Identifying, evaluating, acting - How the Digital Factory Mapping led Dynamica Ropes towards capacity increase and cost reduction

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About FORCE Technology

Technology transformation training and consultancy

Independent and impartial: RTO/GTS organization

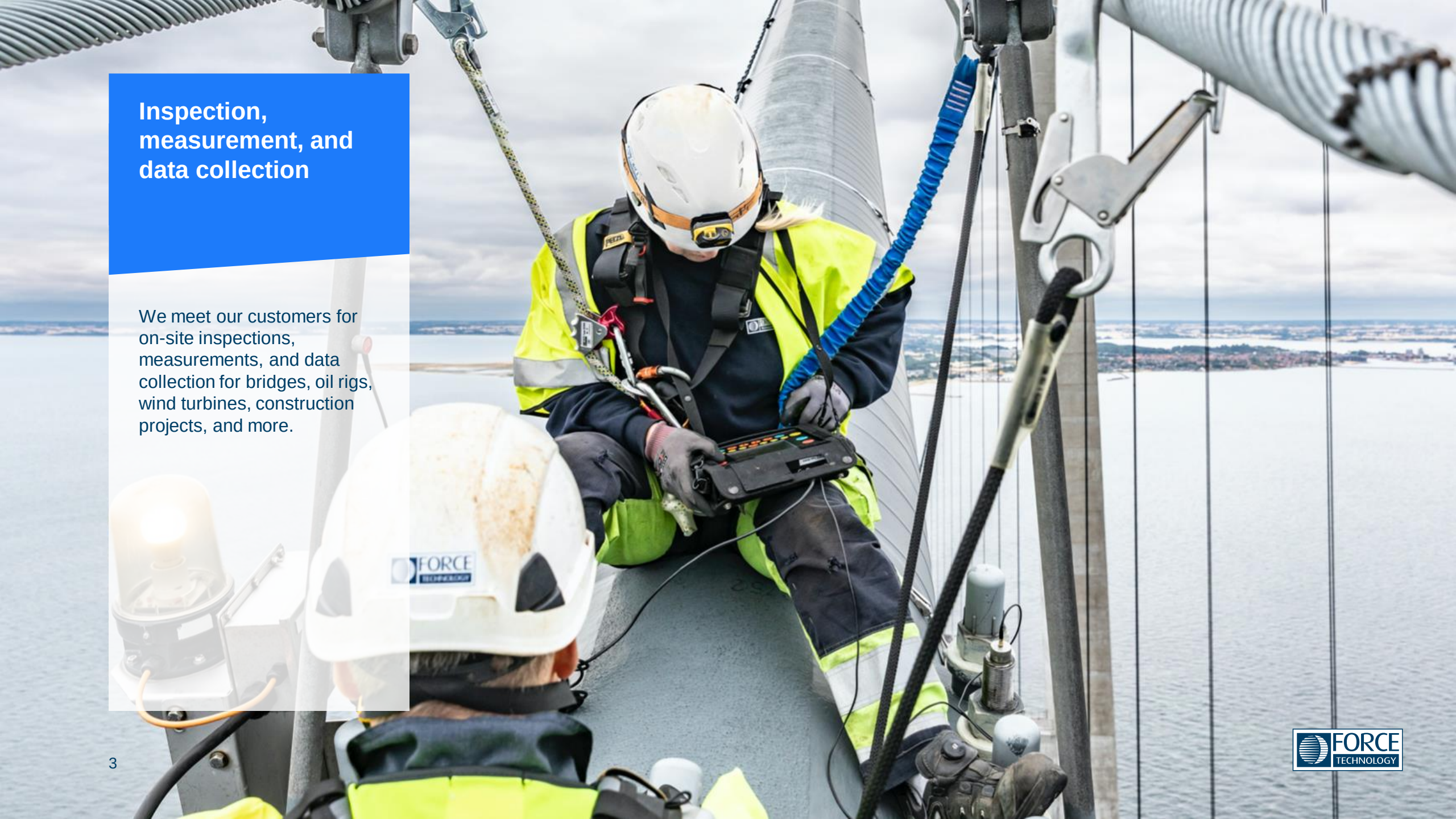
1,063 million
Turnover in DKK

950
Employees

400+
Unique facilities

7,000+
Customers

5,000+
Participants
courses and events



Inspection, measurement, and data collection

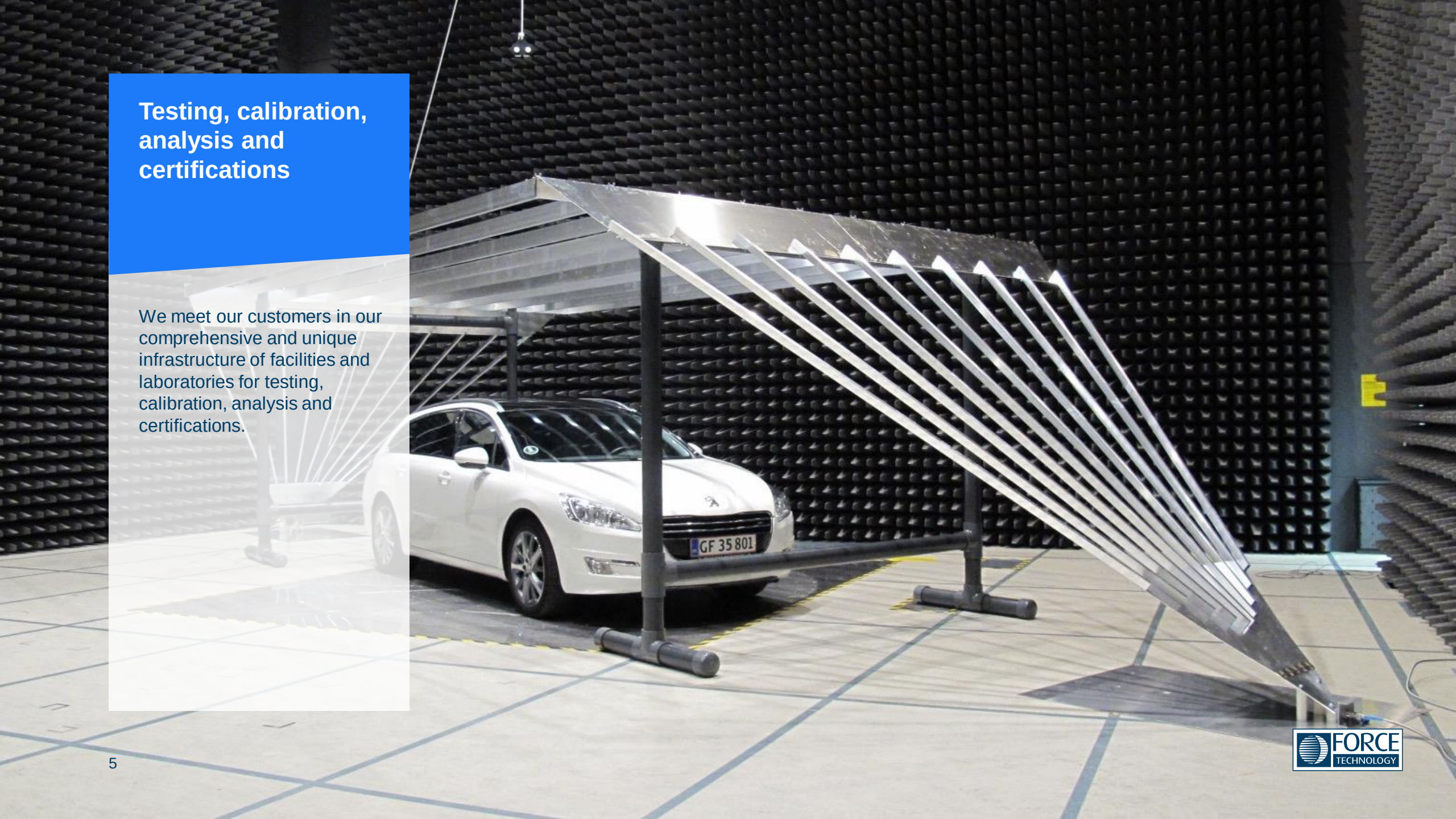
We meet our customers for on-site inspections, measurements, and data collection for bridges, oil rigs, wind turbines, construction projects, and more.

Wind energy

Wind energy plays a crucial role in the green transition. FORCE Technology has been there from the beginning, offering services throughout the entire value chain: monitoring, corrosion protection, NDT, simulation, full-scale testing, component testing, acoustics, materials, and more.

Testing, calibration, analysis and certifications

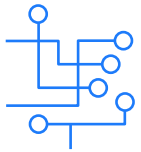
We meet our customers in our comprehensive and unique infrastructure of facilities and laboratories for testing, calibration, analysis and certifications.



Products, components, and sensor systems

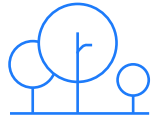
We meet our customers when we deliver products, components, and sensor systems. In combination with FORCE Technology's knowledge, they give our customers decision support, integrity management, and prolonged structure lifetimes. They also give our customers' own products new features and intelligence that create value.

Digital & Sustainable Innovation



IoT Architecture & Technology

Sensors and IoT devices, wireless connectivity, AI, cloud computing, data analytics, data management



Sustainable Business Innovation

Circular economy, resilient business innovation, ESG automation

Digital Production

Production efficiency, digital maintenance, sustainable production

The problem

Translating digitalization into actual production value: still a challenge

Danish manufacturers engage the Industry 4.0 agenda with the aim **to increase their productivity or reduce their costs,** but they (especially SMEs) **often struggle:**

1. **Understanding where to start**: less than 20% have a **digital transformation roadmap**
2. **Quantifying the potentials** of digital innovation initiatives: one of the main barriers for digitalization initiatives is the **absence of a clear business case and of short-term benefits**

The ***Digital Factory Mapping***

Where, how and how much: translate digitalization into production efficiency

FORCE Technology developed the Digital Factory Mapping taking advantage of the ***Lean*** philosophy and extending it to the digital world, mapping both the **material flow** and the **information flow**, to:

a. **Identify** production improvement opportunities
b. **Quantify** their potential, to help formulating a business case
c. **Define** projects for capturing such potential

What

PHYSICAL ANALYSIS – Focus where relevant

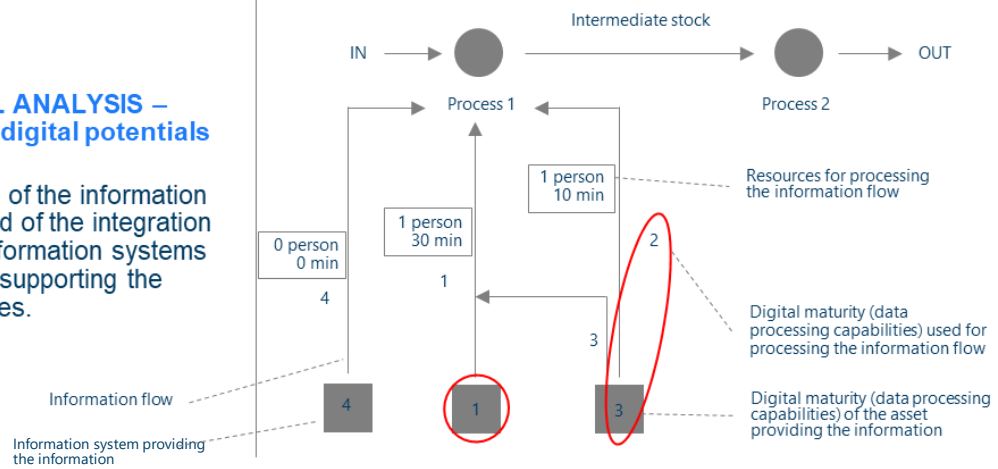
Lean (value stream mapping) analysis of the material flow and of the related processes' performance indicators.

DIGITAL ANALYSIS – Identify digital potentials

Analysis of the information flows and of the integration of the information systems that are supporting the processes.

How

Parameter	Value
Lead time	... s
Resources	...
Takt time	... s
Downtime	...s (or ... %)
Quality ratio	... %



Why

Identify bottlenecks, highlight their causes (e.g. poor quality performance or high downtime) and quantify their impact on the production performance.

Identify limited integration and data processing capabilities in the systems that provide the information and quantify the impact of the related inefficiencies.

Colli et al., 2022

The *Digital Factory Acceleration* program

Support small and medium-sized Danish production companies in translating digital innovation into production performance improvement.

1 RTO
1 University
21 companies
5.8 mio. DKK
60% financing for companies
3 years: Sep 2021- Nov 2024

Digital Factory Mapping
Identification of production improvements that can be implemented using digital technologies

Digital Factory Realization
Implementation of one of the identified potentials and subsequent evaluation of the effect of the implementation

2 months .

5 months

More effective production

Increase in competitive advantage

CASE
Dynamica Ropes

Danish SME manufacturing high-performing ropes and slings.

The company wants to improve the efficiency of its production operations to (1) **increase capacity**, (2) **reduce lead time** and (3) **enhance traceability across production**.

General issues:

- Time waste for transfer data to different IT systems
- Complex and time-consuming traceability when requested (increasingly demanded by customers)
- Low data quality (and trust) due to manual transcription from paper to excel
- High dependability on single planner

Identified problems and related entity

The entity of the identified problems is calculated: this represents the total impact of the problems on the current manual labor, capacity and quality costs. The problems entity represents the baseline value that proposed solutions will aim – partially - to capture.

Problem ID	Problem Cluster	Problem explanation	FTE equivalent (FTE)	FTE equivalent cost (DKK/year)	Capacity equivalent (%)	Turnover equivalent (DKK/year)
P2	Manual workflow communication	A lot of time is spent on physically notifying people on the status of a task and the next task to perform while physically delivering the material to perform the task.	0.1	CONFIDENTIAL	1.38%	CONFIDENTIAL
P3	No stock overview (quantity and location) due to lack of use of inventory management system/module in ERP	A lot of energy and resources are used to keep track of the stock (during sales, planning and production). An Excel table is manually updated after several processes, but data is not trusted hence the stock is visually inspected systematically. This takes additional time because there are no defined areas for the items (although products are stored on different floors depending on frequency of us - good)	0.2		1.24%	
P4	Manual planning	Manual alignment of resources, machines, people and orders (tornado, braiding, oven and sling + cordeller?) - Strategic challenge: dependency on few people which can perform the planning; suboptimal plans	0.1		0.00%	
P5	Paper-based tracking of production orders	Processes, times and waste are manually registered on paper, and they are a highly systematic process: this entails missed potential turnover as manual registration is subtracting potential production time - Strategic challenge: manual work needed for ensuring traceability	0.1		3.65%	
P7	Manual machine software setup	Time is spent to manually download the right software on the machines according to what is being produced. The right software setup should be known when the product is designed.	0.0		1.86%	
P8	Manual supervision and quality control - Basic yarning	Time is spent to manually supervise and perform quality control while the machine is running (manual labor needed in parallel to automated production) **OBS: it is not considered that the operator might produce on another machine/generate additional capacity. If so, we should consider capacity increase possibilities changing the process as "sequential" in the "mapping" sheet**	0.7		0.00%	
P10	Manual supervision and quality control - Braiding	Time is spent to manually supervise and perform quality control while the machine is running (manual labor needed in parallel to automated production) **OBS: it is not considered that the operator might produce on another machine/generate additional capacity. If so, we should consider capacity increase possibilities changing the process as "sequential" in the "mapping" sheet**	0.0		0.00%	
P11	Manual supervision of machines - Coiling and overbraiding	Coiling and covering machines need manual supervision while working. This entails manual labor costs even if the process is automated. **OBS: it is not considered that the operator might produce on another machine/generate additional capacity. If so, we should consider capacity increase possibilities changing the process as "sequential" in the "mapping" sheet**	1.6		0.00%	

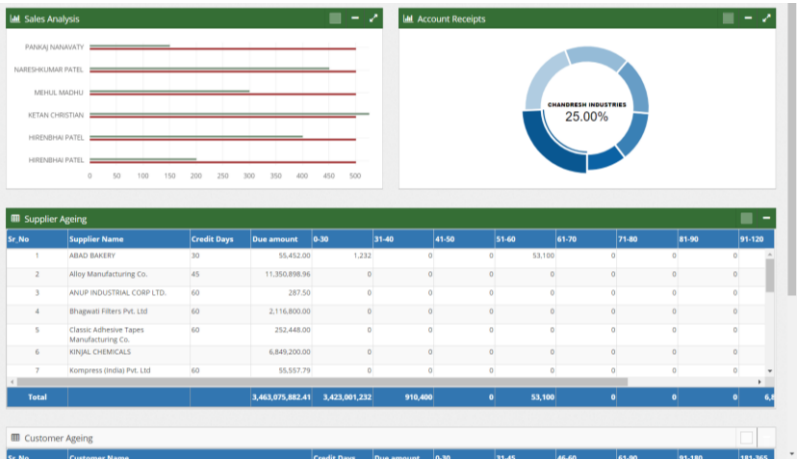
Solution proposals and potentials

S3. Inventory management system

Problem: **P3 No stock overview**. A lot of energy and resources are used to keep track of the stock (during sales, planning and production). The employee needs to manually check the available stock in the inventory area, looking for the available raw materials linked to the orders that need to be produced and reading/correcting the amount of material left on a paper on the rope. An Excel table is manually updated after several processes, but data is not trusted hence the stock is visually inspected systematically. This takes additional time because there are no defined areas for the items. **Strategic issue**: increased risk of downtime due to lack of raw material or of unnecessary stock cost due to too much raw material.

Problem entity quantification: 0.2 FTE or **1.24% capacity**.

S3. Inventory management system



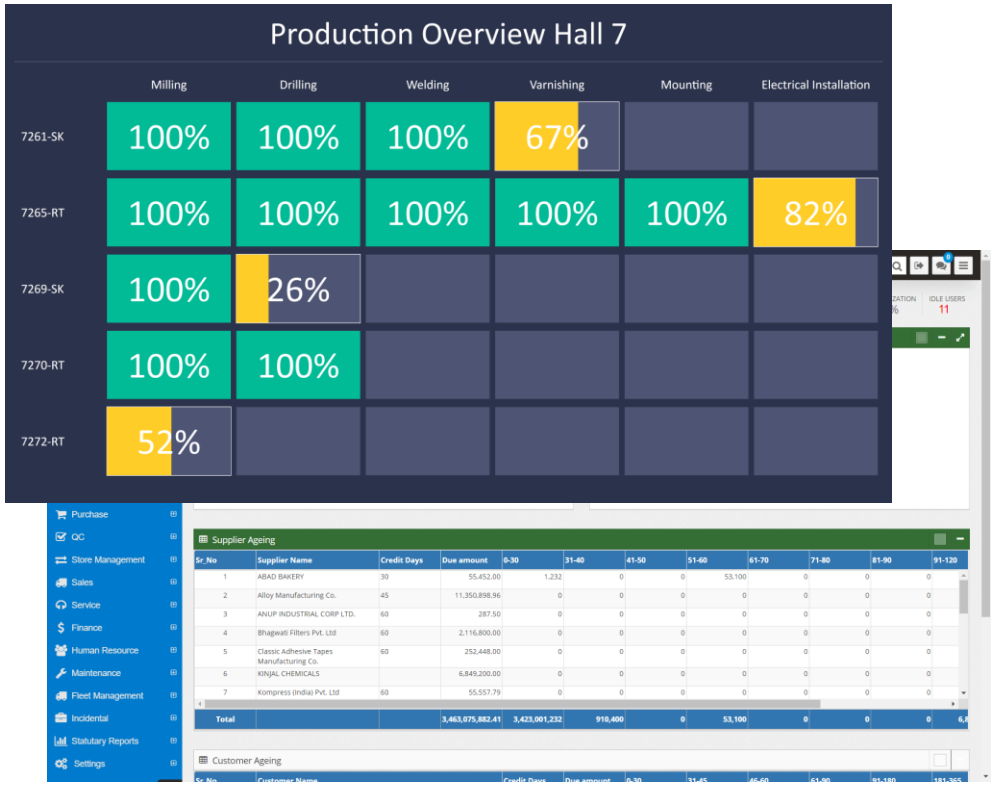
Solution proposal: Inventory management system/module in ERP + scanners and barcodes to be scanned when raw materials are used OR automatic subtraction of raw materials from stock when orders are approved and specific location in the inventory assigned to specific products. *Stock levels are automatically updated once material is used in production, as production orders are scanned in every process and they are scaled from the inventory management module. The employee checks the continuously updated state of the stock on the software.* Furthermore, once more advanced, the system can create purchasing orders automatically (then to be approved).

Figures from Freepik and Datanote

S4. Scheduling system

Problem: **P4 Manual planning**. Manual alignment of resources, machines, people and orders (tornado, braiding, oven and sling + cordeller?) with the related time spent for the activity. **Strategic issue**: reliance on one planner (problems with potential errors, suboptimization due to complexity, re-planning needs when planner is not available).

Problem entity quantification: 0.1 FTE plus the risks related to relying on one planner



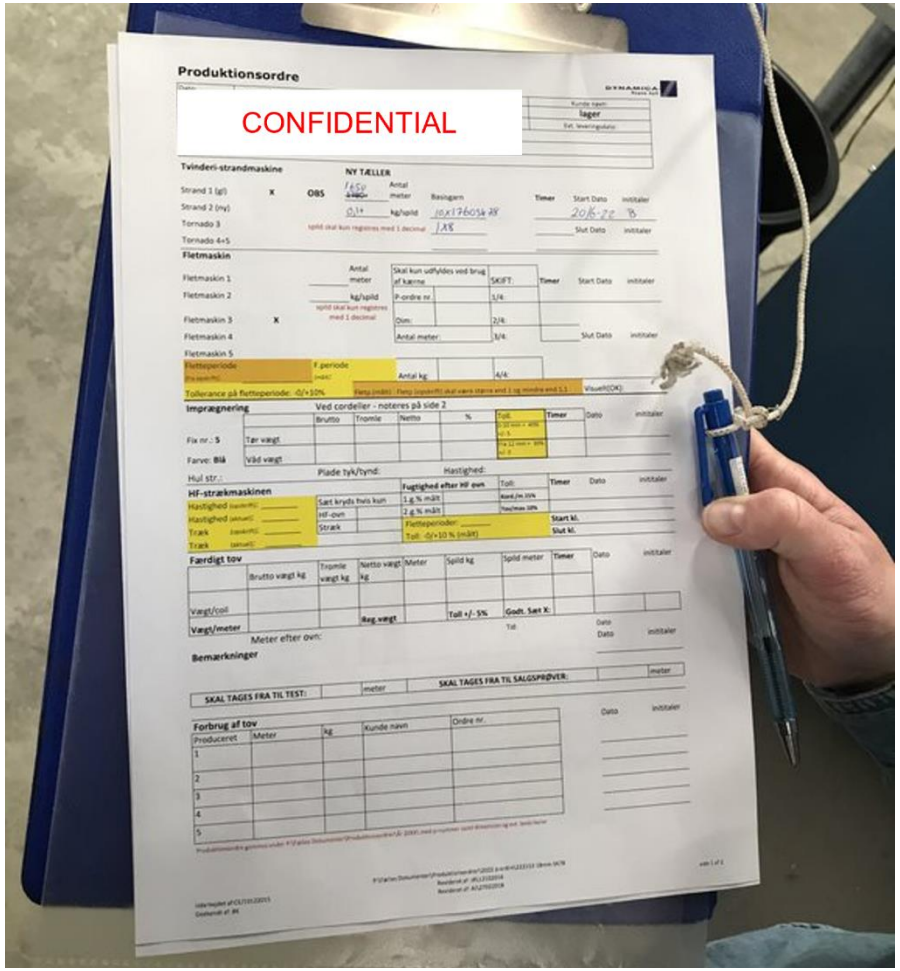
Solution proposal: Adoption of ERP of scheduling module in the ERP system. (important to consider the constraints, e.g., this rope should be produced by this specific braiding machine). Automatic update when orders are added and verifying automatically the optimal schedule matching processing times, available machines and available FTEs. **Strategic implication**: a scalable and simpler solution would remove the risk (and bottleneck) of relying on one planner.

Figures from Peakboard templates and Datanote

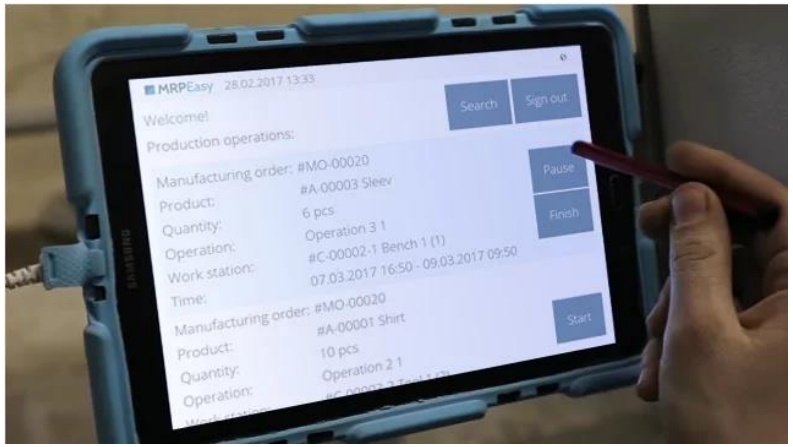
S5. Paperless production

Problem: **P5 Paper-based tracking of production orders**. Processes, times and waste are manually registered on paper, and they are a highly systematic process. This entails missed potential turnover as manual registration is subtracting potential production time. **Strategic issue**: this hinders easy traceability and data reliability.

Problem entity quantification:
0.1 FTE or **3.65% capacity.**



S5. Paperless production



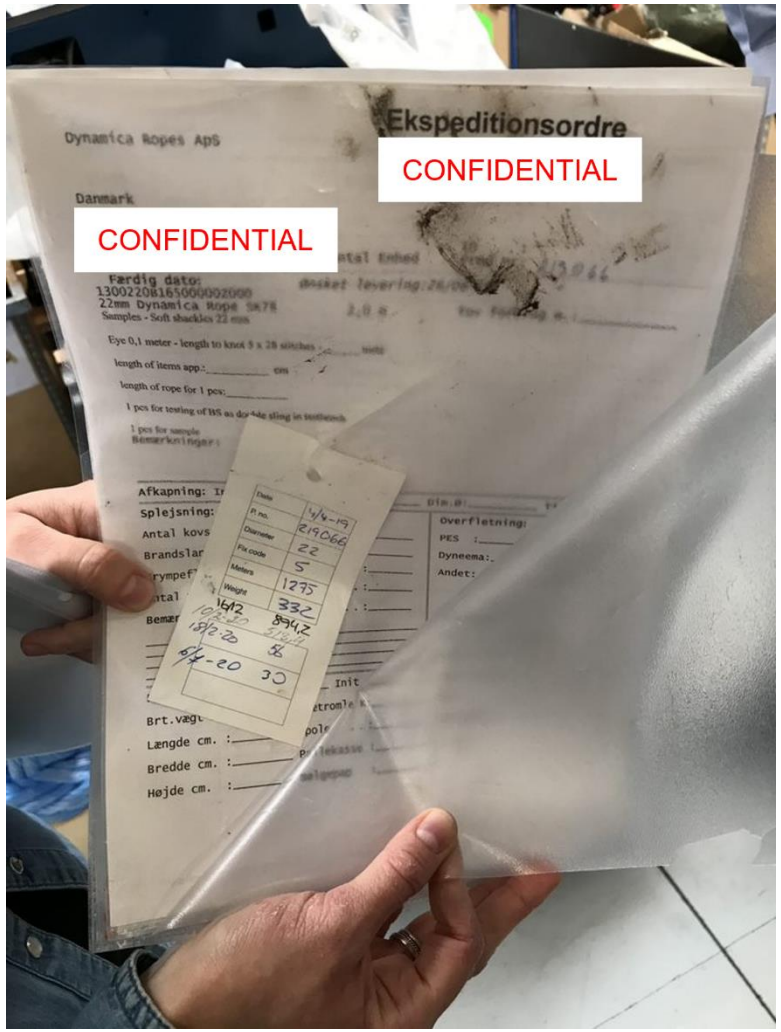
Solution proposal: Introduction of screens connected to ERP system next to each machine, and of barcodes/barcode scanners to track raw materials across production and link them to a specific order on the ERP and automatically register production times and waste (big change, consider resistance to change and steps to get there). *Every product has its own label, which is scanned in every station. The production order and its related times can be tracked, generating transparency and reliable data (enabling automatic and effective planning).* **Strategic implication**: this would enable high level of automatic traceability information possibilities as well as the use of reliable data for continuous improvement.

Figure from MRP Easy

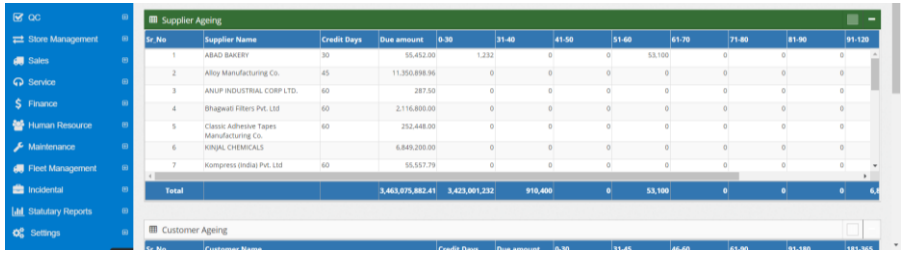
S7. Automatic setup software downloading

Problem: **P7 Manual machine software setup**. Time is spent to manually download the right software on the machines according to what is being produced. The right software setup should be known when the product is designed.

Problem entity quantification: 2% capacity.



S7. Automatic setup software downloading



Solution proposal: Every product has its own label, which is scanned in every station. When scanning the barcode on the production paper/ OR when choosing the order to produce, the right machine software will be downloaded from the software database to the machine (I.e., the right machine software is matched to the order when the product is designed – during R&D processes, enabled by S5).

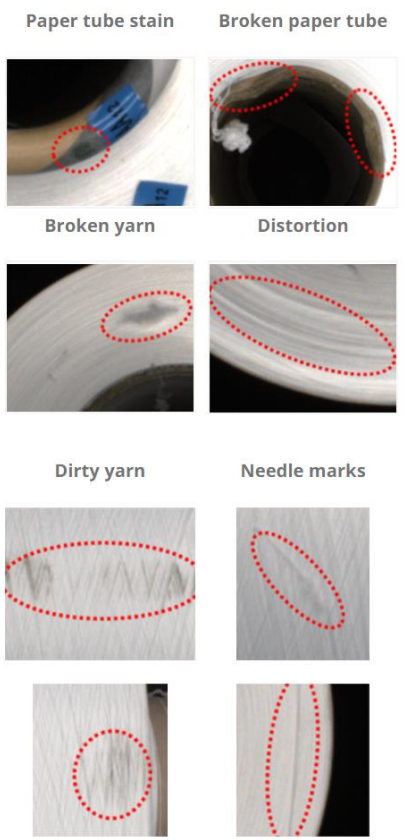
Figure from Datanote

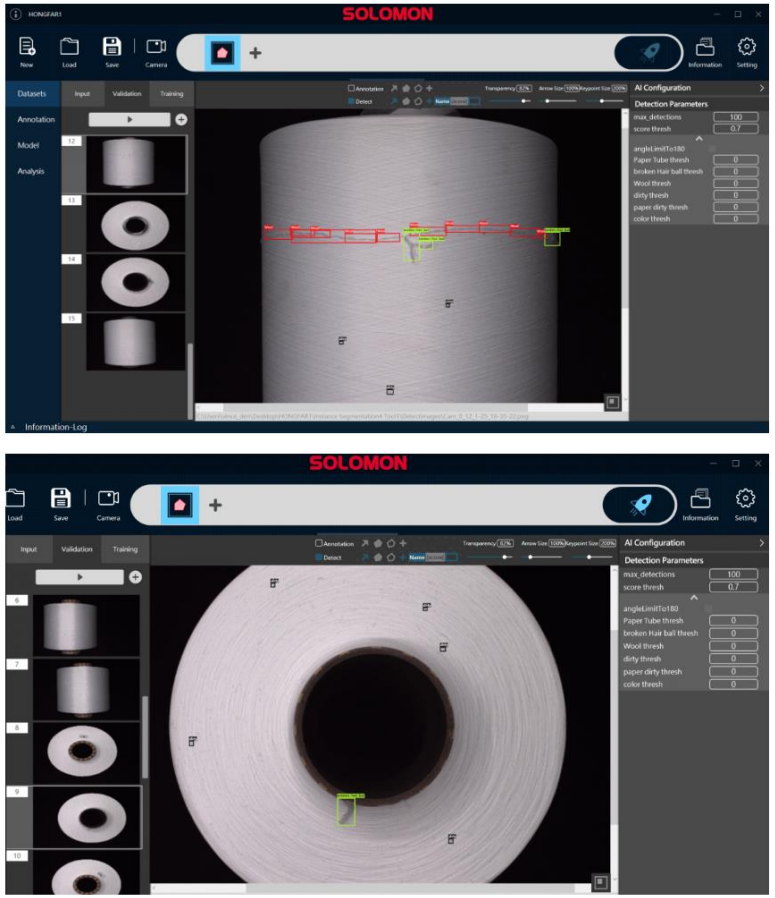
S8. Automatic quality control – Basic yarning + coiling

Problem: **P8/P11 Manual quality control - Basic yarning + Coiling**. Time is spent to manually perform quality control while the machine is running (manual labor needed in parallel to automated production) OBS: it is not considered that the operator might produce on another machine/generate additional capacity. If so, we should consider capacity increase possibilities changing the process as "sequential" in the "mapping" sheet

Problem entity quantification: 0.7 FTE + 1.6 FTE = 2.3 FTEs

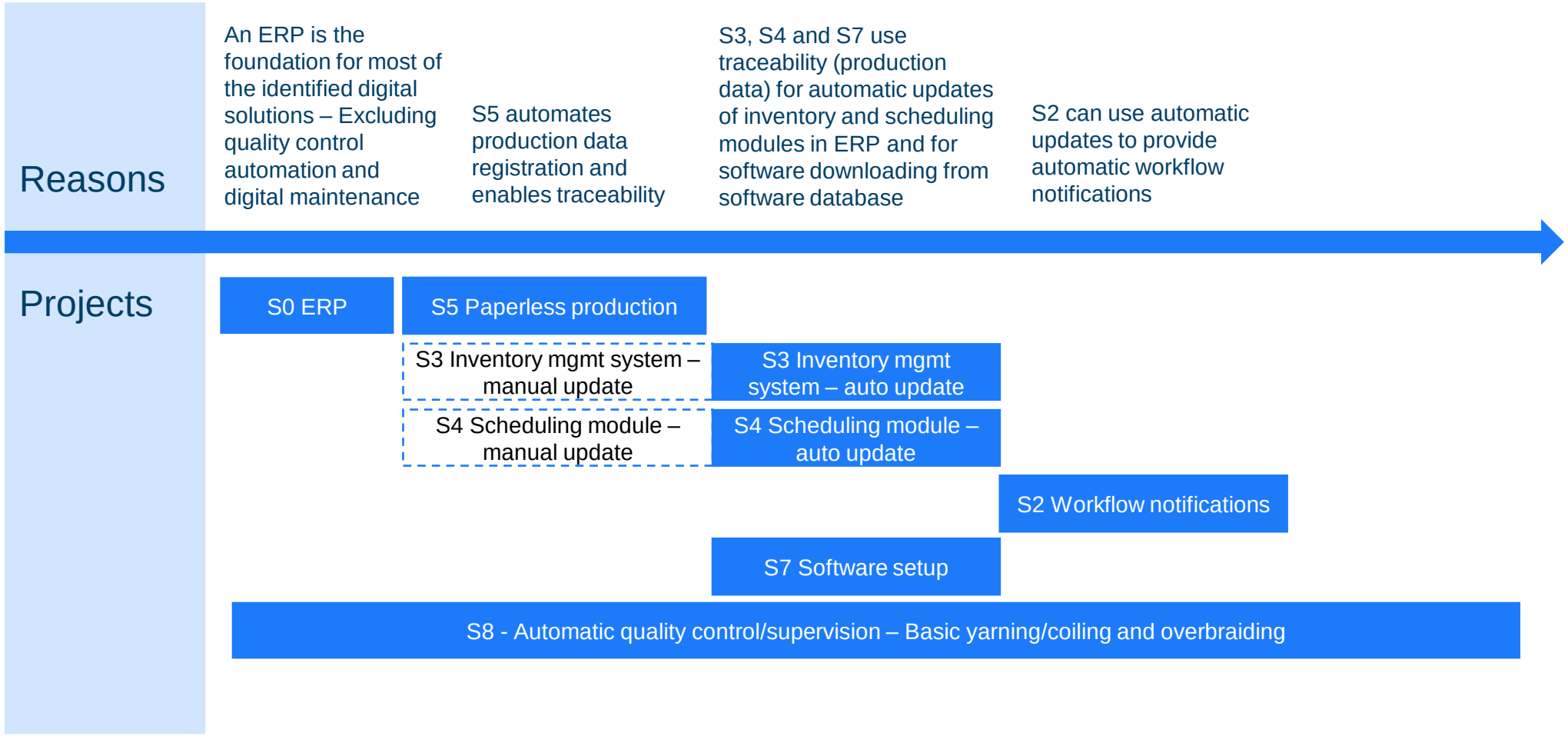
Solution proposal: Automatic quality control (vision system) – see example in figure.



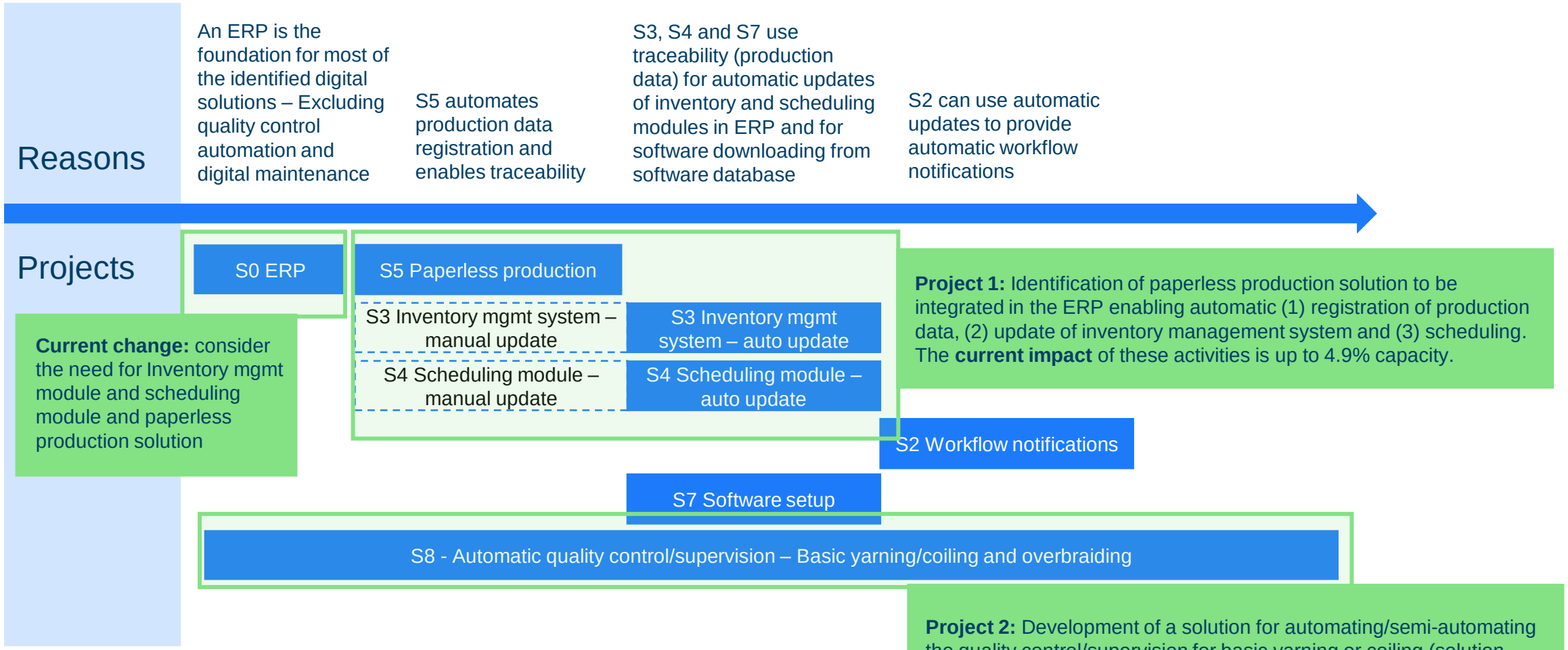


Source: Solomon-3d.com

Conclusions: Roadmap proposal



Conclusions: Roadmap proposal



INDUSTRIENS FOND

“Digitalisering skal styrke vores produktionsplanlægning”

Dynamica Ropes

Et nyt ERP-system, styrket produktionsplanlægning og mindre manuel kontrol. Hos tovværksproducenten Dynamica Ropes er man klar til at høste fordelene ved øget digitalisering. Virksomheden har netop været igennem projekt Den Digitale Fabrik, som er sat i søen for at understøtte den danske fremstillingssektors arbejde med at digitalisere og effektivisere produktionen og dermed styrke konkurrenceevnen.

FORCE TECHNOLOGY

What are your production improvement opportunities?
How much are they worth?
How can they can be translated into value?

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