Automation for Scientific Use –
Strategies for transferring industrial standards, components and strategies to a scientific environment

Summary of Parallel Workshop session at DENIM 2016
21st September

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Disclaimer: These slides are supposed to be used for internal seminar series for educational purposes only!

Overview workshop

• Introduction	20 min	8:30
• 4 Topics (15 to 20 min each)	70 min	
• Coffee Break	30 min	
• 4 Topics (15 to 20 min each)	70 min	
• Wrap up and Summary	20 min	12:00

Introduction round

- Around 16 people attending
- Mixture of engineers (mech and elec) including IT.
- More than 7 institutes represented
- About half had been in industry before working in science.

Some under laying assumptions

- Automation industry is offering a huge market of commercial products to use on Neutron instruments.
- It's about to choose what components/technology to use and to understand the relationship to the industrial supplier.

- Industry has implemented dedicated workflows and procedures that typically are quite effective in their intended environment.
- They can be quite different from ours in science and we need to understand the differences and communalities to be able to choose what to transfer.

General Questions

- What are the differences between industry and science?
- What are the communalities?

- How do I do in my own daily business?

- How do I transfer industrial approaches into science?
- What explicitly I don't want to transfer?

Topics

1. Innovation
2. Standardisation
3. Technical Standards
4. Relationship to Industrial Suppliers

5. Workflow of Projects
6. Quality Control / Acceptance Tests
7. Documentation
8. Service, Maintenance

Topics

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1. Innovation ✓
2. Standardisation ✓
3. Technical Standards
4. Relationship to Industrial Suppliers ✓

5. Workflow of Projects ✓
6. Quality Control / Acceptance Tests ✓
7. Documentation
8. Service, Maintenance

Innovation

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- What is innovation for you, how you would define it?
- What is driving innovations in your facility, what’s the driver in industry?
- How do you handle innovations in your job?
- Do you have a budget for this ?
- What's Your innovation cycle (for different technologies 5, 10, 20 y) ?
- What about “old” products with a proven record?
- How do you keep yourself updated ?

Innovation

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- **Innovation in industry and science**
  - Definition of innovation can be slightly different between science and industry. Is innovation really just choosing an automation platform or is innovation solving a problem that hasn't been solved before?
  - In industry if you come up with an innovation you may get a bonus where as in Science you need to plead your case and/or beg to get the opportunity to do it.
  - Collaborative innovation from science instead of competitive innovation in Industry.
- **Forces of innovation**
  - Obsolescence is a strong force, others are safety regulations or special demanding applications.
  - Competition can enforce innovation e.g. another institution has better equipment. This often comes from a Scientist saying that they can do a better or easier experiment somewhere else.

Innovation

- **How to foster innovation culture**
  - Innovation can be cultural and/or personal
  - Can be good to have a group with two types of personalities: people who like to innovation and people who like to stick with what they know. This way you get both perspectives.
  - Sometimes engineers aren't great at selling innovation and often are accused to innovate just for the sake of innovation.
  - Engineers need people to understand long term benefits and they should promote innovation as early as possible; don't leave it until it's too late.
  - Seek allies: All the best innovation projects at ANSTO are championed by a scientist.
  - Constant or frequent reviews of standards and standard systems can help innovation.
  - R&D specific money certainly helps to drive innovation.

Industrial Supplier

- How do you handle industrial supplier ?
- How do you select a supplier (smaller, innovative companies? how long on the market? other criteria)
- How specialised are your suppliers ?
- How do you establish relationship ?
- Do you find always 3 supplier for tender ?
- Do you know relationships between suppliers (who is producing for whom)? Do you care?

Industrial Supplier

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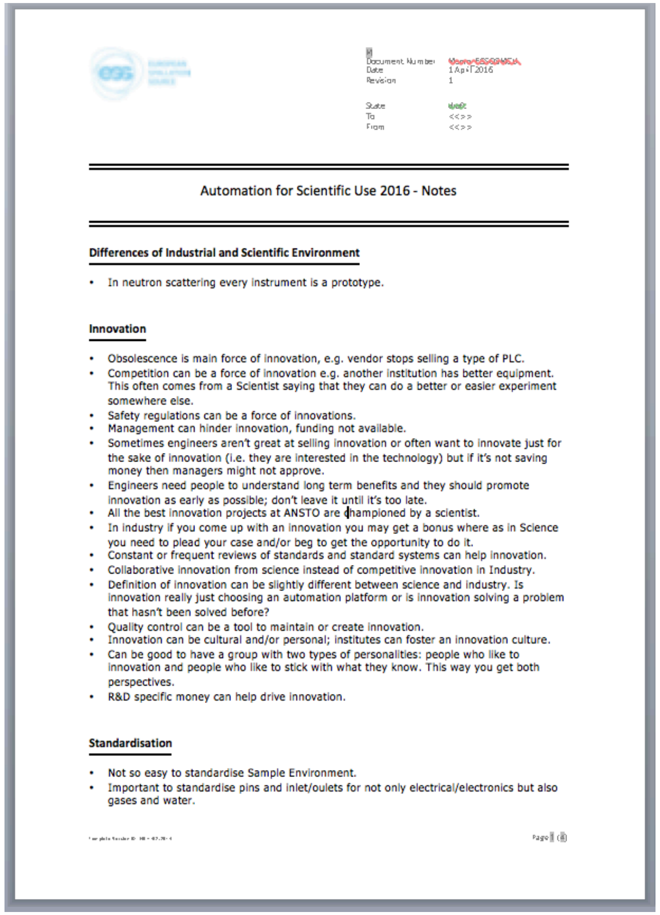
- **Choice of Supplier**
  - The more stringent your requirements the less options you have for suppliers.
  - Suppliers that want to get into science or are interested in science can be more easily engaged. They tend to be themselves smaller innovative companies.
  - Risks related to dealing with one man specialized companies exist. Can be positives and negatives: they may not be around in 20 years but they may be very dedicated to you because you're a big job.
  - Location can affect suppliers available: e.g. Oak Ridge or Grenoble would have access to more companies and/or larger/head offices where as for example Australia may be isolated.
- **Relationship to Supplier**
  - Supplier always want to know the application and requirements. Sometimes difficult to fix in scientific projects.
  - Science projects are different customers, suppliers needs time to understand.
  - Prestige or reputations of an institute can have an influence on how suppliers deal with you.
  - In most cases science is too small a customer for the automation industry to be able to demand or influence developments at the supplier.

Thank you!

- More details in the minutes of the workshop on the DENIM 2016 webpage.



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Automation for Scientific Use 2016 - Notes

Differences of Industrial and Scientific Environment

- In neutron scattering every instrument is a prototype.

Innovation

- Obsolescence is main force of innovation, e.g. vendor stops selling a type of PLC.
- Competition can be a force of innovation e.g. another institution has better equipment. This often comes from a Scientist saying that they can do a better or easier experiment somewhere else.
- Safety regulations can be a force of innovations.
- Management can hinder innovation, funding not available.
- Sometimes engineers aren't great at selling innovation or often want to innovate just for the sake of innovation (i.e. they are interested in the technology) but if it's not saving money then managers might not approve.
- Engineers need people to understand long term benefits and they should promote innovation as early as possible; don't leave it until it's too late.
- All the best innovation projects at ANSTO are championed by a scientist.
- In industry if you come up with an innovation you may get a bonus where as in Science you need to plead your case and/or beg to get the opportunity to do it.
- Constant or frequent reviews of standards and standard systems can help innovation.
- Collaborative innovation from science instead of competitive innovation in Industry.
- Definition of innovation can be slightly different between science and industry. Is innovation really just choosing an automation platform or is innovation solving a problem that hasn't been solved before?
- Quality control can be a tool to maintain or create innovation.
- Innovation can be cultural and/or personal; institutes can foster an innovation culture.
- Can be good to have a group with two types of personalities: people who like to innovation and people who like to stick with what they know. This way you get both perspectives.
- R&D specific money can help drive innovation.

Standardisation

- Not so easy to standardise Sample Environment.
- Important to standardise pins and inlet/oulets for not only electrical/electronics but also gases and water.

Industry 4.0

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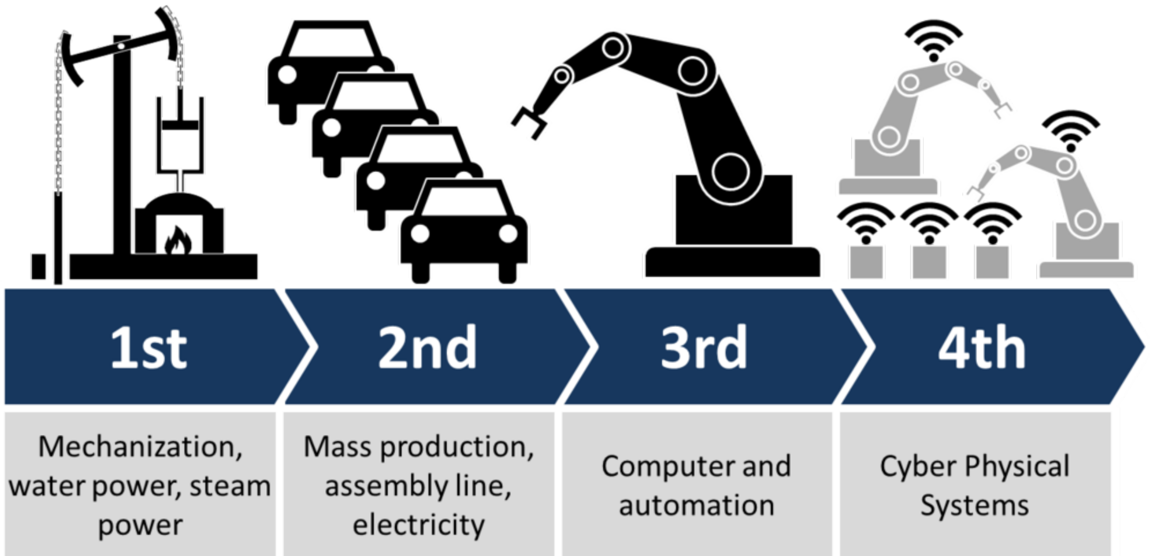
- Industry 4.0 or the fourth industrial revolution, is the current trend of automation and data exchange in manufacturing technologies. It creates what has been called a "smart factory". Within the modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions.
- It includes cyber-physical systems, the Internet of things and cloud computing (https://en.wikipedia.org/wiki/Industry_4.0)



Industry 4.0 – Design Principles

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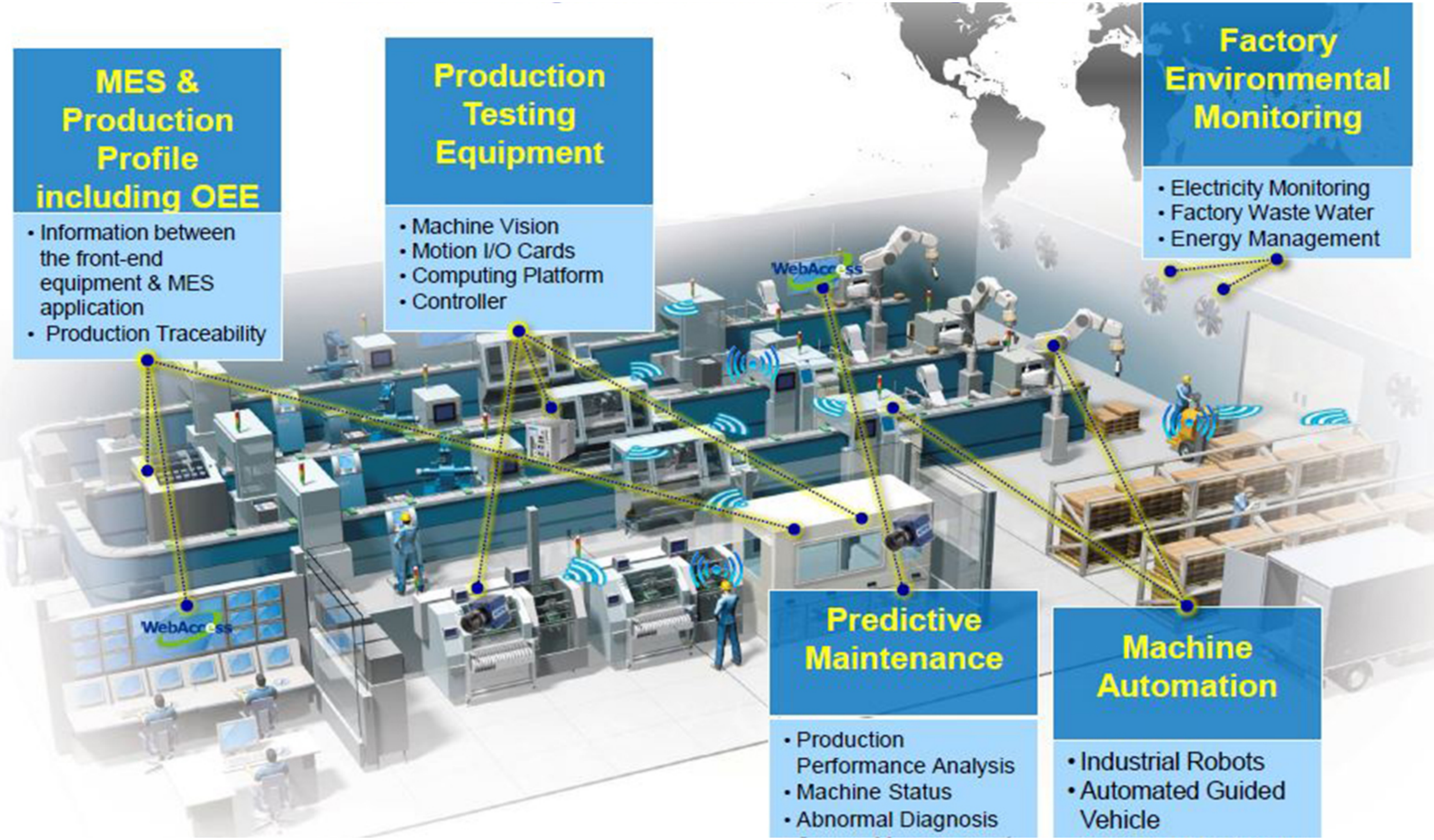
- **Interoperability**: The ability of machines, devices, sensors, and people to connect and communicate with each other via the Internet of Things (IoT) or the Internet of People (IoP).
- **Information transparency**: The ability of information systems to create a virtual copy of the physical world by enriching digital plant models with sensor data. This requires the aggregation of raw sensor data to higher-value context information.
- **Technical assistance**: First, the ability of assistance systems to support humans by aggregating and visualizing information comprehensibly for making informed decisions and solving urgent problems on short notice. Second, the ability of cyber physical systems to physically support humans by conducting a range of tasks that are unpleasant, too exhausting, or unsafe for their human co-workers.
- **Decentralized decisions**: The ability of cyber physical systems to make decisions on their own and to perform their tasks as autonomous as possible. Only in case of exceptions, interferences, or conflicting goals, tasks are delegated to a higher level.

5 big Domains @ Industry 4.0



The 6Cs in Big Data Analytics @ Industry 4.0

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Big Data Analytics consists of 6Cs in the integrated Industry 4.0 and Cyber Physical Systems environment

1. Connection (sensor and networks)
2. Cloud (computing and data on demand)
3. Cyber (model & memory)
4. Content/context (meaning and correlation)
5. Community (sharing & collaboration)
6. Customization (personalization and value)