

The logo for Chr. Hansen, featuring the company name in a blue sans-serif font above a green diamond shape.

*Improving food & health*

A photograph of a laboratory workstation. In the foreground, there is a multi-well plate on a tray. In the background, a robotic arm with a pipette tip is positioned over the plate. The scene is lit with blue and white lights, creating a clean, professional atmosphere.

## Documentation of science work in Chr. Hansen A/S

... a story about going from paper notes to ELN and beyond

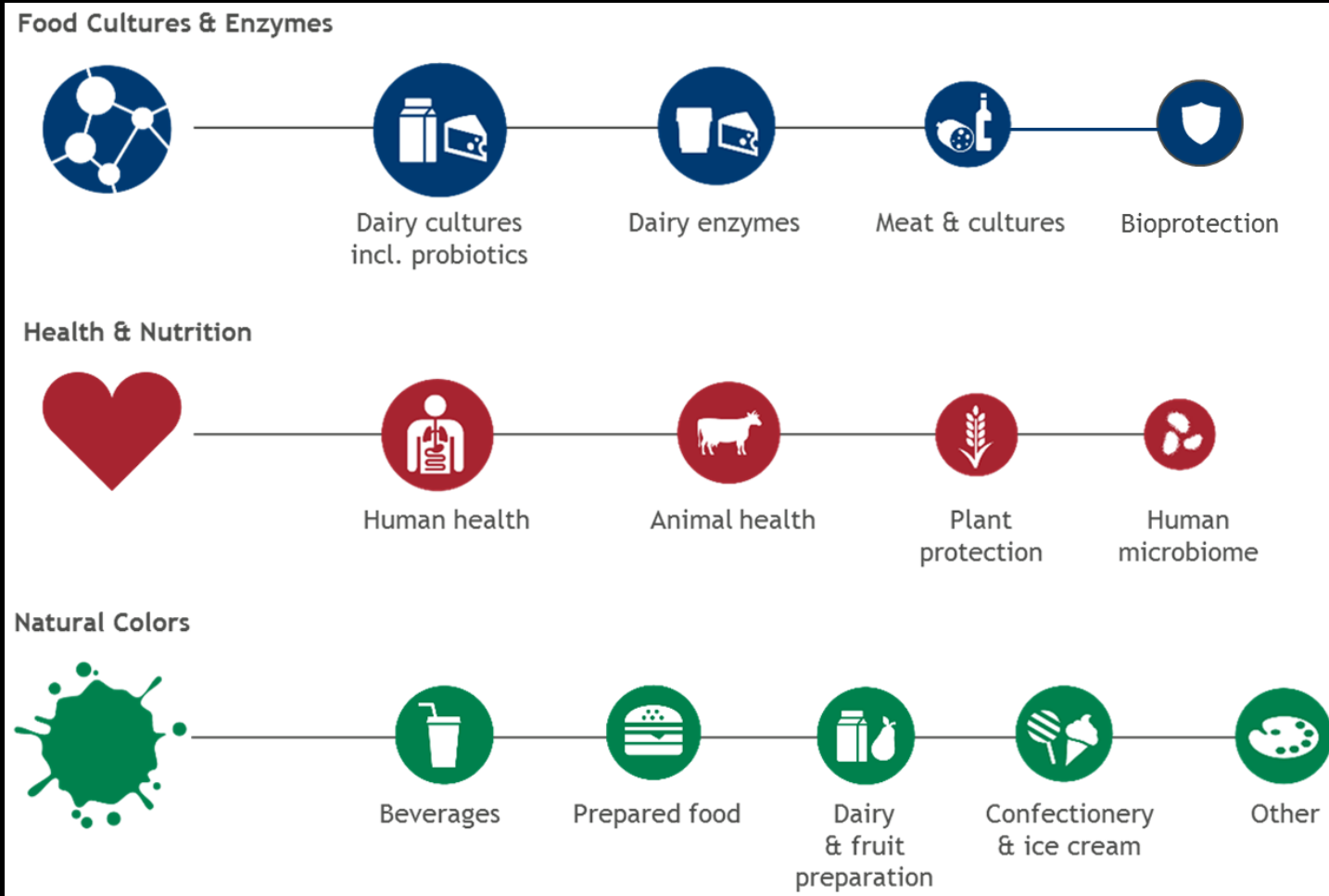
eLabBook workshop, Aarhus 13 April 2018

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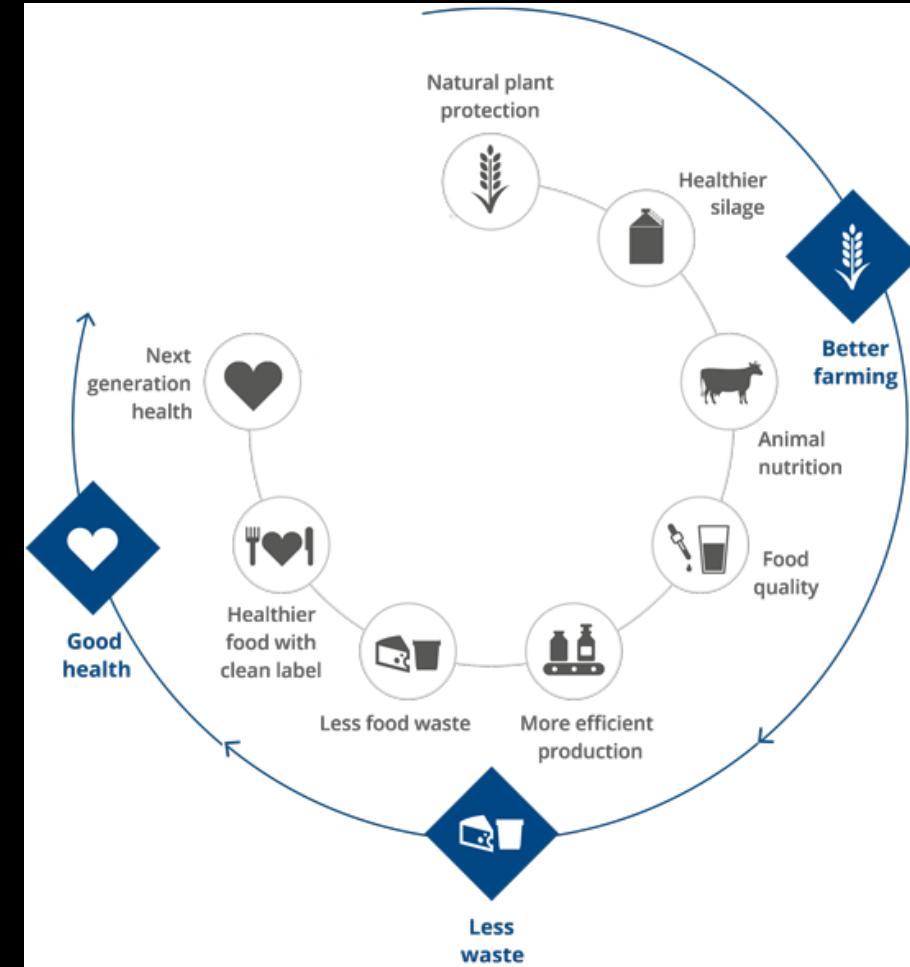
# A global bioscience-based company



Founded in 1874 in Copenhagen by the Danish pharmacist Christian D.A. Hansen



3 business areas



Chr. Hansen pioneers a more sustainable future from farm to fork

Read more on [www.chr-hansen.com](http://www.chr-hansen.com)

# A company based on innovative products



Our leading market position derive from innovative products and production processes based on strong research and development capabilities

**Hence, our scientific data is a valuable asset**



**Therefore, we care about our asset**

**We also constantly look for new ways to release the value potential in the data, therefore we explore the opportunities in Big Data including Artificial Intelligence**



However, as scientists in our hearts, we know that....



“The only difference between screwing around and science is writing it down”

*Jamie Hyneman og Adam Savage, Mythbusters*



# From the ELN project charter approved 2010

## Critical success factors

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Complete discontinuation of paper laboratory note books for experimental results

The ELN is perceived by the user to make their work easier and more efficient

The ELN becomes the standard for storage of data generated in Innovation in CED, Color and HND

ELN becomes the standard for storing experimental results generated in the ITC's

Results from field trials are stored in the ELN in such a way that all tests with a given product can be listed in one overview

The ELN enables standardization of experiments, e.g. field trials, to ensure that results from the various tests can be compared and statistical analysis can be performed

## Project strategy

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In order to maximise the probability of a successful implementation, the project will follow this process:

1. Screening of ELN's to find those that are relevant for Chr. Hansen's size and complexity
2. Evaluation of relevant ELN's through
  - vendor presentations
  - meetings with vendors (questions and answers)
  - hands on test of ELN's (workshop with technicians from Innovation)
  - visit companies where ELN's have been implemented
  - Sourcing negotiating with the vendors
3. Pilot implementation in selected departments in Hoersholm
4. Roll out globally

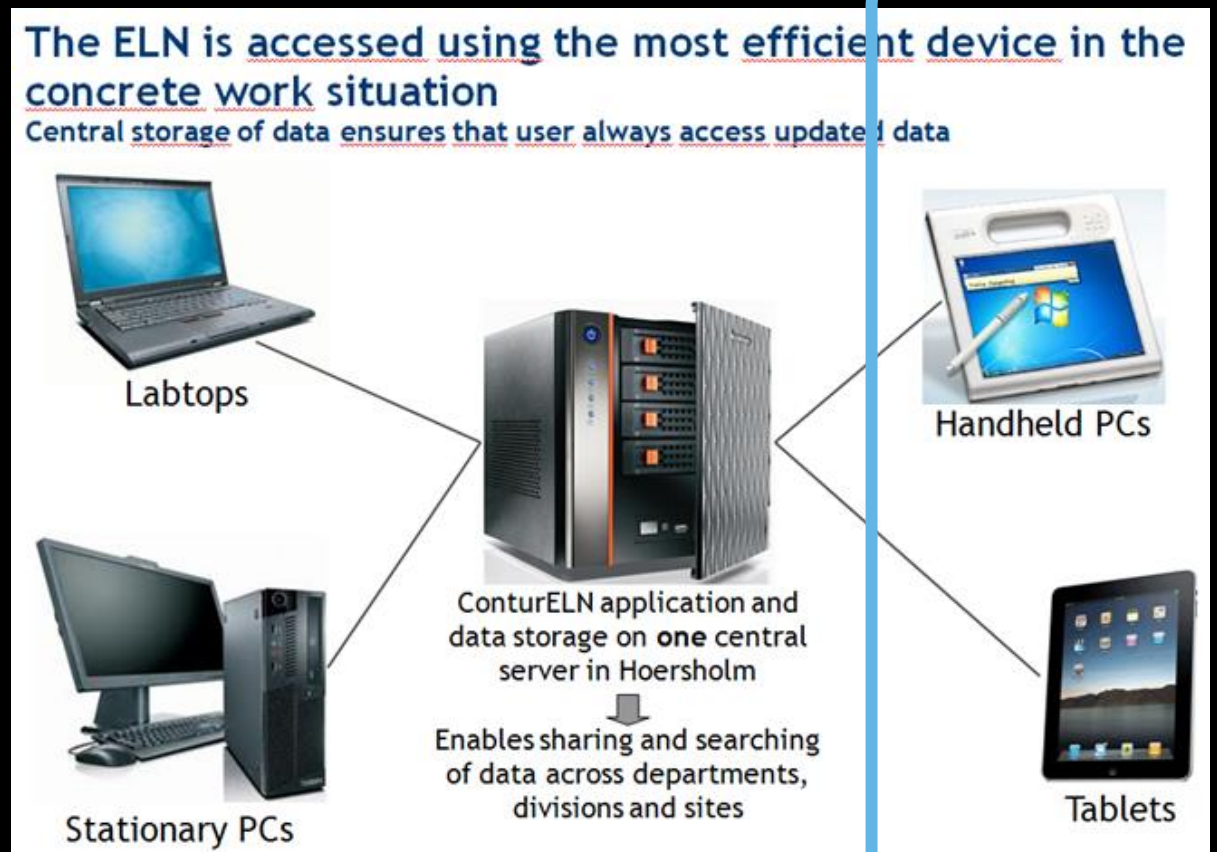
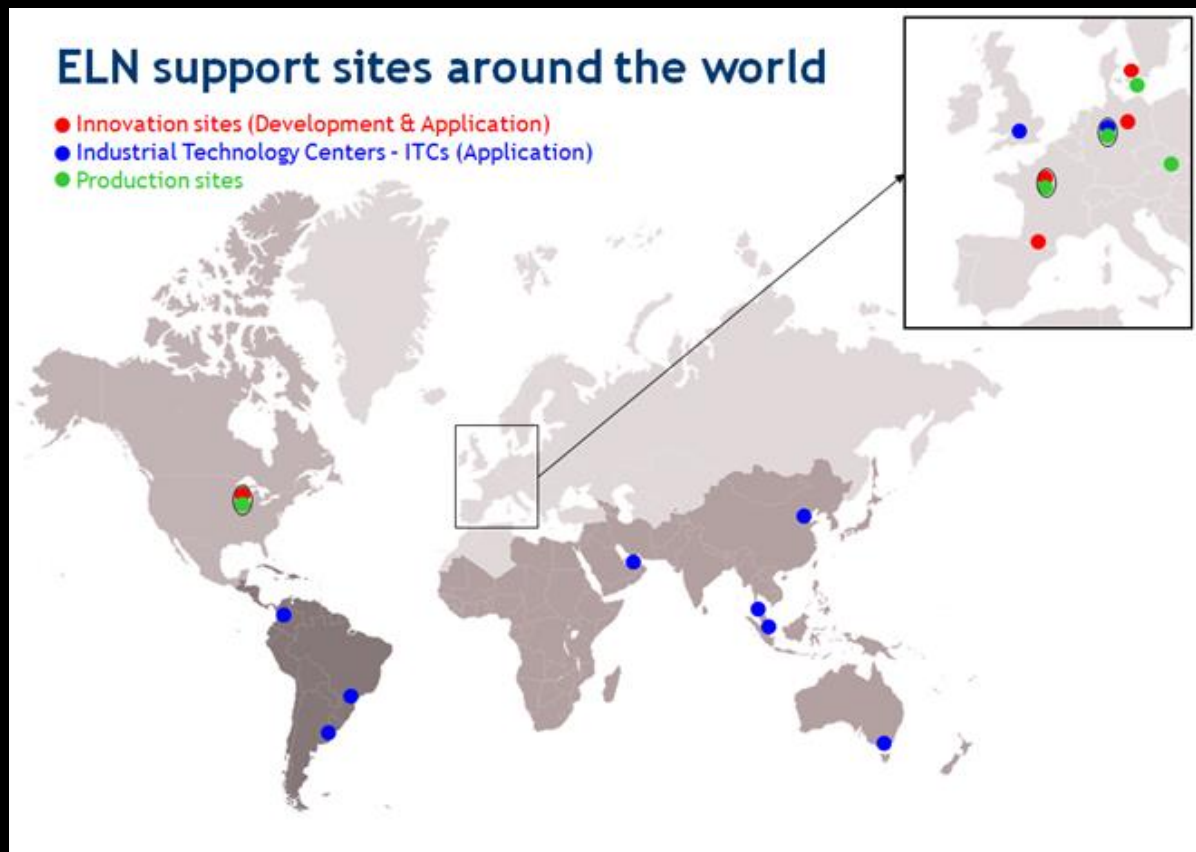
# ELN design decisions helped the selection process

- Simplicity and ease of use
- Central storage of data
- On-premise (not ready for cloud at that time)
- SQL platform (Chr. Hansen strategy)
- Must be able to completely replace paper-based lab note books
- Basic functionalities include
  - author and reader access control
  - approving data (sign/counter-sign)
  - searching data

# So what did we get?

... Implementation of electronic laboratory notebooks (ELN)

Finally coming - maybe



The formal way ELN is described in DocBox (where procedures are kept)  
.... Reality is - of course – slightly different

## Introduction

- In Chr. Hansen it is mandatory to use the Electronic Laboratory Notebook (ELN) to maintain a complete and permanent record of any Research, Development and Application activities carried out for the company.
- The ELN record must be kept accurately and in accordance with these instructions.
- An ELN record is to include a description of purposes for experiments and of derived results and conclusions hereof.
- The ELN and all information recorded therein, is the exclusive property of Chr. Hansen. The contents of the ELN records are strictly confidential.
- The ELN records may become crucial as documentation in questions relating to ownership of data, date of invention, inventorship and prior use and additionally in relation to Quality Assurance (GXP).

*After this there is the specific procedure on how to submit and countersign experiments*

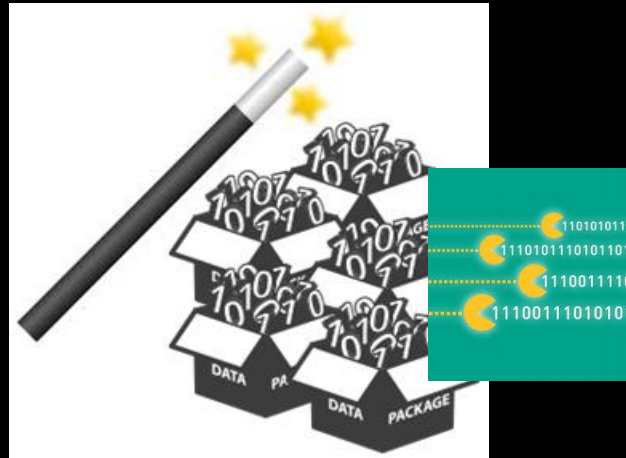


In summery:

We got an easy to use ELN well suited to manage information



So far so good  
... but basically what the scientists are asking for..



This require a...

**Digital transformation** – to have data available for analytics

**Data transformation** – to work data centric

**AI transformation** – to have support from digital assistants

**Business transformation** – to become **data driven in our innovation**

This has forced us to think beyond the original scope of our ELN implementation

... to working with data in new ways

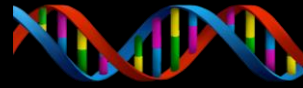
From managing information...



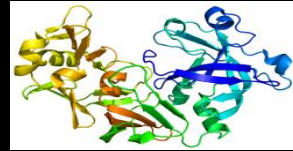
# The solution for us is a module-based Digital Lab framework

Examples of services

	A	B	C	D	E	F	G
A	91	558	96	113	109	125	57
B	21	1	21	21	18	18	8
C	75	652	93	232	290	278	291
D	100	19	122	70	97	90	41
E	97	22	122	86	112	102	47
F	83	23	103	96	114	483	46
G	12	2	10	10	8	10	0
H	96	20	109	102	106	107	48
I	100	21	98	87	97	95	45
J	101	18	81	83	777	111	52



A-T-G-C



**Yield of cheese from cow milk**  
 Abstract  
 Comparison between Synthetic population Bulgarian milk (SPBM) and East-Friesian (EF) sheep was done for laboratory yield of cheese and milk composition. The comparison of the means for the individual laboratory yield of cheese showed significantly higher values in the ewes of SPBM on first lactation (2,4736 g) compared to the EF breed (1,7668 g), (P<0.001). The higher amount of cheese probably was connected with the tendency for higher content of the fat, protein and dry matter. However on the second lactation the two breeds showed the same values: SPBM 1,9370 g and EF breed 1,9282 g. No significant differences in the quantity of milk, and its composition between the sheep on first and second lactation were observed for both breeds.



Tabular

Genome

Protein

Text

Image

Audio

Plan and create

Full service by supplier

Prototype from explore study

Capture and store

Master data  
CHCC

Bio-Product  
 • Protein engineering  
 • Molecular design  
 • DNA diagnostics

Full service by supplier

Machine Learning based mould growth scorer

Transform and combine

Sense

Platform  
R environment

Scibite  
 • Semantic text recognition  
 • Text analytics  
 • Search

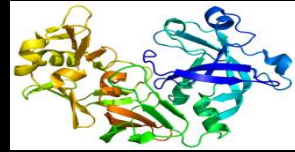
Share (internal)

Application  
Genome browser

Share (external)

# Our ELN in the frame of the Digital Lab

	A	B	C	D	E	F	G
A	91	558	96	113	109	125	57
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**Tabular**

**Genome**

**Protein**

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**Audio**

**Plan and create**

**ELN: 1) Ideas and discussions, 2) Results and conclusions 3) Documenting the process**

**ELN: 1) Ideas and discussions, 2) Results and conclusions 3) Documenting the process**

**Share (internal)**

**Share (external)**

# Our ELN in the larger strategic perspective

## The Endeavour to realize the full value potential of data

**Transformations**  
**Digital transformation**  
**Data transformation**  
**AI transformation**  
**Business transformation**

... to data driven innovation

**Digital application assistant**

**Data-based business models**

**Data and analytics as services**

**Establish AI base**

**Broad use of Big Data**

**Consolidating Big Data**

**Maturing Big Data**

**Big Data awareness**

**Digitalization (paper to IT)**

The effort is guided by themes

From domain oriented processes.....

It a change in mindset rather than new technologies

- From one-man armies to collaborative communities
- Have trust in (other scientists) data
- Predicting the future rather than reporting on the past
- Prescripting/shaping the future
- Working with robots / digital assistants
- Rethinking how innovation is done
- Rethinking what products are