

# Skills for NDE 4.0

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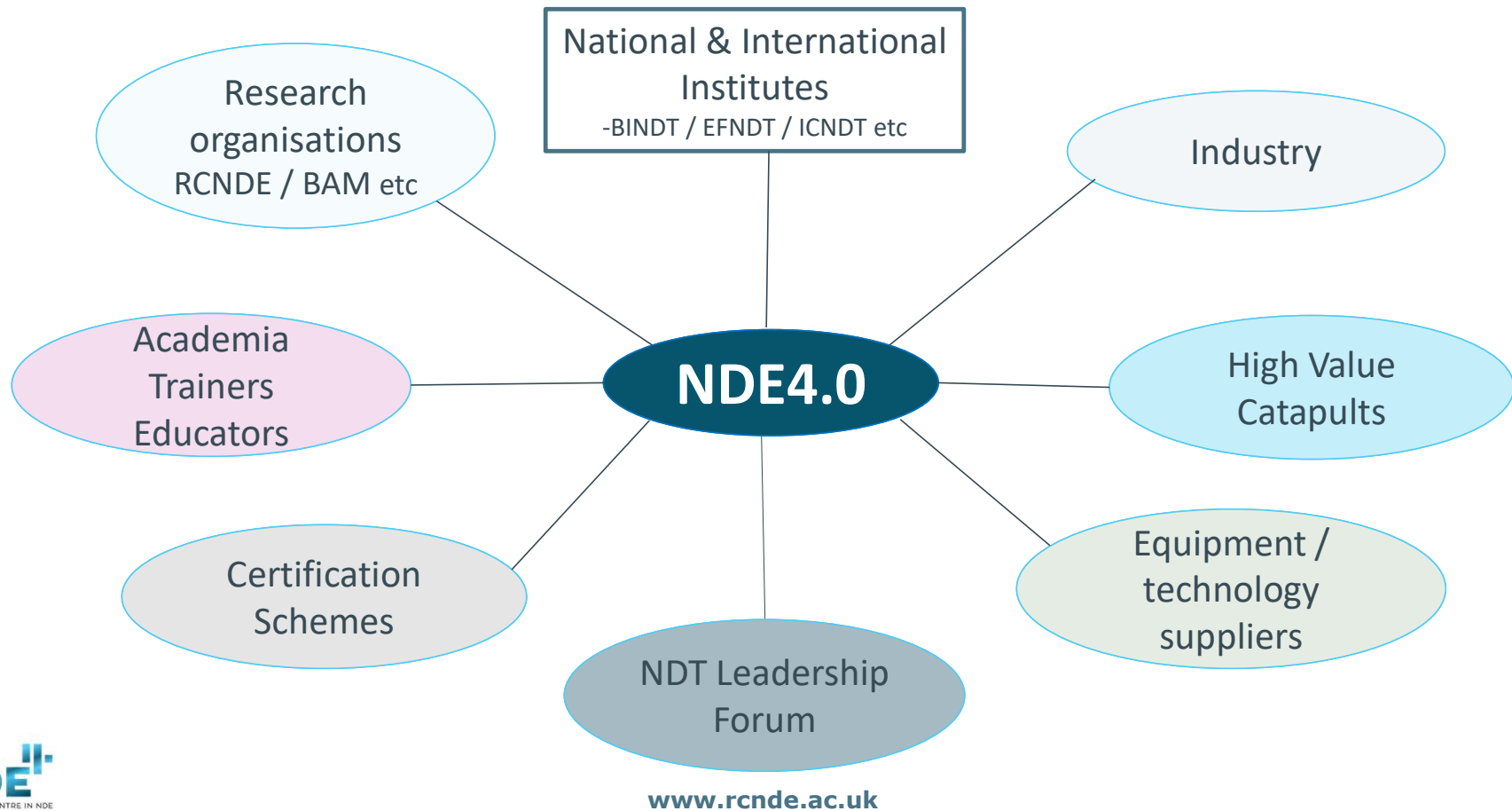


# Overview

- Stakeholders
- Requirements
- Existing schemes and activities
- Examples of proposed roles
- Big questions
- Feedback from RCNDE members
- Future Look



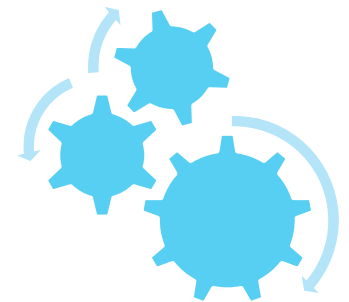
# Skills for NDE 4.0 Stakeholders



# Requirements

**Suitably skilled personnel to research, develop, integrate and maintain and use NDE 4.0 technologies**

- Certification schemes with qualifications such as L1-3
  - › Recognition of existing qualifications - gap analysis to NDE 4.0
- ‘Training’ schemes - Qualifications – Degrees / PhD / EngD
- Ability to respond to skills gap as technology develops
- Ability to respond in the face of new demands.
- Ability to assess and demonstrate relevant skills and competence



***Note: For NDE 4.0 - not all roles will require specific NDT knowledge***

# Existing schemes and activities

- Centre for Doctoral Training - Quantitative NDE & Future Innovation in NDE (FIND)
- Degrees - including University of Northampton
- Certifications schemes - PCN / ASNT etc
- Organisations - Catapults / Industry
- RCNDE Research, Development and Tech Transfer activities
- EFNDT & EWF European NDE Evaluation Engineer
- ASNT NDT Engineer
- NDT Leadership Forum
- NDT Integrity Engineering in UK academia
- National Metrology Skills Alliance
- DGZfP group (Marija Bertovic)
- Work by Bertovic / Virkkunen and Singh / Vrana.



# Proposed NDE4.0 Roles



## Definition of new roles



### System developer

Dictates strategy  
Develops the system and integrates it with other systems  
Defines performance metrics  
Responsible for reliability



### Caretaker

Oversees the functioning of the system  
Notifies failures  
Undertakes measures to repair or adapt the system  
Responsible for the day-to-day deployment and operation of the system



### Decision maker

Strategic decision maker and flexible problem solver  
Know-how to diagnose more substantial problems in the systems use or to offer further explanation of the results and their meaning  
High flexibility and adaptability to continuously changing conditions.



### User experience (UX) designer

Creates the user interface and dictates user experience  
Carried out by a multidisciplinary team (engineer, IT expert, designer, UX expert)

\*Bertovic, M., & Virkkunen, I. (2021; in review). NDE 4.0: New paradigm for the NDT Inspection Personnel. *Handbook of NDE 4.0*. Springer.

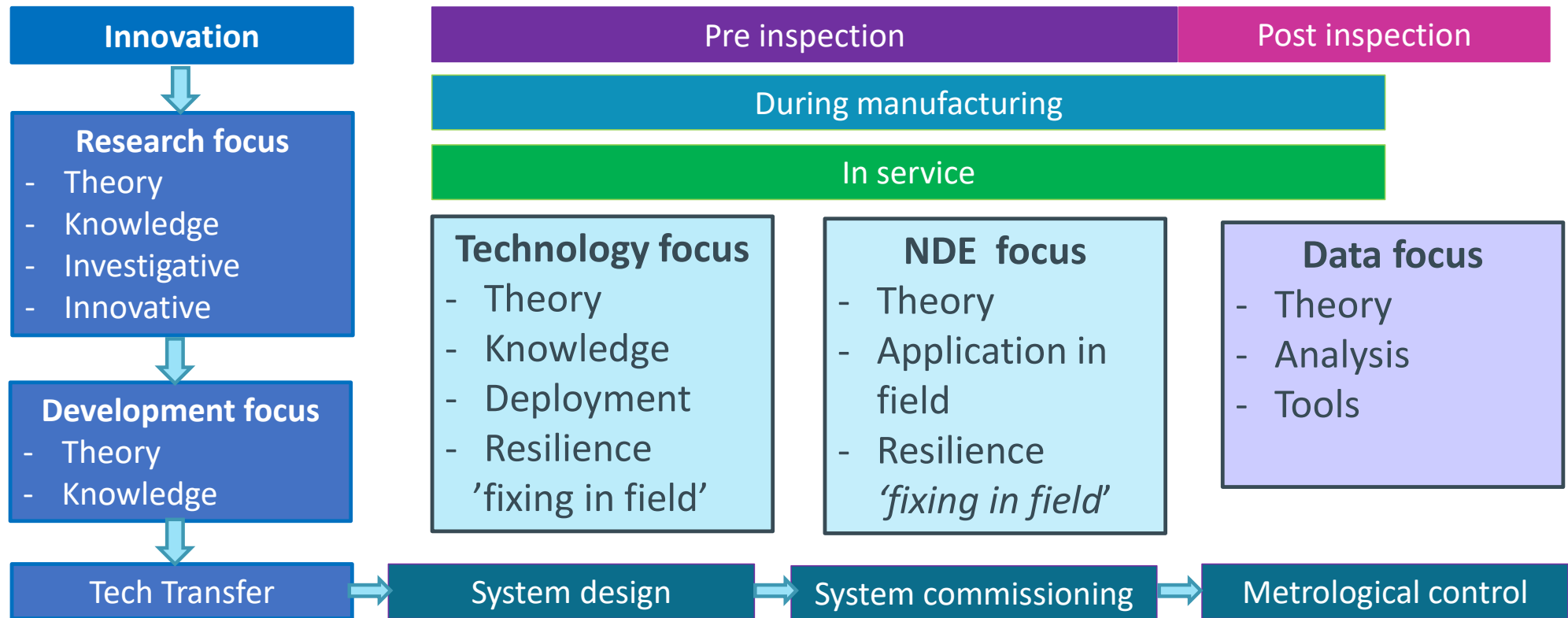
# Proposed NDE Roles (2)

- New skills:
  - › Mathematical / statistical / data science / quantum physics
  - › Interdisciplinary - across traditional engineering
  - › Psychology
- New requirements:
  - › Cross discipline working & understanding - leading to social competence
  - › Problem solving
  - › Creativity
- Domain knowledge assurance important
- Proposed Roles:

Ref: *The World of NDE4.0* Ripi Singh & Johannes Vrana



# NDE4.0 Role Requirements





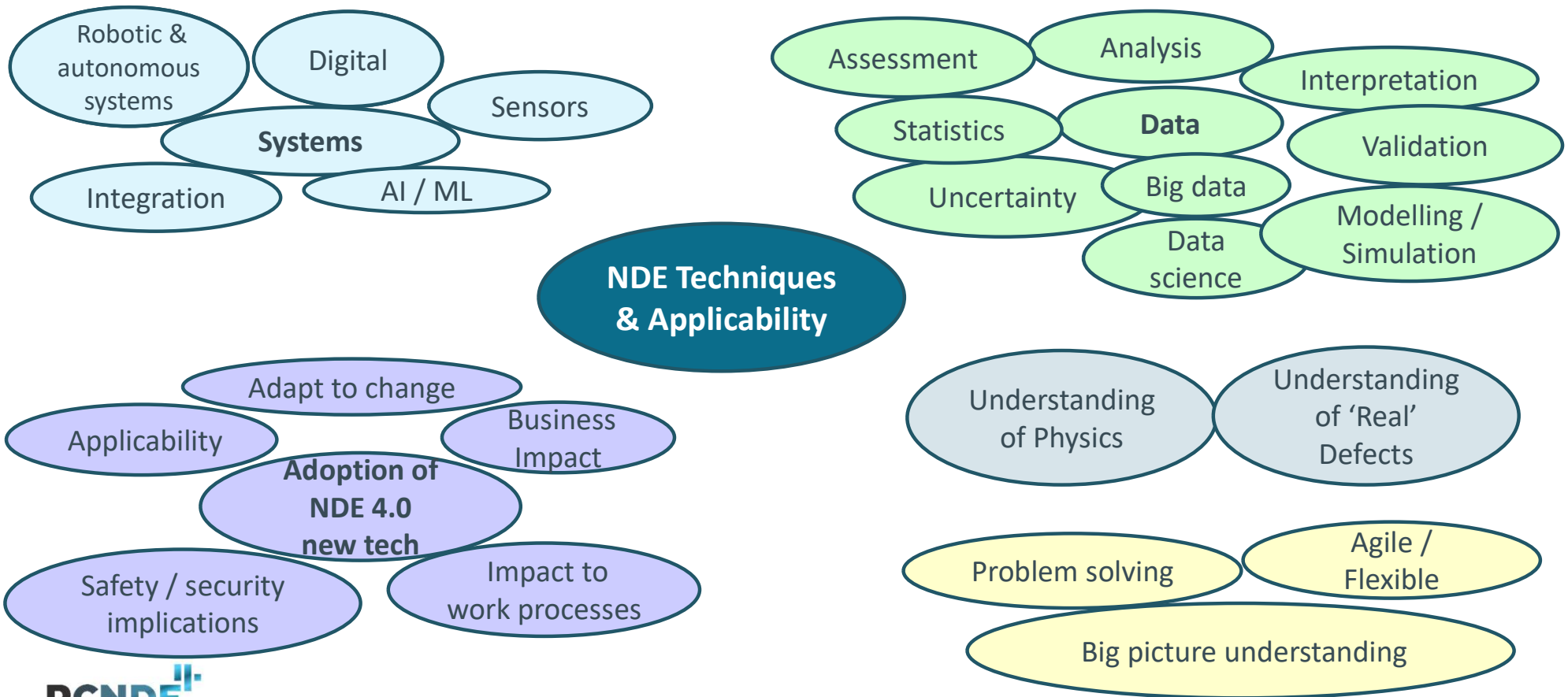
# Big questions to answer

- What skills, training and qualifications are needed for NDE 4.0?
- How will NDE4.0 skills needs be met?
- How will skills etc. be demonstrated / evidenced?
- Who will be responsible and how?



**What are our roles and how to they integrate with those of system designers and asset managers?**

# What skills are needed for NDE 4.0?



# What training and qualifications are needed for NDE 4.0?

- **Modular qualifications**

- In collaboration with multiple certification bodies.
- Split qualifications - 'one size fits no-one'.
- Updates to PCN syllabus + ASNT → NDT Level 4-5

- **Requirements**

- PhD/EngD for fundamental innovations down to understanding at technical level.
- Degree/Master level
- Apprenticeship
- Multi-discipline
- Awareness of adjacent trades & engineering.
- Focus on experience rather than training

## Specific

- Traditional NDT techniques
- Handling of data systems & safety.
- Monitoring degradation
- Sensors
- Robotics control
- Product technology.
- Limitations of modelling/valuation

**Need a flexible approach**

**Have to adapt at the same rate as  
NDE 4.0 develop**

# How will NDE 4.0 skills needs be met?

- Changes need to be driven by demand from industry
- Industry engagement
- Requirements for the 'Factory of the Future'
- Integration of work processes & closed loop processing/development
- Collaboration & feedback from other communities
- Academia/industry collaboration – joined up approach
- Through work experience
- Investment in development – funding in place
- Influence into government policy
- Greater awareness of NDT in media

## Key elements

Create environment for change

Engagement

Collaboration

Funding

Influence

**Design for  
NDE4.0**

# Future Look – Skills for NDE 4.0



## Human - NDE4.0

Human factors  
Personalisation  
Equality, Diversity, Inclusion  
Interfaces - AI Enhanced reasoning



## Technology developments & impacts

- skills gaps, loss of traditional roles



## Culture

New ways of working and communicating  
Combining with other skill-sets  
Agile / Flexible / Adaptable



Ensure we are NDE4.0 skills ‘future-ready’  
and integrated with SHM & CM



# Skills for NDE 4.0

Thank you for listening

Questions and Suggestions Welcomed

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