Smart Resilience: Autonomous Systems in Service of Society

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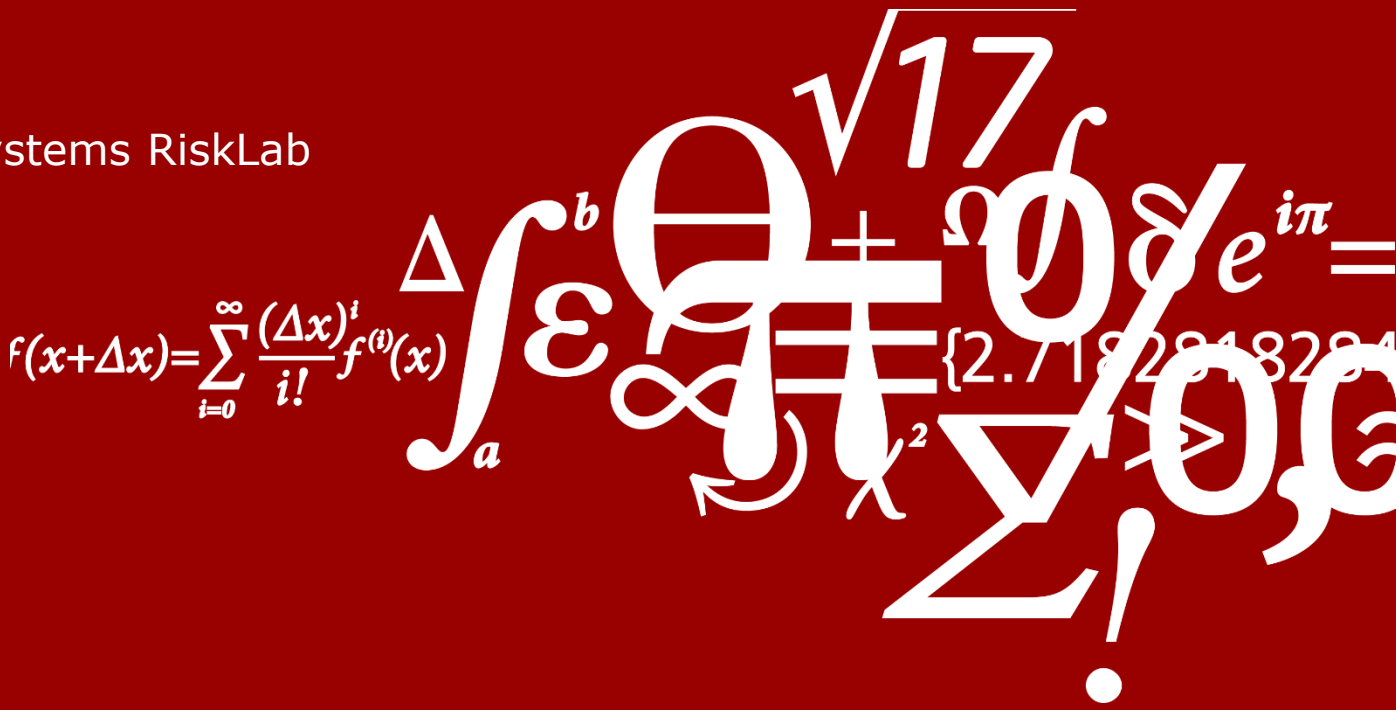

Engineering Systems
Department of Management Engineering

Collaborative Autonomous Systems:

Is that “Good News” or “Bad News”?


Collaborative Autonomous Systems:
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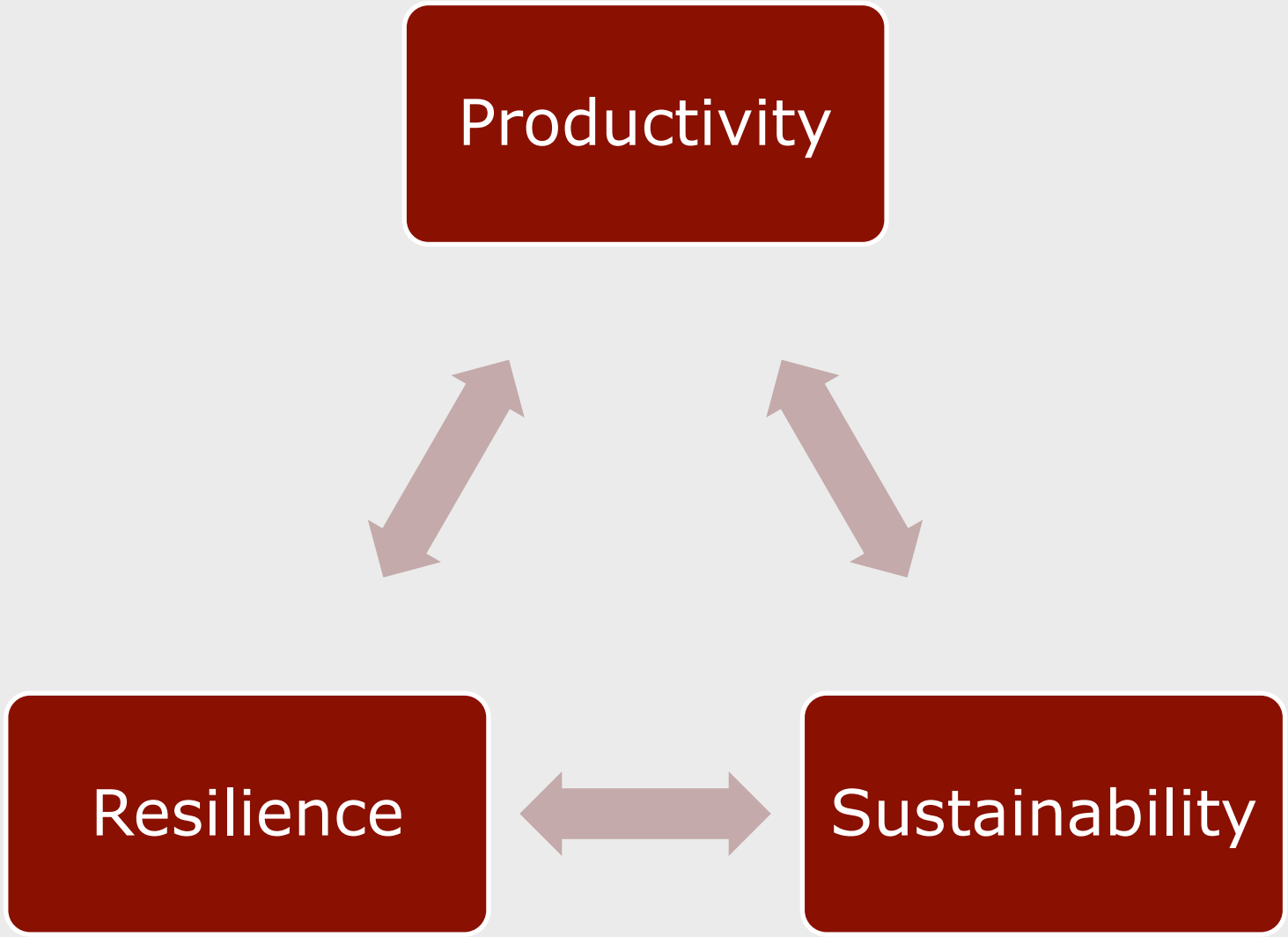
Well, what is it that you care about?

Society (and that includes your life) rests on three pillars.



Source: I thought I had come up with this first, but no – see Gopalakrishnan et al 2010

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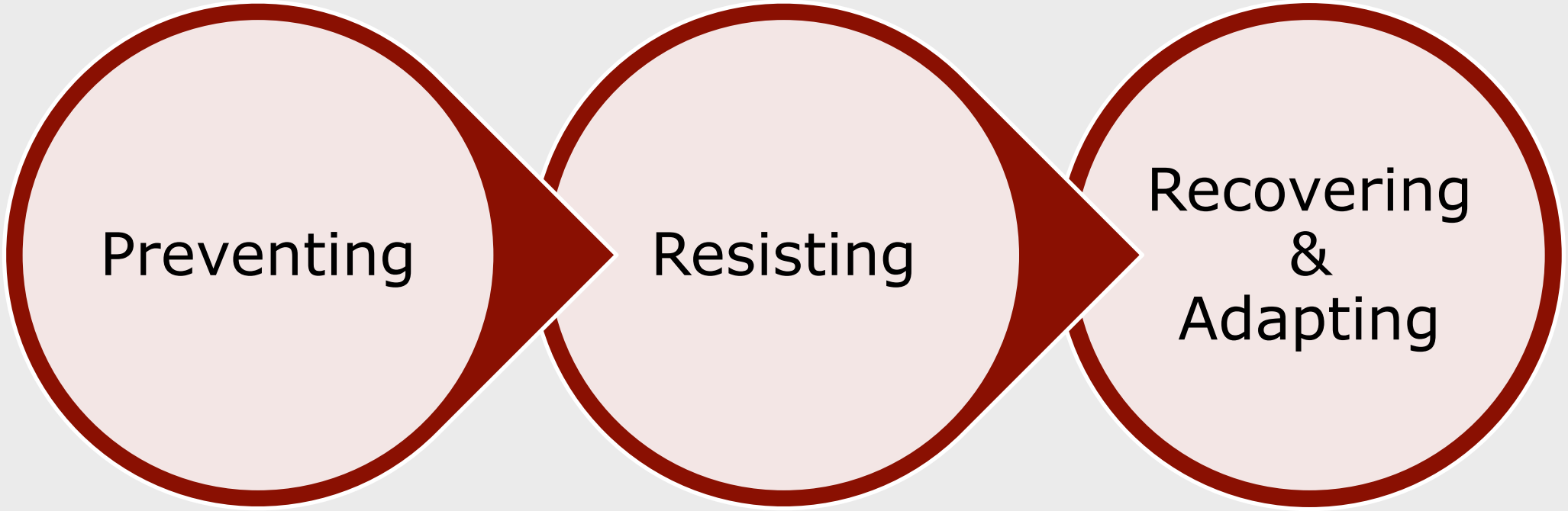
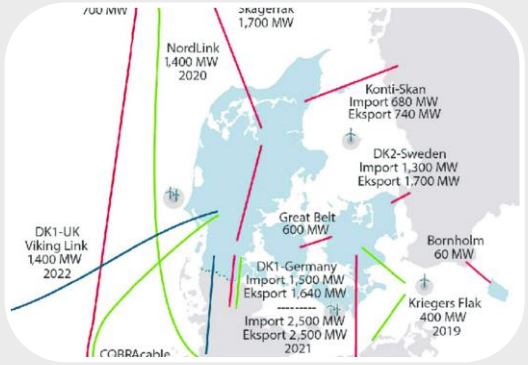
Resilience as the capability of a system to prevent, resist and recover from disruptions.



Denmark will collapse when one (!) of our critical societal services collapses. These are based on our critical cyber-physical infrastructure.



Energy Supply

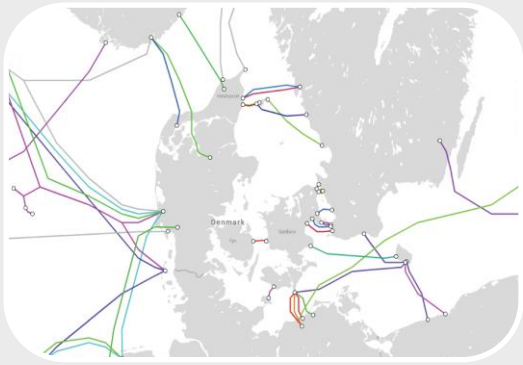
Oil, gas, electricity, hydrogen (generation and transportation)

Water Supply

Drinking water production and supply, sewage treatment

Food Supply

Production, Processing, Transport (!), Sales, Inspection



Communication

Internet, cellular service, emergency services

Healthcare

Hospitals, Medical Suplies, Emergency Services

Finance

Digital payment services, cash processing, liquidity, banking and insurance

Transportation

Sea, Rail, Road, Air, Space

Government

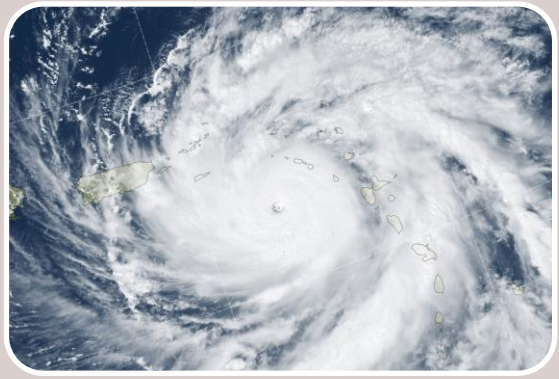
Emergency services, legislative, judiciary and executive, military

Source: BMI KRITIS (2009)

The hazards to our critical cyber-physical infrastructure are growing. CCAS are both good news and bad news.

Cyberthreats

The Security – Safety Cascade



Climate Change

Unprecedented and unanticipated disruptions

Connected-ness of systems

Unidentified risks

Speed of degradation

It is too late too quickly

The Road to Smart Resilience
It will not be cheap, but a lot cheaper than business as usual.

PEOPLE

Leading the National Conversation:

Resilience Targets

Cost of Resilience

Privacy and Surveillance

PROCESS

Rethinking Resilience Management:

Systematic Resilience Assessment Framework

Design for Resilience

Prepare, Respond, Recover & Adapt Operations Processes

TECHNOLOGY

Smart Systems Capabilities for Resilience:

Real-Time Situational Awareness: Integration of Basic Process Control Systems with Safety and Security

Early Warning System

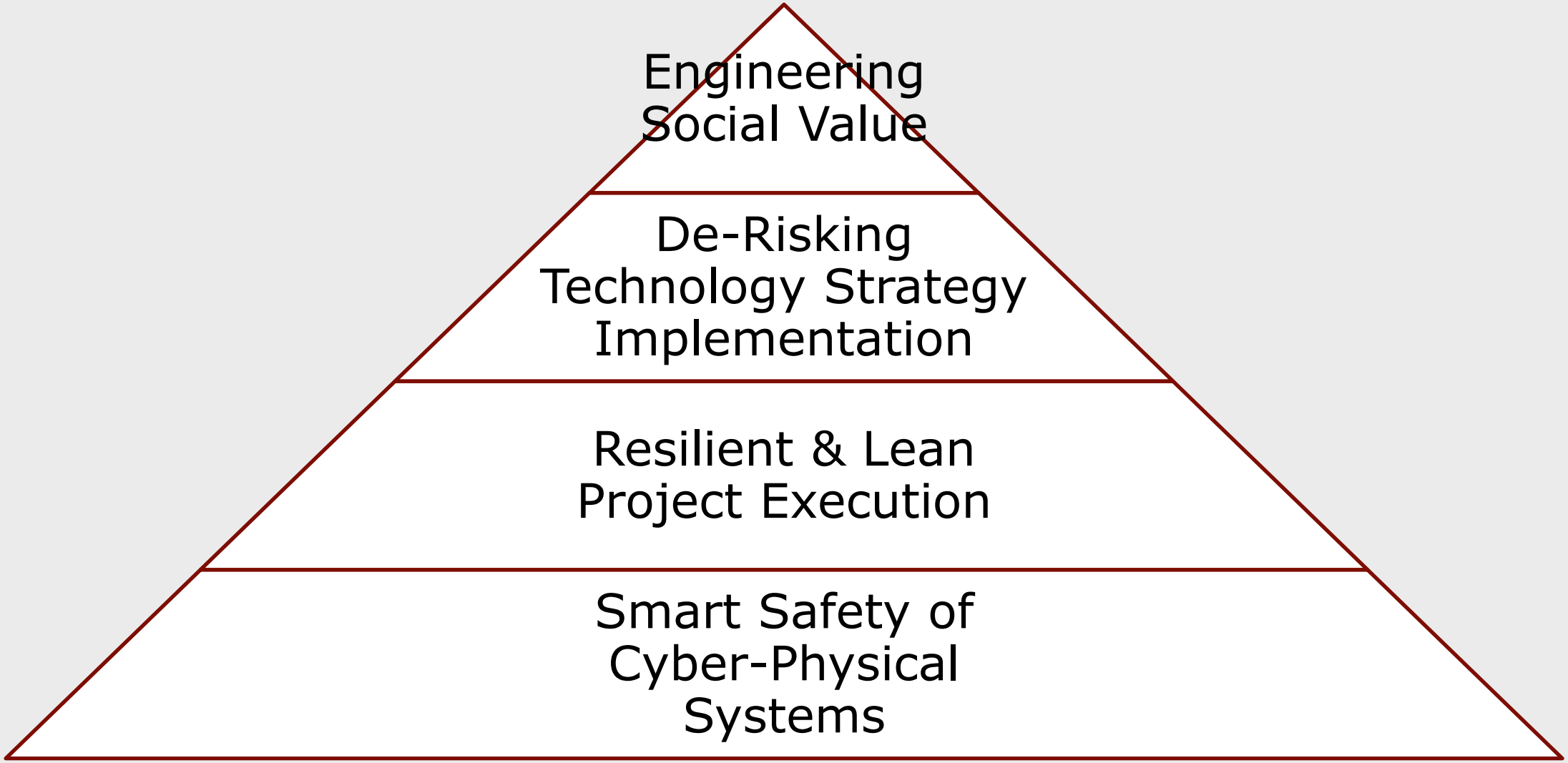
Data Acquisition, Fusion and Analysis

Thank you!

risklab.dtu.dk
es.man.dtu.dk

Backup

DTU's Engineering Systems RiskLab
http://risklab.dtu.dk



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