

# The Waferstepper Challenge: Innovation and Reliability despite Complexity

by *Gerrit Muller* University of South-Eastern Norway-NISE

e-mail: `gaudisite@gmail.com`

`www.gaudisite.nl`

## Abstract

The function of the waferstepper is explained and its most important characteristics. The dynamic market provides continuous technological challenges, resulting in ever increasing performance, but also complexity. Despite the exponential increase of performance and complexity, the reliability must be good. The reliability is crucial when the stepper is used in volume production.

The ASML engineering style plays a central role in tackling this challenge. Three key aspects of this style are: Feedback, Focus and Future awareness. The concurrent application of these three aspects has so far been proven to be effective.

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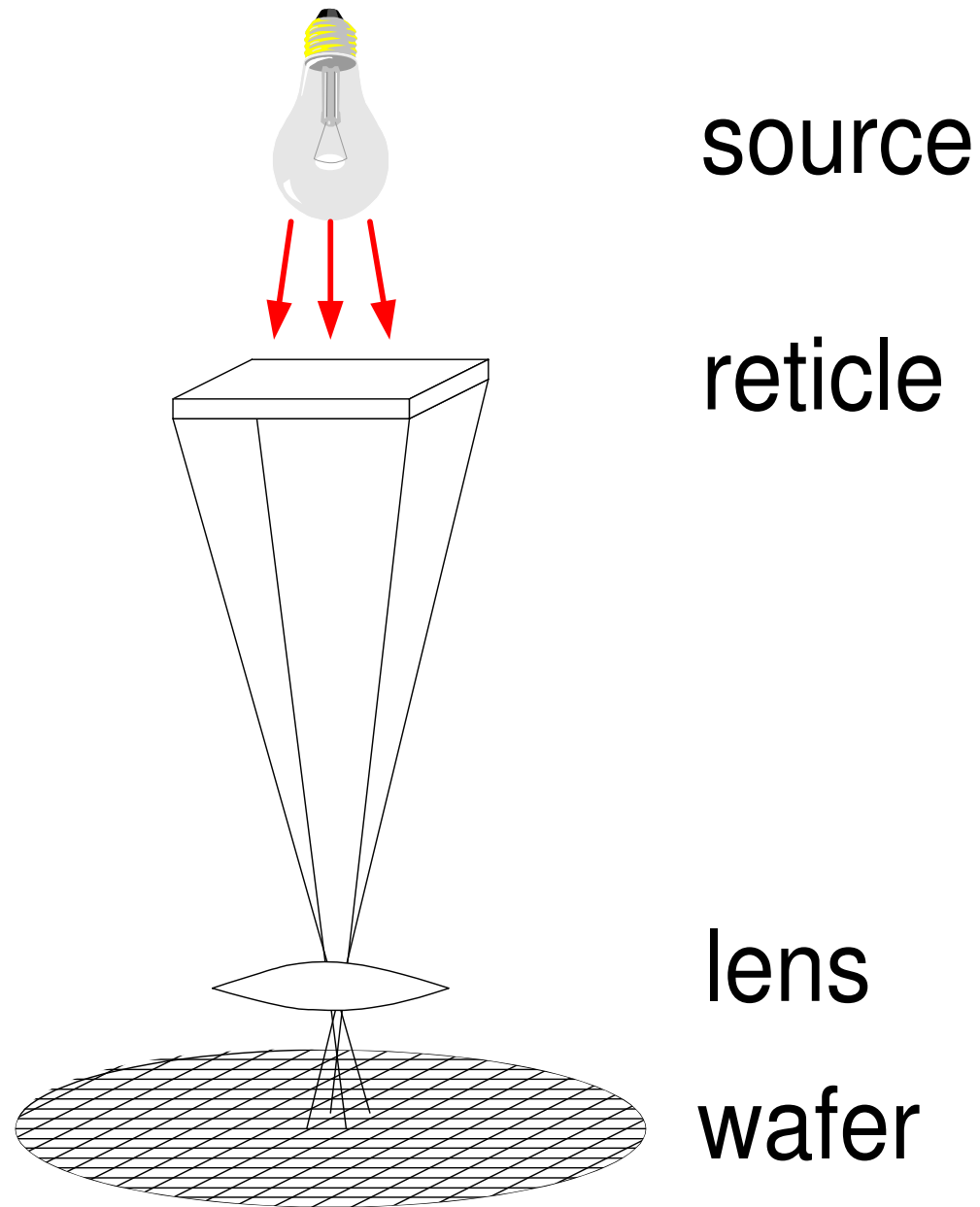
September 9, 2018  
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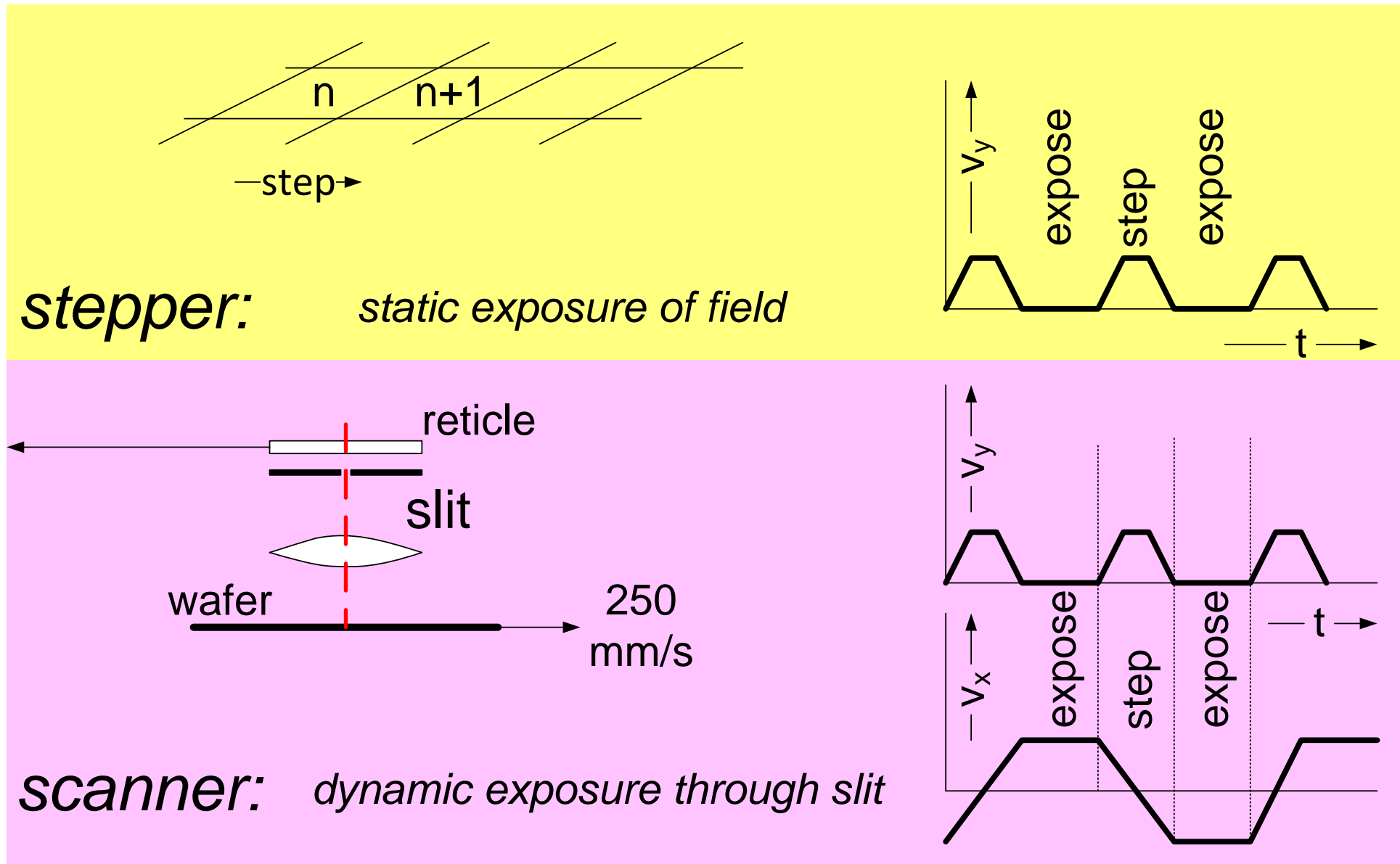
# Twinscan AT1100



# What is a waferstepper

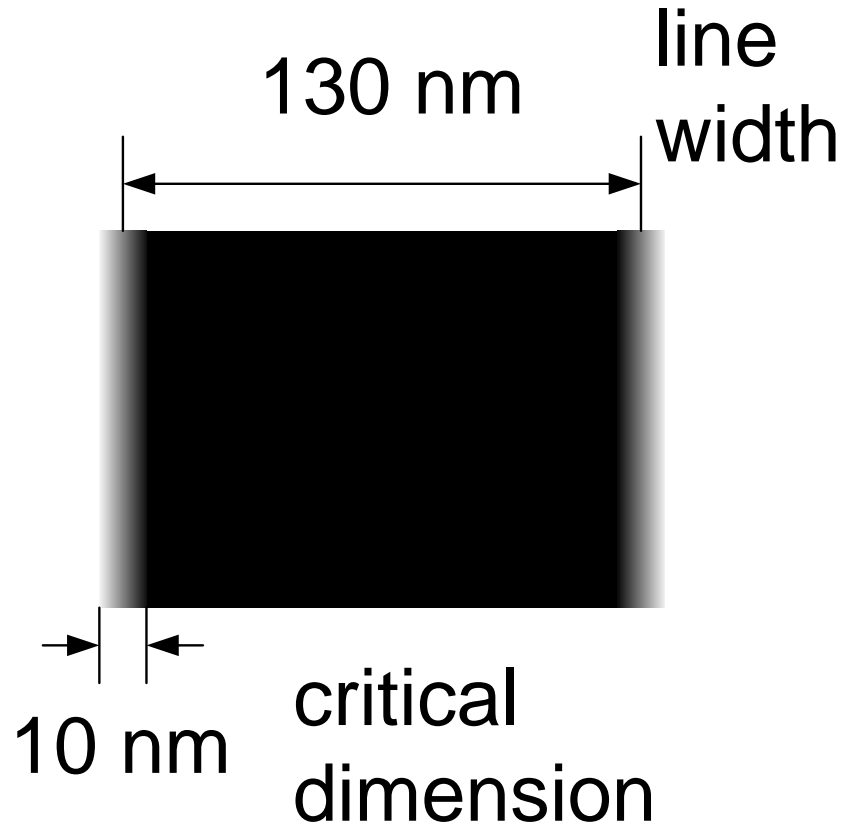


# From stepping to scanning

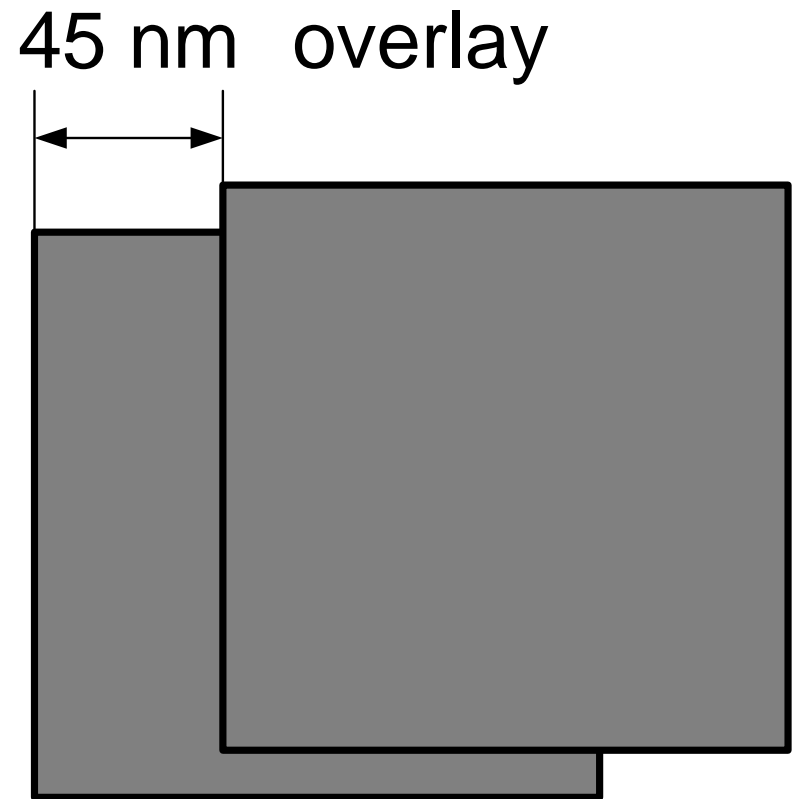


# Key specifications waferstepper

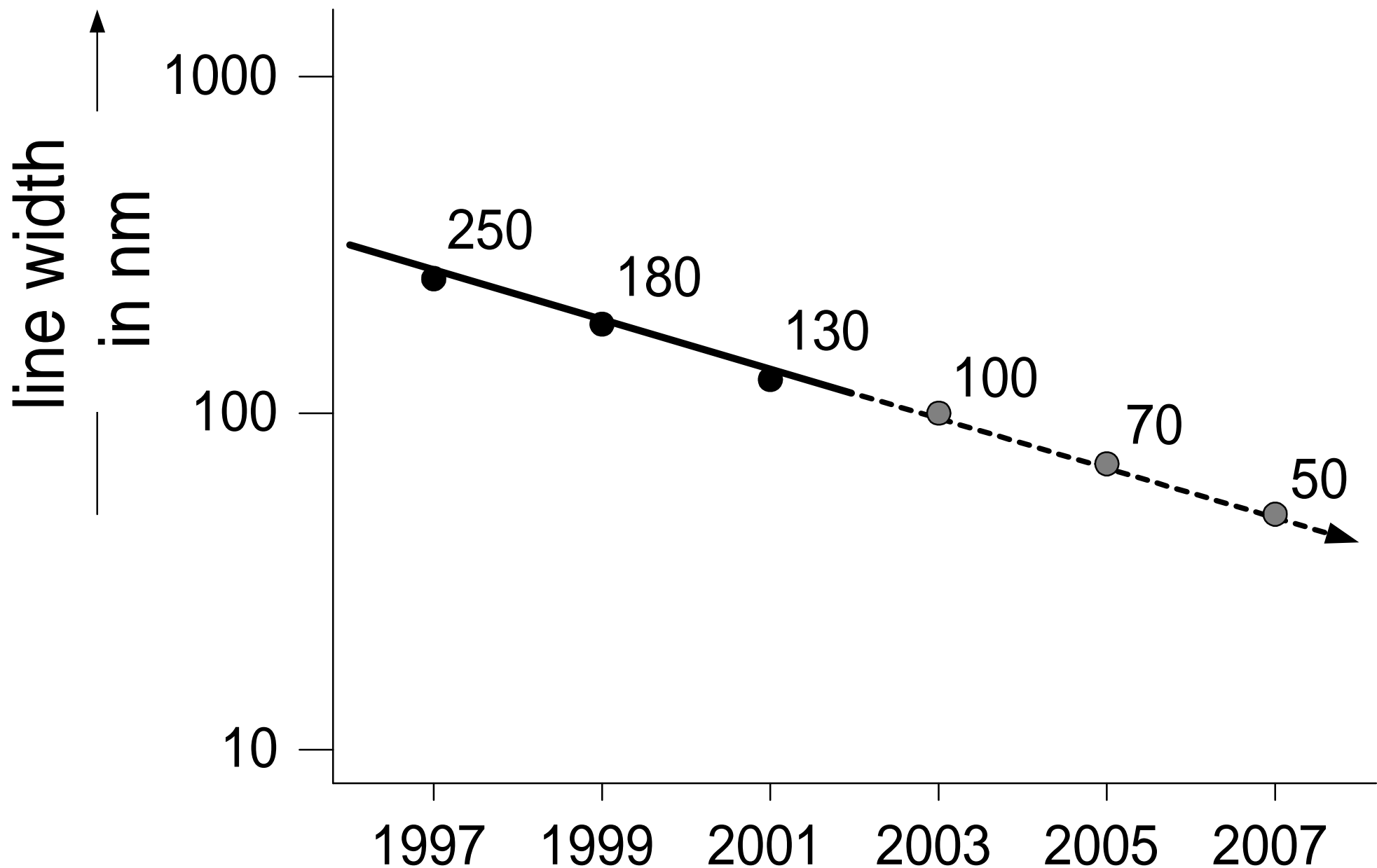
## imaging



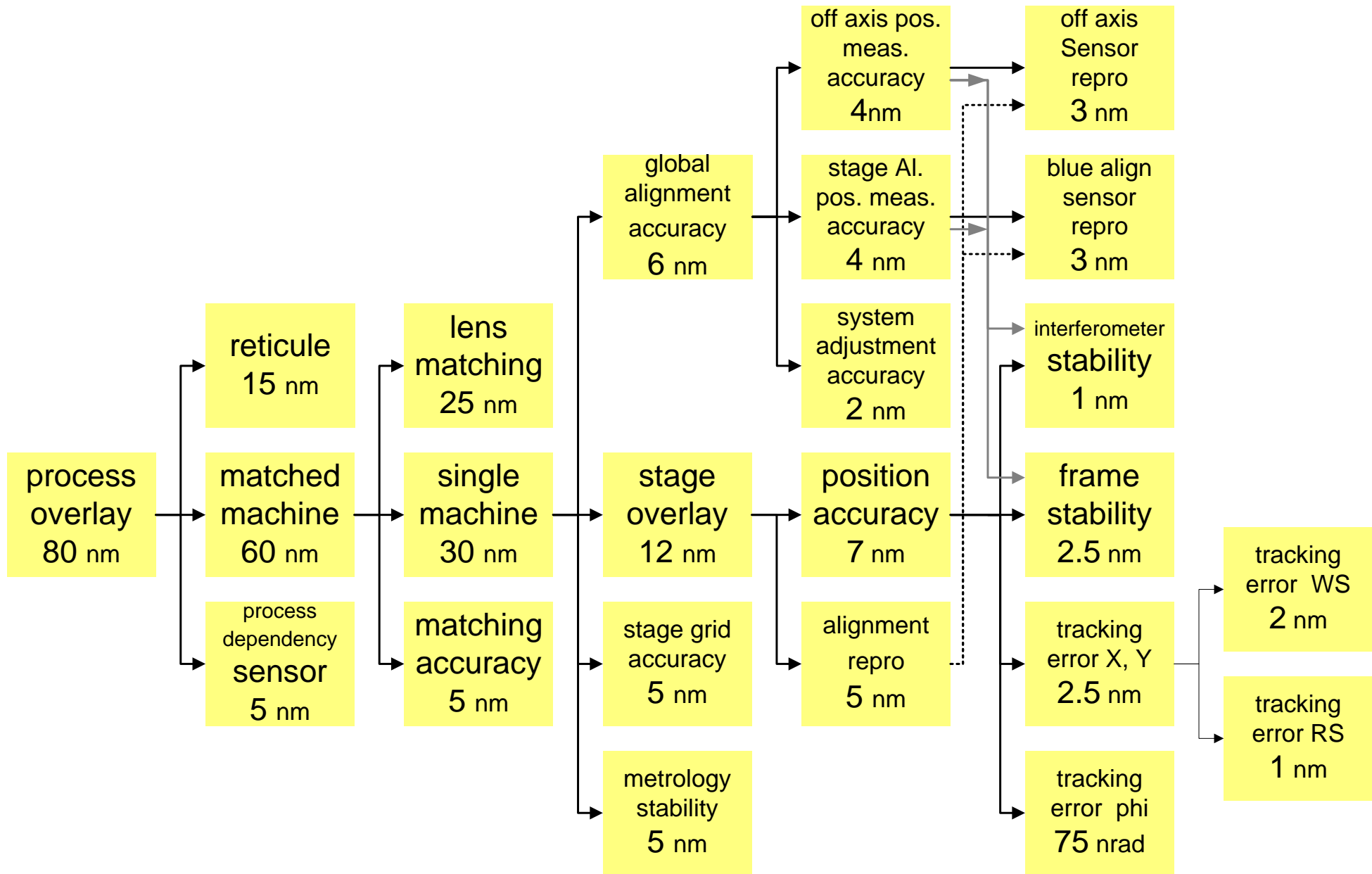
## alignment



# Moore's law




# Overlay budget (1999)

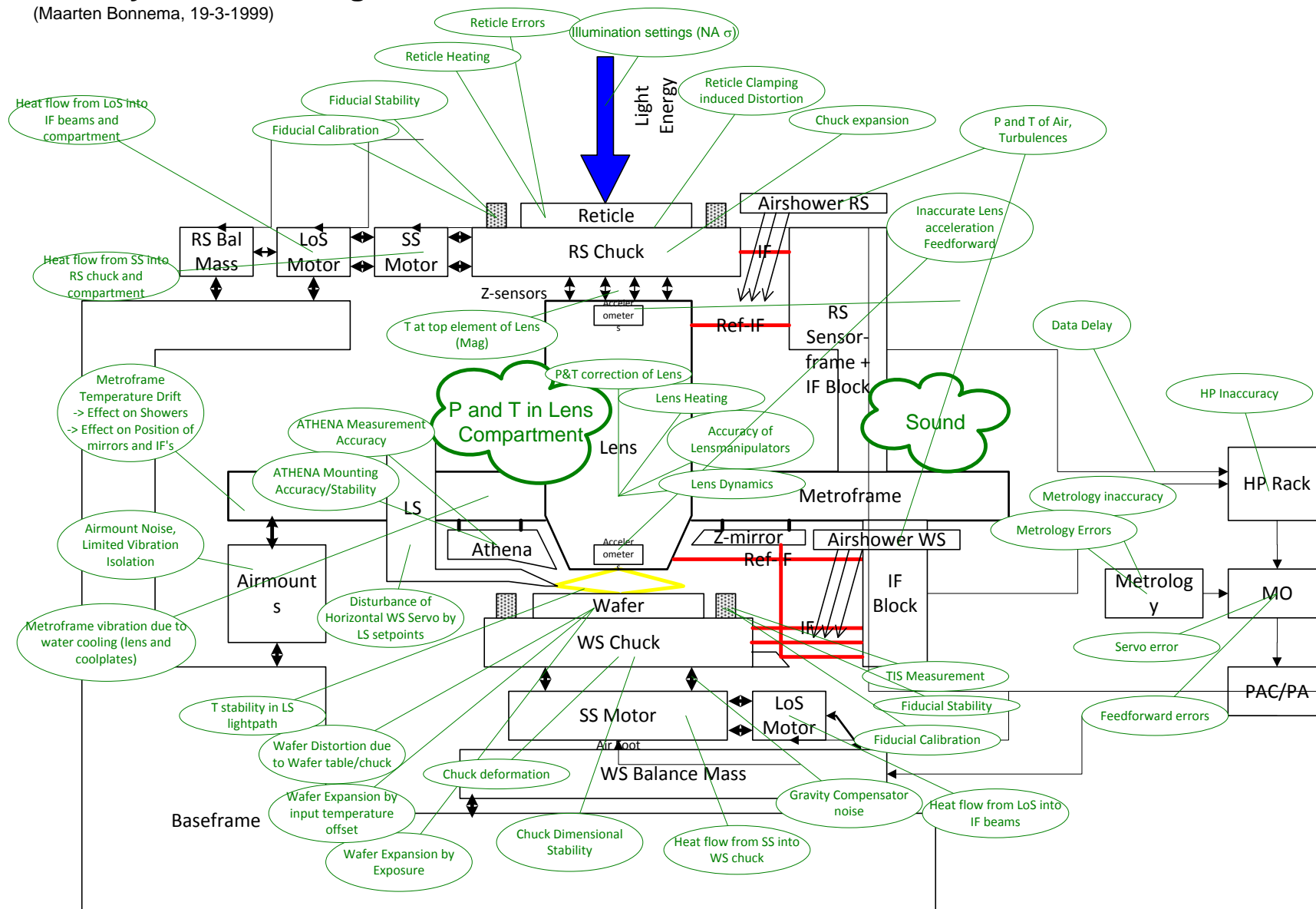


# Everything influences overlay

## Overlay Influence Diagram.

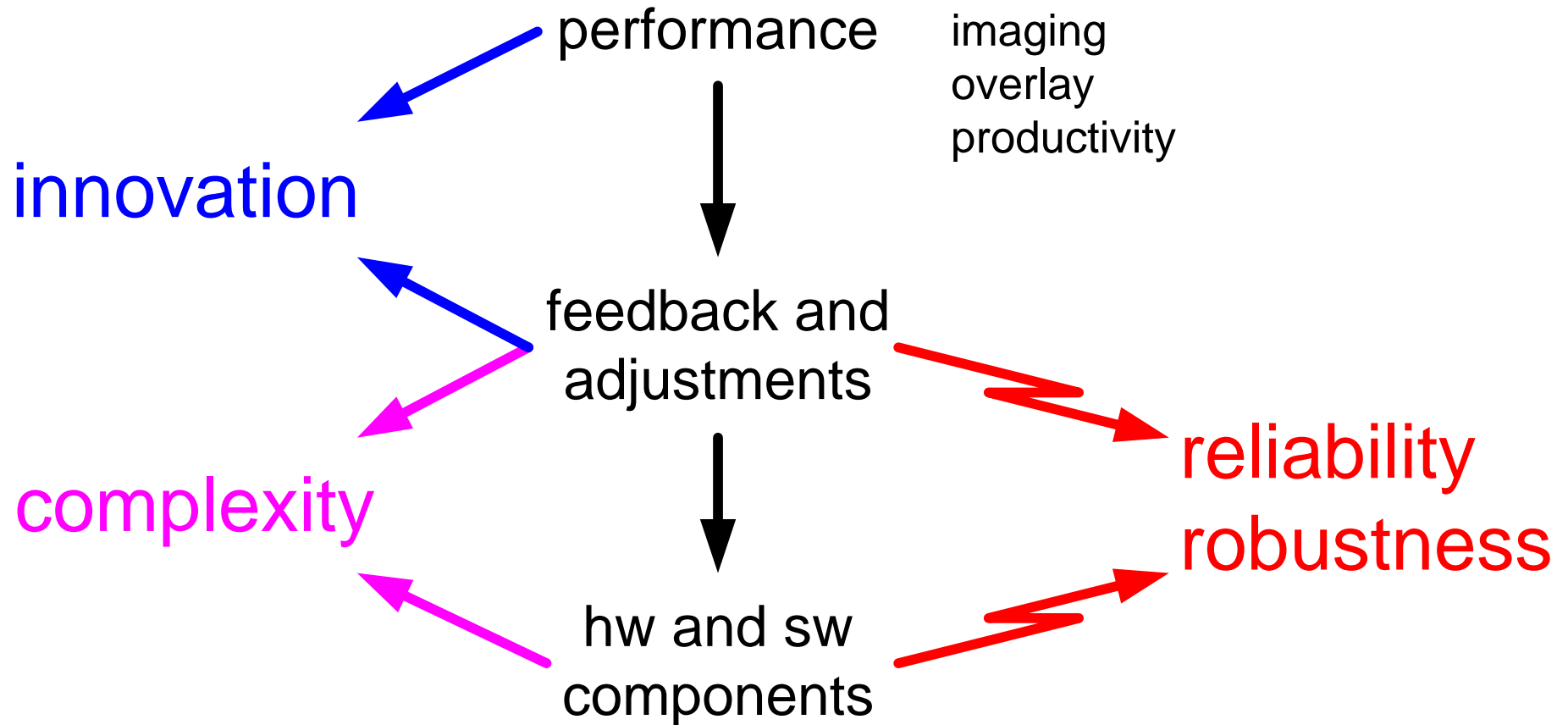
(Maarten Bonnema, 19-3-1999)

 : Fiducial

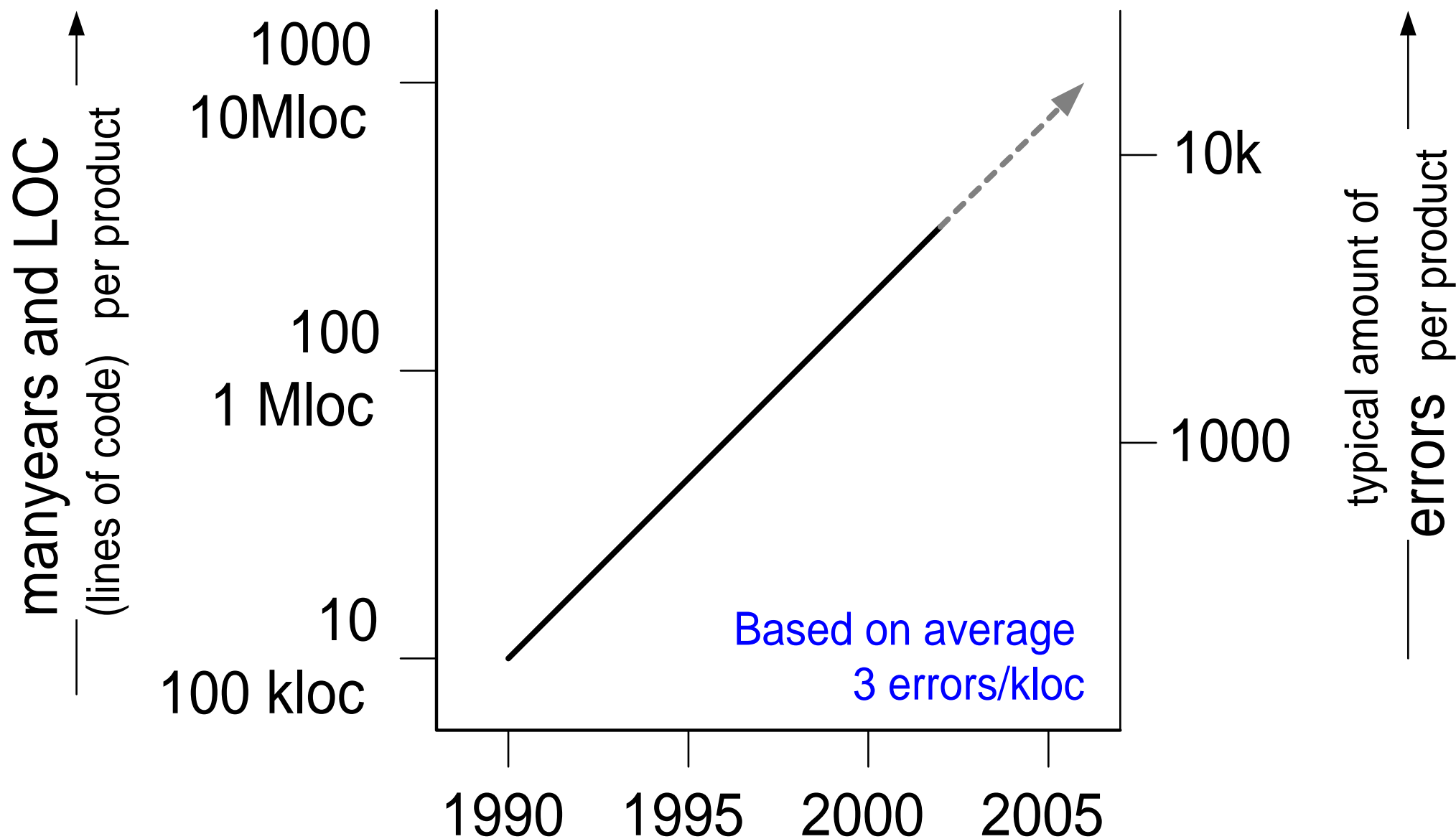




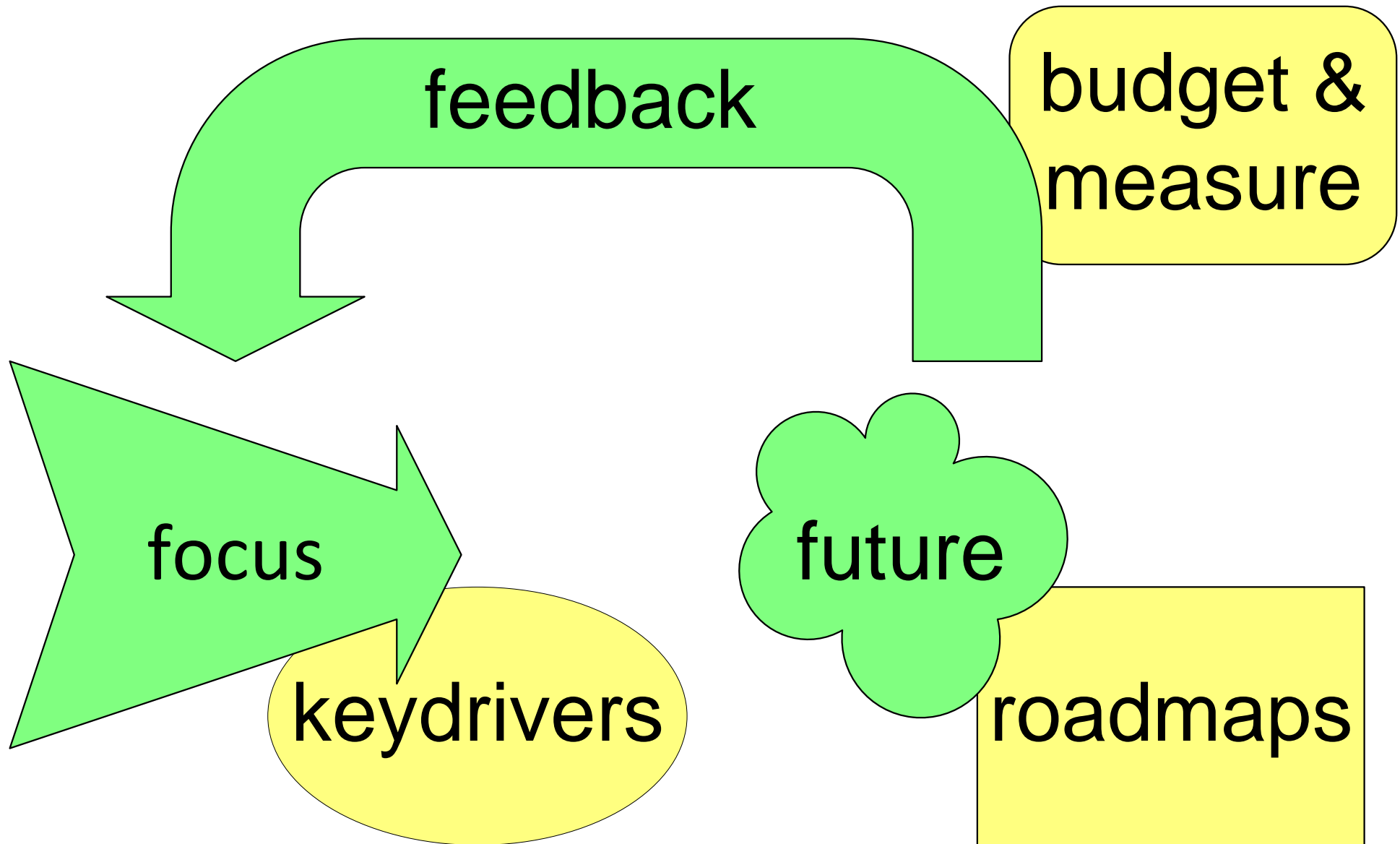
# Challenge: Exponential Increase



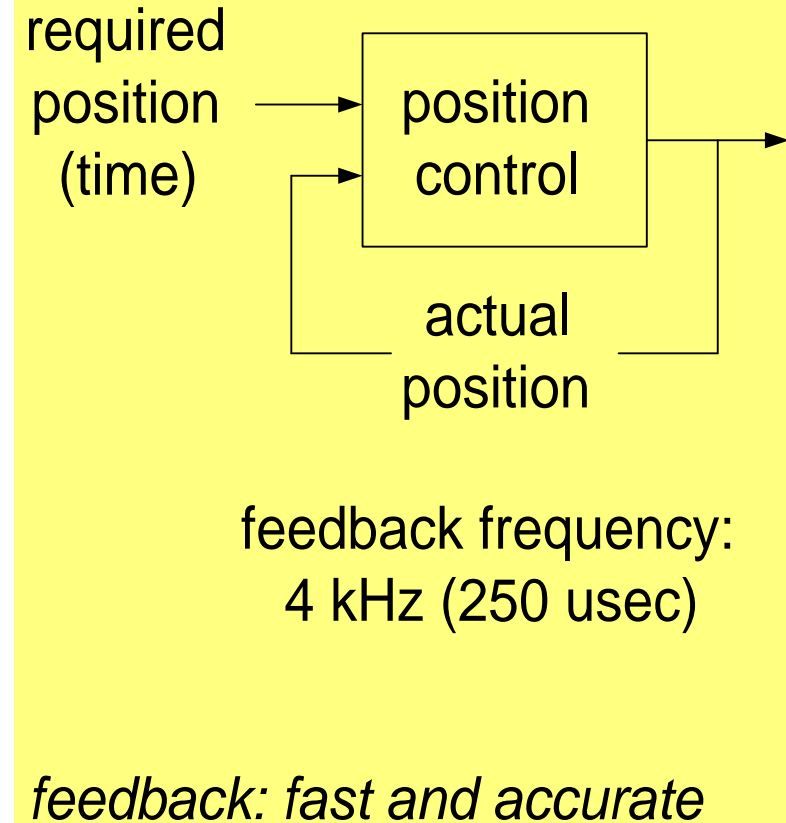
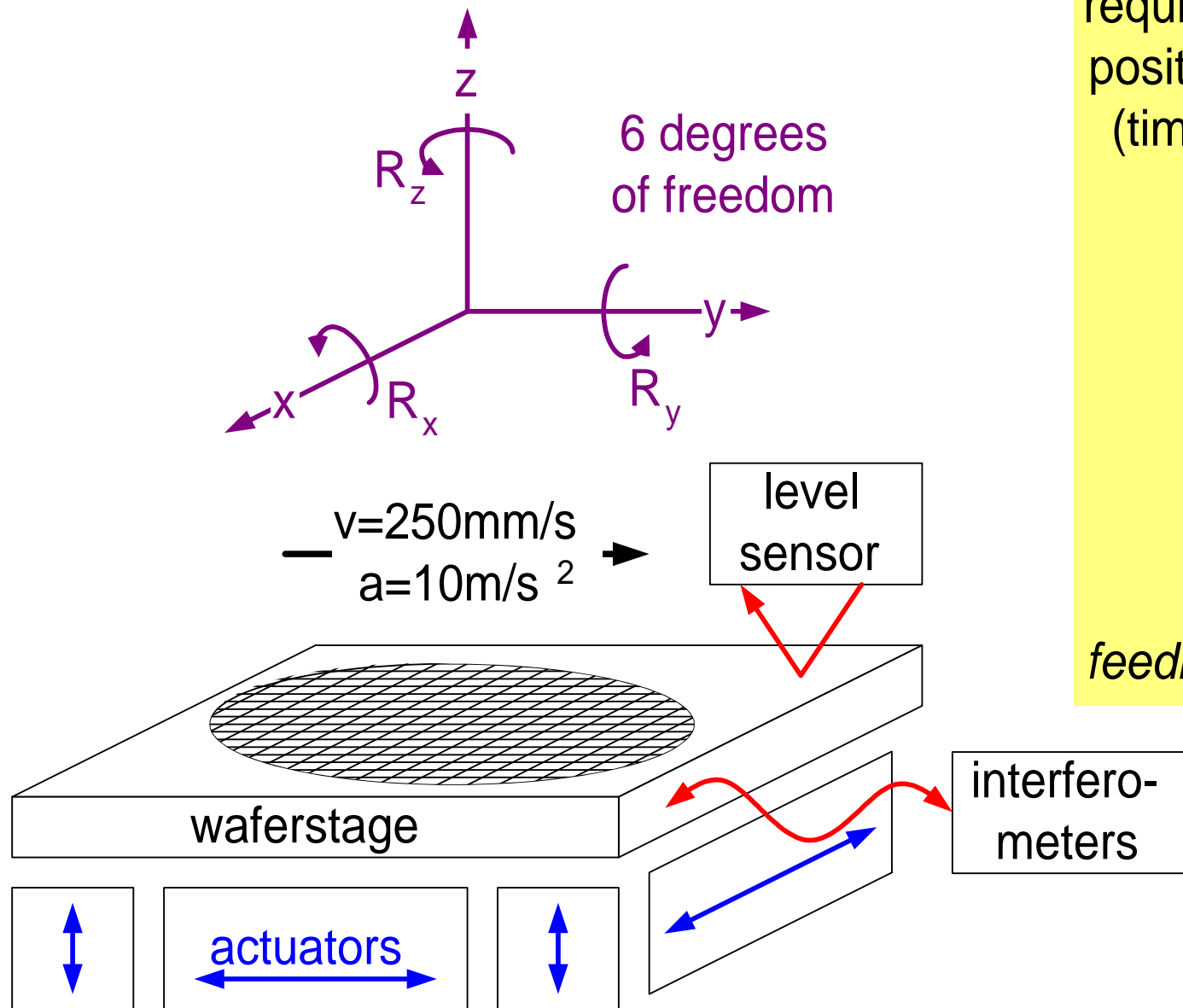
# The Software Reliability Threat



# Success factor: ASML system engineering style

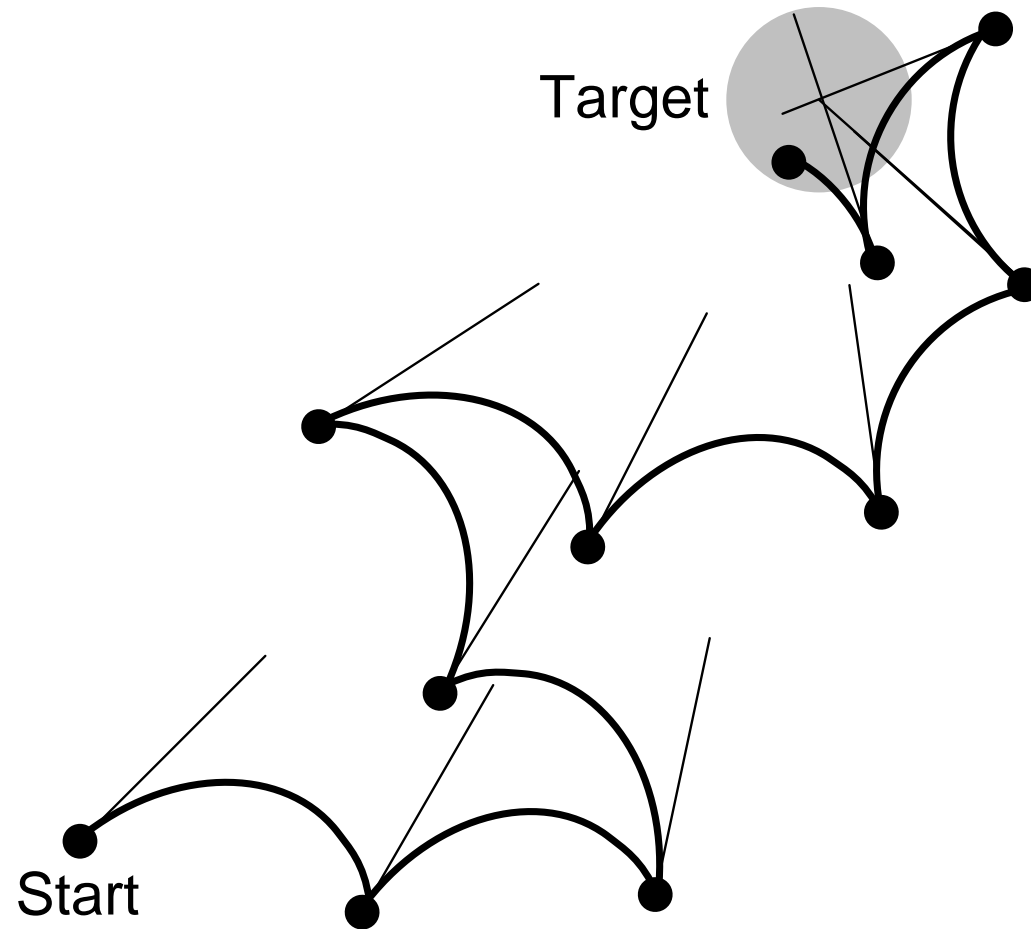


# Feedback as technical design pattern



# Feedback as development process pattern

stepsize: 3 months  
elapsed time: 25 months

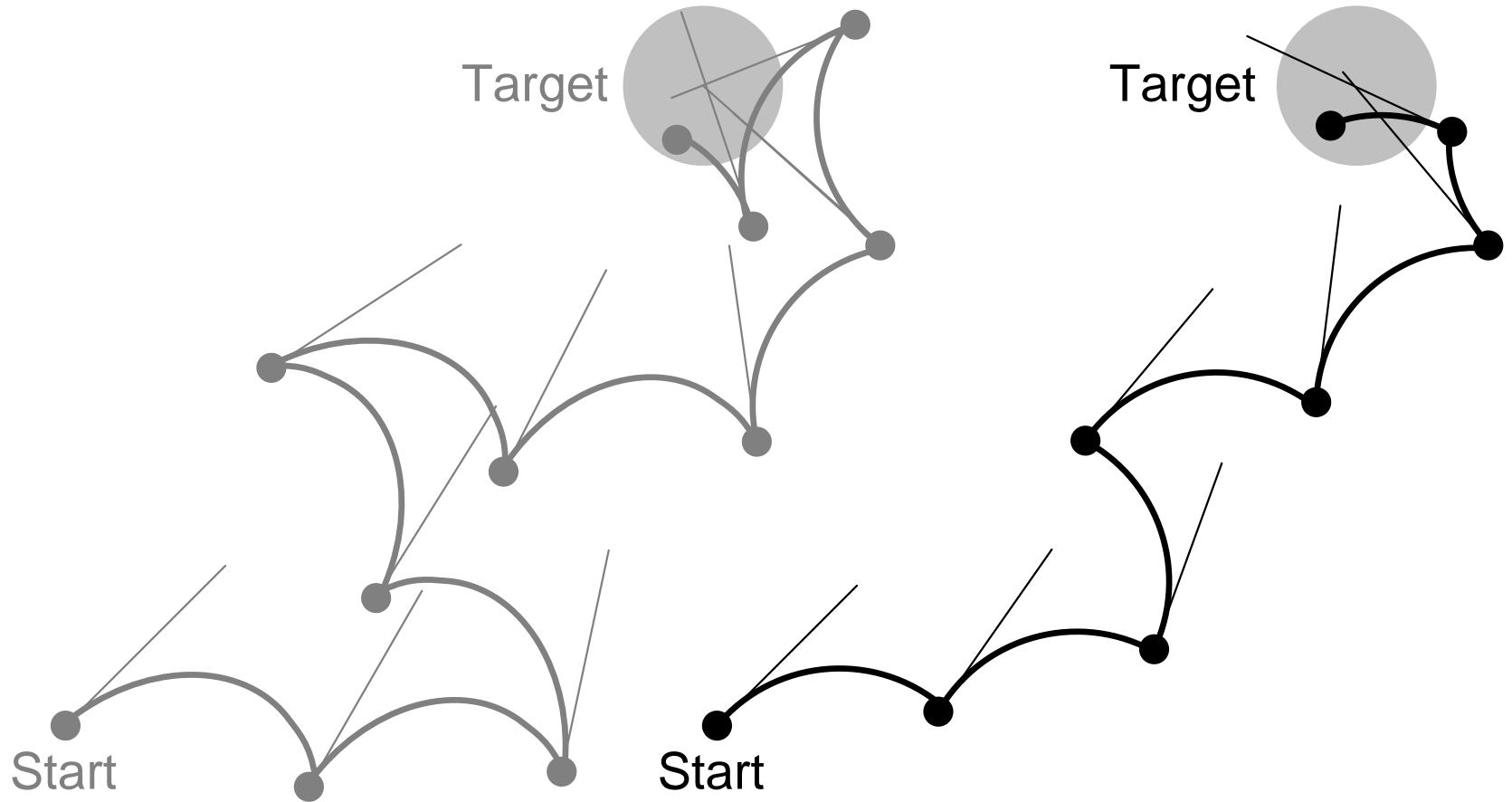


# Feedback (2)

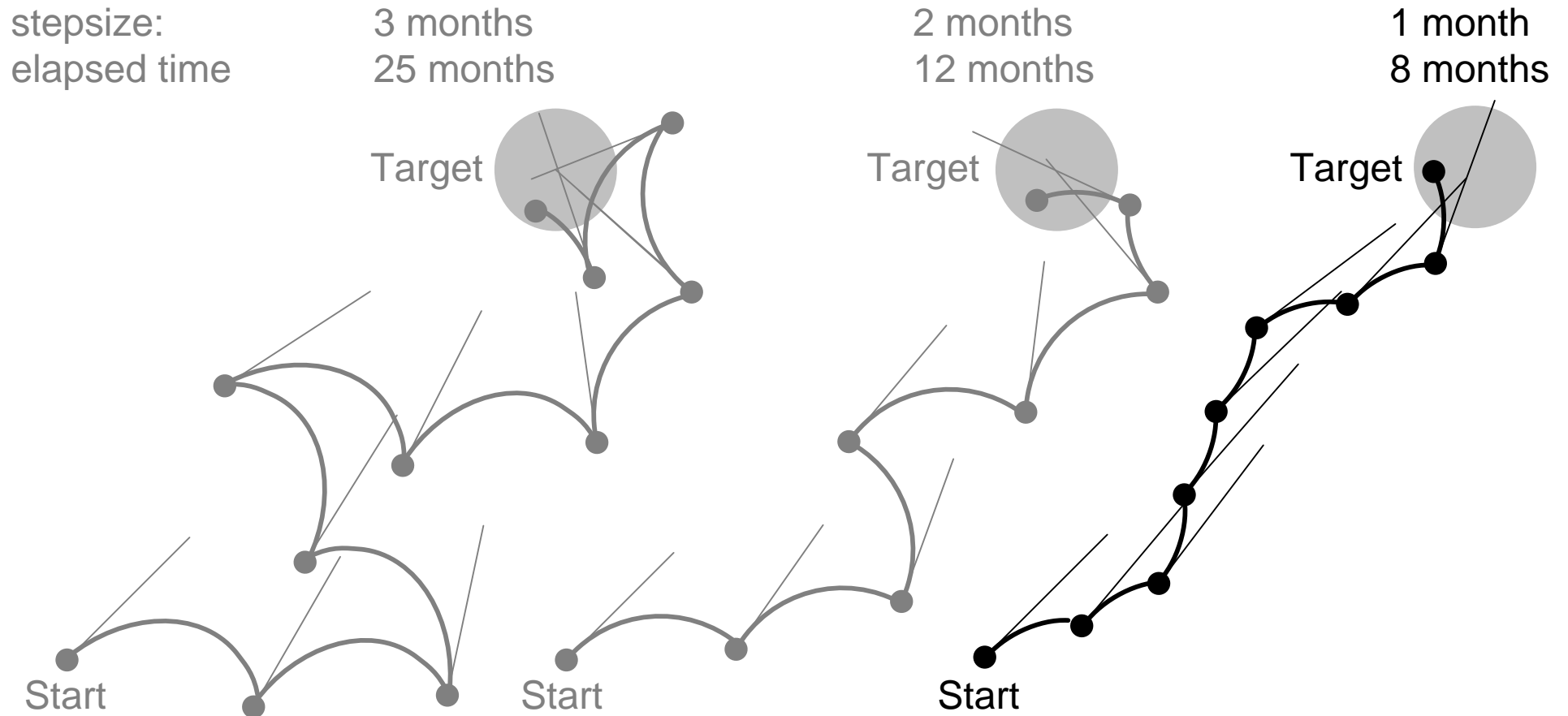
stepsize:  
elapsed time

3 months  
25 months

2 months  
12 months

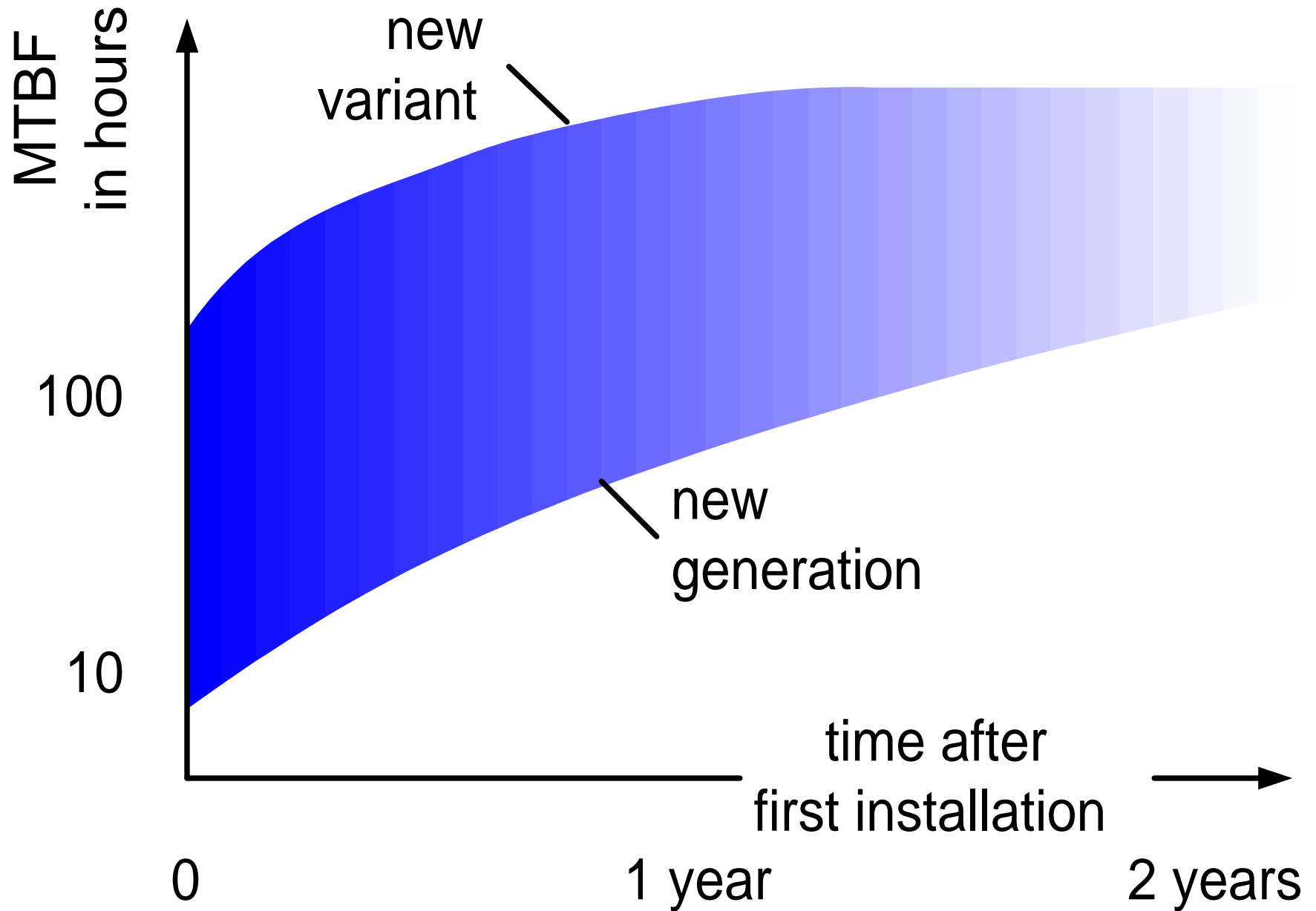


# Feedback (3)



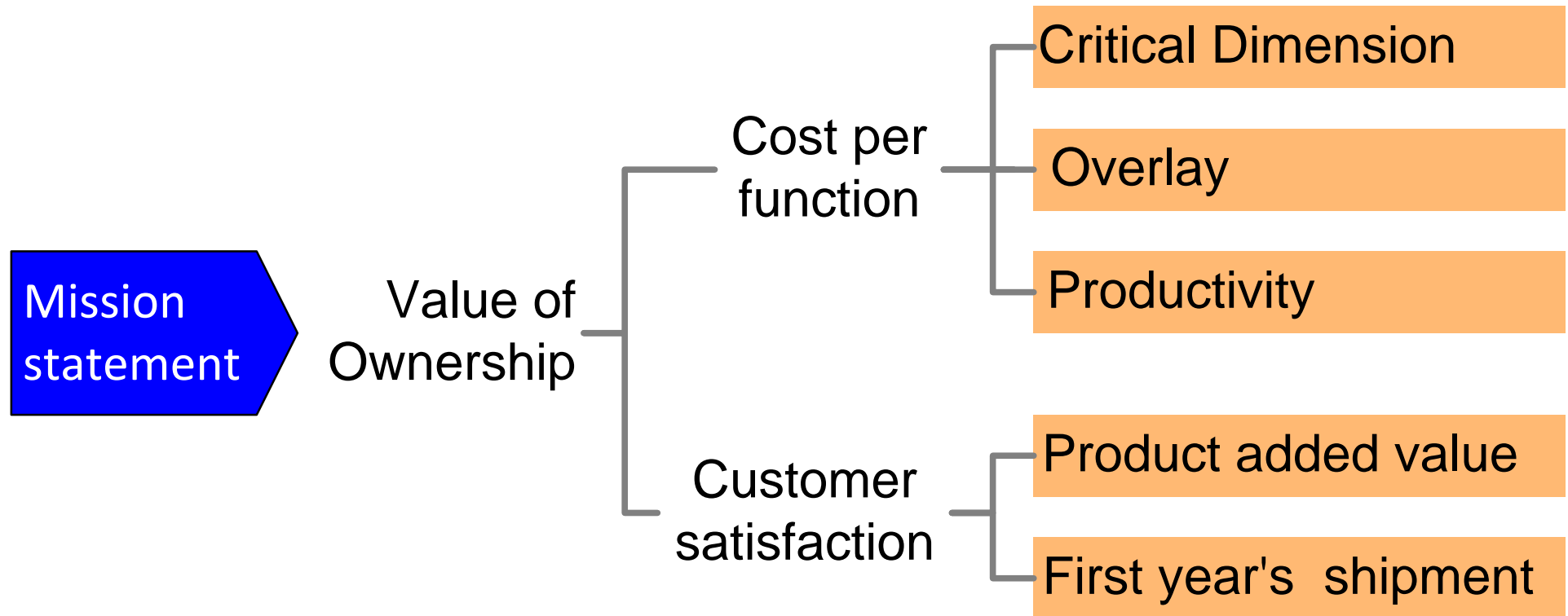
Small feedback cycles result in Faster Time to Market

# MTBF as function of time

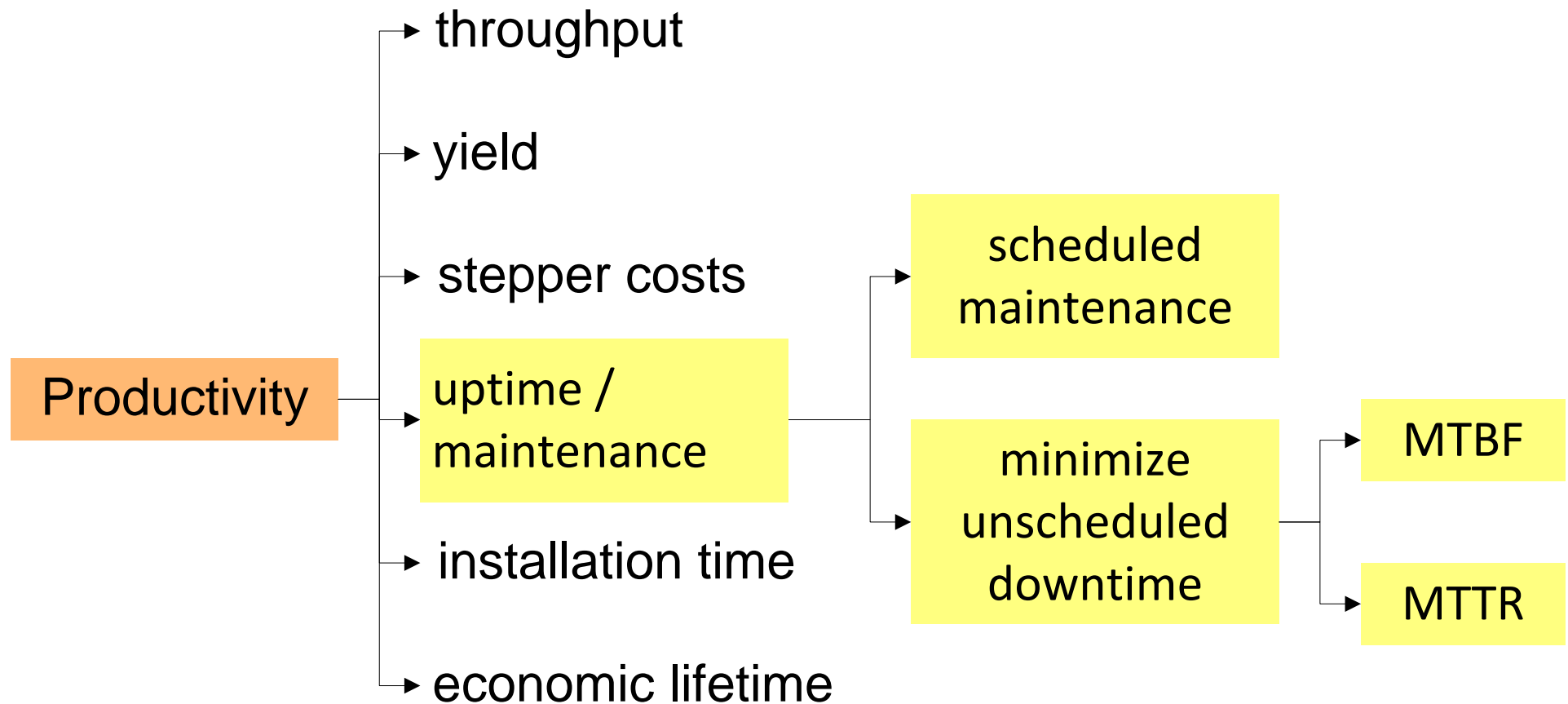


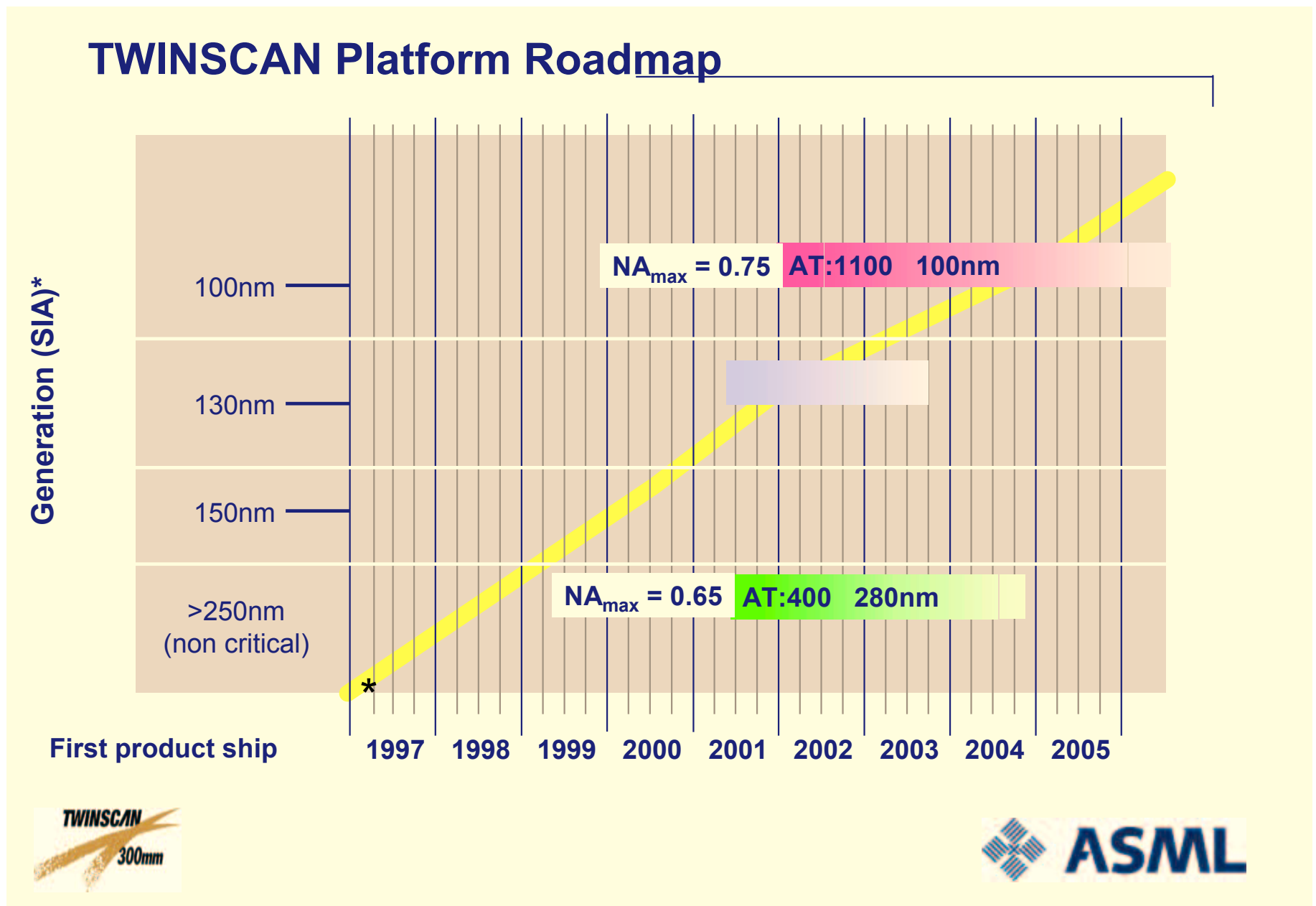


# Focus via key drivers

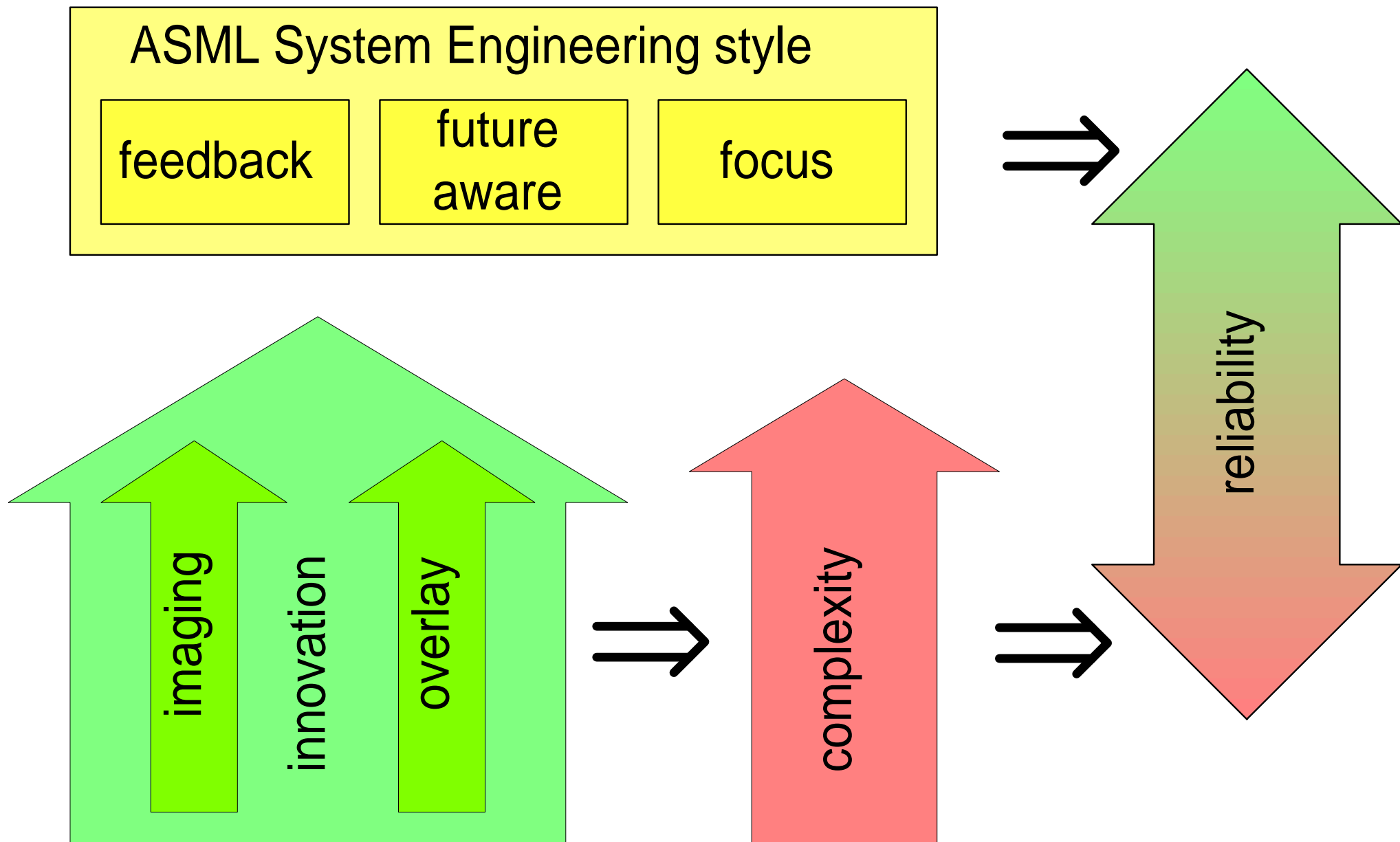


# Productivity decomposed





# Conclusion



## disclaimer

The case material is based on actual data, from a complex context with large commercial interests. The material is ***simplified*** to increase the accessibility, while at the same time ***small changes*** have been made to remove commercial sensitivity. Commercial sensitivity is further reduced by using relatively ***old*** data (between 5 and 10 years in the past). Care has been taken that the illustrative value is maintained