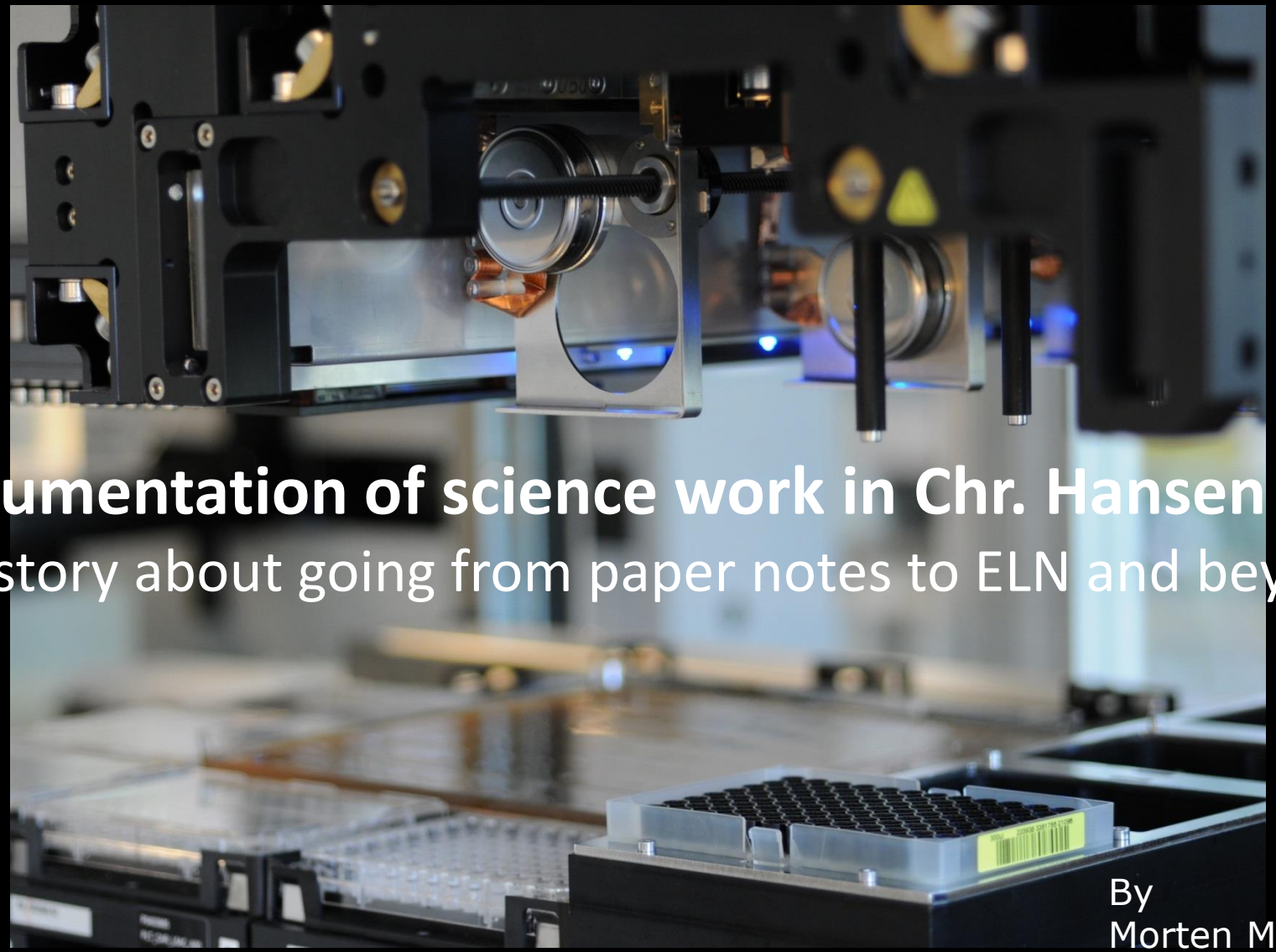

Documentation of science work in Chr. Hansen A/S

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

eLabBook workshop, Aarhus 13 April 2018

By
Morten Meldgaard
Project Director, Big Data program
Chr. Hansen A/S
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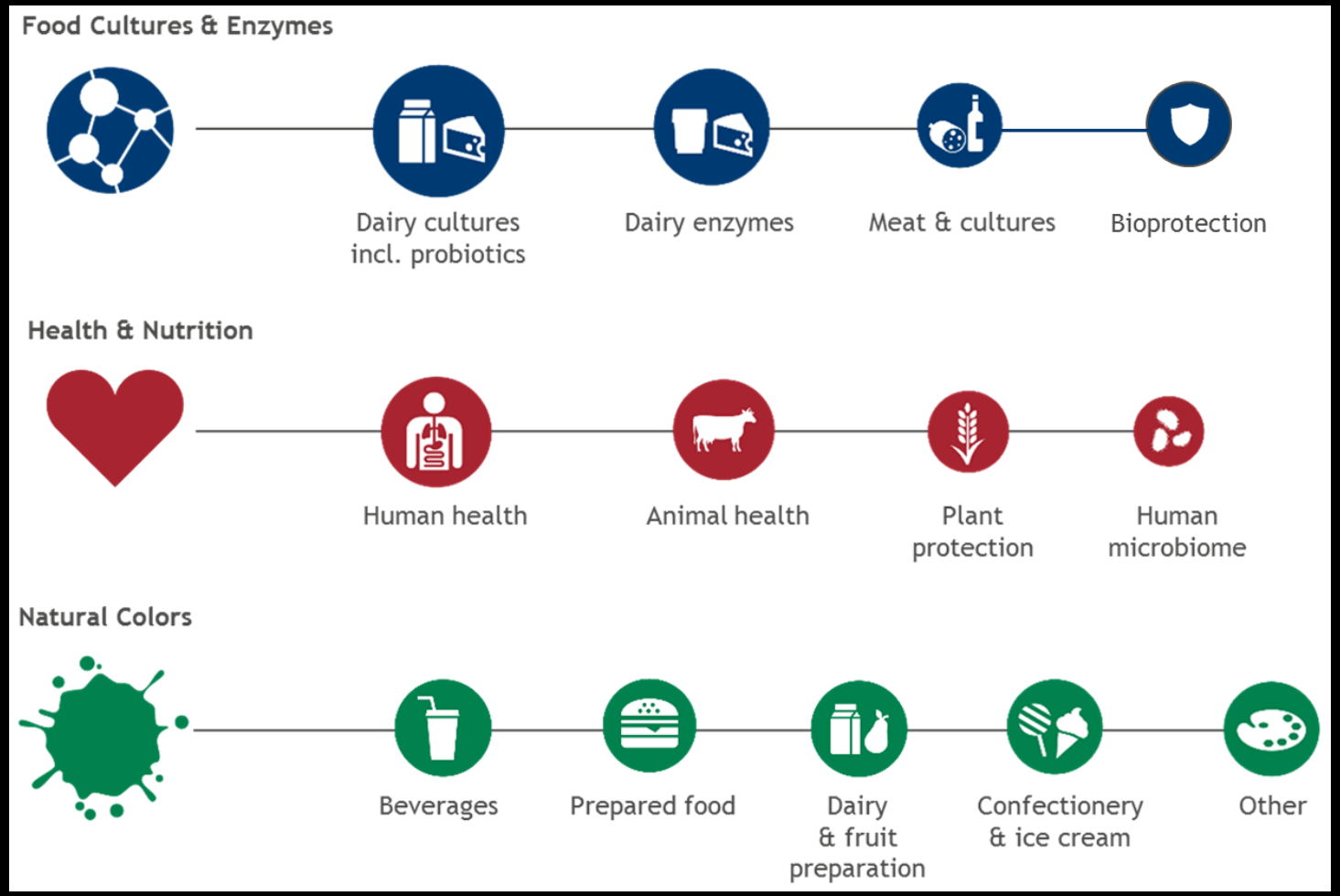
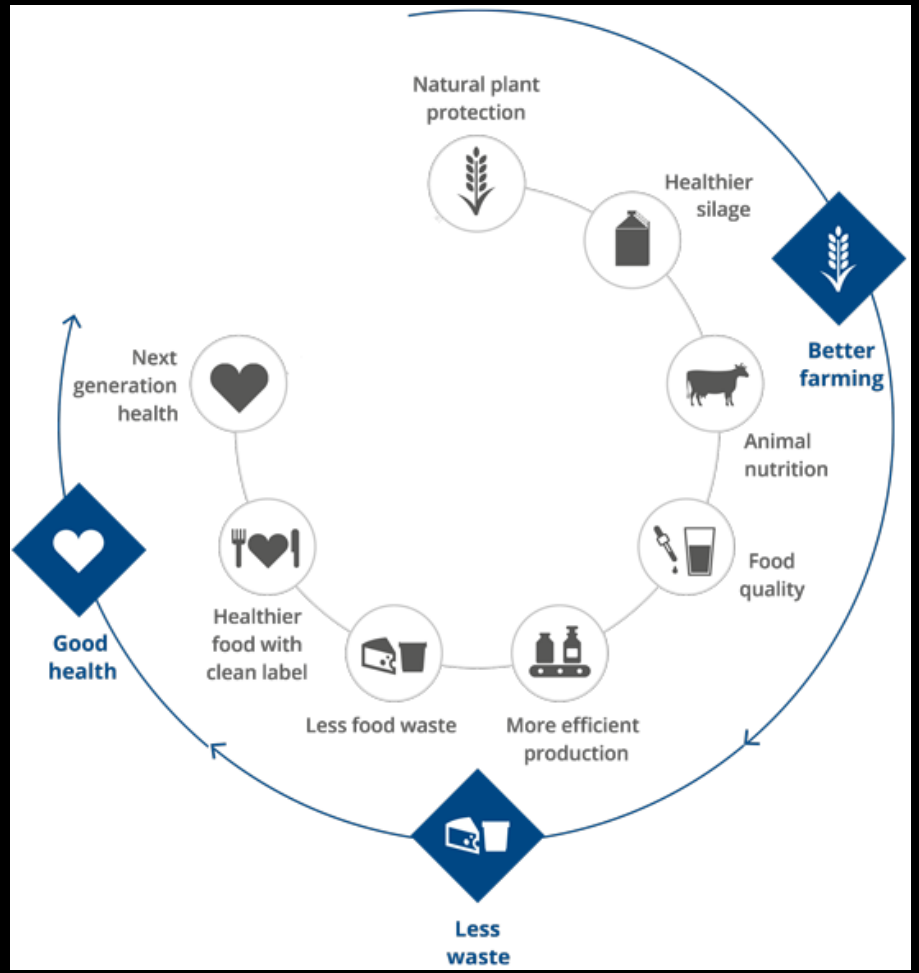
A global bioscience-based company

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

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

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 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

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

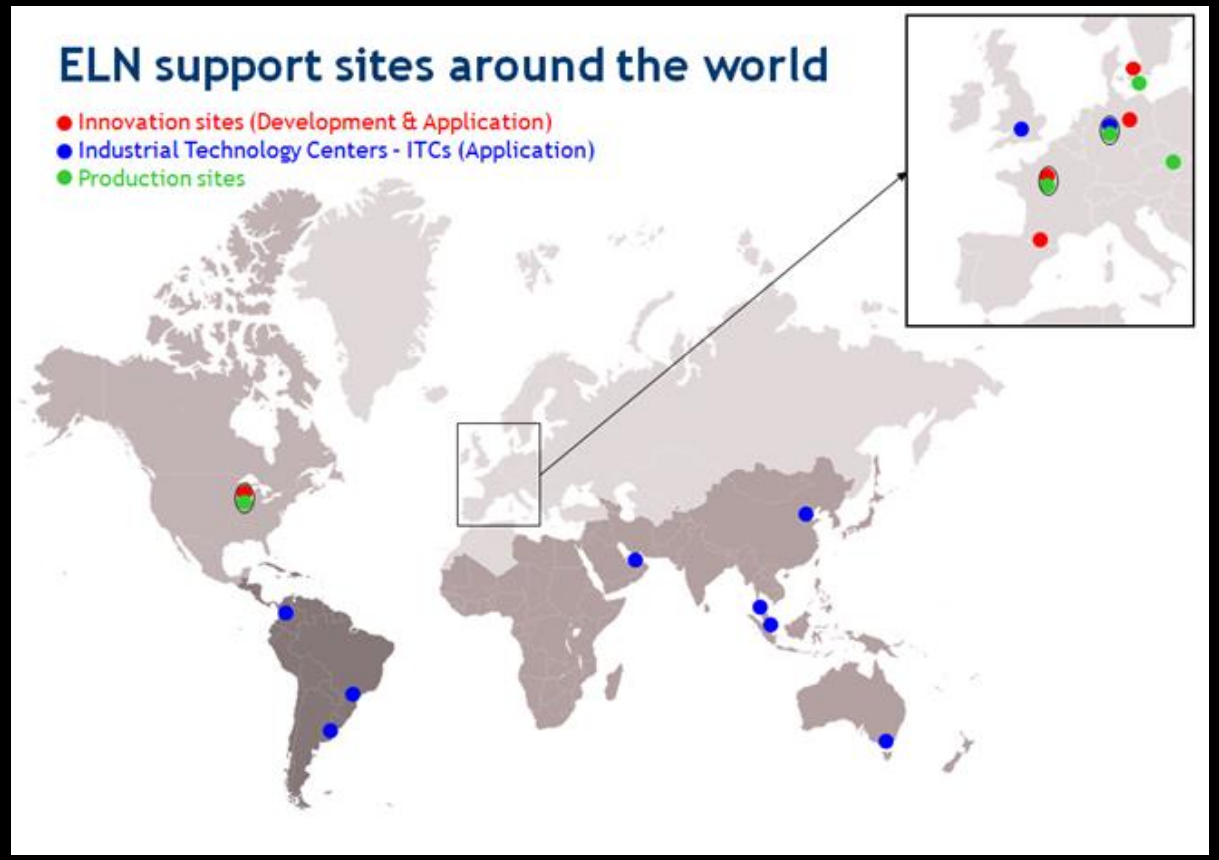
ELN design decisions helped the selection process

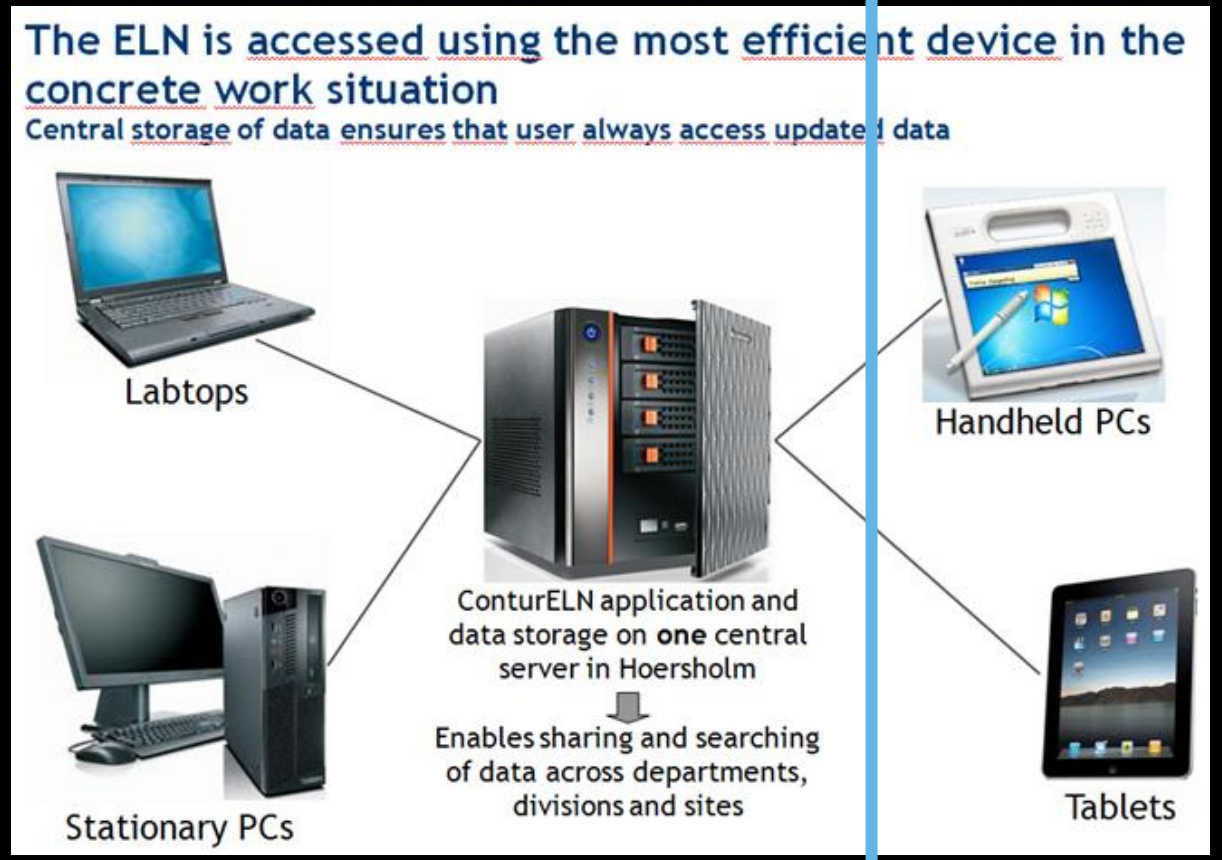
- Simplicity and ease of use
- Central storage of data
- On-premise (not ready for cloud at that time)
- SQL platform (Chr. Hansen strategy)
- Must be able to completely replace paper-based lab note books
- Basic functionalities include
    - author and reader access control
    - approving data (sign/counter-sign)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

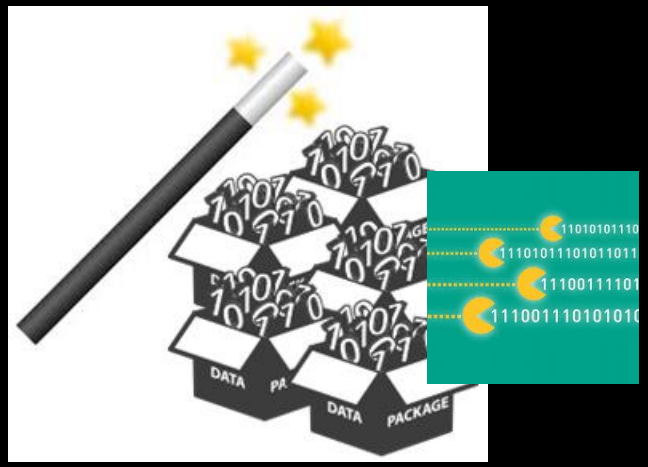
Introduction

- 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…

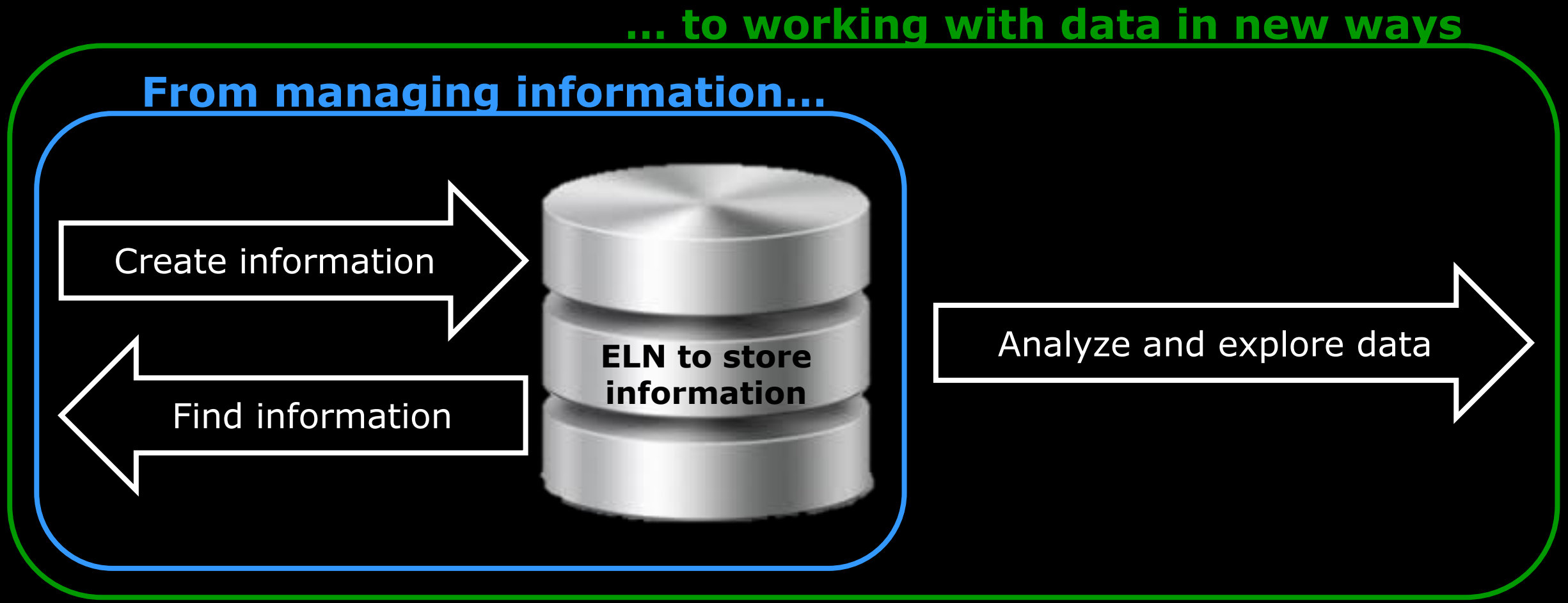
Digital transformation – to have data available for analytics

Data transformation – to work data centric

AI transformation – to have support from digital assistents

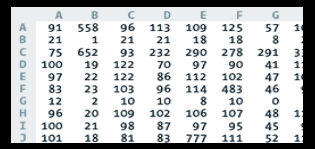
Business transformation – to become **data driven in our innovation**

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



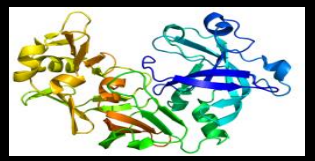
The solution for us is a module-based Digital Lab framework

Examples of services



Tabular

Genome



Protein

Text

Image

Audio

Plan and create

Capture and store

Master data

CHCC

Transform and combine

Sense

Platform

R environment

Share (internal)

Application

Genome browser

Share (external)

Full service by supplier

Bio-Prodict
- **Protein engineering**
- **Molecular design**
- **DNA diagnostics**

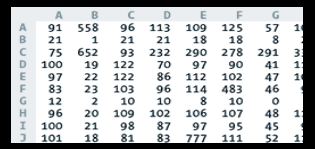
Full service by supplier

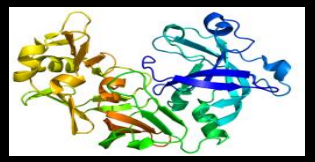
Scibite
- **Semantic text recognition**
- **Text analytics**
- **Search**

Protype from explore study

Machine Learning based mould growth scorer

Our ELN in the frame of the Digital Lab



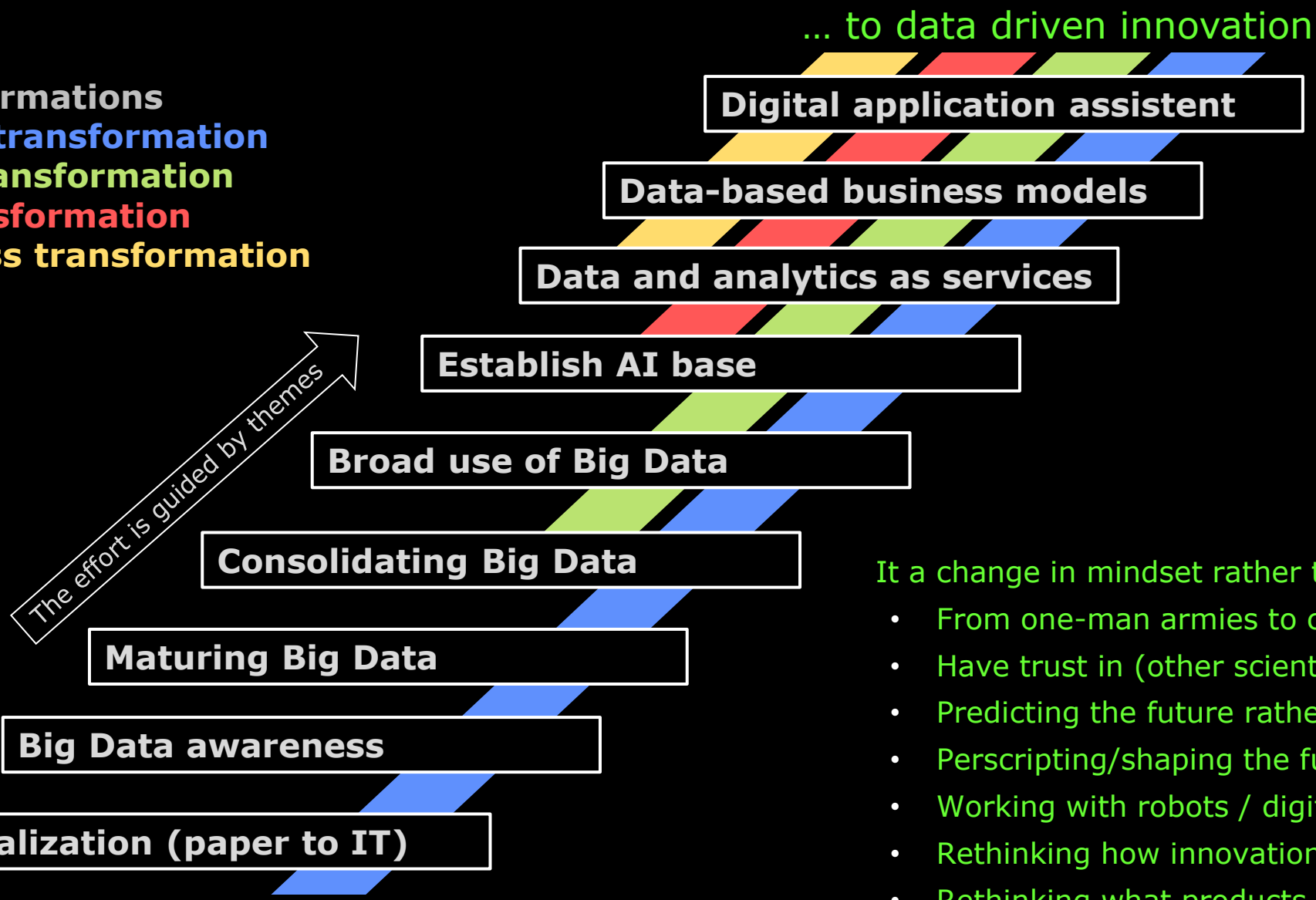


	Tabular	Genome	Protein	Text	Image	Audio
Plan and create						
Capture and store	**ELN: 1) Ideas and discussions, 2) Results and conclusions 3) Documenting the process**					
Transform and combine						
Sense						
Share (internal)	**ELN: 1) Ideas and discussions, 2) Results and conclusions 3) Documenting the process**					
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



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
- Perscripting/shaping the future
- Working with robots / digital assistents
- Rethinking how innovation is done
- Rethinking what products are