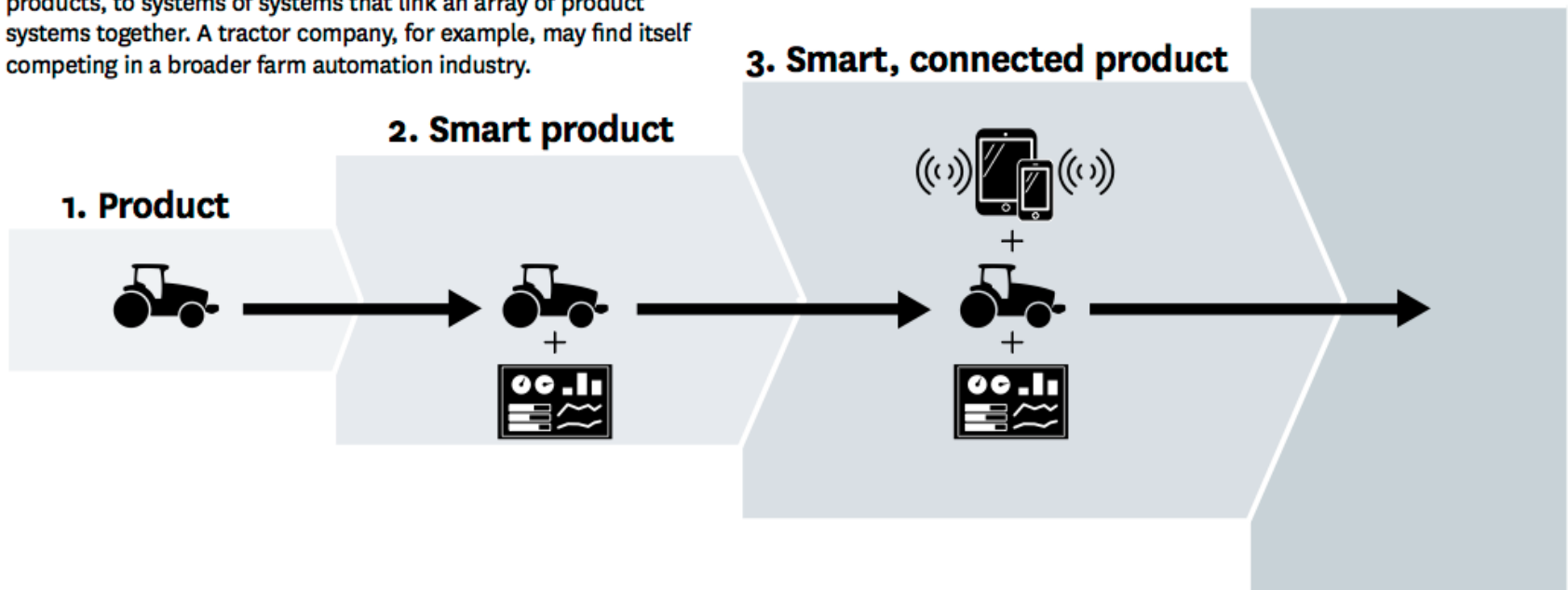


How to prepare the people to support Industry 4.0 implementation?

Petri Kuosmanen and Martti Mäntylä

Industrial Internet: From products ...

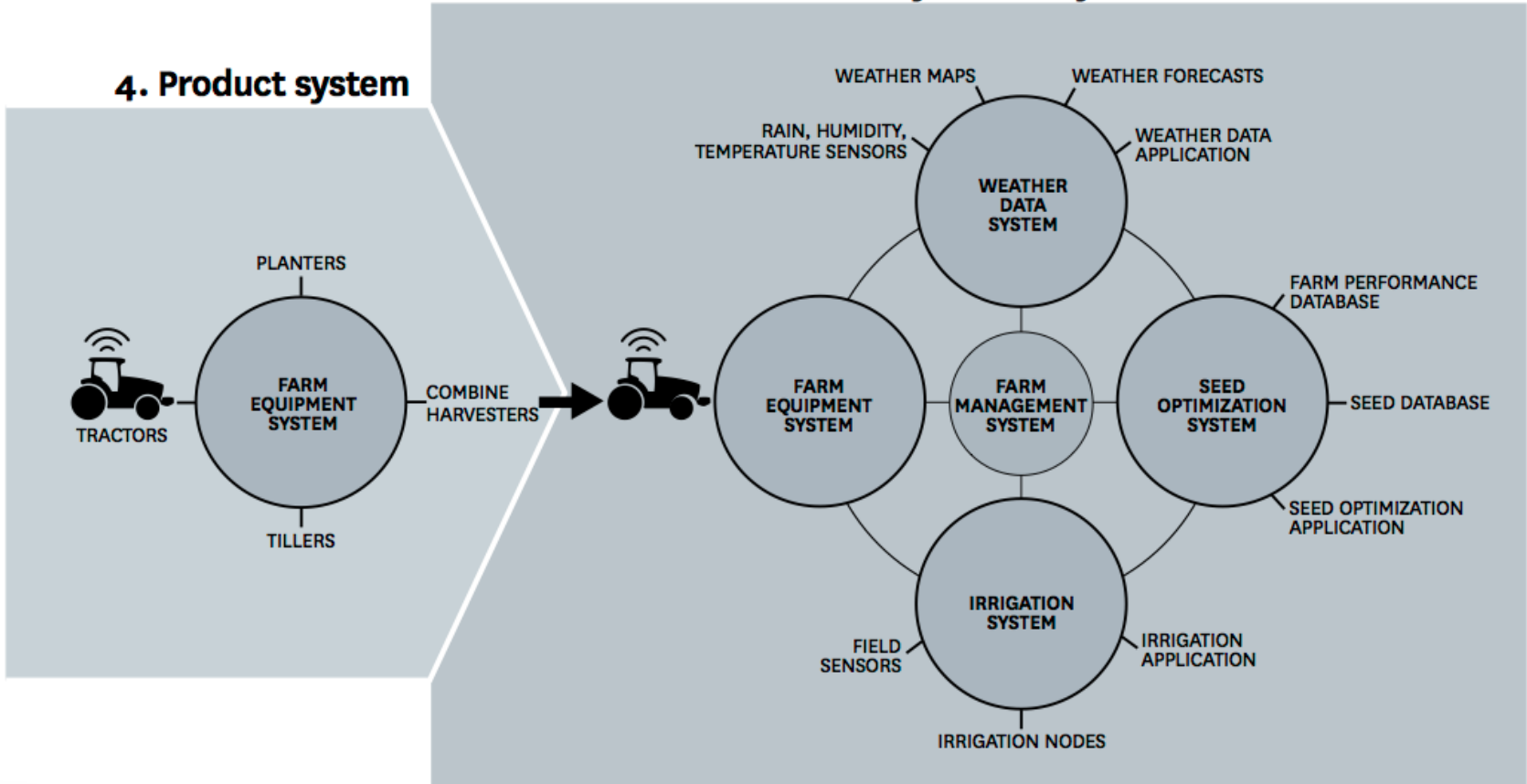
The increasing capabilities of smart, connected products not only reshape competition within industries but expand industry boundaries. This occurs as the basis of competition shifts from discrete products, to product systems consisting of closely related products, to systems of systems that link an array of product systems together. A tractor company, for example, may find itself competing in a broader farm automation industry.



Porter & Heppelmann

... to systems of systems

5. System of systems



Porter & Heppelmann

Traditional Massey Ferguson Tractor



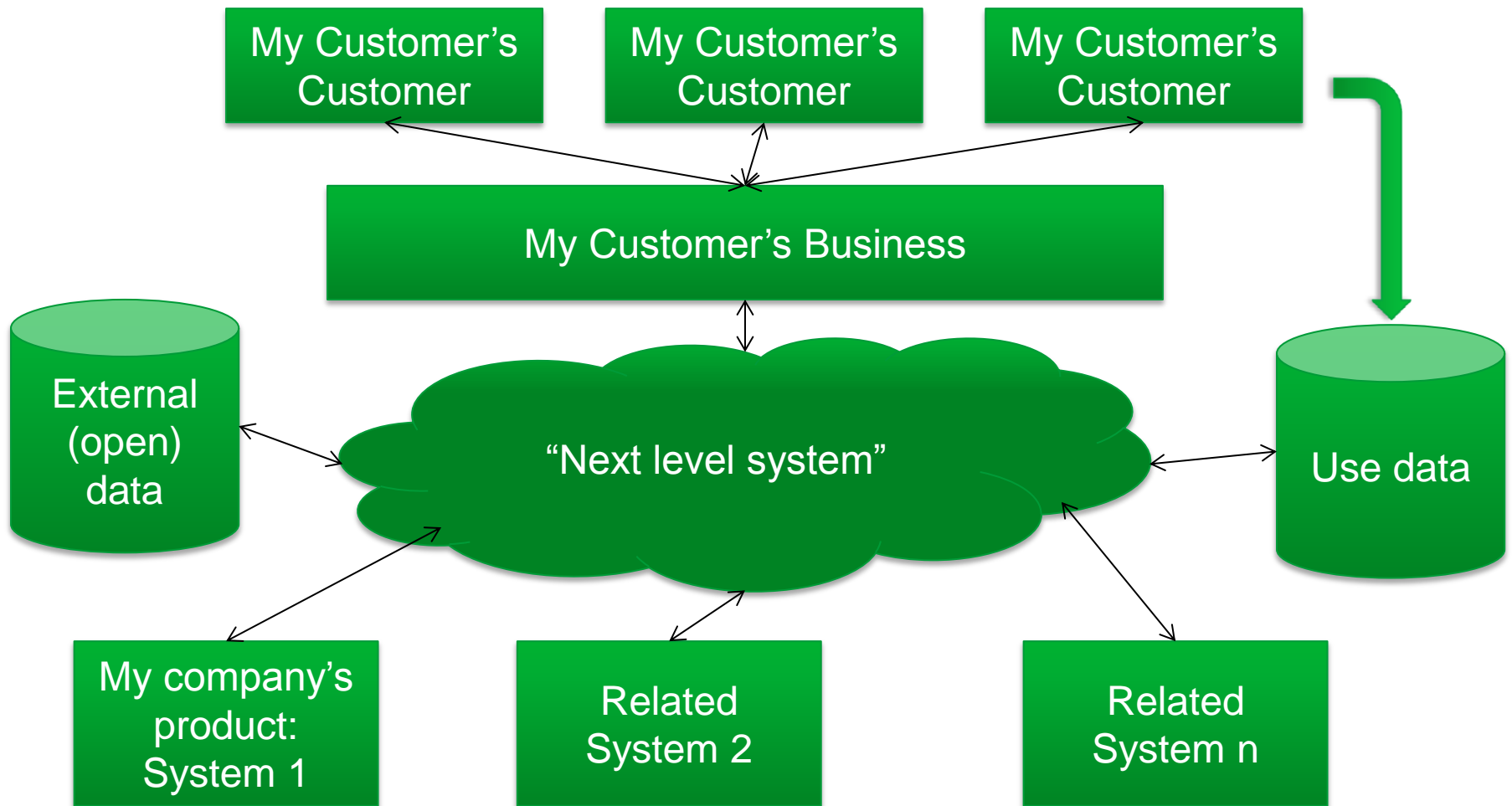
Modern Valtra N-series tractor



Valtra cabin with topcon, gps and satellite steering

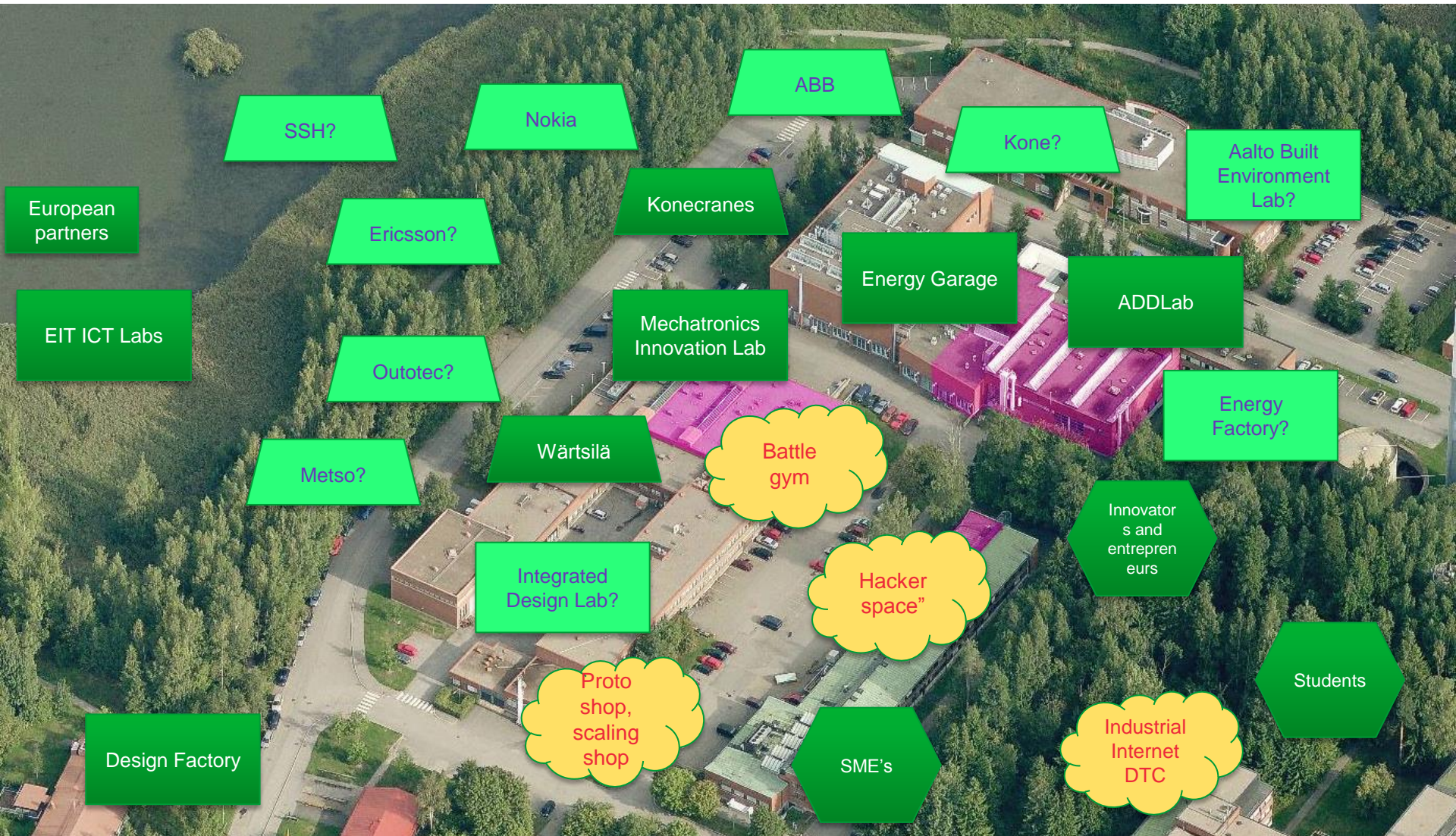


System of Systems



How university and society should react to challenges of Industrial Internet?

Aalto Industrial Internet Campus – ecosystem for research based teaching



Overall Ambition

- **World-class platform for research, education and innovation activities in digital design and production based on close encounters of manufacturing and ICT industries**
- Suberb physical and digital infrastructure
 - Physical: Lab spaces, working spaces for students, innovators & companies, networking facilities, ...
 - Digital: Fixed and wireless networks (LTE/4G, 5G, ...), ubiquitous outdoor and indoor positioning, ubiquitous sensors for tracking activities, cloud services, data analysis services, ...
- Open to students, researchers, and innovators inside and outside Aalto
- Landing and growing space for industry, SME's and start-ups
- Linked to relevant international networks (e.g., EIT ICT Labs))

Offer to Large Companies

- Space for short and long term residents from industry
- Opportunity to get involved with full scale of research, education, and innovation activities in the area
- Access to talent (project courses, diploma workers, DTC doctoral students)
- Learning from innovative use cases / business cases exposed by experiments and student projects
- Manufacturing Industry
 - E.g., Konecranes, Wärtsilä, Valmet, Kone, Outotec, ...
 - Opportunity to contribute to the physical platform by installing their products for experiments and innovative development
- ICT Industry
 - E.g., Nokia, Ericsson, ...
 - Opportunity to contribute to the digital platform by installing their offerings and providing open access to the technology interfaces

Offer to SME's and Startups

- Space for short and long term residents from industry
- Opportunity to get involved with full scale of research, education, and innovation activities in the area
- Opportunity to integrate their specific offerings in the larger platform for experiments and innovations
- Opportunity to network with large companies and learn potential business opportunities exposed by experiments and student projects
- Access to talent (project courses, diploma workers, DTC doctoral students)
- Through EIT ICT Labs and European project access to European innovation platforms

Existing Aalto Facilities

- Design Factory <http://www.aaltodesignfactory.fi/> : A highlight of Aalto, could be moved closer to the core in medium future to fully benefit of its services
- ADDLab <http://addlab.aalto.fi/> : Expanding and developing its services to Aalto
- Mechatronics Innovation Lab <http://mechatronics.aalto.fi/en/circus/> : Homeground for the mechatronics project course, can expand its scope to provide opportunities also for Computer Science and Production Engineering students, could make use of NetLeap
- Energy Garage <http://energyscience.aalto.fi/en/garage/> : Just opened and developing its services
- Open Innovation House: Home to EIT ICT Labs and Nokia Technology – can benefit of a further link to the campus
- NetLeap test 4G/LTE network from Nokia – offers capability for experiments needing dedicated network capacity

Industrial Internet education

- Industrial Internet is not a discipline – it is a “horizontal” approach of addressing the wide-scale digitalization of industry and its stakeholders
- Therefore, it should be blended in discipline-based engineering education to augment students’ disciplinary competences and make them proficient applicers of its concepts and technologies
 - Aalto level M.Sc. minor topic
 - But also presence in B.Sc. studies embedded in relevant contexts

Doctoral Education: Industrial Internet Doctoral Training Centre

- Careful selection of students combining relevance and rigor;
- Physical (part-time) co-location of students;
- Strong liaison with industry expressed in a signed MOU;
- Strong mentoring from a secondary supervisor from industry;
- Access to industrial problems, data, and experimental conditions;
- Industrial internships for students from academia and academic internships for students from industry;
- DTC-wide activities: special courses, Summer School
- Co-operation with other schools
- **Key outcome: doctors attractive to industry!**

Professional Diploma in Industrial Internet

- Professional education initiative for mid-level managers and experts in industry
- Launch September, 2015
- Duration 1,5 years

The screenshot shows the Aalto University website for the 'Teollinen internet: Internet of Things (IoT) -koulutus' program. The page features a navigation bar with 'ETUSIVU', 'KOULUTUKSET', 'TYÖVOIMAKOULUTUS', 'ASIAKASKOHTAISET RATKAISUT', and 'VAIKUTUKSEMME'. The main header includes the APRO logo and 'Aalto University Professional Development'. A large banner image shows a soccer ball with the text 'TEOLLINEN INTERNET KASVUN JA TEHOKKUUDEN LÄHTEENÄ'. Below the banner, there is a section for 'HAE KOULUTUKSIA' and 'KOULUTUSKOKONAISUUDET'. The main content area is titled 'TEOLLINEN INTERNET (IOT) -KOULUTUSOHJELMA' with dates '17.09.2015 - 09.12.2016'. It includes social media icons for Twitter, Facebook, and LinkedIn, and a 'Lisää tietoa +' button. The text describes the program's goal: 'Miten verkkoon kytketyt tuotteet ja palvelut luovat yrityksellesi uutta kasvua sekä kilpailukykyä?'. It also lists 'Koulutuksen hyödyt' (Benefits of the education):

- Saat ymmärryksen teollisesta internetistä ja sen tuomien mahdollisuuksien hyödyntämisestä.
- Ymmärrät tuottavuuden tehostamisen mahdollisuudet teollisen internetin avulla.

A 'TIEDOT PÄHKINÄNKUORESSA' (Key facts) box provides:

- Aika:** 17.09.2015 - 09.12.2016 (23 pv)
- Hinta:** 19 600 € + alv. Nopean toimijan etu -10 % (17 640 € + alv.) 15.4.2015 mennessä ilmoittautuneille.
- Linkki:** www.aalto.fi/iot

Buttons for 'Pyydä lisätietoa' and 'Ilmoittaudu' are present. On the right side, there are two call-to-action boxes: 'OTA YHTEYTTÄ' (Contact) featuring Anita Vastamäki, Business Area Director, and 'MITÄ SEURAAVAKSI?' (What next?) with a button 'Ilmoittaudu koulutukseen'. A small pop-up window asks 'Kiinnostaako teollinen internet?' (Are you interested in industrial internet?) with a 'LÄHETA' button.

Prime minister's office

Study: Turning Finland into the Silicon Valley of the industrial internet

Do we see the industrial internet as a job killer, or job creator?

The industrial internet is an opportunity to increase Finnish well-being and productivity and to make Finland an attractive target for investment. The working group estimates that if successful, business activities of the industrial internet would bring € 12 billion in investments and 48,000 jobs by 2023.

TEKES – the Finnish Funding Agency for Innovation

Industrial Internet – Business Revolution 2014–2019

The programme aims to renew the business operations of companies through the Industrial Internet and encourage companies from different fields to engage in new kinds of cooperation.

The total budget for the five-year programme is appr. EUR 100 million, of which Tekes funds appr. EUR 50 million.

Academy of Finland

Disruptive Technologies and Changing Institutions

The strategic research programme Disruptive Technologies and Changing Institutions provides funding to research into the identification and utilisation of disruptive technologies. The research consortia are expected to address the following questions:

- In the case of a concrete disruptive technology, how is it manifested in Finland and what are its potential benefits?
- In order to make the best possible use of that particular disruptive technology, what changes are required in human activity, institutions and operational methods?
- In what ways can the public sector best support a well-managed transition and thus create the best possible conditions for Finland to utilise disruptive technologies?

Ministry of education - CODE 2016

- 2016 programming will be part of mathematics teaching in elementary schools
- Teachers of mathematics will be in a key roll to improve ICT skills of students in elementary schools

HEUREKA - the finnish science centre



Going underground exhibition in heureka

Intelligent city exhibition in heureka



How to prepare the people to support Industry 4.0 implementation?

Answer:

- Give people practical examples, motivate and encourage to have fun!
- Organize systematic teaching process from elementary school to doctoral and professional education
- Have respect for those who have challenge to adapt to changing environment – there is a risk to loose "quiet knowledge"