

# ZeFMaP: Productivity in ATM

Theodor Zeh, Volker Grantz, Stephan Kind, Robert Rubenser

Amela Karahasanović, Bjørn Andersen, Lisbeth Hansson,  
Jan Alexander Langlo, Hans Erik Swendgaard



# Zero Failure process at Maximum Productivity in Safety Critical Environment

*What can we learn from Mass Production Processes?*



# The Hypothesis

- Applying processes from mass production improves productivity and safety in ATM Systems.
- Assumptions
  - *An ATM Control Room is a sociotechnical system*
  - *An ATM Control Room is producing “something”*
- Main Questions
  - *Can ATM be seen as production process?*
  - *Can the production be divided into value adding production steps?*
  - *Which process tools fit best?*



# Basics: Today's situation in Mass Production

- Continuous Improvement Processes
  - *Part of the philosophy of mass production*
  - *Has its origin in automotive mass production*
  - *Productivity combined with Zero Defect Policy*
- Decisions
  - *are analysed with impact on the overall production output*
  - *are weighed in several “quality” steps*



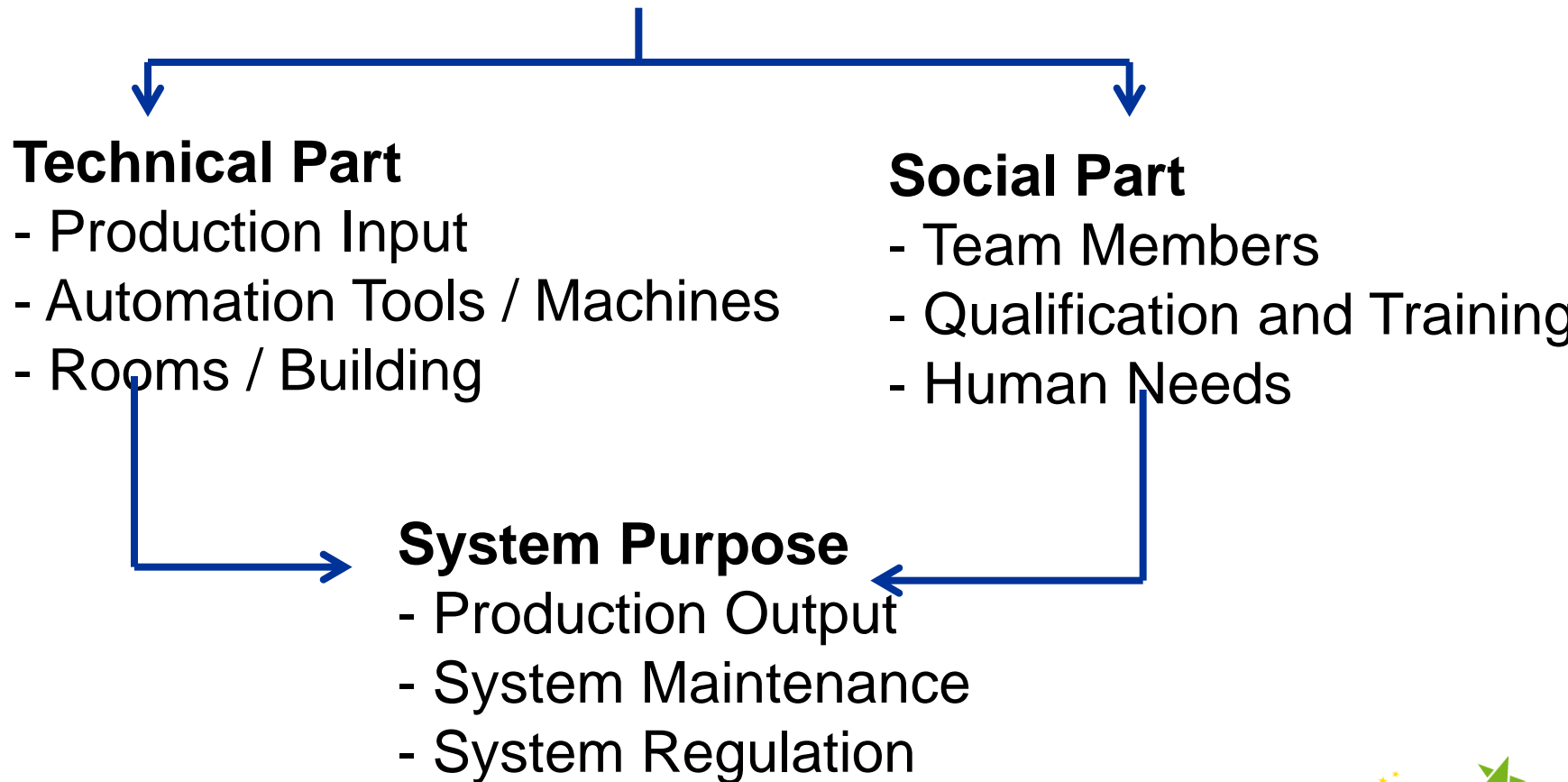
# Basics: Today's situation in ATM

- Continuous Improvement Processes
  - *not seen in ATM business („production“) process*
  - *if then focussed on error prevention*
- Decisions
  - *are seen isolated without of cross impact analyses (on the overall System).*
  - *are “right” (safe) or “wrong” (unsafe)*



# Basics: Sociotechnical System

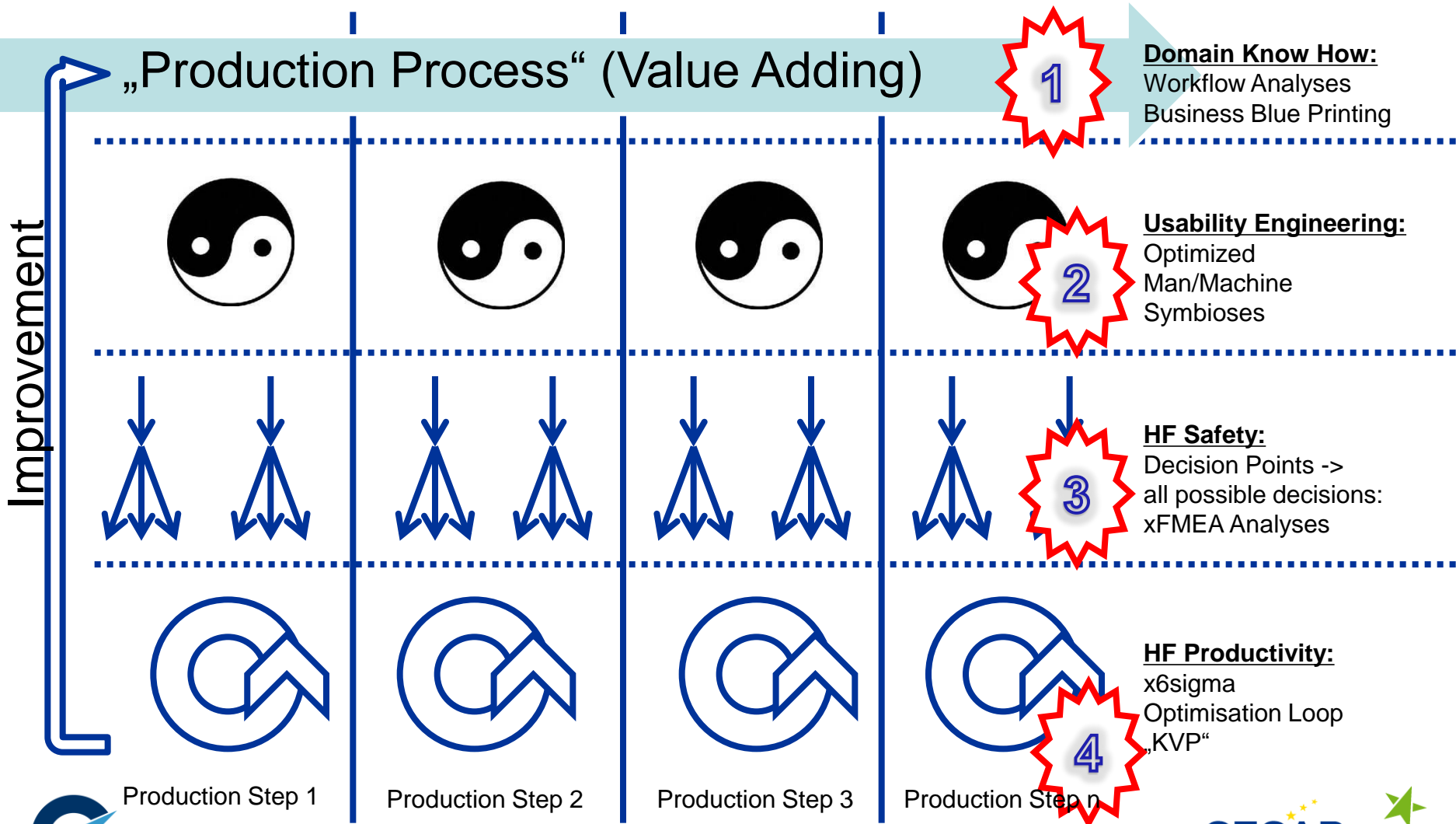
## Sociotechnical System



# “ATM Mass Production”

- What do we produce in ATM?
  - *Safe Airmiles?*
  - *Safe starts and landings?*
  - *To be elaborated further together with KPIs*
  - ...

# ZeFMaP - Safety Critical Mass Production





# What is the right tool to improve productivity in ATM?



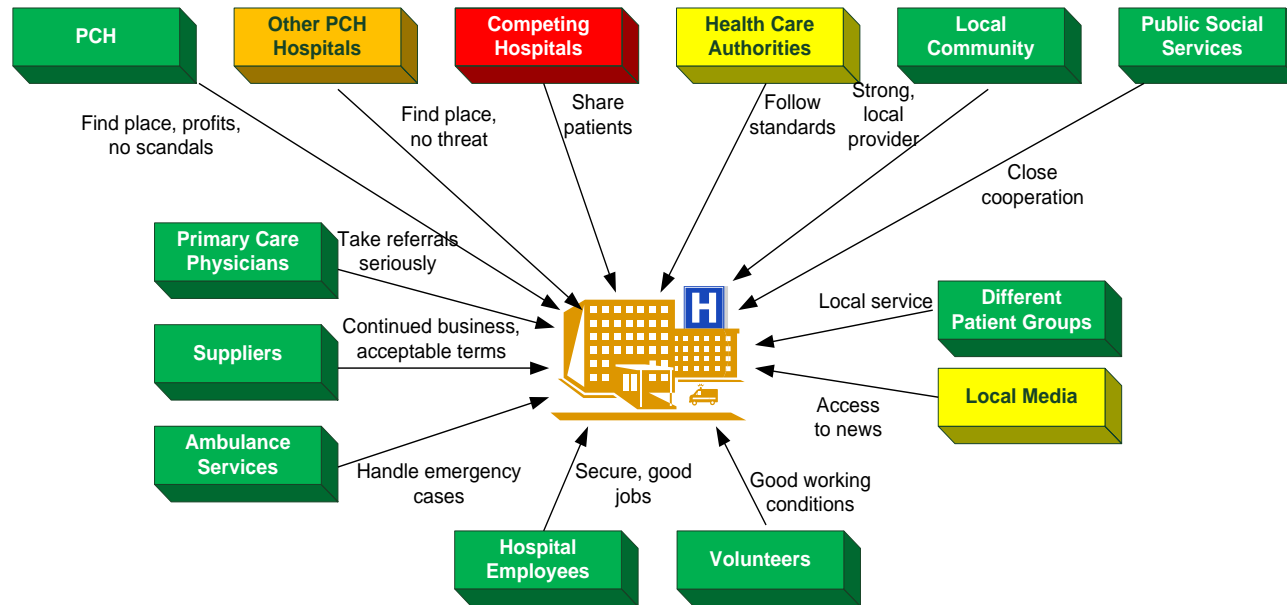
Process modelling  
Problem solving  
Toyota Production System approach  
Load analysis  
...

?

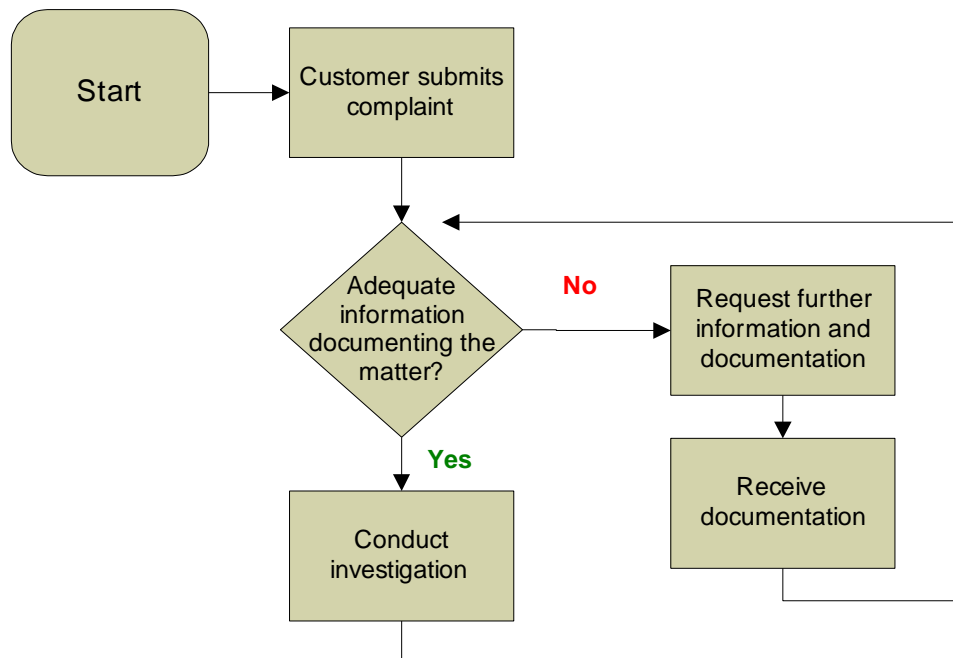


# Process modelling

- Business Process Modeling (BPM) is the activity of representing processes of an enterprise, so that the current process may be analyzed and improved



Stakeholder map for a Norwegian hospital

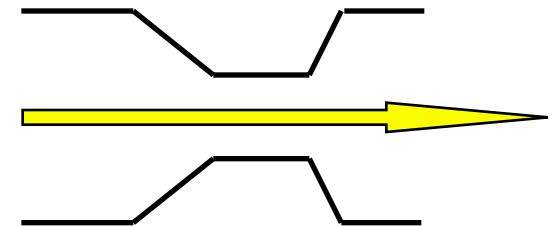


Basic flowchart for a customer complaint process



# Load Analysis/Bottlenecks

- An organization consists of a system for transforming input to products or services
- Everything that is used in this transformation process are resources, e.g., machines, storage space, people,
- All such resources can be classified as either bottlenecks or non-bottlenecks.
- A bottleneck is defined as:



*“ . . . a point in the transformation process that limits the flow the process can output.”*

# How to proceed?

- Perform analytical evaluation of existing approaches, methods and tools
- Adapt the methods and tools to ATM domain
- Apply them on TWR process in several iterations
- Some challenges:
  - *Barrier against seeing 'a big picture'*
  - *Conflicts between lean principles and safety*
  - *Inner drive in the organisation is important*

# How to validate our claims?

- Hamburg Airport Scenario
  - *Sufficient complexity to require higher automation tools*
  - *Simple enough to analyse it with production methods*
- Simulated with real peak hour traffic scenario from the past
  - *University of Salzburg Simulator*
  - *Airport seen as black box*
  - *Inbound and outbound traffic life scenario from past peak hour*

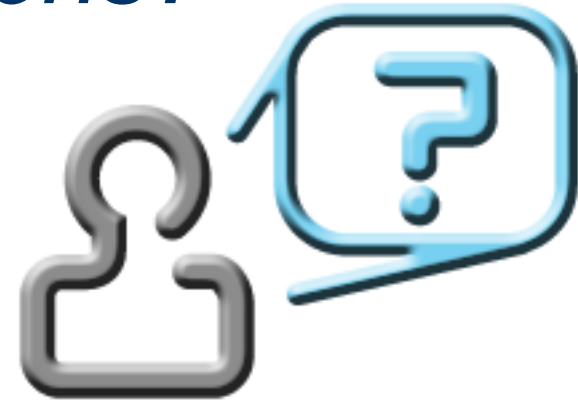


- KPI comparison with and without ZeFMaP
  - *Definition of KPIs (ATM KPIs, others - team performance indicators...)*
  - *Baseline simulation run without ZeFMaP help*
  - *Up to 3 runs with (offline) ZeFMaP optimisation of decisions*
- Expectations
  - *Improvement of productivity KPIs (punctuality, time to runway, time to gate) especially in high traffic load*
  - *Improvements will continue to a lesser extent with each iteration*
  - *Acceptance (satisfaction) by air traffic controllers will be equal or slightly improved*
  - *Follow up projects*



# Thank you for your attention!

## *Questions? Suggestions?*



Contacts:

Theodor.Zeh@frequentis.com

Amela@sintef.no