Systems Thinking in a Nutshell

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Abstract

Systems Thinking is a way of thinking to help understand the problem and solution space. It entails a.o. distinguishing systems and seeing them in their context, being able to zoom in and out, to recognize relations and understand dynamics and emergence, and to take many perspectives. In this presentation we illustrate this with an example.

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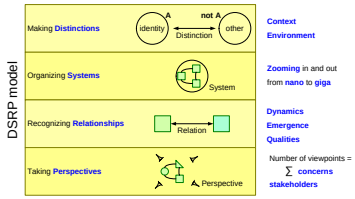
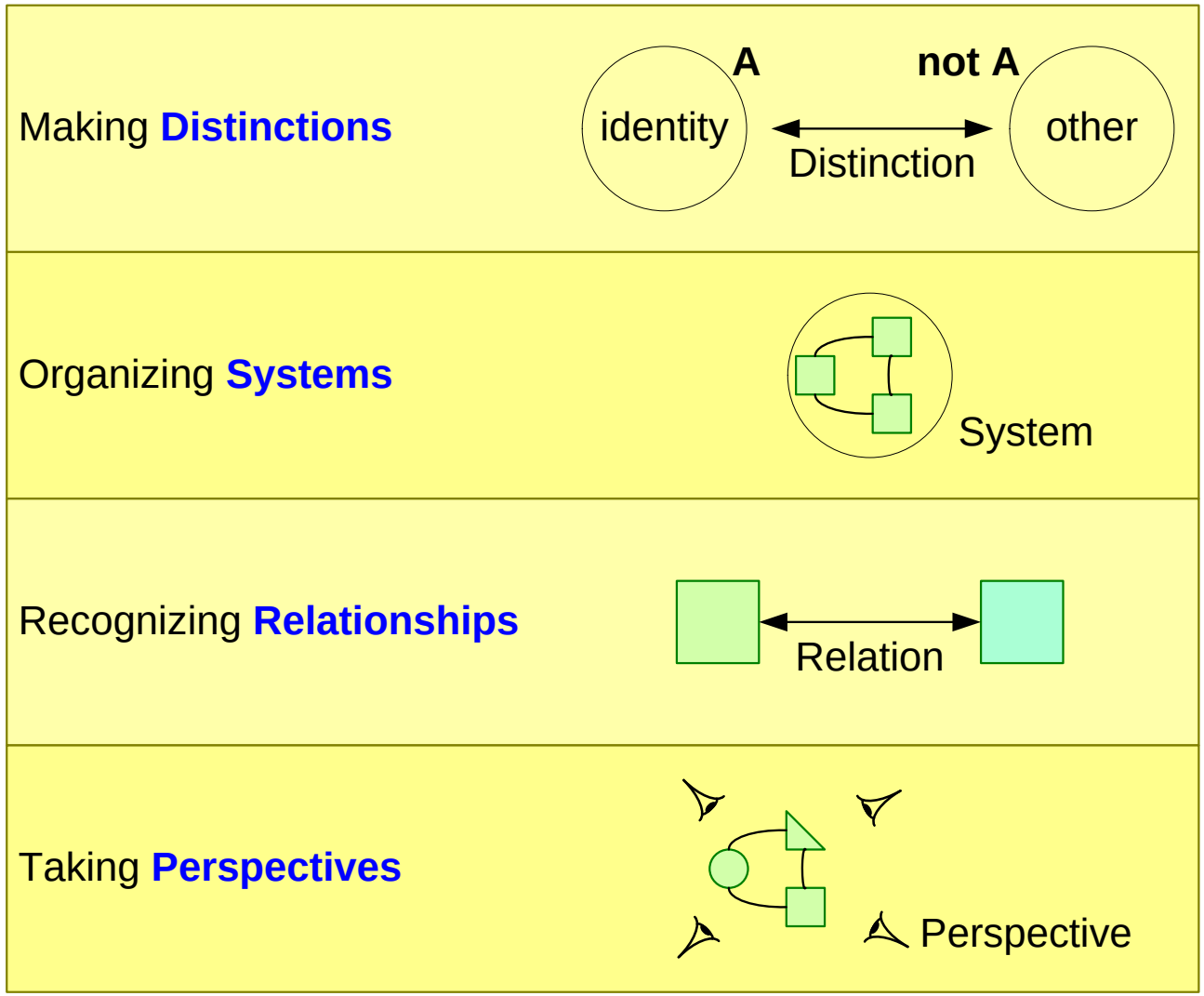


Explaining Systems Thinking with the DSRP Model

DSRP model



Context

Environment

Zooming in and out

from **nano** to **giga**

Dynamics

Emergence

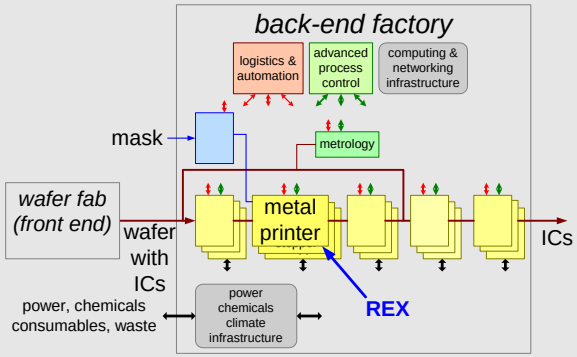
Qualities

Number of viewpoints =

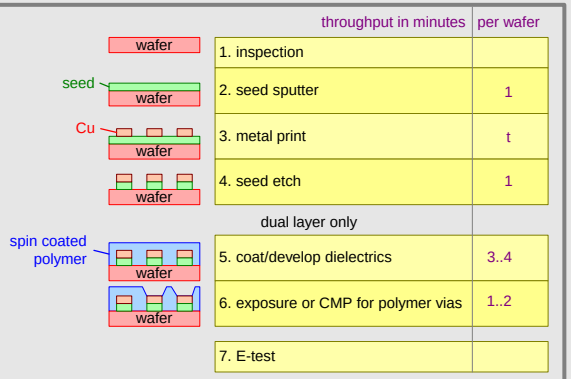
$\sum$ **concerns**

stakeholders

A3 architecture overview of the Metal Printer (all numbers have been removed for competitive sensitivity)



back-end factory: systems and process model



process steps throughput

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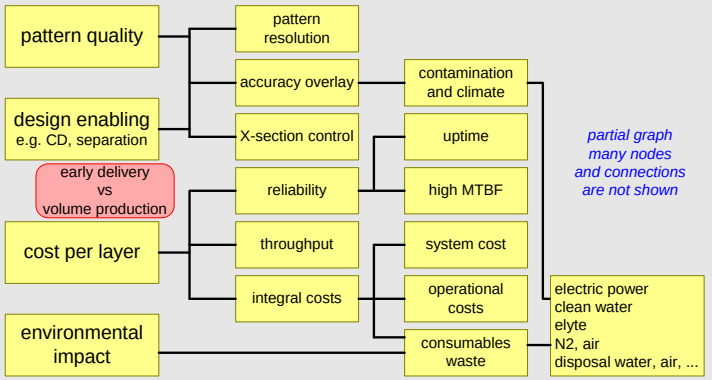
status	preliminary draft

Document meta-information



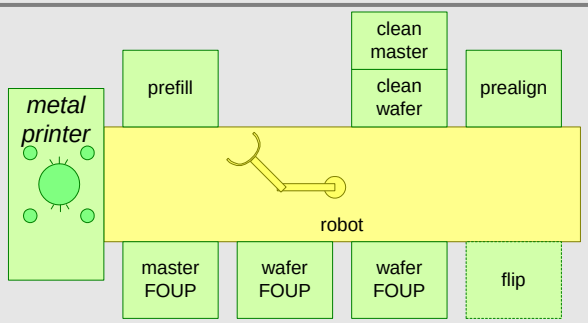
customer key drivers

min. line width	a μm
overlay	b μm
throughput	c WPH
MTBF	d hr

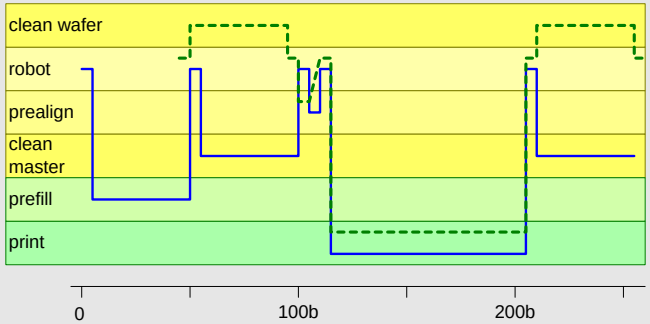
wafer size	200, 300 mm
power	x kW
clean room class	
floor vibration class	

key performance parameters

Customer key-drivers and Key Performance Parameters

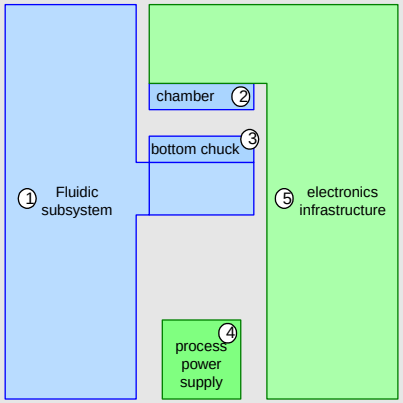


metal printing cell

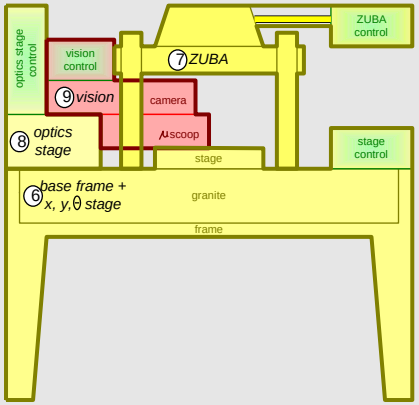


metal printing time-line

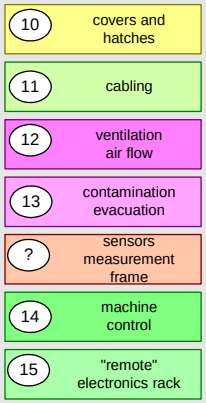
metal printing cell: systems and performance model



metal printer back side

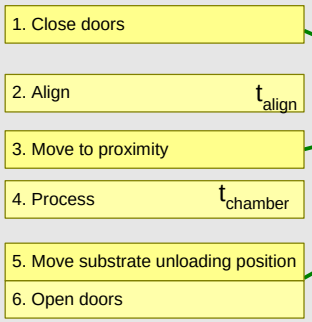


metal printer front side



integrating subsystems

metal printer subsystems



metal printer functional flow

note: original diagram was annotated with actual performance figures
for confidentiality reasons these numbers have been removed

$$t_{print} = t_{p,prepare} + t_{p,align} + t_{chamber}(thickness) + t_{p,finalize}$$

$$t_{prepare} = t_{close\ doors} + t_{move\ to\ proximity}$$

$$t_{finalize} = t_{move\ to\ unload} + t_{open\ doors}$$

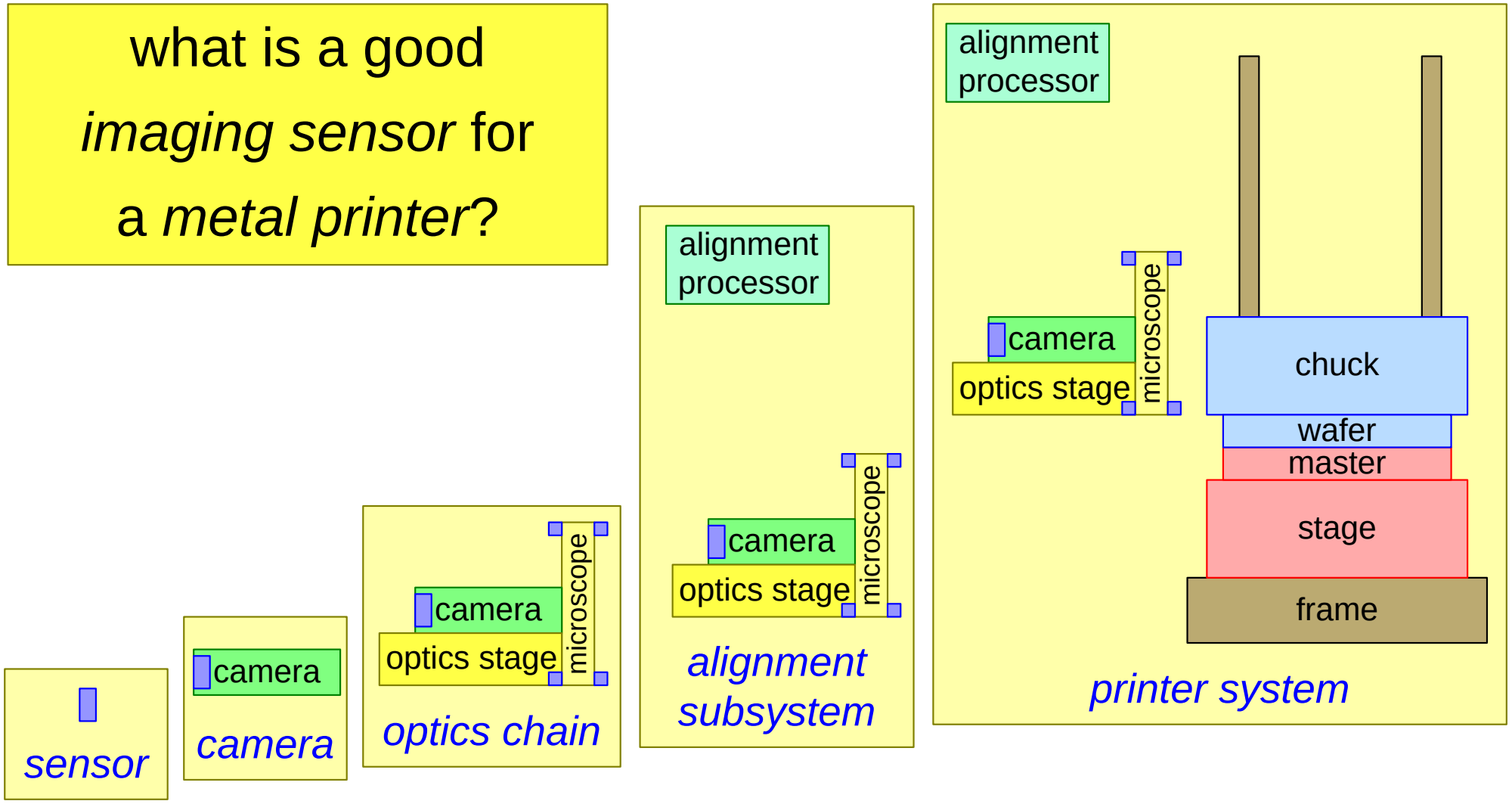
$$t_{print} = t_{p,overhead} + C_{transfer} * thickness$$

formula print cycle time

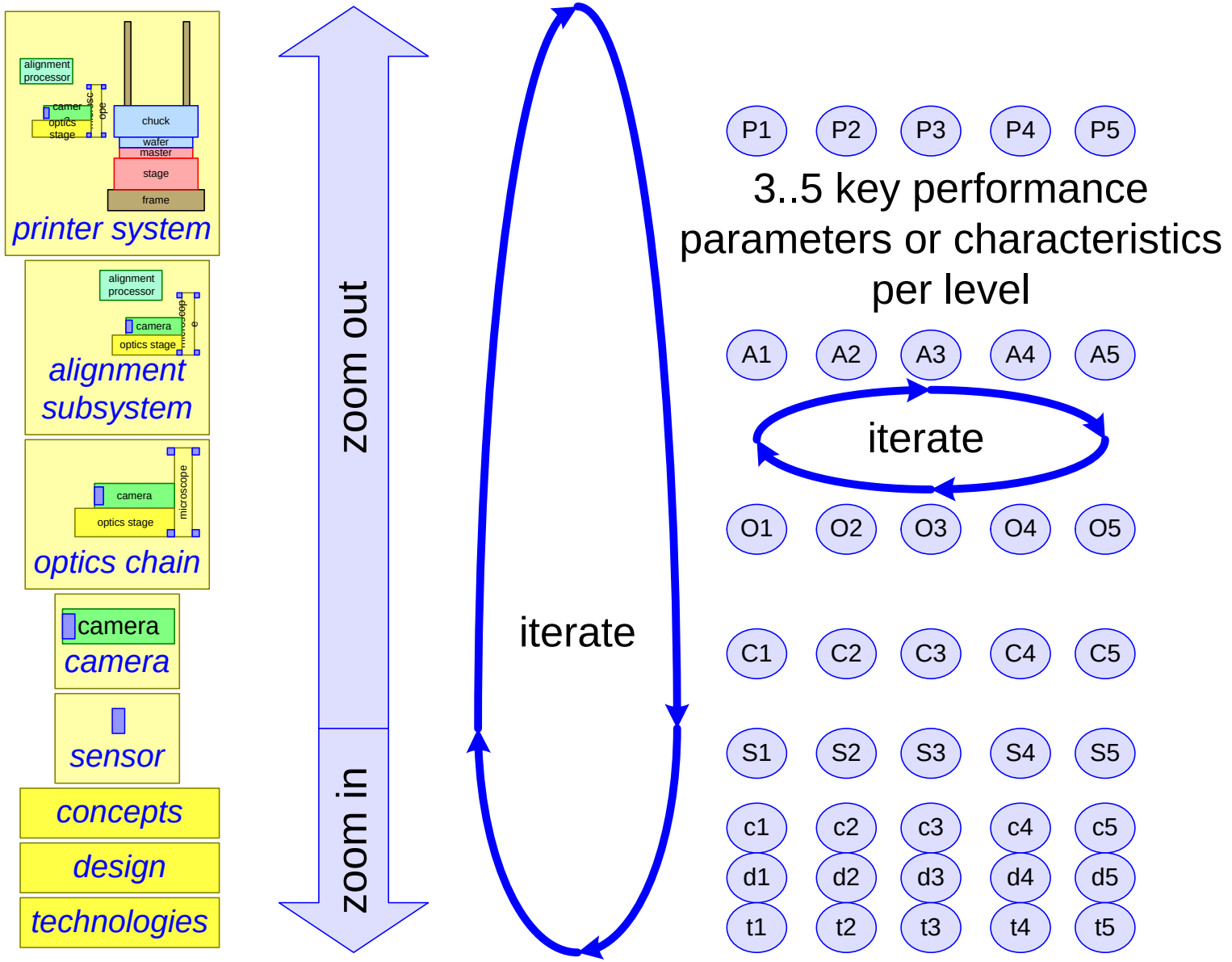
metal printer subsystems, functions, and cycle time model

Zooming In

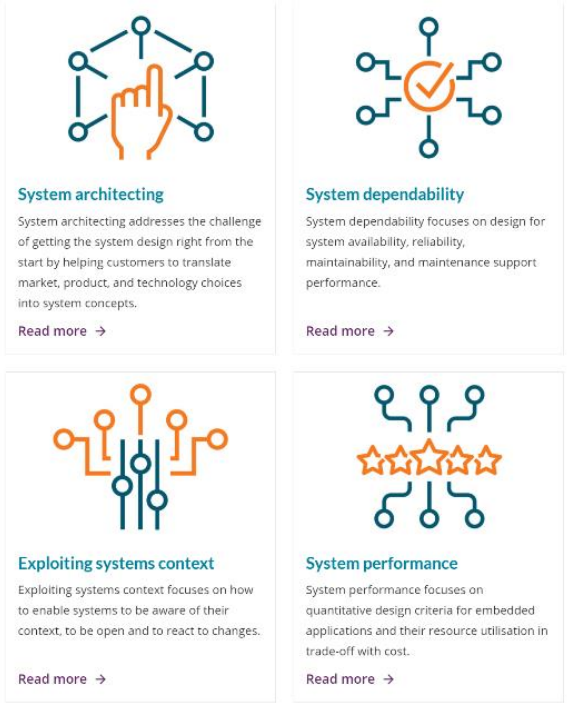
what is a good *imaging sensor* for a *metal printer?*



Many Perspectives at Many Levels



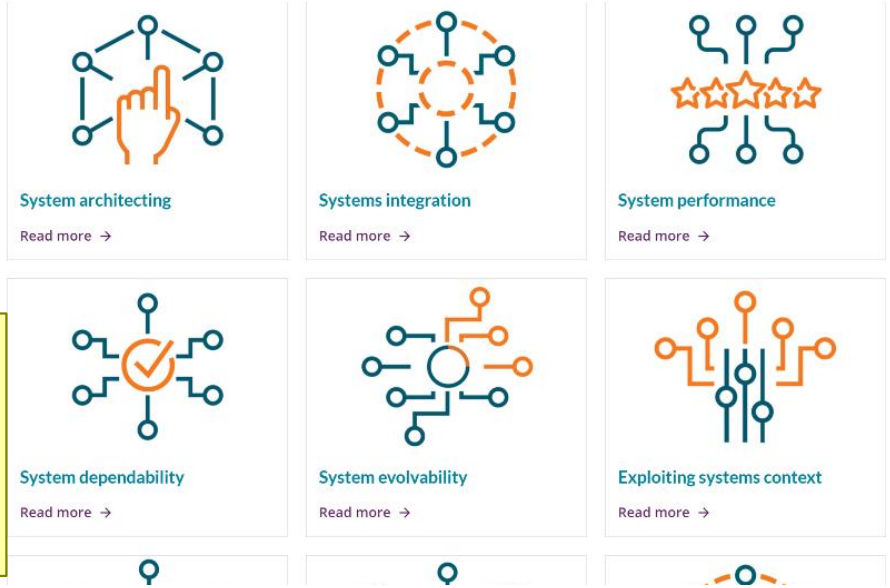
ESI research and Education 2002..2021



Research at and with the Dutch High-Tech Industry

ASML, Philips, Thales, Canon, Thermo Fischer,

VanderLande, Signify, NXP, and more

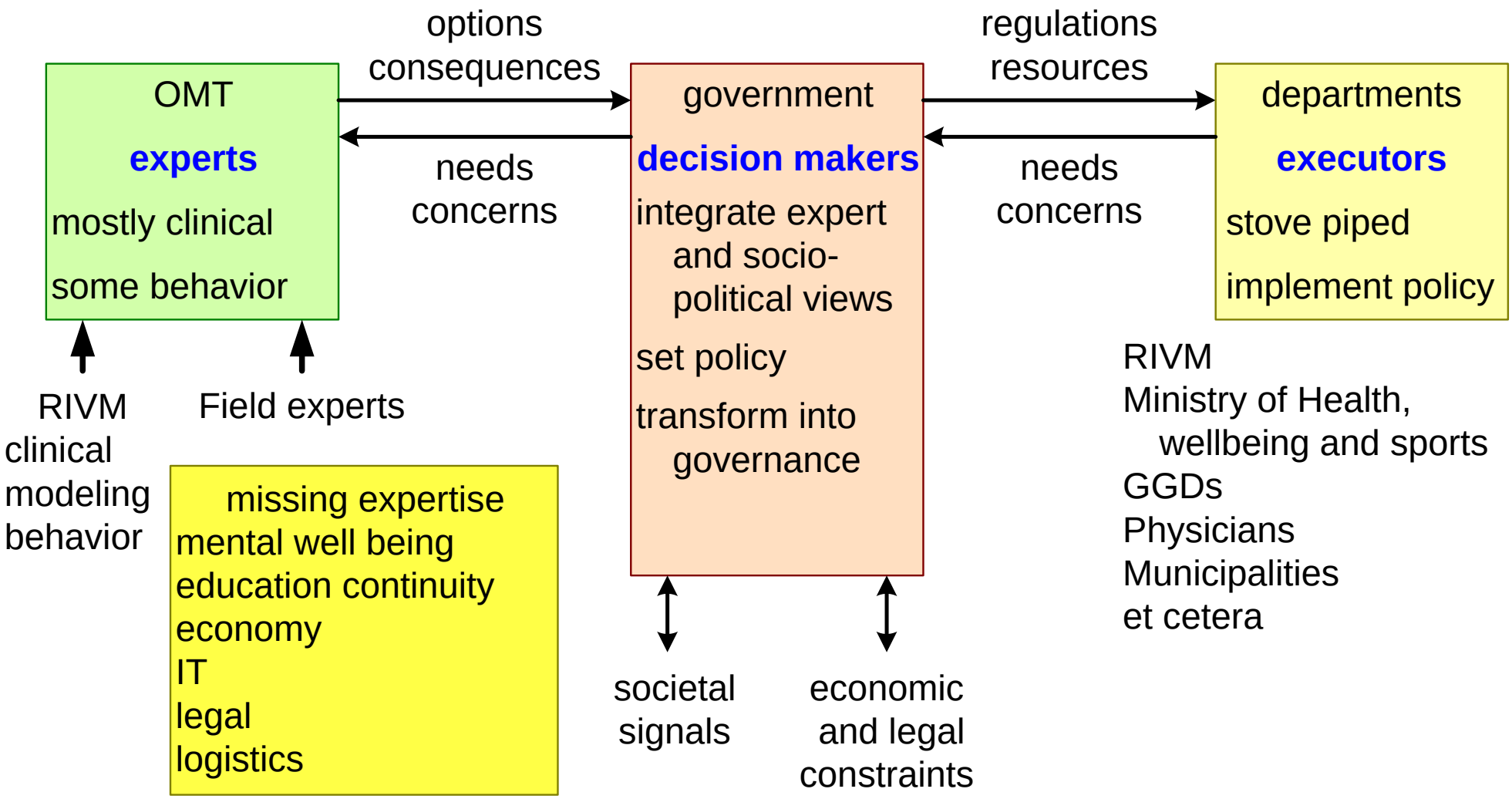


Education at the Dutch High-Tech Industry

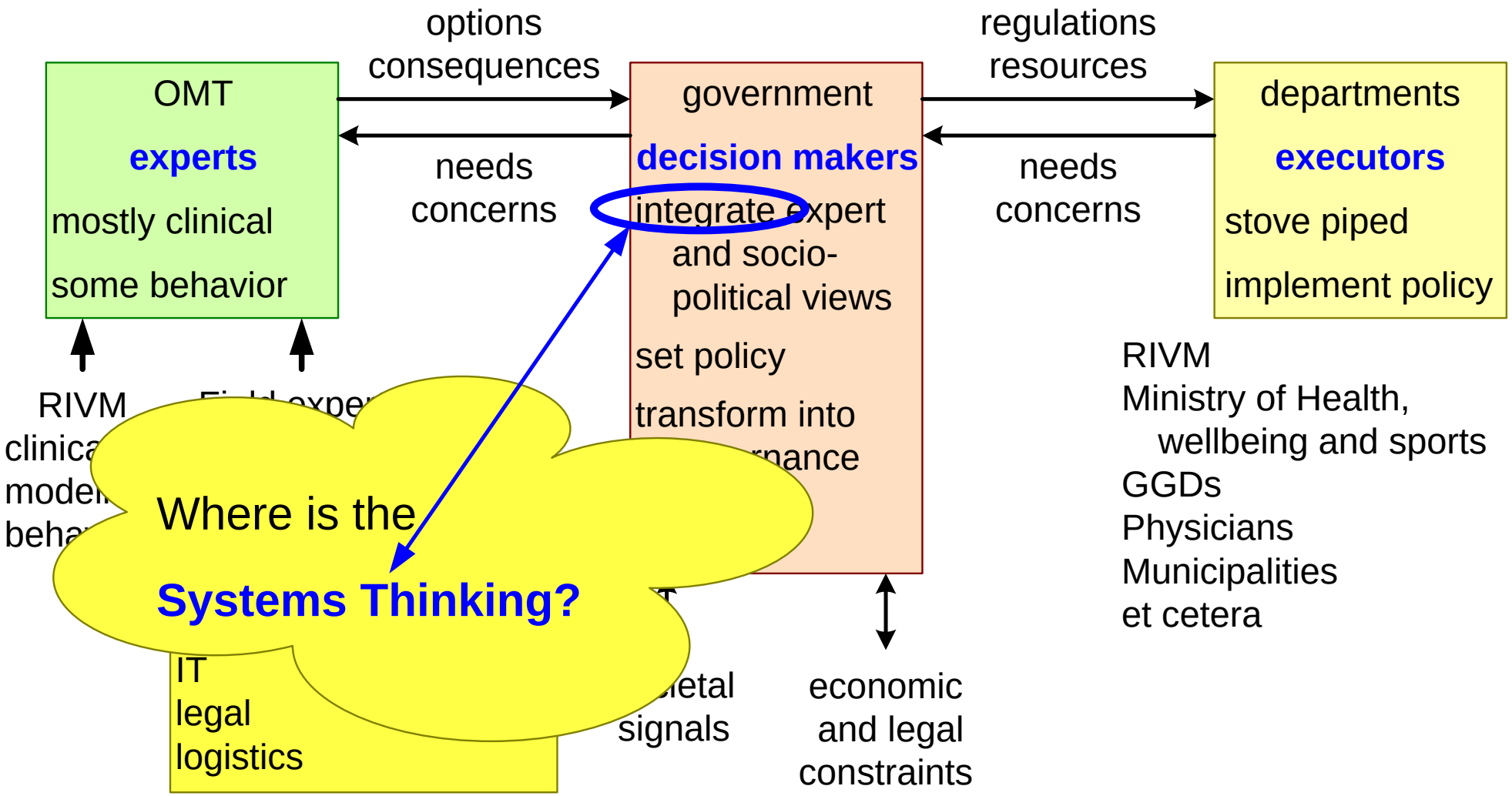
ASML, Philips, Thales, Canon, Thermo Fischer,

VanderLande, Signify, NXP, and many more

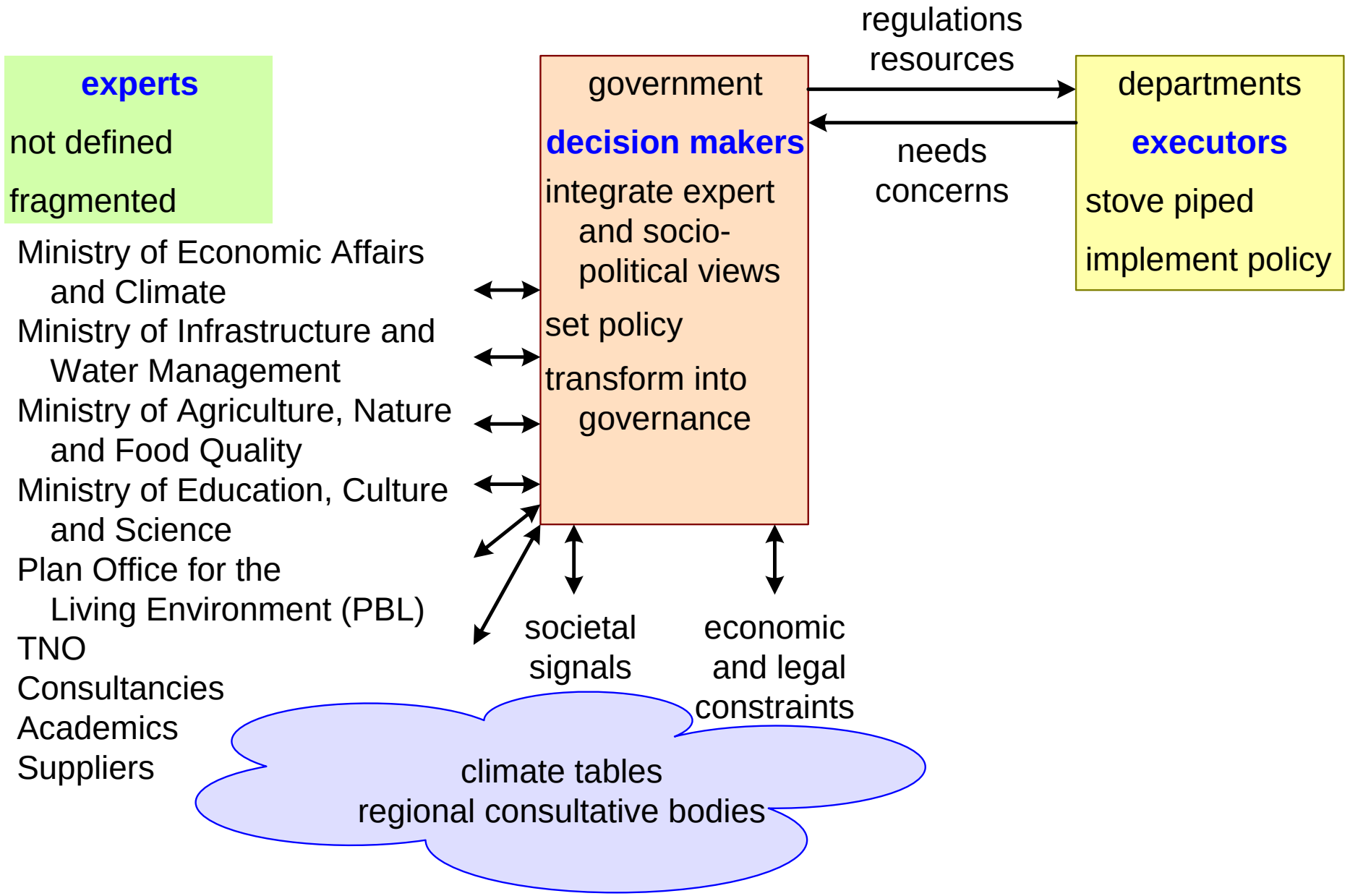
Roles in the Pandemic Situation



Who does the Systems Thinking?



National Sustainability Organization(?)



Reflective Question

What range from nano to giga do you cover?

See some examples below