How Industry4.0 actors could help the Formulation industry?

Enabling Innovation Formulation
The Aceform4.0 strategic Research Agenda for digital technologies

Aceform4.0 Webinar
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• How Industry4.0 actors could help the Formulation Industry?

• 3 aspects

Formulated Product

- Home & Personal care
- Pharma
- Agro
- Coatings
- Food
- Advanced materials

No specific calls or guidelines from EU
AceForm4.0 Project

Formulated Product
- Home & Personal care
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Connect
Consult
Common Vision

www.formulation-network.eu
Aceform4.0 Project

Objective 1: Establish a European Formulation Interest Group

Objective 2: Identified Common Scientific and Industrial Challenges

Objective 3: Establish a Common Vision, Roadmap for 2025 and Associated Implementation Plan

Objective 4: Through Knowledge Exchange Activities Facilitate Creation of New Cross-Sector Value Chains Initiatives

Objective 5: Establish a Business Plan for Continuity
Presentation of Aceform4.0

Objective 1: Establish a European Formulation Interest Group
- 150+ members (Target: 500)

Objective 2: Identified Common Scientific and Industrial Challenges
- 24 Interviews
- 106 surveys

Objective 3: Establish a Common Vision, Roadmap for 2025 and Associated Implementation Plan
- Reports Validation phase
- Analysis of 5 SRAs

Objective 4: Through Knowledge Exchange Activities, Facilitate Creation of New Cross-Sector Value Chains Initiatives
- 7 Workshops
- 3 Webinars
- Newsletter Web portal

Objective 5: Establish a Business Plan for Continuity
- Circular Value chain mapping structure
- Collab supports x 10

Report

Web portal

Newsletter

Reports Validation phase

Analysis of 5 SRAs

Open / survey
Industry 4.0

How Industry 4.0 actors could help the Formulation industry?

Connect  Consult  Common Vision
Industry 4.0 is the integration of various digitalisation technologies (existing and emerging) to enable advanced capabilities to **Connect, Model** and **Automate** design, manufacturing and supply chains systems.

=> delivering products, processes and services **faster**, **more efficiently** and **more flexibly**.
Industry 4.0

How Industry 4.0 actors could help the Formulation industry?

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Industry4.0: Connect

• Creation of the EU-FIG
  • 150+ members (up to 500)
  • Covering all formulation sectors
  • Circular Economy actors
  • Industry4.0 actors
    • Interested in collaboration with Formulation
    • AI /Automation/Modelling/Big data/3D printing

• Website to host the community: http://formulation-network.eu
  • Register to EU-FIG
  • Project outputs (SRA, Roadmap, Value Chain Maps, Survey results)
  • Announcement of Formulation events related to CE and I4.0
  • Matchmaking tool
Industry 4.0

How Industry 4.0 actors could help the Formulation industry?
Industry 4.0: Consult

- Interviews and surveys
- Questions
  - Challenges
  - Needs for innovation
  - Business drivers
- Innovation aspects
  - General
  - Circular Economy
  - Industry 4.0

Through the consultation it was possible to gain insight into the challenges and needs of formulation industries targeting a wide range of market sectors.
Industry4.0: Consult

- Interviews and surveys
- Questions
  - Challenges
  - Needs for innovation
  - Business drivers
- Innovation aspects
  - General
  - Circular Economy
  - Industry4.0

Other common areas in need for innovation included process control, plant automation and production scale up.
Industry 4.0: Consult

- Industry 4.0 questions

31. Are you familiar with the term "Industry 4.0" within your organization?

- 39% Yes
- 41% No
- 20% Do not know
- 0% No Answer
32. In which of the following areas, has your company implemented/is considering implementing the use of smart (interconnected) devices encompassed by Industry 4.0?

- Supply chain management and integration
- Accelerating new product development
- Developing new, in-stream analytical and control processes
- Improving accuracy of analytical and control processes
- Sensor work across manufacturing plants and/or supply chain for gathering operational data and analytics
- Health and safety
- Robotic/Factory automation
- Prototyping Equipment
- Test and Inspection
- Communication (Optical, wireless, RFID)
- Reducing or eliminating pollution
- Product Distribution
- Product utilisation by end-users
- Others/Please specify
- Do not know
- No Answer

- Industry4.0 questions
Industry 4.0: Consult

- **Industry 4.0 questions**

  **Why do you want implement I4.0 technologies?**
  - Reducing time to market (18%),
  - Increasing automation of existing manufacturing/quality control processes (10%) 
  - Flexibility of the production process (10%).

Fast  Reliable  Flexible
Industry4.0: Consult

- Industry4.0 consultation outputs:
  - Beginning of the implementation
  - Possible from R&D to End-user
  - Place for:
    - Automation
    - AI/Modelling
    - Sensors
    - 3D-printing
    - ...

31. Are you familiar with the term "Industry 4.0" within your organization?
- Yes: 39%
- No: 41%
- Do not know: 20%
- No Answer: 0%

32. In which of the following areas, has your company implemented/s considering implementing the use of smart (interconnected) devices encompassed by Industry 4.0?
- Supply chain management and integration
- Accelerating new product development
- Developing new, to include analytical and control processes
- Improving accuracy of analytical and control processes
- Service work across manufacturing plants and/or supply chain by gathering operational data and analysis
- Health and safety
- Mobile/Field service
- Procurement/Supplier
- Test and inspection
- Communication (Optical, wireless, IoT)
- No backlog or interrupting production
- Product serialization
- Product identification by serial number
- Other/Please specify
- Do not know
- No Answer
Industry 4.0

How Industry 4.0 actors could help the Formulation industry?

Connect  Consult  Common Vision
Industry4.0: Common Vision

• Provide to Europe a common vision to facilitate and encourage the implementation of Industry4.0 technology in the formulation Industry:

Europe will lead the global path in **the innovation** and commercialisation of new sustainable formulated products that **deliver radical effects and high-performance** to downstream industries, end-users and consumers whilst **optimising resource** and energy efficiency and minimising adverse impacts on biodiversity and the environment.
Industry 4.0: Common Vision

• Value Chain & Cycle Collaboration
  • **Finding new Partners** – beyond ‘business as usual’ networks
  • **Modelling Value Chains and (Re)-Cycles** – Increase collaboration, IP

• Industry 4.0 – The toolkit for Future Formulation
  • **Understanding what it is and the Implications**
  • **An enabler for Radical Product and Process Design**
  • **Universal Industrial Challenges** - Integration, Data Sharing and Digital skills gap
  • **Formulation Specific Technical Challenges**
  • **Knowing where to start?** – Digital Formulation Capability Benchmarking and Roadmapping
Industry 4.0: Common Vision

- Actions list to Europe to:

  - Inform
  - Connect
  - Access
  - Fund
AceForm consultation highlights a generally poor understanding of Industry 4.0 across Formulating Industries.

- Elements are being applied in silos; so missing the bigger picture opportunities.
- **Action 8 – Improve awareness of resources and networks that promote the value of Industry 4.0 (Inform, Connect)**

- Importance of case studies:
  - Smart Farm Digital
  - Preventative Healthcare
  - Tailored Engine Oil
  - Fruit sorting (Yazzoom.be)
Industry 4.0 can unlock a more collaborative, dynamic approach to product and process design

- **Breaking barriers** between lab, factory and field
- Enabling new Value Chains/Cycles and Circular Economy **collaborative opportunities**
- i4.0 enables **step-change learning from data** (modelled, experimental, in-use) across many locations, companies, environments and points in time
- i4.0 enables **flexibility to adapt design and production protocols** to evolving technical and market learnings.

- **Action 9** – Influence CR&D calls to prioritise deployment of i4.0 technologies for radical Product and Process Design (Fund)
- **Action 10** - Influence wider Industry4.0/digitalisation calls; maximising relevance to formulating industries (Fund)
Industry 4.0: Common Vision, Challenges

Universal Industrial Challenges

- **Data-sharing** - A step-change is required
  - Access
  - Across sector
  - Along the value chain

- **Integration** - many digital systems, many functional business needs, many legacy capital assets

- **Digital skills** – retraining for tools of the future

Formulation Specific Technical Challenges

- **Digital Twins** - are not easily created for Formulations; performance/failure mechanisms are not well understood (rooted in subtle nano/micro phenomena; often product specific)

- **Formulations are inherently unstable**. ‘Good’ is only a point in time. As such, **stability / performance / quality assessments** over can be unreliable over short periods of time.

- **Standards** for describing formulations or structuring data don’t exist. This limits the ability to apply novel data approaches and codify knowledge

- **Target properties** - are generally difficult to reduce to a discrete measure/physical attribute; as such it will continue to be difficult to make a meaningful quality measurement. (Engage consumer/Model)

*Action 11 – Raise awareness and build on projects already seeking to resolve these issues (Inform, Connect, Access)*
Industry4.0: Common Vision, Where to start?

Aceform Roadmap, over 5-10-15 years:

Against Four themes
1. **Quantification** – all aspects of the formulation life-cycle should be reduced to numbers or numerical models.
2. **Connection** – data generated through all stages of the formulation life-cycle and captured centrally.
3. **Embed multiscale modelling** – predictive design for material/structure-property relationship models across time/length-scales
4. **Embed intelligence** – Human expertise uniformity/Artificial Intelligence

Across six stage of Formulation life-cycle
1. **Ingredients**
2. **Mixture** (often viewed at the formulation)
3. **Process** – including recovery/recycle
4. **Delivery** - Storage/transportation/device
5. **Application** e.g. wetting, delivery, heat transfer
6. **Subject** e.g. skin, leaf, engine

**Action 12** – Develop and deploy toolkit to roadmap and **benchmark digital formulation capability** (Connect, Access).

**Action 13** – Influence CR&D calls to value impact of **co-development of advanced underpinning formulation capability** (Fund, Access).

**Action 14** – Analyse capability roadmaps to identify **infrastructure gaps** to be supported through **public investment** (Fund, Access).
Industry 4.0

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EU-FIG Matchmaking tools  Survey results  Support/Comment Aceform4.0 Road map
The EU Formulation Interest Group Validating and actioning AceForm4.0 outputs

• Your benefits:
  • Receive AceForm4.0 newsletter (ca. every two months)
  • Get exclusive access to deliverables, presentations, partner search engine and further information in the restricted members area
  • Influence on future call topics in the area
  • Get access to a network of important players in the formulation
  • Connect to experts across industrial sectors in the frame of FP9, Horizon Europe
  • Opportunities in connection to initiatives along the value chains

• Register and connect here: formulation-network.eu/members