The Perception of Traditional Training Techniques and Employment of Alternative Advanced Solutions for Sustainable Capacity Building

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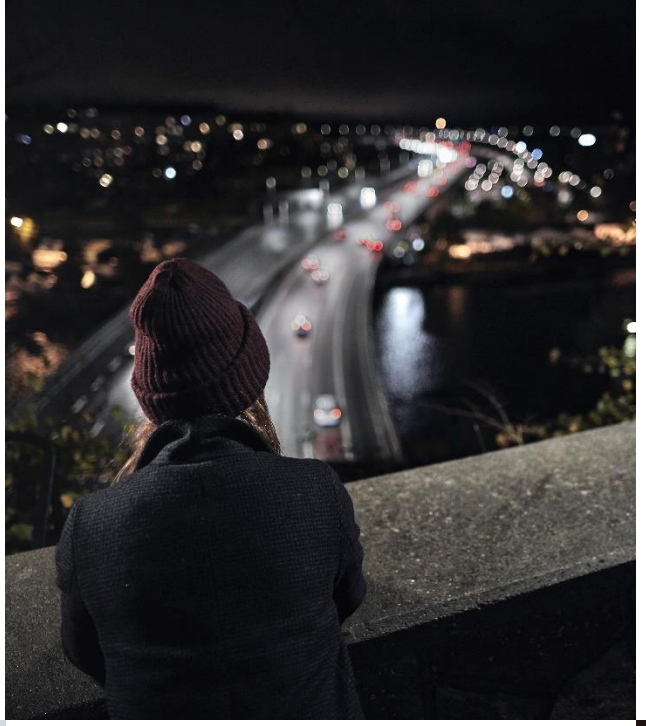
CHAPTER 1

Introduction

Who are we?

What do we do?

Nomenclature

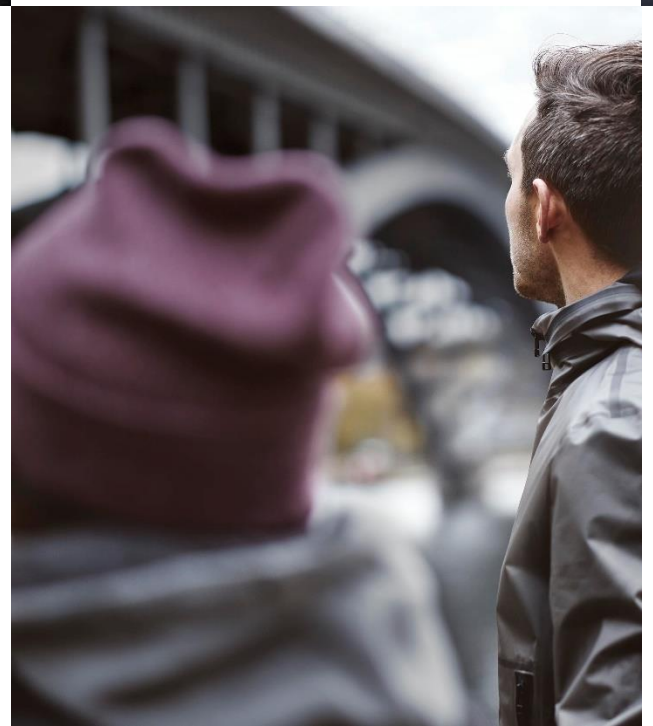


CHAPTER 2

Our experience

Perceptions of capacity building

Approach to blended learning



CHAPTER 3

Solutions

eLearning

Long-term tutoring

Development and maintenance of accepted curricula

Digital twins

CHAPTER 4

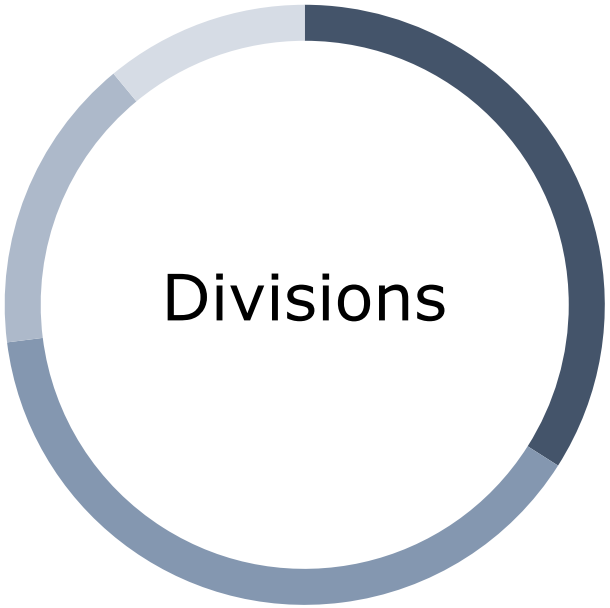
Conclusions

Time

Cost

Effectiveness

We’re an engineering and design company



- Industry 34%
- Infrastructure 39%
- Digital Solutions 16%
- Energy 11%

13 BSEK

Net Sales 2017

10,000

Employees

The market’s most comprehensive portfolio of service offer across industries

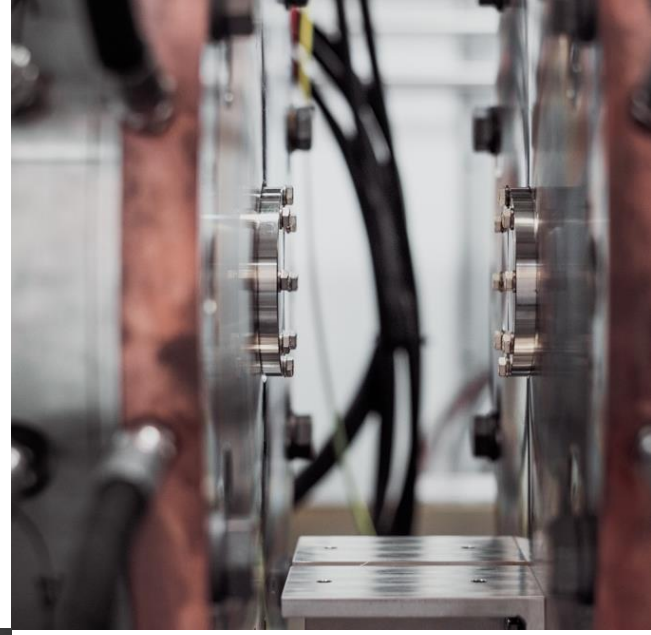

OUR MISSION
We create sustainable engineering and design solutions

Infrastructure

Buildings
Rail & Road
Project Management
Water & Environment
Architecture & Design

Industry

Advanced Manufacturing
Automotive R&D
Food & Pharma
Process Industry
Product Development
Industrial Engineering
Specialized Technical Service



Energy

Thermal Heat & Power
Hydro Power
Renewable Energy
Nuclear Energy
Transmission & Distribution
Oil & Gas
Energy Markets

Digital Solutions

Experience Design
IT Solutions
Embedded Systems
Systems Management

LBL – *Lecture-based learning* or *Traditional teaching mode*

a. Classroom-centered
b. Lecture-based
c. Teacher-dominant
d. Passive acceptance

Pro: Systematic and comprehensive

Con: Does not realize the beneficial combination of theory and practice to stimulate students' enthusiasm




PBL – *Problem-based learning*

a. Student-centric
b. Independent learning
c. Problem solving
d. Focus on application

Pro: Activated classroom atmosphere, promotes independent thinking and practical ability

Con: Ignores learning objectives, fragmented knowledge




eLearning

Learning utilizing electronic technologies to access educational curriculum outside of a traditional classroom.

Pro: Your schedule, your pace, your place, significantly greater retention of materials, consistency of materials

Con: Up-front cost and time investment, lack of student/teacher interaction

CHAPTER 2

Our experience

Perceptions of capacity building

THE MOST FREQUENTLY REPORTED DECOMMISSIONING CHALLENGE [NKS - NORDEC]

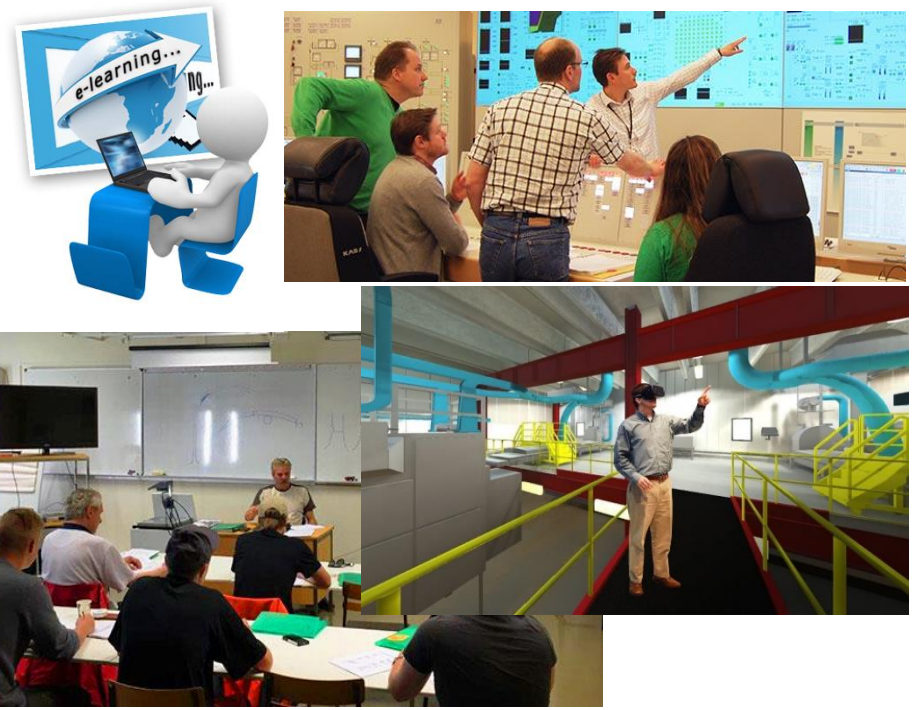
Developing and maintaining competence and motivation

Uncertainty about whether the operational staff have the competence for decommissioning projects.

The set of skills needed for the works change over time and over the course of a project.

General lack of decommissioning experience within the Nordic countries.

New training methods



Perceptions of capacity building

- ÅF's training and tutoring program
- IAEA capacity building efforts
- EC capacity building efforts

Perceptions of capacity building

NUCLEAR TOURISM

Loss of focus

INEFFICIENT

High costs (travel, experts, etc.)

Time (planning, schedules, etc.)

INCONSISTENT

Overlap with previous training

Inconsistent and not fit-for-purpose

Approach to blended learning

Blend of traditional training techniques and eLearning with focus on:

a. Extended tutoring

b. Application-based

c. Situation-specific problem solving

d. Development and maintenance of accepted curricula

"…evidence-based studies conclude that student achievement was higher in blended learning experiences when compared to either fully online or fully face-to-face learning experiences." (Siemens et. al. 2015)

CHAPTER 3

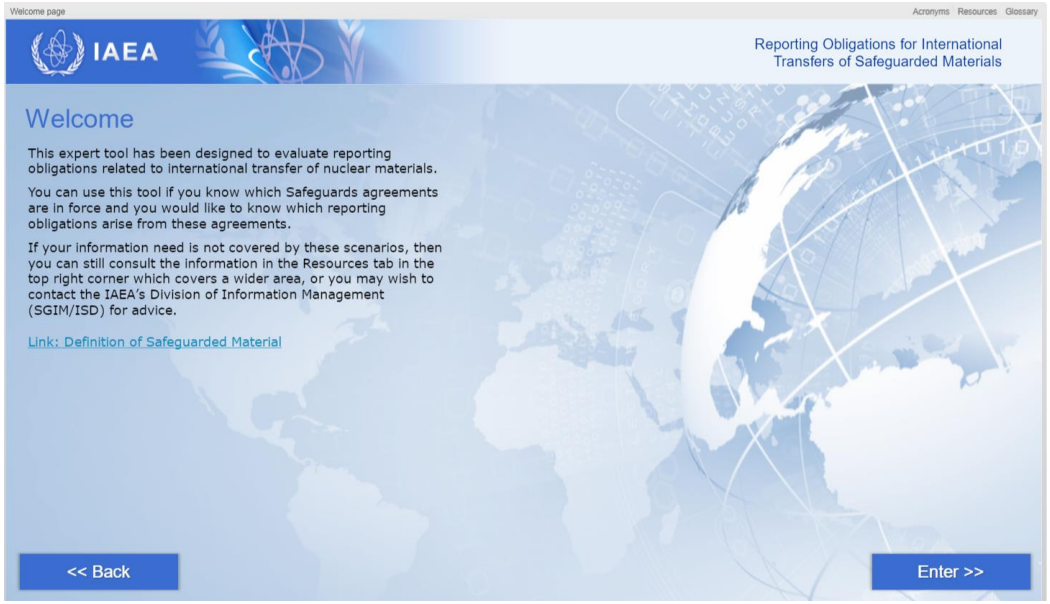
Solutions

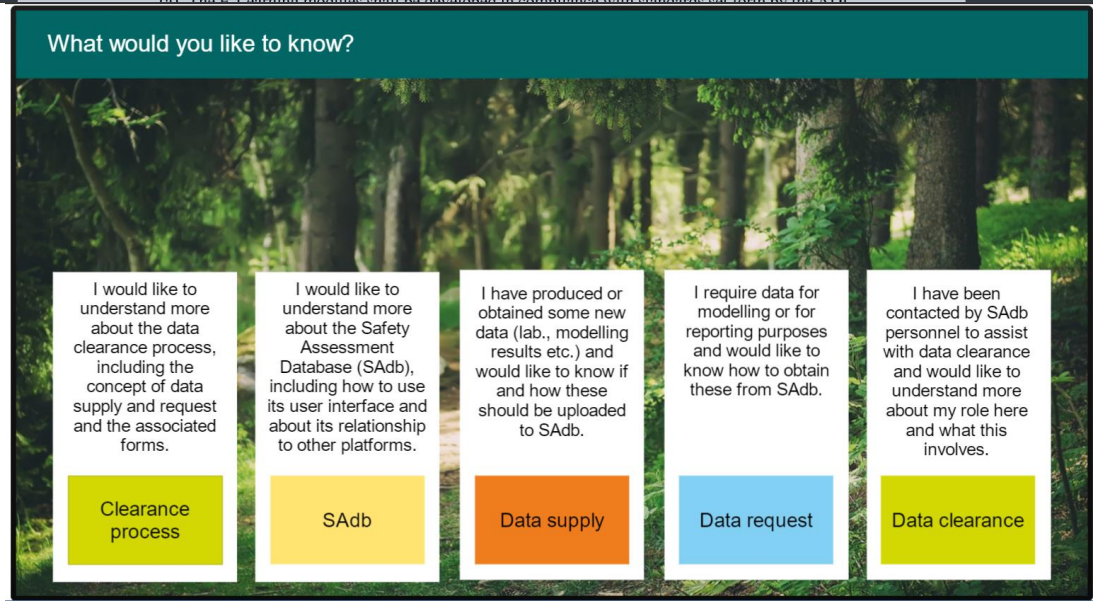
eLearning

Examples

E-Learning Capabilities and Offerings Website

- https://facilia-orau-consortium.facilia.se





Long-term tutoring

Smaller groups

Extended period

Hands-on application

Problem-solving focus

Independent learning

Defense

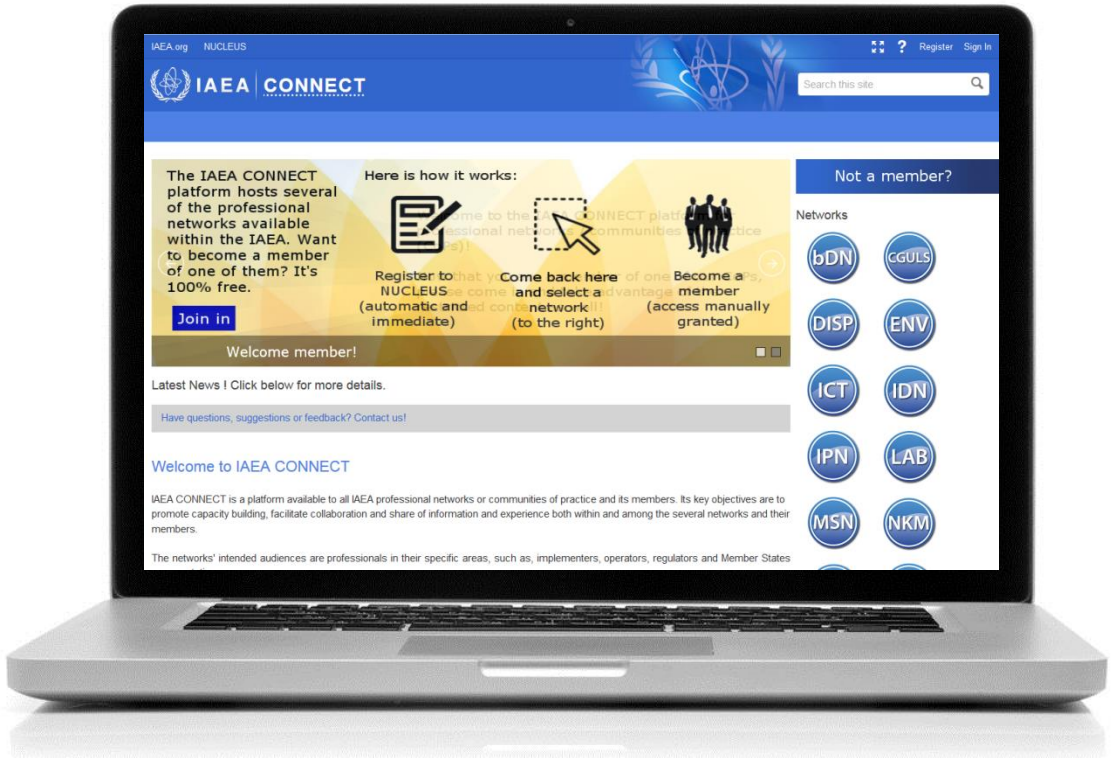
Development and maintenance of accepted curricula

IAEA CONNECT

“Schools”

Use of an IAEA accepted (certification) program for specific areas of nuclear safety and security

ORAU – Decommissioning certificate program



How will advanced plant information systems affect capacity building?

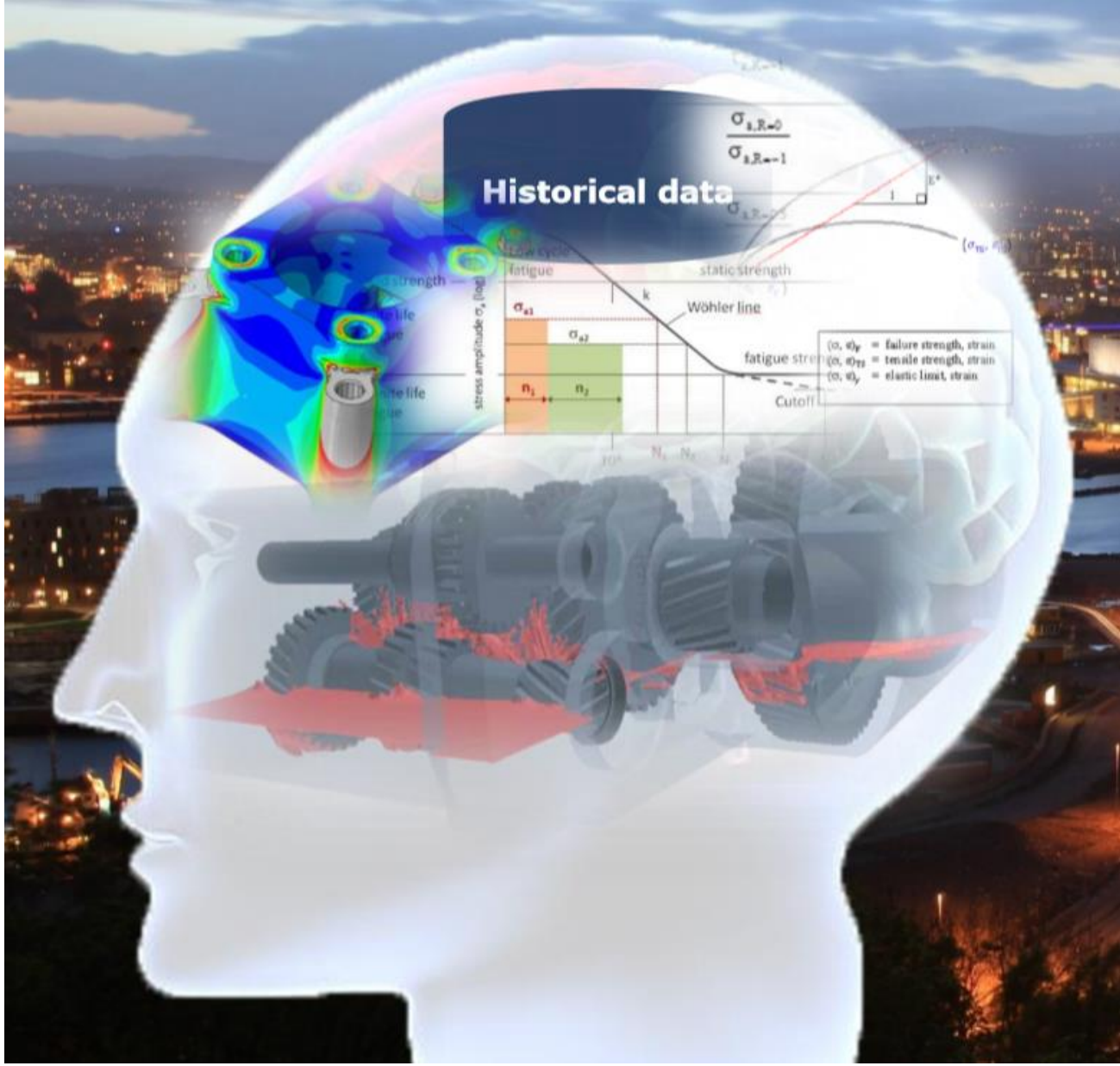
Increased complexity

Application of innovative technologies

Integration with existing procedures

Reliance upon:

a. Consistency
b. Efficiency (time and cost)
c. Virtual systems/environments/models

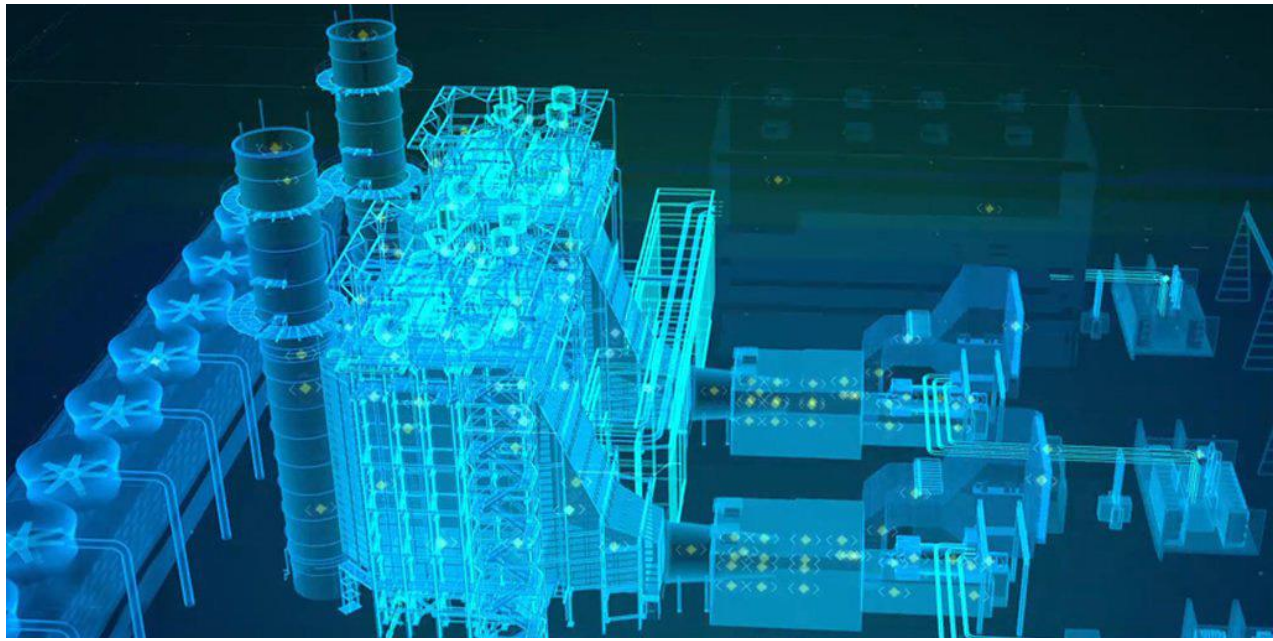


What is a digital twin?

Bridge between the physical and digital world.

"Quite simply, a digital twin is a virtual model of a process, product or service."

Allows for analysis of data and monitoring of systems to head off problems before they occur, prevent downtime, develop new opportunities and even plan for the future by using simulations.

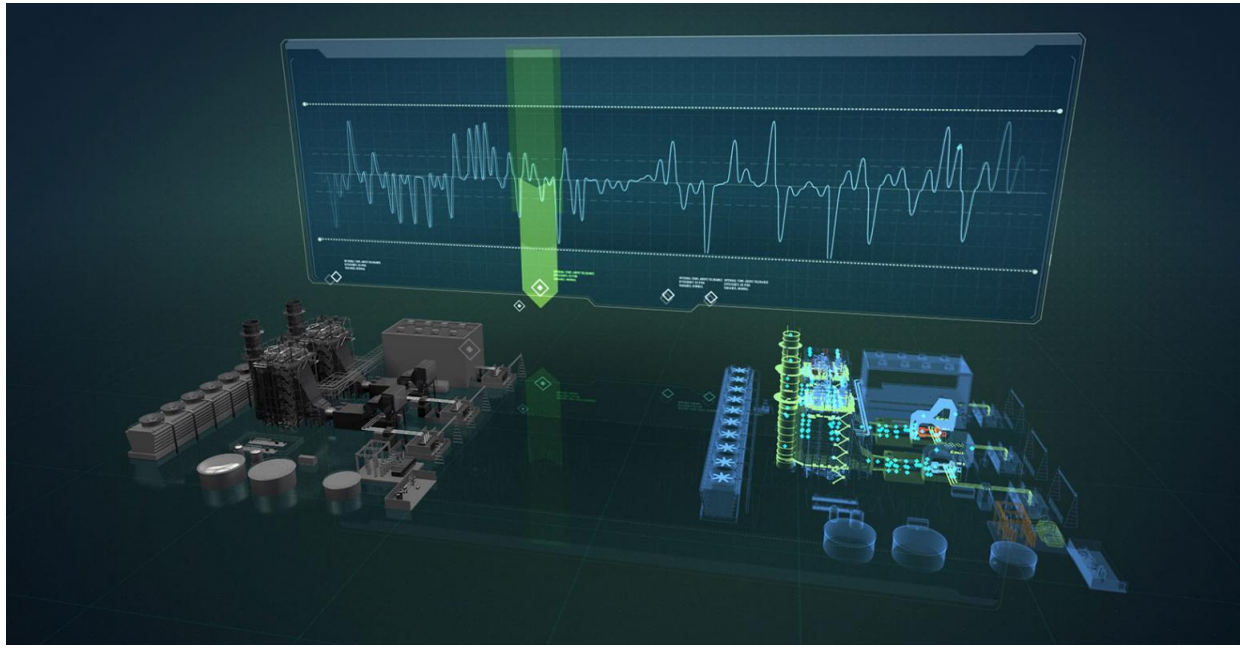


How does it work?

Smart components that use sensors to gather data about real-time status, working condition, or position are integrated with a physical item.

The components are connected to a cloud-based system that receives and processes all the data the sensors monitor. This input is analyzed against business and other contextual data.

Lessons are learned and opportunities are uncovered within the virtual environment that can be applied to the physical world.



"The ultimate vision for the digital twin is to create, test and build our equipment in a virtual environment."

John Vickers, NASA

Digital twins at Ringhals

Ringhals nuclear power plant, the largest power plant in Scandinavia, has digital twins of their turbine units 1, 3 and 4. They are represented by simulation models connected to the physical units and fed with real input data.

ÅF has contributed with state of the art simulation engineering related to validation and calibration of the digital twins' models. The result is a simulation model that predicts faults and optimizes electric power production.

Application to decommissioning

Understanding of physical structures

Planning and implementation of processes

Modeling of doses

Performance of equipment/instrumentation

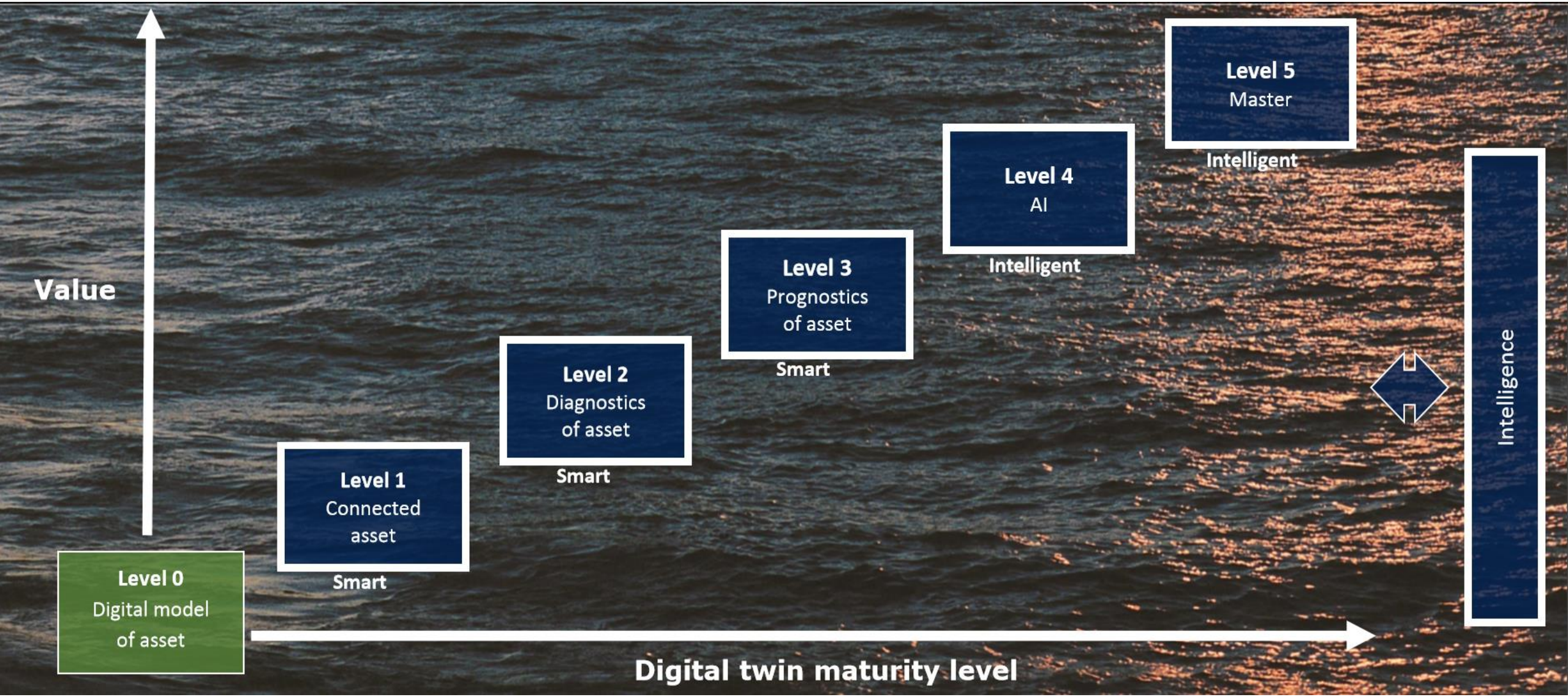
Scheduling

Decision-making

Licensing

Regulatory review

Training


Value
Level 0
Digital model
of asset
Level 1
Connected
asset
Smart
Level 2
Diagnostics
of asset
Smart
Level 3
Prognostics
of asset
Smart
Level 4
AI
Intelligent
Level 5
Master
Intelligent
Intelligence
Digital twin maturity level

Integration with other capacity building techniques

eLearning - gamification

LBL

PBL

Simulation modeling

Virtual reality

Conclusions

Cost savings - Travel, room rental, printed materials, catering, trainers accommodations, equipment, etc.

Speed and consistency – Improved quality of content, easily updated, easily customized, rich learning experience, quick roll-out, self-paced

Increased efficiency – Ensuring baseline knowledge is in place

Increased engagement and retention

Integration of capacity building solutions with digital twin technology


Thank you!
Making Future.