

From Art to Science

Using analytical tools and techniques to better understand, control and optimise Food Manufacturing Processes

Working together for a healthy future

[BCCC Conference April 2011](#)



imagination at work

From Art to Science



GE
Intelligent Platforms

Simon Lawson



STICORP

Steve Diggines



imagination at work

GE in Europe

90,000 employees
€27B revenues



From “art to science”

An on-going collaboration between GE, it's partners and customers

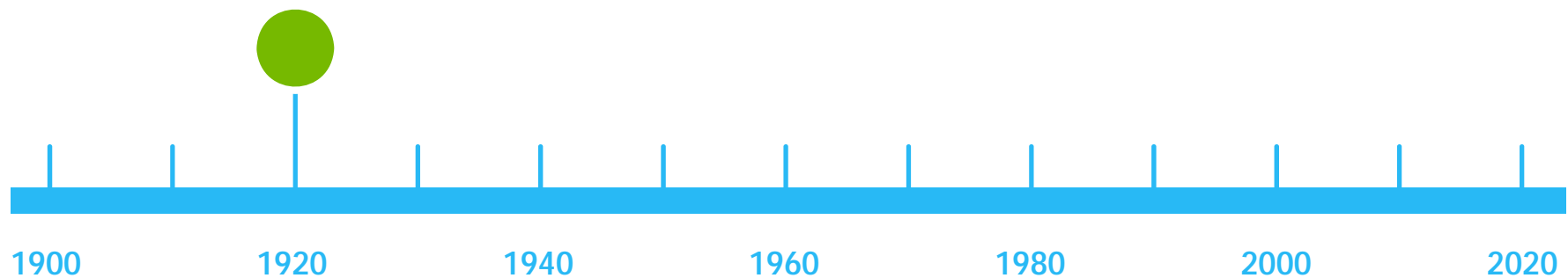
Applying a rigorous and scientific approach to process optimisation

A very brief history

1920's



Engineers realized the importance of reducing variation in a manufacturing process and start to systematically improve processes

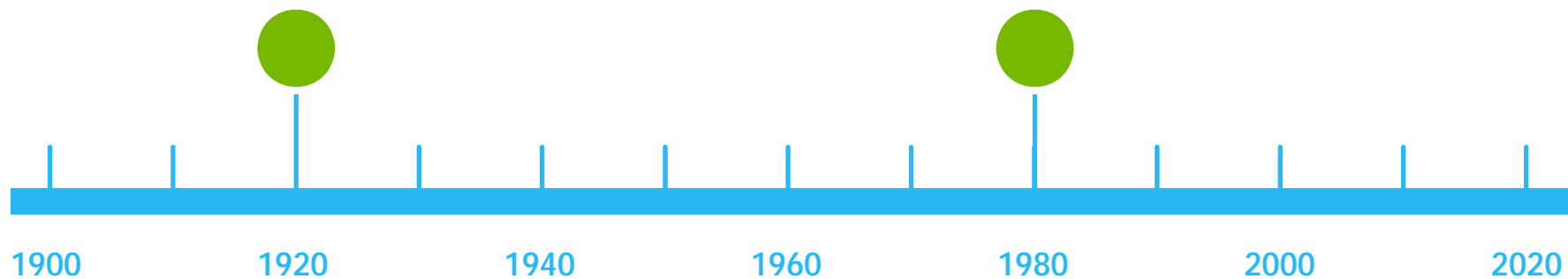


A very brief history

1920's – 1980's



Concepts are refined and methodologies developed to bake into manufacturing daily life – TQM, Six Sigma

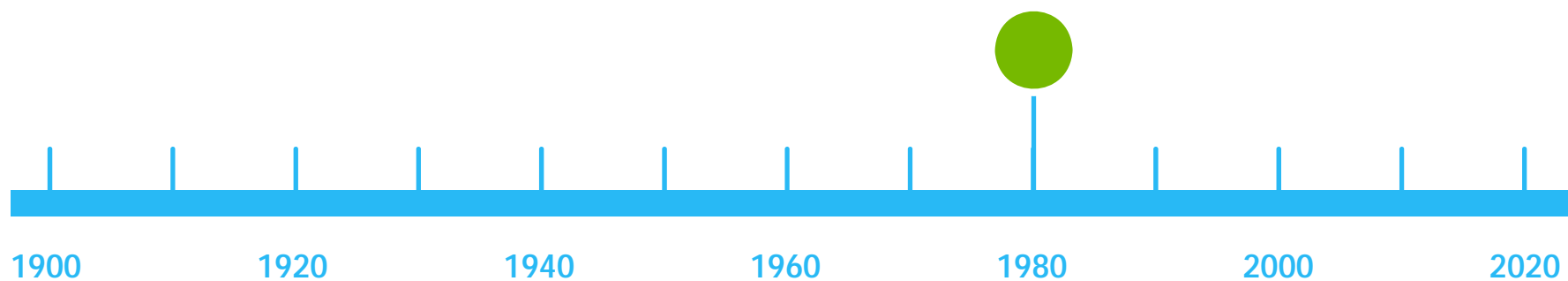


A very brief history

1980's – Now



Computers provide the ability to analyse more data and use ever more sophisticated techniques ...

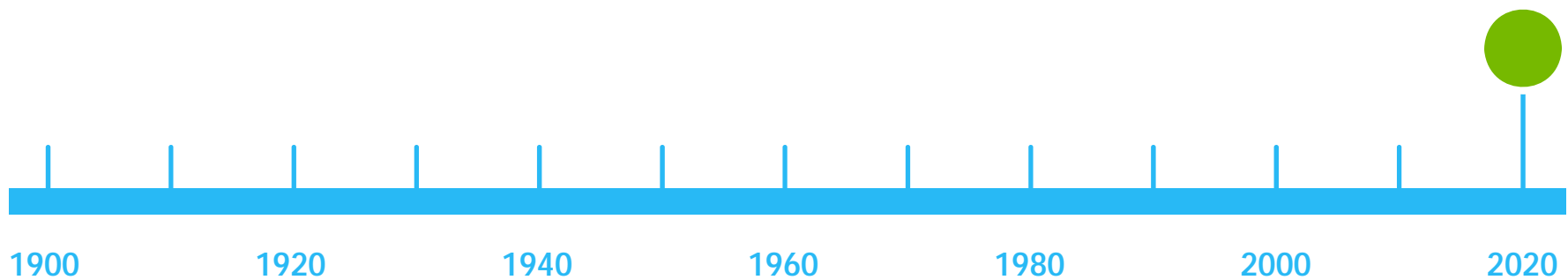


A very brief history

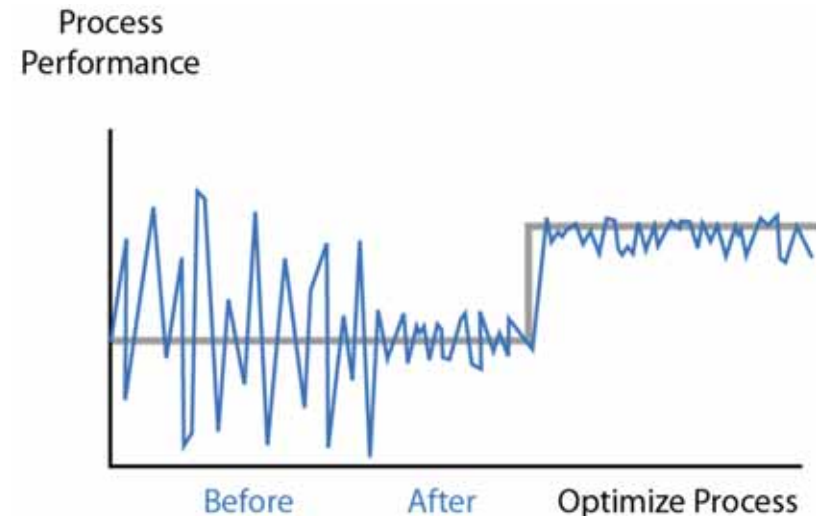
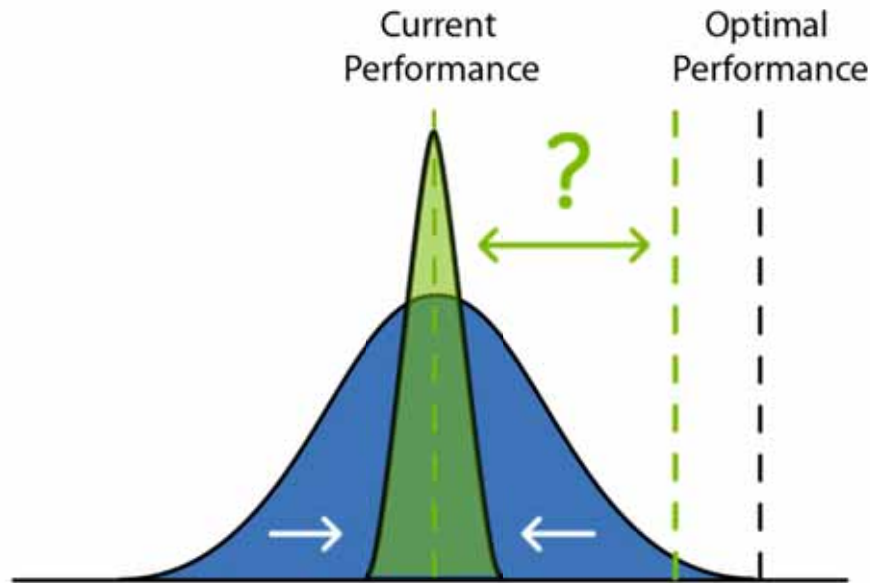
Future



The Factory of the Future...



Fundamentals



- Identify and Understand Causes of Process Performance Variation
- Minimize the Impact of the Causes
- Optimize the Process

The Prize For food?



... or process advantage

Suppliers

- Energy
- Raw Material
- Water

INPUTS (Limited Resources)

Customers

- Good Product
- Service

OUTPUTS (Desirable)

PROCESS

Minimizing
resource usage



Undesirable Outputs

- Faulty Products
- Emissions
- Bi-products
- Effluent

Minimizing
waste



Food Manufacturing Process



- Machines
- People
- Procedures
- Knowledge

- Disturbances
- Automatic Controls
- Manual Controls

“Developments in computers, a better understanding of food processing operations and a greater awareness of the relationship between food quality, food structure and composition, allow individuals to construct numerical models of unit operations, process lines and even the operations of whole factories”

Professor Bronek Wedzicha,
Founder Food Modelling Group



Case Study



How can we in Innovation and Improvement use GE tools within the production environment to support manufacturing / solving problems?



"Could we develop a system using your software that we could take to a site and "piggyback" onto a process and crunch through the data streams coming off?"

We can use a manual quality entry screen to capture off-line data

Our historian can collect all of the process data from the plant (110 tags for pilot)

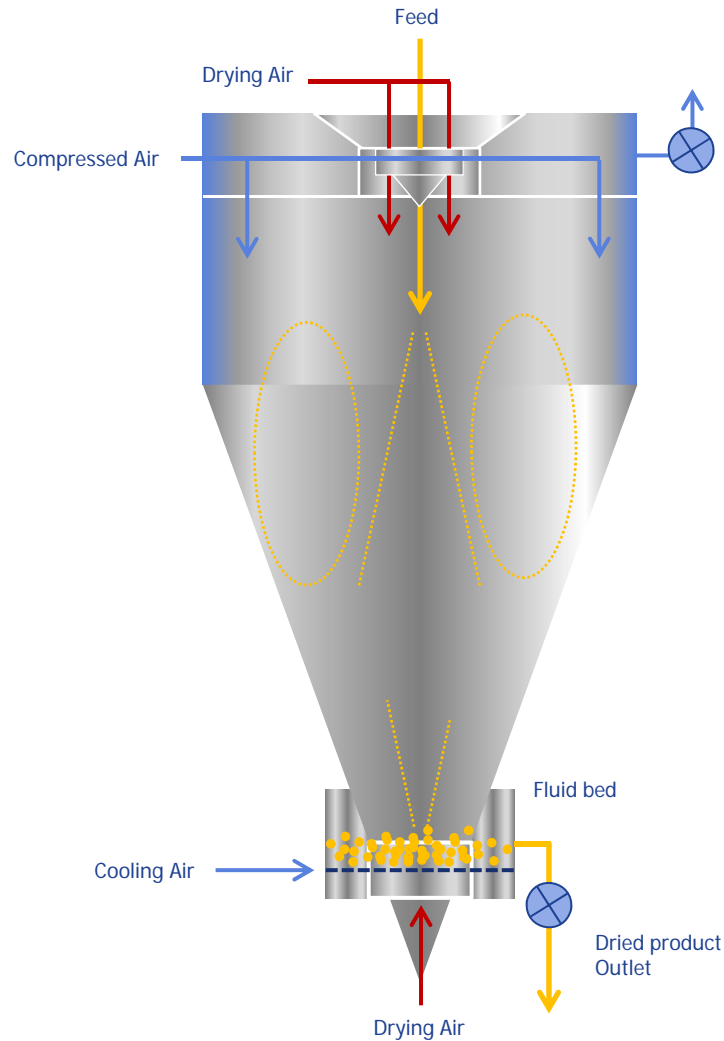
On the back of this we could then look at how that data related to the science and technology of the process in hand?



We can build a model that allows us to understand the relationship between inputs and outputs.



Spray Drying Process



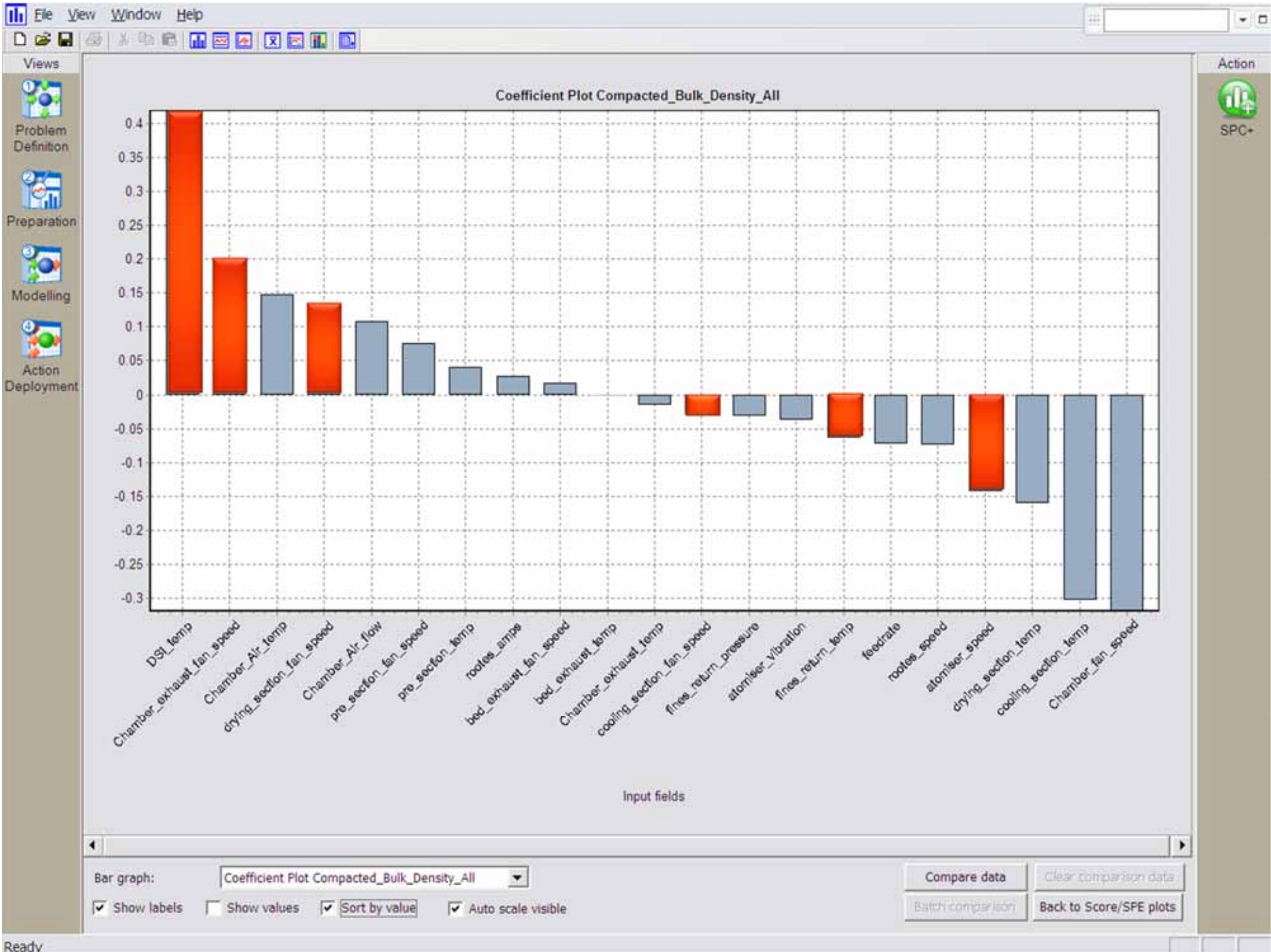
Looks simple but with
deceptively complex
dynamics

So what are the factors that impact on Bulk density that we have quality problems on?



These are the factors that have the biggest impact on bulk density.





That seems strange, we currently adjust atomiser speed, but your model predicts that this won't bring bulk density down



However, you can see from the history that the atomizer speed adjustments are not working



What should
we do then?



It would be better to adjust DSI temp. Based on the model we can tell you the right settings to get the desired change in bulk density.



Fantastic, that has solved my immediate problem – but how can I carry on using these tools to improve quality and increase throughput.



Sustaining improvement has been a problem in the past

“We did get people in the packaging industry to initially work with our optimizer. But once the guys left who knew how to use it moved on, it just died”

“Actually within the UK food industry we never got anywhere, they were happy for us to optimize things for them, but never their own guys. The UK food industry is very conservative and generally do not carry the engineering staff capable of using specialized software”

“Even in recent projects, we have had to develop systems with MS Excel so the company’s staff will use it”

Dr Jason Matthews Research Officer
Bath University



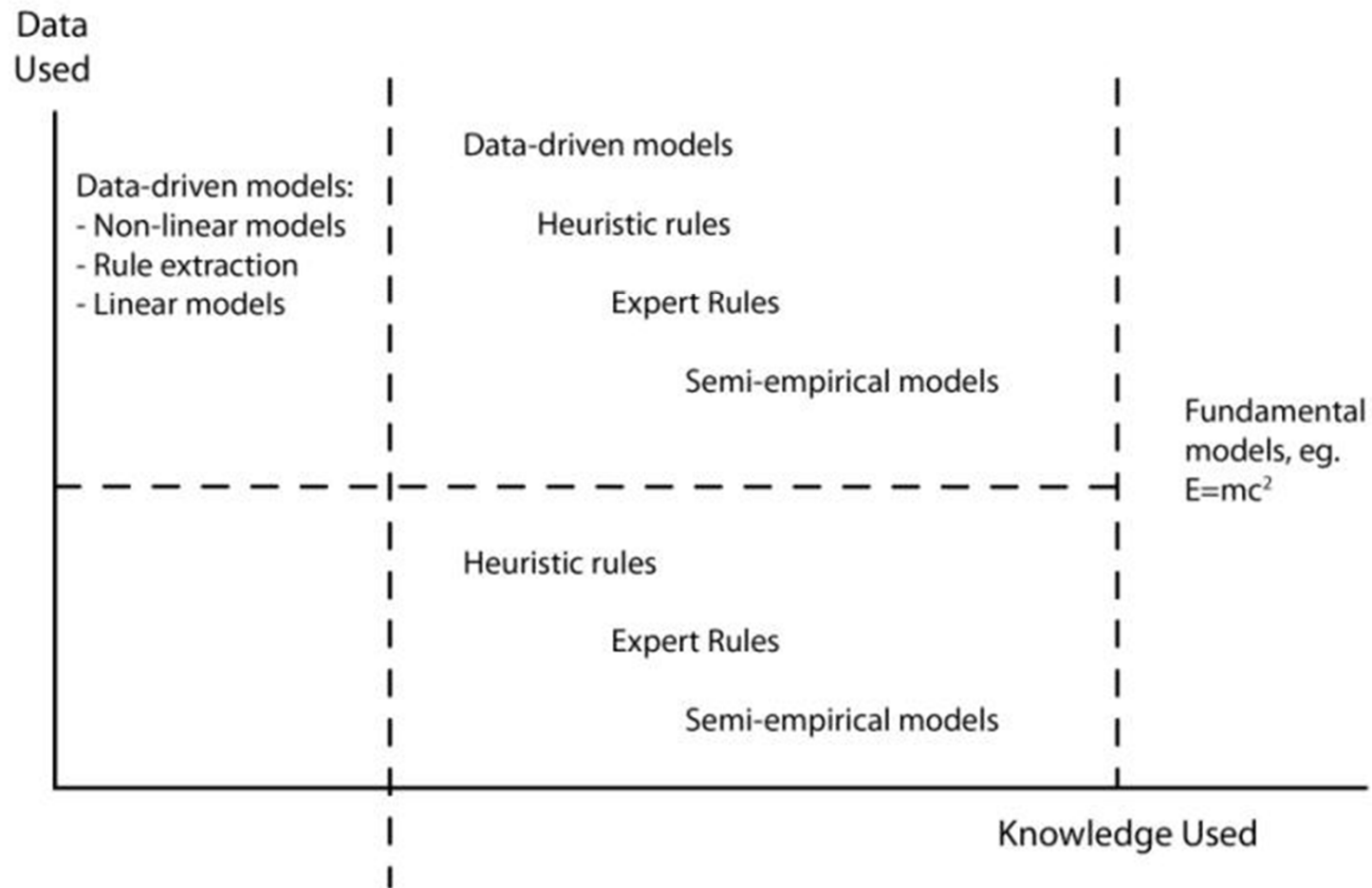
What are the Barriers?

- Takes too long?
- Engineering Skills
- Silo Mentality
- Resource
- Programme overload
- Vision
- Ownership
- Inertia?

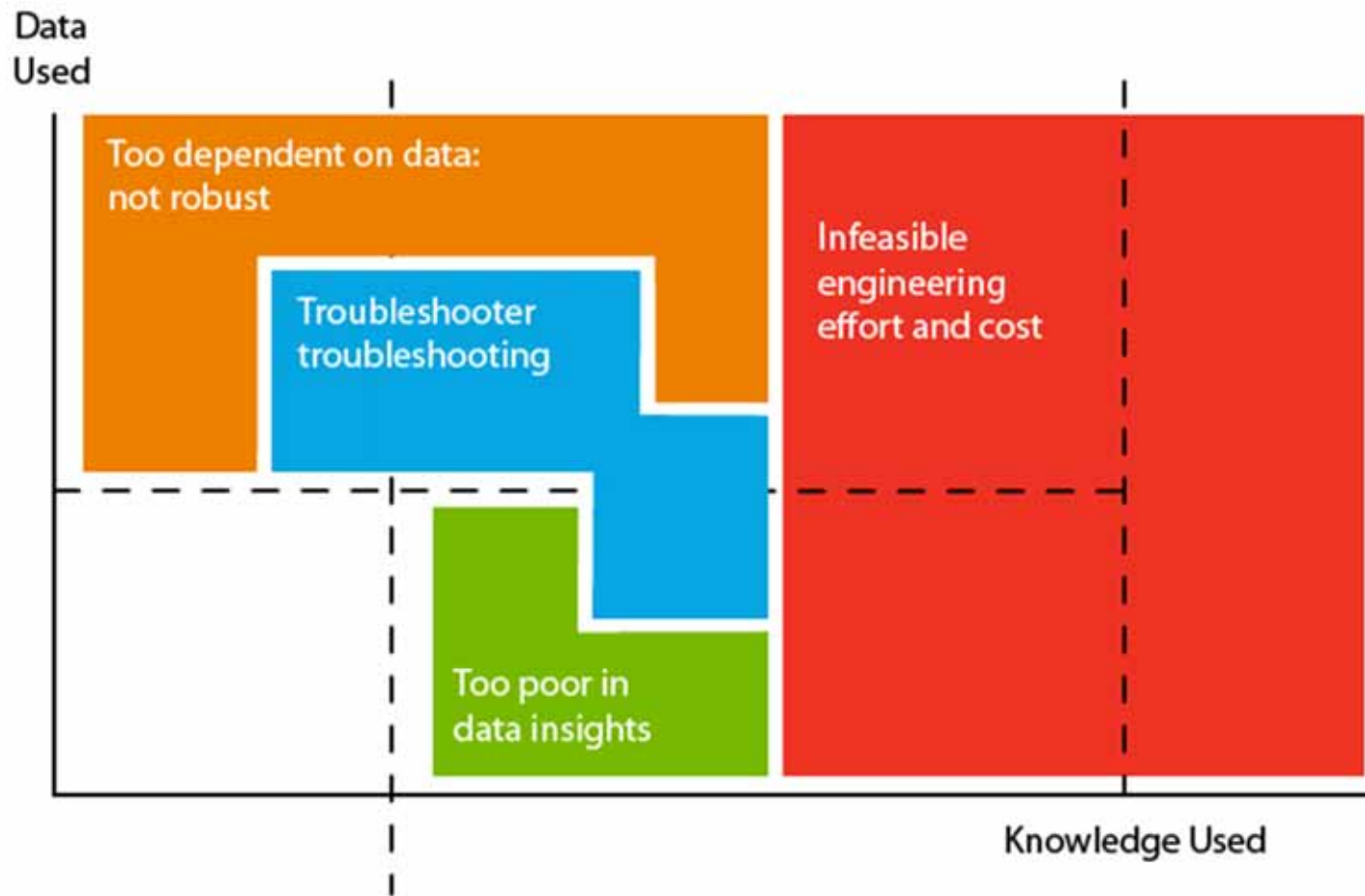
"As a general comment, the food industry is seen to be one with a great deal of inertia as compared to other industries"

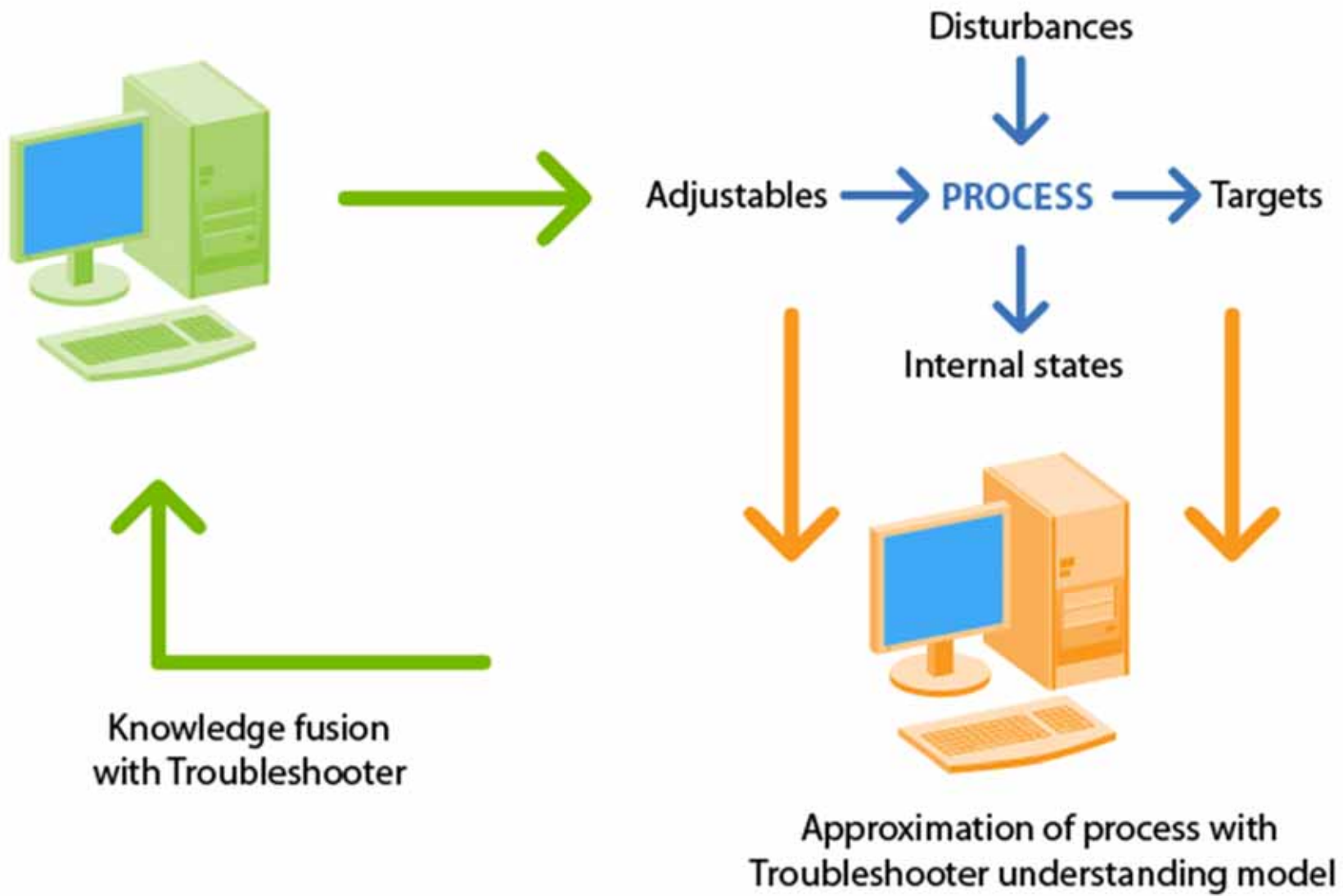
TRUST

Takes too long



Takes too long





Moving Forward

- Sponsored top down
- Implemented bottom up
- Business Case Driven
- Clear ownership
- Joined up
- Engaging people
- Providing a vision for the future
- Technology enabled



Factory of the Future

- Less waste
- Less energy use
- Faster time-to-market
- Better quality

Partner Integration

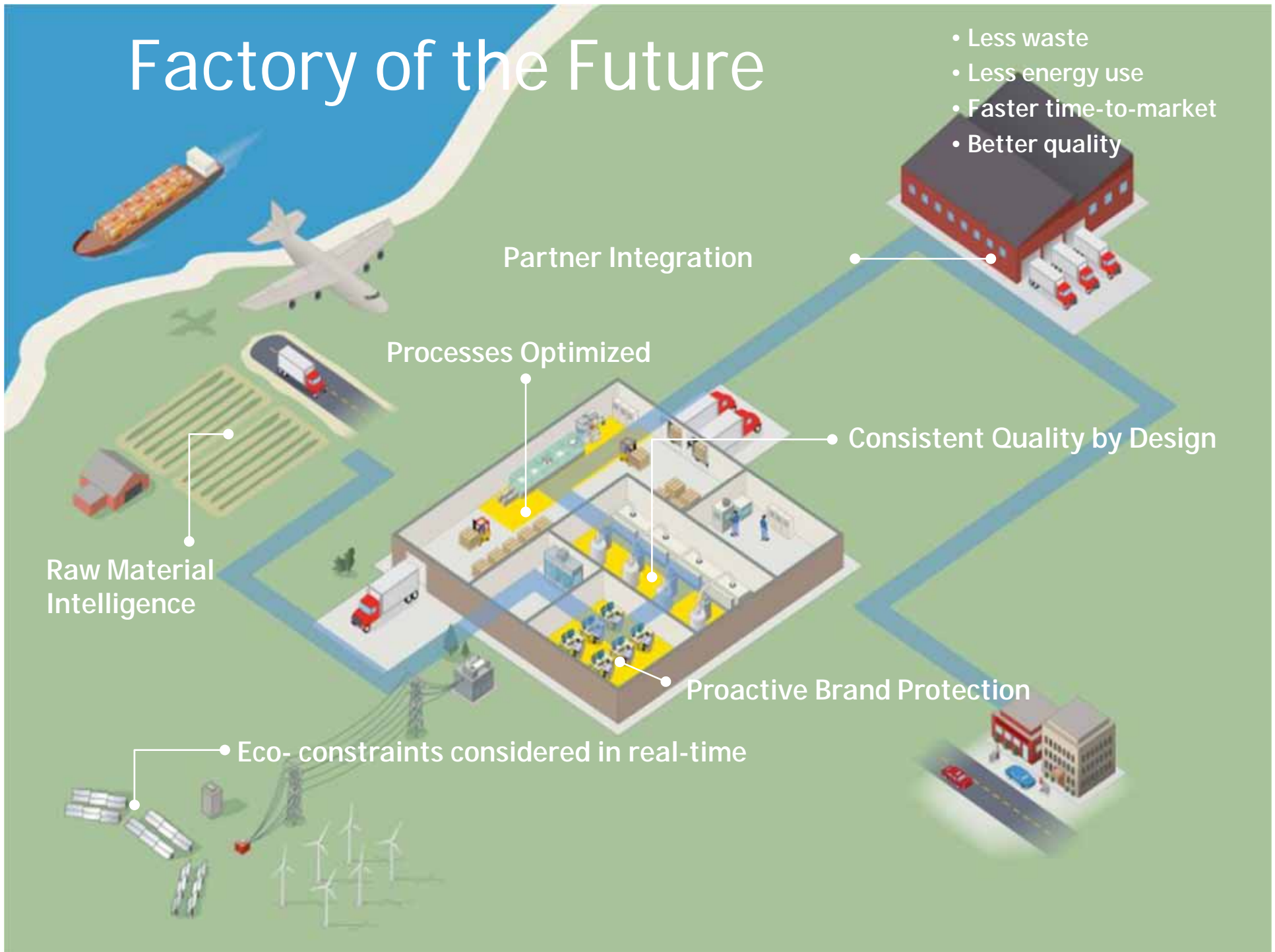
Processes Optimized

Consistent Quality by Design

Raw Material Intelligence

Proactive Brand Protection

Eco-constraints considered in real-time



Thanks for listening



GE
Intelligent Platforms

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imagination at work