveyor Connect
Model
Read Save Clear
Element
Modify Class Delete
Locate Populate
Sel Trn Rot
Message Window
Simulation halted
1
Light Camera Fly Rotate Cruise View Display Modes
6

Thank you for listening!

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