

VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD



System Dynamics and Systems Thinking

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May 25th, 2018

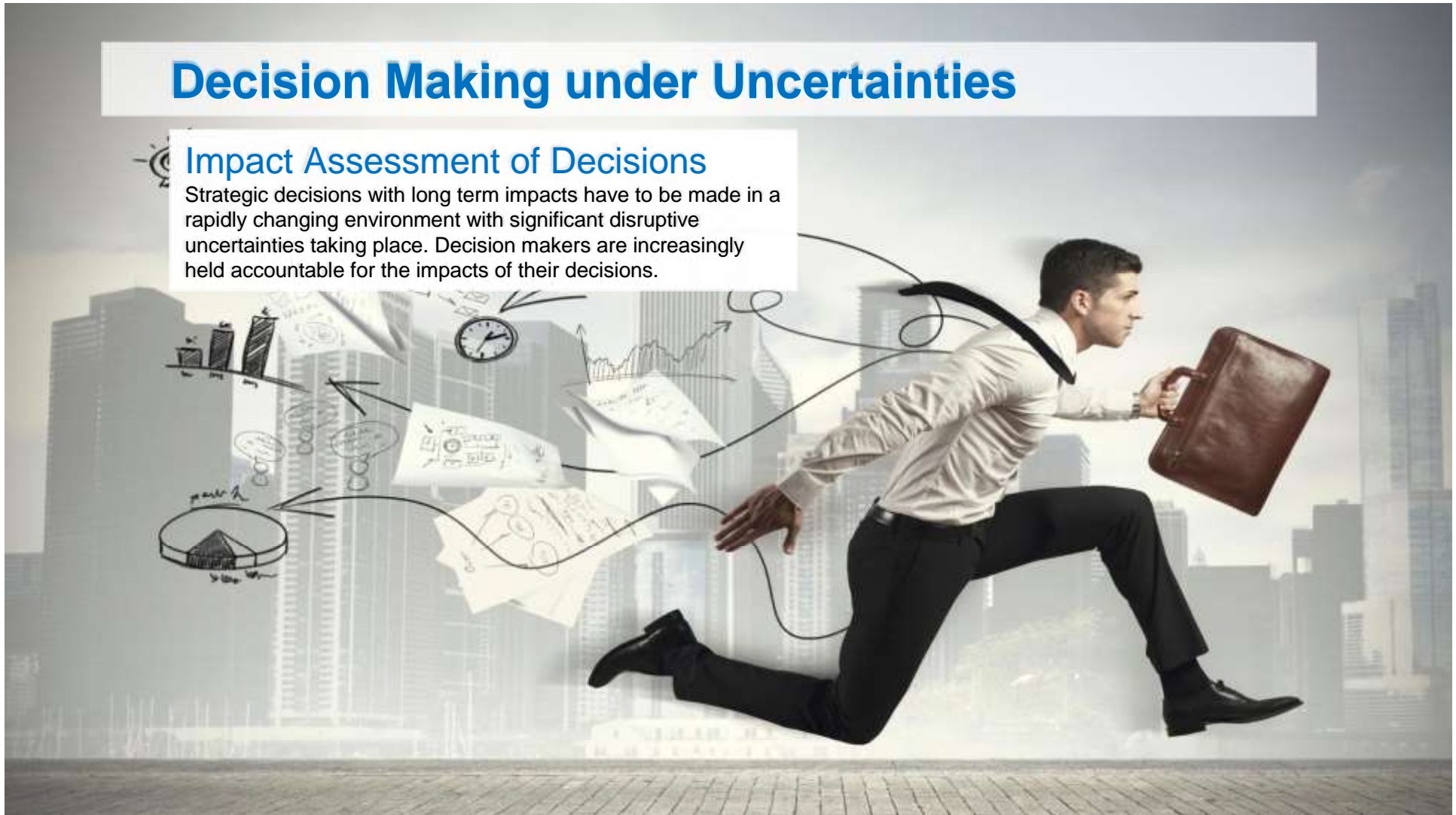


This work has been supported by the Strategic Research Council at the Academy of Finland, project CloseLoop (grant number 303452) www.closeloop.fi and EIT Raw Materials, project Modelling Factory (grant number PA15060).

Decision Making under Uncertainties

Impact Assessment of Decisions

Strategic decisions with long term impacts have to be made in a rapidly changing environment with significant disruptive uncertainties taking place. Decision makers are increasingly held accountable for the impacts of their decisions.



Future Oriented Systemic Decision Support Tools

Management Flight Simulators

Systemic impact assessment tool consist of Foresight, System Dynamic Modelling, Societal Embedding in a Impact Assessment Framework. Different future scenarios, What-if simulations and sensitivity analysis are visualized for evaluating decisions.



Systems Thinking and System dynamics



Identifying complex cause and effect relationships



Tool to help construct and communicate mental models



Understanding the long- and short-term consequences of actions



Foreseeing unintended consequences



Finding leverage – seeing where actions can lead to significant and enduring improvements



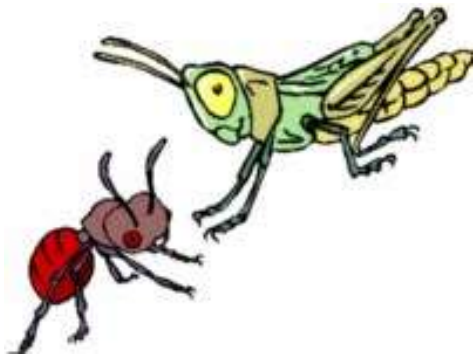
Simulating policies under different assumptions and uncertainties



Dynamic hypothesis - Case: Project management

Let's take a simple example of project work

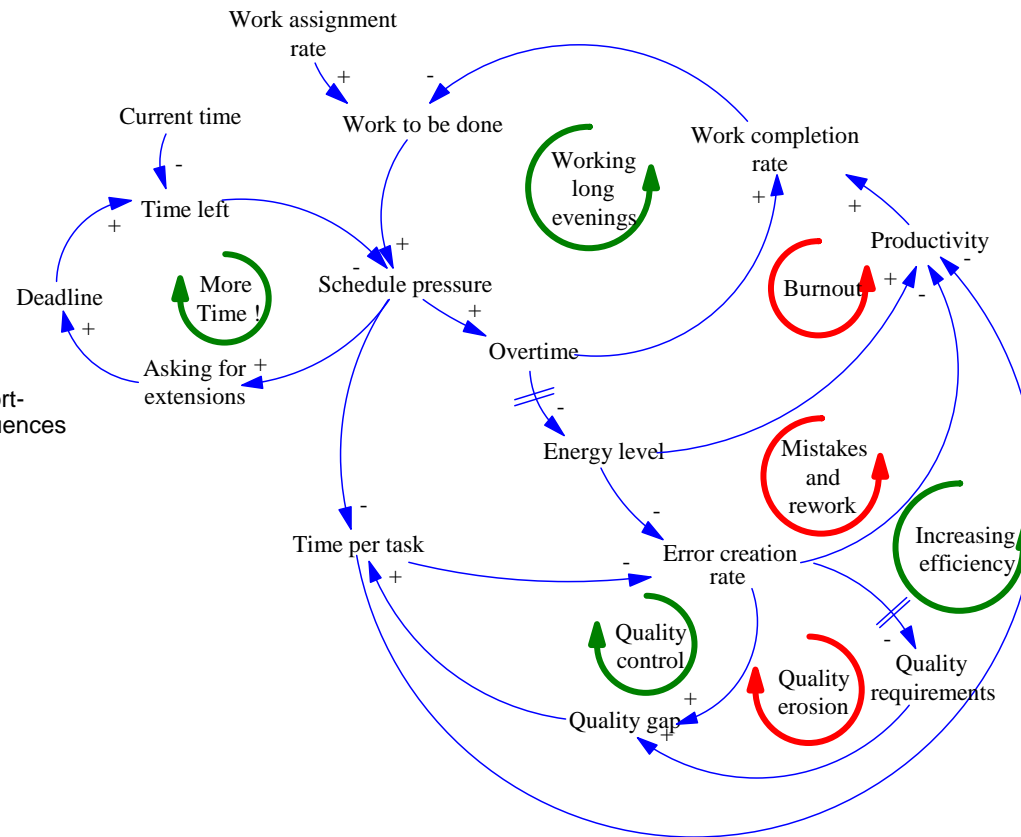
- A company has challenges in delivering project outcomes to the customer in certain projects ...



- Some of the project participants are grasshoppers and some ants, e.g. procrastinators (with stress, burn-out, low quality work, slipping deadlines) and nonprocrastinators (irritating diligent co-workers).

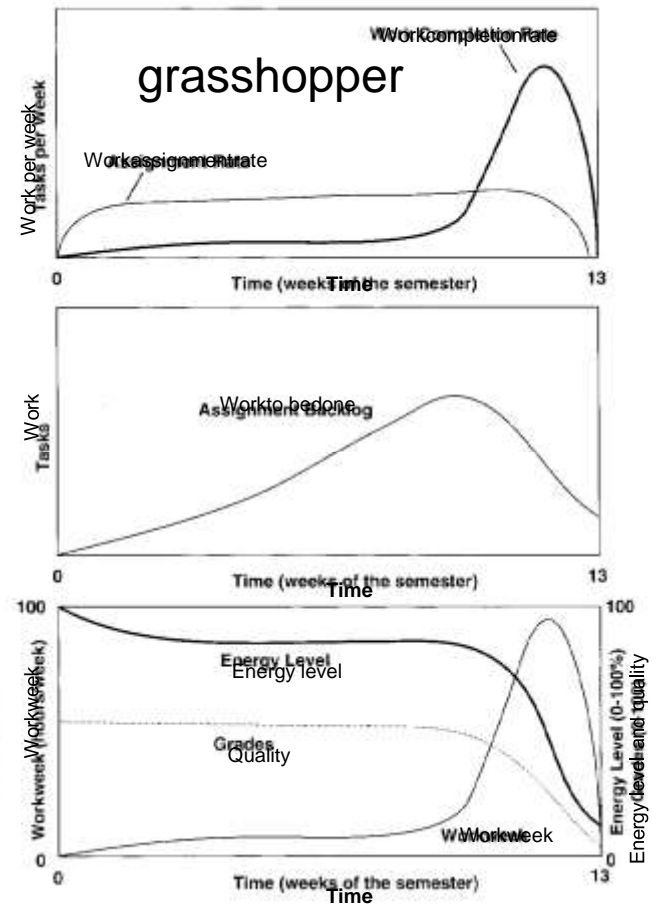
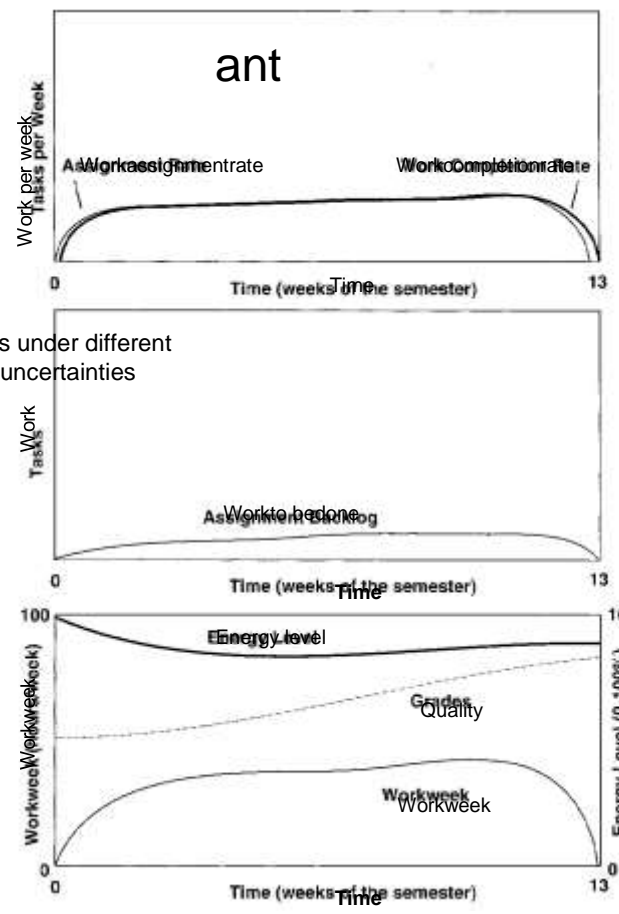


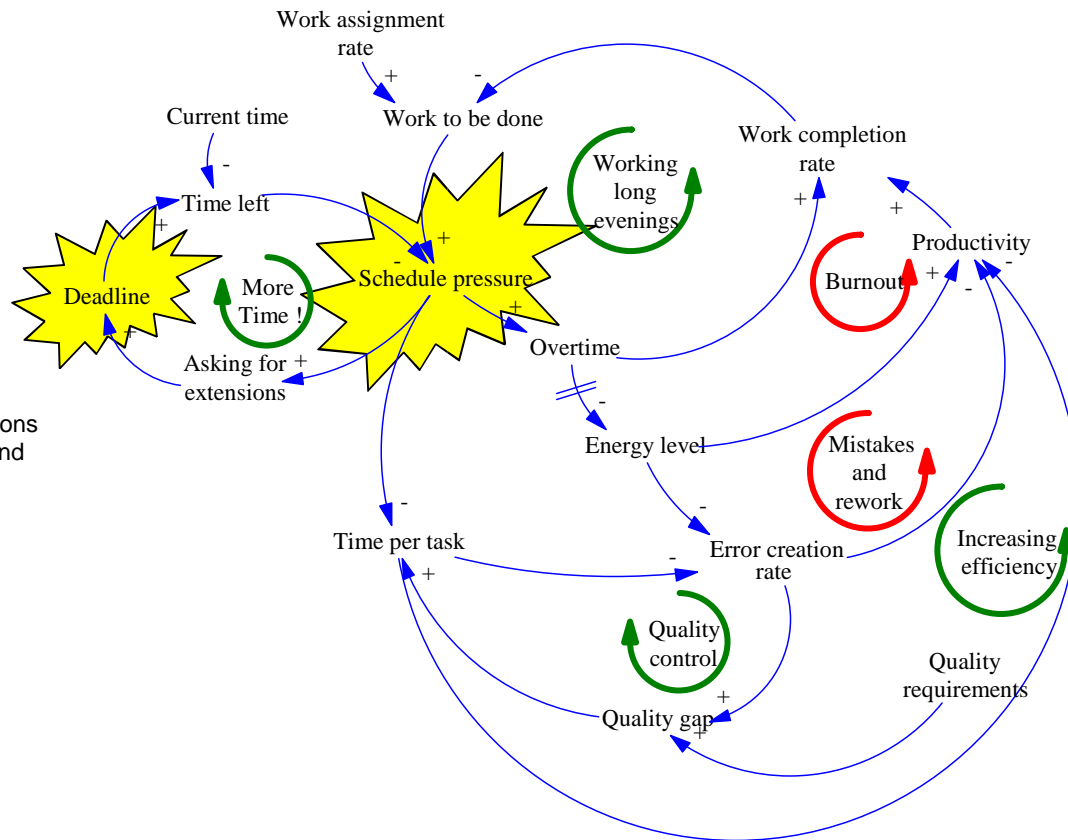
Understanding the long-term consequences of short-term decisions
 Forecasting the consequences of decisions
 Models





Simulating policies under different assumptions and uncertainties





Finding leverage –seeing where actions and change can lead to significant and enduring improvements

System dynamic model elements



User Interface

Year: 2014

Customer segments
 (Set customer segments, trading course per month)

Consumers
 (Consumer cost factors, electronic)

Marketing
 (Set start invested in marketing, delivery of VTT, Marketing investment, Marketing, IT cost)

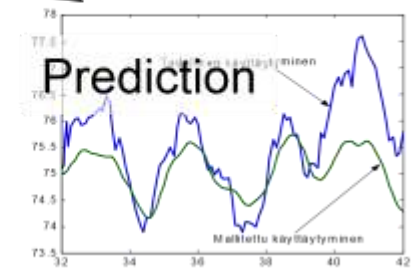
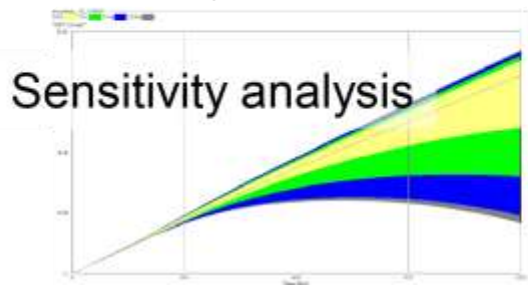
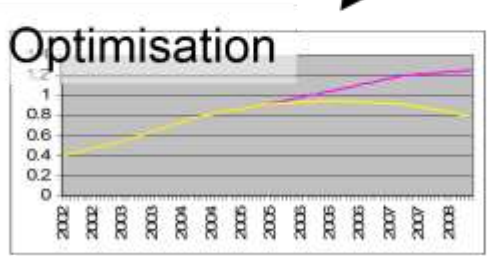
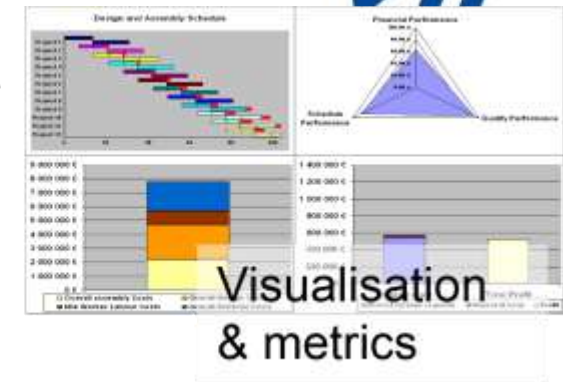
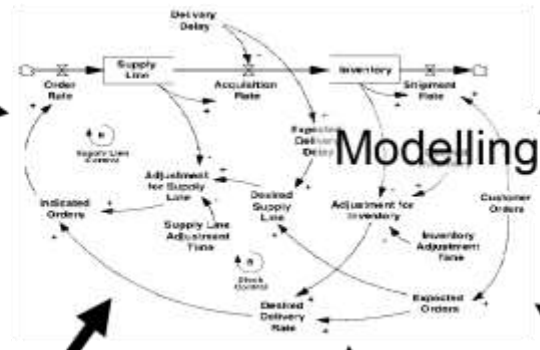
Economic Factors
 (Set growth (% per year))

Development of prices and costs

Paper folders
 Price development (Price for service (% per year))
 Development of variable costs (% per year)
 Development of fixed costs (% per year)

Technical folders
 Price development (Price for service (% per year))
 Development of variable costs (% per year)
 Development of fixed costs (% per year)

Technological factors
 Electronic services in general
 Adoption for service reduction
 Development of security



Project scheduling



Projects specs and schedules

Project 1	
Amount of Design Work	400
Design Start	0
Design Completion	6.936
Design QA Completion	13.87
Amount of Assembly Work	400
Assembly Start	13.87
Assembly Completion	22.25
Assembly QA Completion	30.1

Project 2	
Amount of Design Work	400
Design Start	7.217
Design Completion	14.15
Design QA Completion	21.09
Amount of Assembly Work	400
Assembly Start	21.09
Assembly Completion	29.46
Assembly QA Completion	37.31

Project 3	
Amount of Design Work	400
Design Start	14.43
Design Completion	21.37
Design QA Completion	28.3
Amount of Assembly Work	400
Assembly Start	28.3
Assembly Completion	36.68
Assembly QA Completion	44.53

Project 4	
Amount of Design Work	400
Design Start	21.65
Design Completion	28.59
Design QA Completion	35.52
Amount of Assembly Work	400
Assembly Start	35.52
Assembly Completion	43.9
Assembly QA Completion	51.75

Project 1	
Project Price:	800 000 €
Amount of Design Work:	400
Amount of Assembly Work:	400
Specification Deadline:	0
Customer Competence [%]:	90
Customer's Authority over Design [%]:	10
Material A:	50
Material B:	50
Material C:	50

Project 5	
Project Price:	800 000 €
Amount of Design Work:	400
Amount of Assembly Work:	400
Specification Deadline:	0
Customer Competence [%]:	90
Customer's Authority over Design [%]:	10
Material A:	50
Material B:	50
Material C:	50

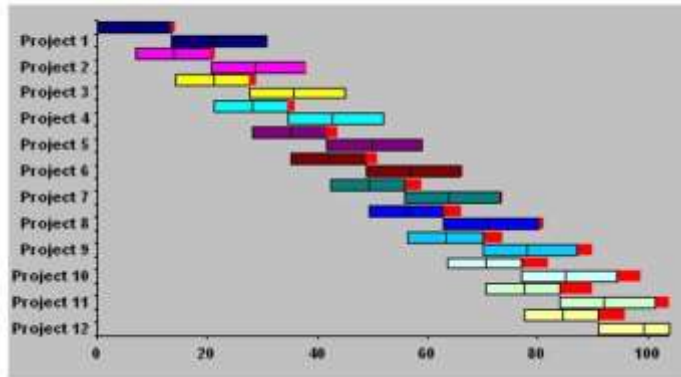
Project 2	
Project Price:	800 000 €
Amount of Design Work:	400
Amount of Assembly Work:	400
Specification Deadline:	0
Customer Competence [%]:	90
Customer's Authority over Design [%]:	10
Material A:	50
Material B:	50
Material C:	50

Project 6	
Project Price:	800 000 €
Amount of Design Work:	400
Amount of Assembly Work:	400
Specification Deadline:	0
Customer Competence [%]:	90
Customer's Authority over Design [%]:	10
Material A:	50
Material B:	50
Material C:	50

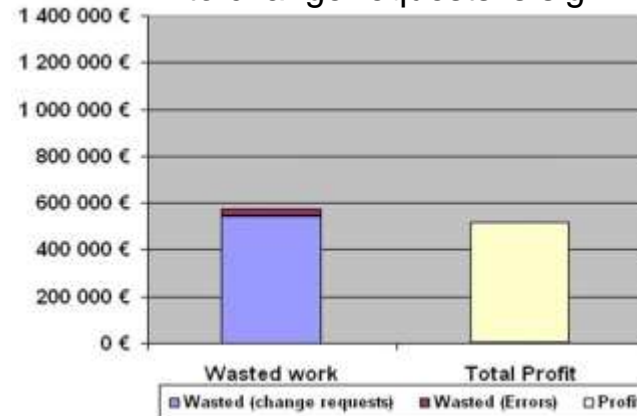
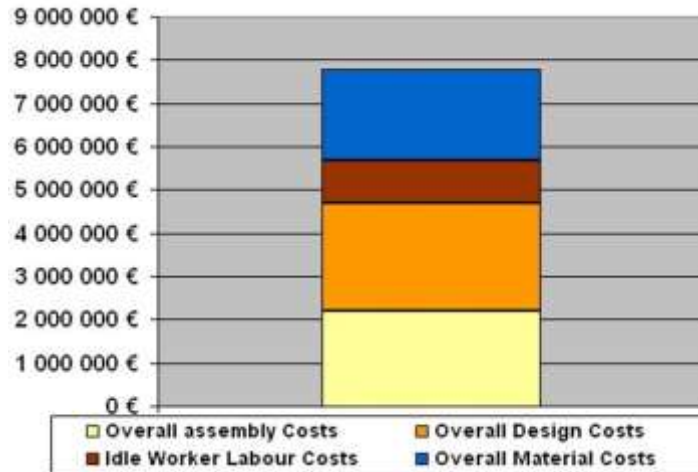
12 special product projects are scheduled



Design and Assembly Schedule



The amount of wasted work due to change requests is significant



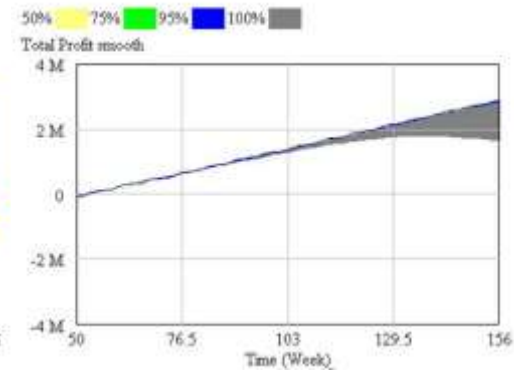
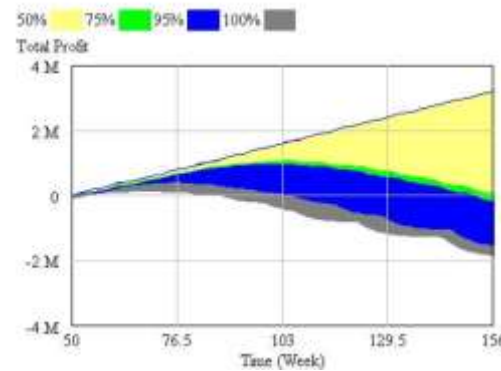
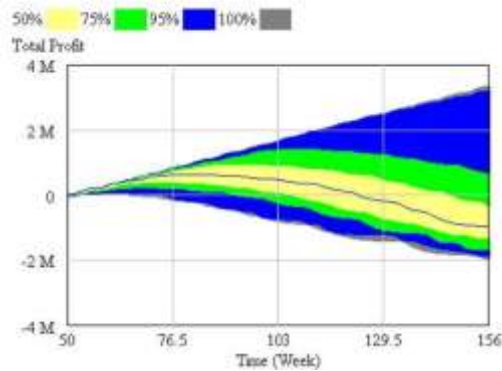
Example: Special Product manufacturing: Different strategies are simulated



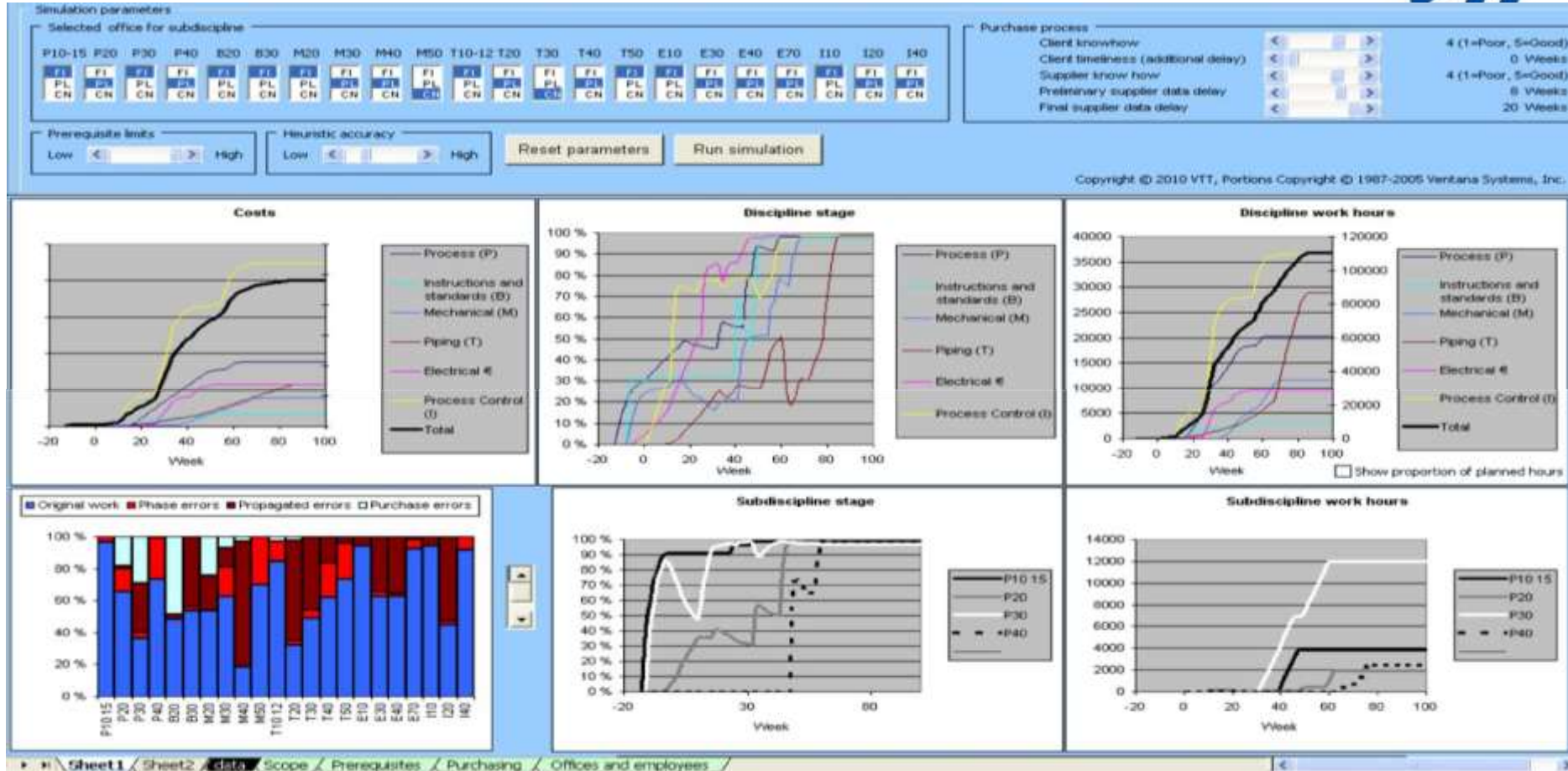
Every special product is manufactured uncertainties individually (no portfolio)

Portfolio is planned and buffers are removed (no room for uncertainties)

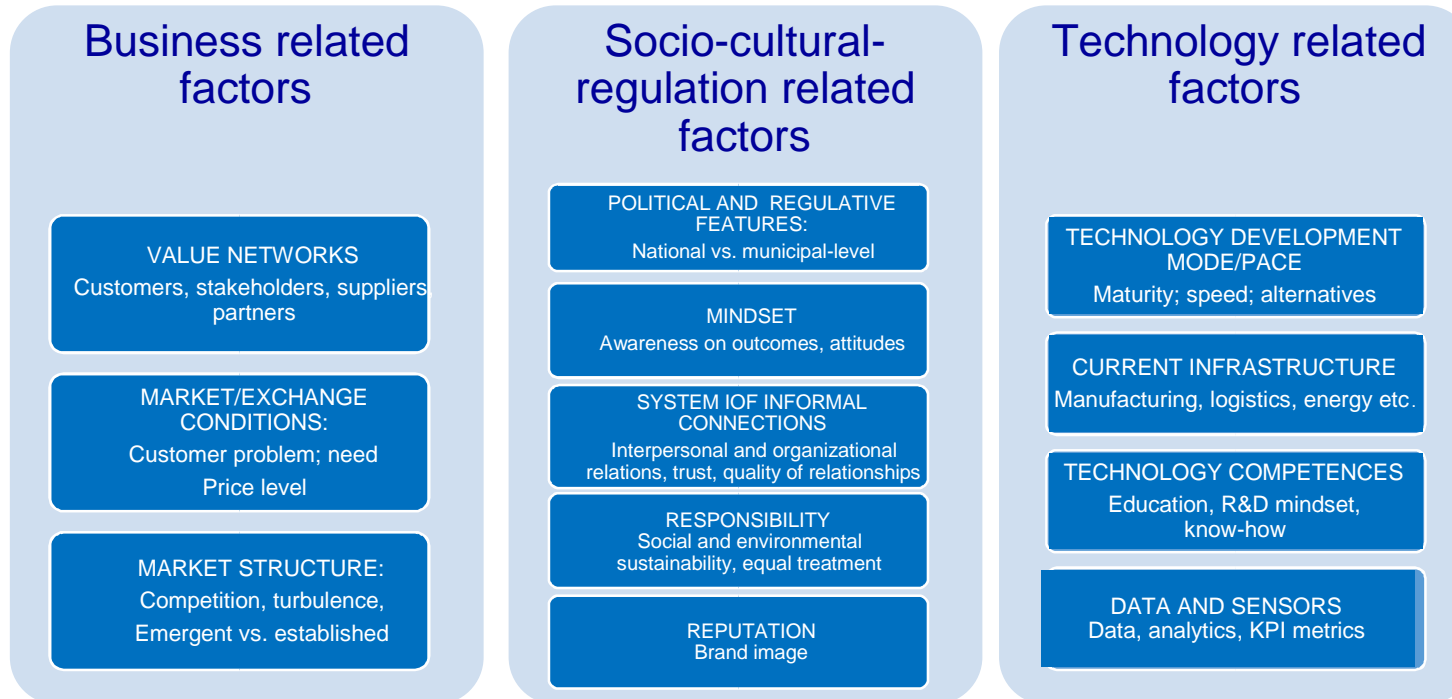
Portfolio is planned and taken into account in robust optimization



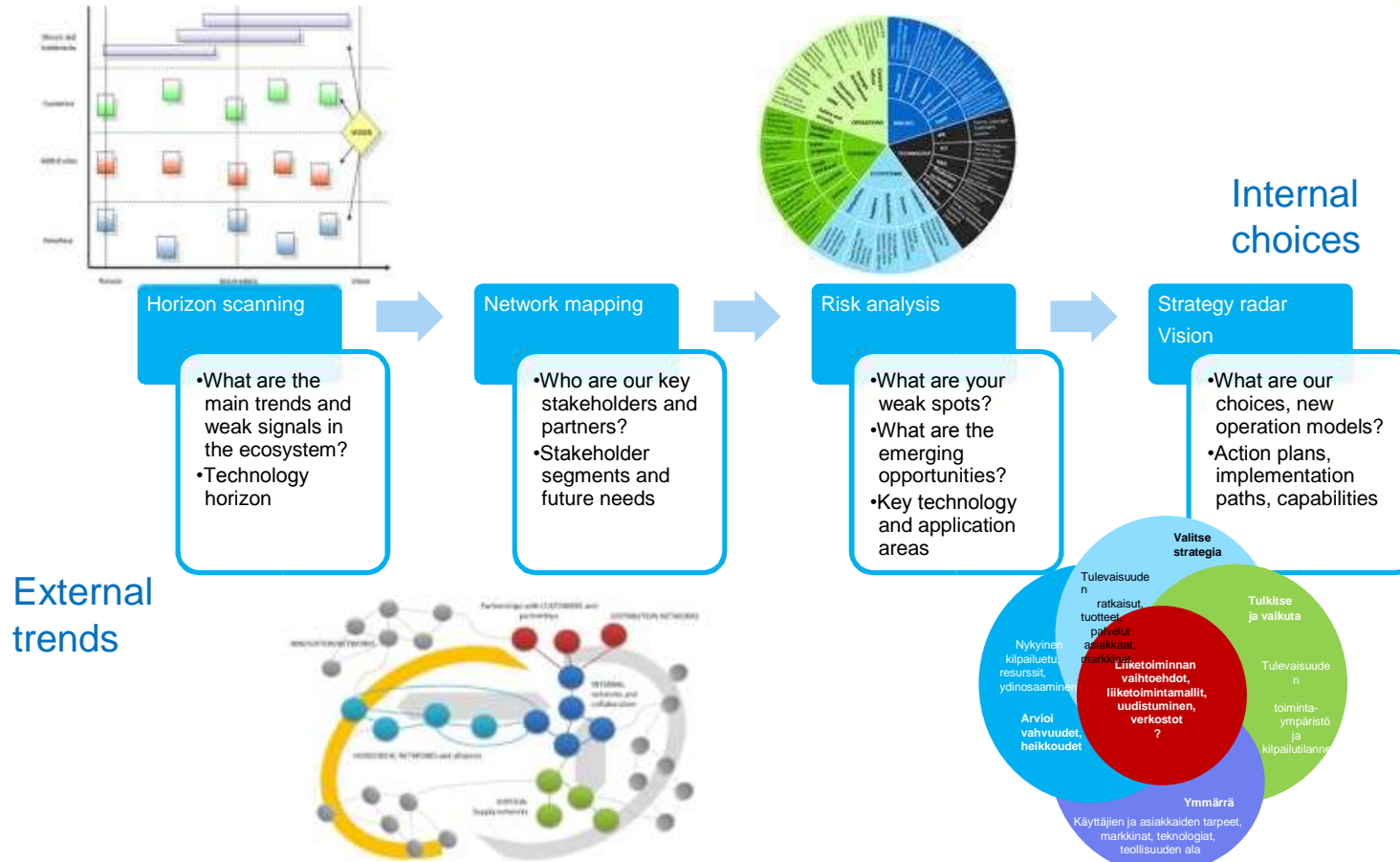
Example: Pöyry Managing Outcome in a Complex Network



Systemic approach requires understanding of complex systems, diverse factors and their interlinkages



From foresight to strategies





TECHNOLOGY FOR BUSINESS