Digital transformation of Europe’s forest-based sector: challenges and opportunities for the sustainable bioeconomy

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Mistra Digital Forest Conference ◦ Stockholm, 4 Dec 2019
Intro

Scope and purpose
Main challenges and opportunities
Digital transformation: a game changer for industry

Key principles

- Smart Factory
- Disruptive digital tech
- Automation, assistance
- System integration
- Transparency
- Decentralised decisions
- Customisation
Main challenges and opportunities

Challenges
• Forests are diverse and dynamic ecosystems
• Millions of forest owners
• Forest-based industries: complex cluster of value chains
• Underdeveloped, intransparent wood markets

Opportunities
• **Exploitation of ITC** can lead to ground-breaking novel solutions and solve major barriers and typical bottlenecks in the sector
• **Connecting forests with industry** in smart value chains, i.e. from standing trees up to end products, to implement SFM and enhance valorisation of wood on a much larger scale

Brus et al. 2011
Main challenges and opportunities

Main infrastructure needs and fields of interest for R&I

• Sensors, big data, advanced measurement
• Communication infrastructures, data hubs, de-centralised architectures
• Data exchange standards
• Data access, data transparency, data security
• Connectivity in forest
• Automation, AI
• Smart factory
• Additive manufacturing, advanced materials
• Value chain optimisation, incl. traceability and LCA
• Digital skills, digital literacy, education
Scope and purpose
Digital transformation of the forest-based sector

Objective

➢ Overview of the state of digitalisation and automation in the forest-based sector
➢ Main trends and R&I priorities in concerned industries
➢ Recommendations for R&I programmes

Methodology

• Desktop study 1 March – Sept 2019, co-financed by CASA project
• Support from a group of 25 experts (questionnaires)
• Review of past and ongoing R&I initiatives
Forests and forestry

Innovations & priorities
Forests and forestry
Forest inventory and ecosystem monitoring

R&I priorities

• High resolution forest assessment
• Risk analysis and disaster response systems
• Wood identification and measurement
• Biodiversity modelling and monitoring
Forests and forestry
Forest management, harvesting, wood supply

R&I priorities

- Information systems for forest managers
- Precision forestry, climate-smart forestry
- Advanced mechanisation and automation of harvesting systems
- Optimised timber transport and logistics
- Safety and smart assistance for human workers
Forests and forestry
Support for private forest owners

R&I priorities

- Information tools, awareness campaigns
- Centralised platforms for management support and timber marketing
- New customer centred services

Metsaverkko.fi
Arbonaut.com
Maforet2012
laforetbouge.fr
Södra
Forest-based industries

Innovations & priorities
Forest-based industries
Sawmill industry

R&I priorities

• Enhanced scanning, grading and sorting
• Automation, customisation
• Smart factory, operational optimisation
Forest-based industries
Building with wood

R&I priorities

- Building Information Modelling (BIM)
- Computational design of complex structures
- Robotics in prefabrication
- 3D printing with biobased materials
- Smart control, predictive maintenance
- LCA of environmental impacts
- Collaboration platforms, traceability
Forest-based industries
Building with wood

R&I priorities

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Forest-based industries
Building with wood

R&I priorities

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• Collaboration platforms, traceability
Forest-based industries
Furniture industry

R&I priorities

• Flexible production, automation
• Advanced business and collaboration models
• Customisation, customer design
• Intelligent products (sensors, surfaces, new functionalities)
• Additive manufacturing
• Eco-design, circular products
• Healthy living, interior design
Forest-based industries
Pulp and paper industry

R&I priorities

• Engineering, digital twins
• Computational upscaling, complex chemistry modelling
• Process automation
• Remote live control, predictive maintenance
• Smart products
• Biorefinery
Conclusions

Main findings & key messages
Conclusions

Key messages (1)

➢ Digital transformation is a major opportunity to solve the barriers and bottlenecks, to enhance transparency and to develop fair, competitive collaboration models among value chain actors.

• **Adaptation of forests** to climate change needs big data-driven, intelligent monitoring and SFM systems.

• Forest owners and forest managers can largely benefit from digitalisation.

• **Integrating complex value chains** through digital innovation can strengthen Europe’s competitive advantages.

• Better **market transparency** can unlock underused forest resources and help optimise climate friendly value chains.
Conclusions

Key messages (2)

➢ Forest-based sector represents a major part of the bioeconomy and is already today a main contributor to climate protection.
  • Now it’s time to put our mark on the Circular Economy!
  • Need for more proof-of-concepts, pilots, demos, innovations
  • Upscaling, market uptake
Conclusions

Key messages (3)

➢ EU policies put digitalisation with high priority on the agenda.
  • Multiple national strategies and programmes support digitalisation
  • Some examples of **FBS digital strategies and programmes** identified
  • Large differences of progress between EU countries

➢ Need for a major technology push in the FBS facilitated by digital.
  • **R&I actors** need to embrace the digital transformation
  • **Stronger priority** in research agendas and programmes required
  • New qualifications, specialised skills
Conclusions

Key messages (4)

➢ Human capital: Digital change leads to a mismatch with available competencies. Digital literacy will be critical.

• **Educational system** requires progressive reform and innovation (PwC Curriculum Guidelines 4.0, forthcoming):
  • Life-long learning, ‘Big picture’ education, personalized teaching
  • University-industry collaboration, learning ecosystems
  • Students as ‘change agents’
  • Human-machine collaboration
  • Problem-based learning, technology-enabled learning

• **New safety and health risks**
  • Risk of unlimited flexibility, precarious work models
  • Digital divide: urban vs. rural
Conclusions, in a nutshell

Key priorities for R&I to foster the digital transformation

1. Joint research infrastructures, data hubs, collaboration platforms
2. (Open) data access, transparency and security
3. Knowledge-based solutions
4. Sensors, intelligent machinery, automation, assistance
5. Smart factory, value chain optimisation
6. Co-creation, living labs, joint testbeds with/for industry
7. Coordinated European R&I agendas for the FBS
8. Skills, education
Closing words

The future?

“Digital disruption in manufacturing: a long fuse, but a big bang.”
Deloitte report 2014

« If you want to go fast, go alone. If you want to go far, go together. »

African proverb
Thank you for your attention!

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