



TRANSNATIONAL ROADMAP INCLUDING ACTION PLAN FOR 11 SELECTED CE RELEVANT KNOWLEDGE AXES

D.T1.5.1 PP3 CAM

Version 1
11 | 2017

REPORT – Executive Summary

DT1.5.1 Transnational roadmap including action plan for 11 selected CE relevant knowledge axes

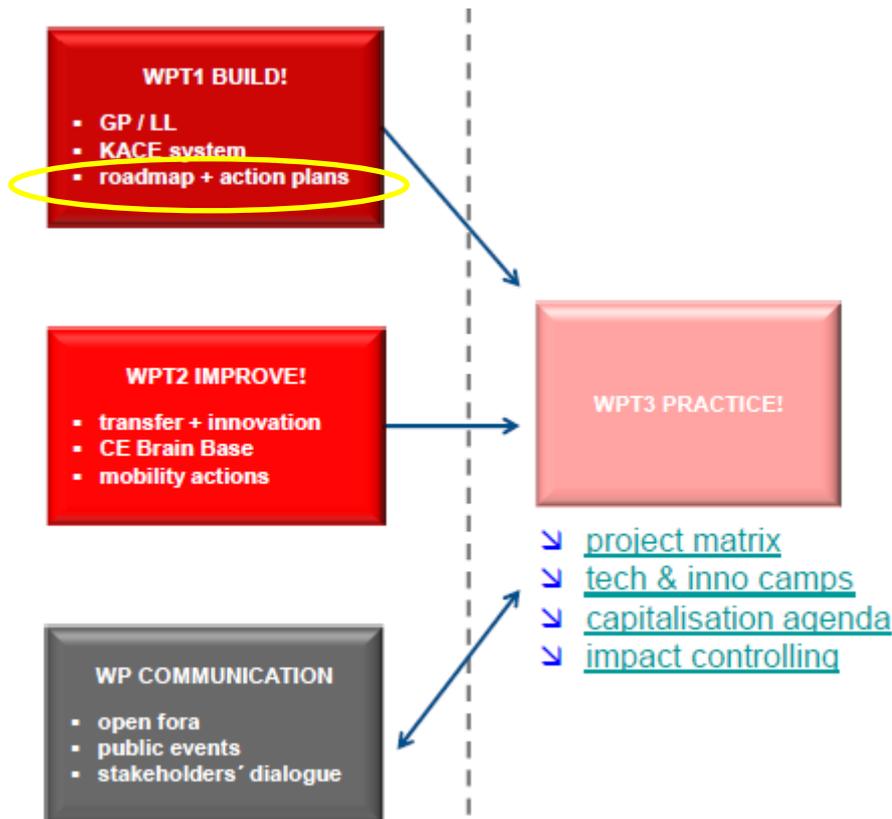
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DT1.5.1 Transnational roadmap including action plan for 11 selected CE relevant knowledge axes

1. INTRODUCTION

The general Function of DT1.5.1 Transnational roadmap and action plan is to generate the necessary information for a structured transnational cooperation within the identified knowledge axis.



Based on the Results of D.T1.3.2 - Report on a Strategic System for Transnational Knowledge Axis, which are viewed in general for introduction, the main goal of DT1.5.1 is to generate a common roadmap and 11 KACE action plans to structure the transnational cooperation and view some focus areas due to EU trends and actions.

The starting situation is the matrix of KACE topics with its responsible KACE LEAD partners and the KACE working groups, based on the competence profiles of the 11 partners, which of course also reflect to the actual trends, demands and initiatives within the EU:

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| High-level KACE Descriptions | |
|---|---|
| KACE NAME | KACE Description |
| 1. Additive Manufacturing | Technologies for additive manufacturing and hybrid technologies for production systems |
| 2. 3D Design/ Engineering/ Scanning/ Simulation | Technologies and process optimisation for 3D design and engineering, including tools and methodologies |
| 3. Smart and functional materials | New materials exploration such as nano-materials as well as integrated computational materials engineering (ICME) |
| 4. Digital life | New technologies and production processes for personalisation and low volume manufacturing of health-improving products |
| 5. Technologies for sustainable manufacturing | Development and implementation of sustainable manufacturing systems reducing total resource (human, capital, asset) utilisation toward zero -x (zero defect, zero maintenance, zero emission, ...) and circular economy |
| 6. Virtual and augmented reality for manufacturing | Factory and product planning, prototype development, acceleration and implementation. |
| 7. Value-added virtual supply chains | Digital and virtual factory, technologies 4.0, cyber-physical systems, Internet of Things, Big Data and the e-Cloud |
| 8. Smart Services | The development of value-added services to support the smart engineering and rapid prototyping, e.g. smart maintenance. |
| 9. Robotics (components, machines and intelligent robots) | Use of flexible robots augments intelligence, automates certain processes and creates new forms of worker-robot interaction |
| 10. Mechatronics (sensor, monitoring and control) | Synergistic combination of mechanical engineering, electronic control and systems thinking in design of products and manufacturing processes |
| 11. CE Brain Base | Anchoring best practice knowledge transfer through shared tools, methodologies and training |

These 11 Topics build the knowledge structure for cooperation activities of 3DCentral partners.

The following figure graphically represents this approach considering that besides the application related to the project purposes it is potentially extensible to other topics due to its modular structure.

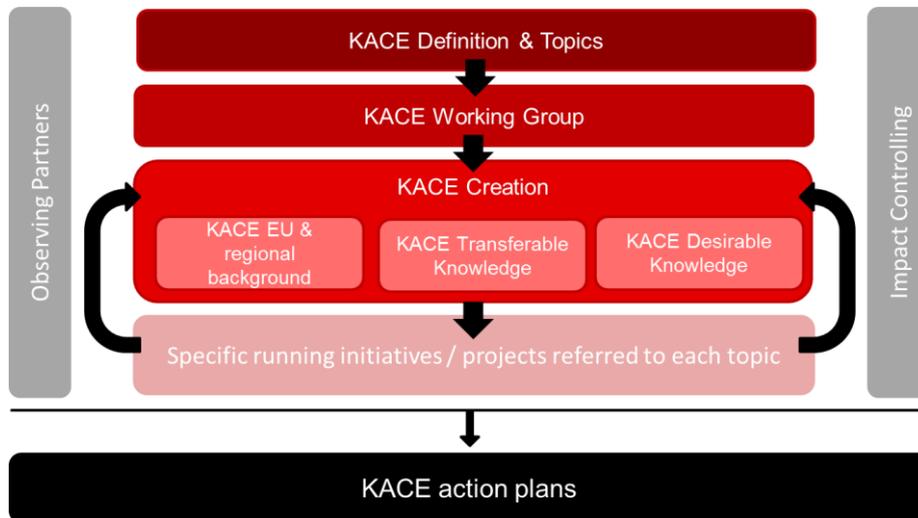


Figure 1. KACE development stages

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As mentioned in the D.T1.3.2 - Report the actions that should be implemented for the development of the KACEs are the following:

| Main actions | |
|--|--|
| KACE definition & topics: | assessment of the scope and the boundaries of a specific KACE |
| KACE working group: | identification of the KACE leader and support that will guide the KACE development with the involvement of relevant stakeholders and the experts. |
| KACE creation: | definition of KACE European and regional background highlighting the transferable and the desirable knowledge, that is what is already available to transfer and what is missing to do more progress |
| Specific running initiatives/projects: | list of relevant projects / initiatives (European, National or Regional) be used as a possible playground either to transfer or to acquire knowledge |

2. METHODOLOGY

In order to effectively develop a transnational road map, information from each national and regional strategy must be collected into one comprehensive perspective for Central Europe. The methodology for completing this activity is reliant on an effective synthesis of existing documents.

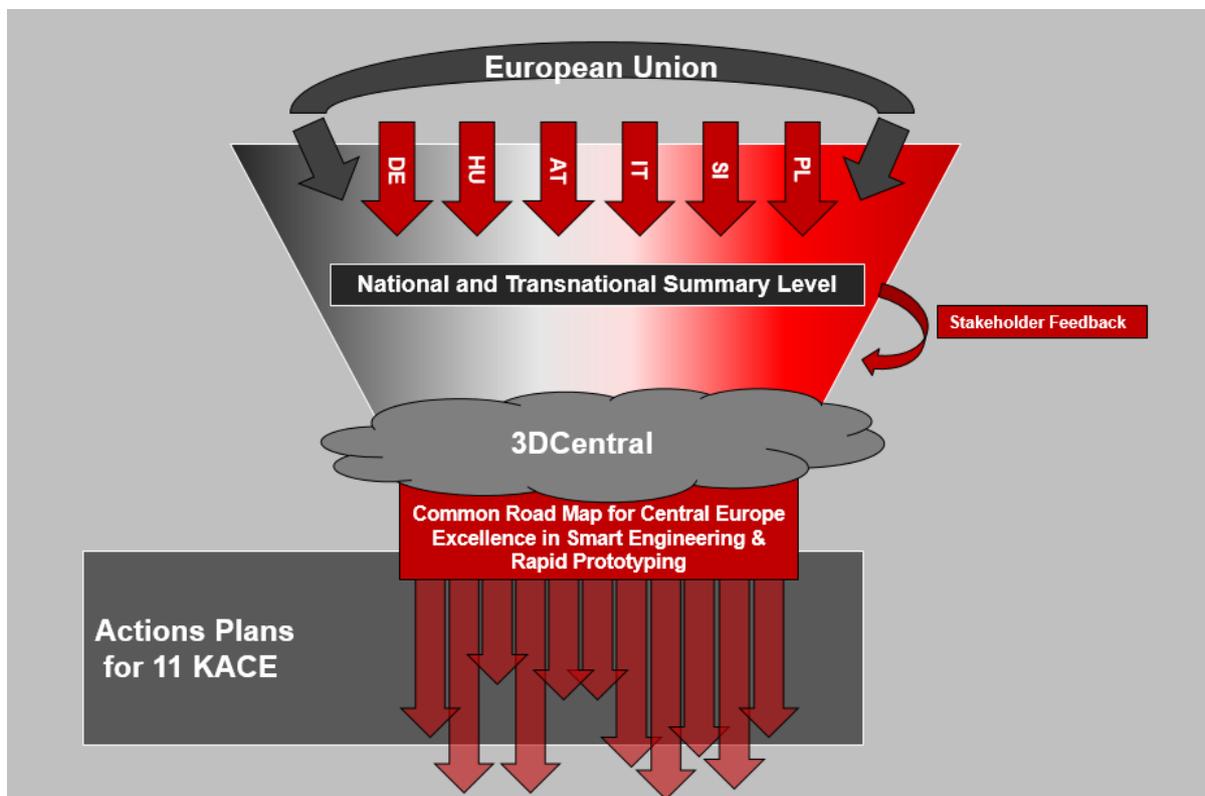


Fig 2. Roadmapping Process

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The roadmap is targeting on visualizing the common interests on KACE Topic on 2D dimension and define more concrete subtopics to be developed in structured partnerships with complementary competences fitting to the regional strategies.

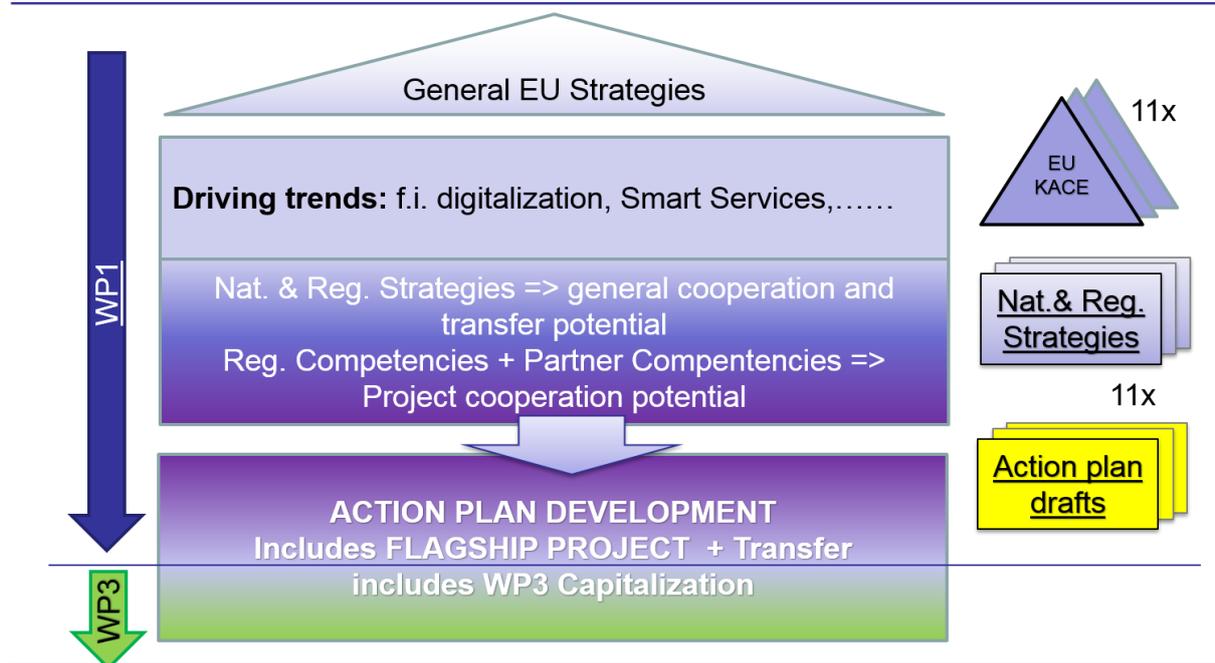


Fig 3. Roadmap and Action Plans in relation to the project outline.

To select the required information templates have been elaborated to gain a structured input on 3 information levels:

- European strategy level: Template on European KACE Topic Consolidation
- Regional strategy and program level: Template for National Regional Position on Research, Technology and Innovation
- Regional initiatives an action level: Template for KACE Action Plan Contribution

All partners have be asked to fill in these information requests, while regional information should be coordinated between partners situated in the same region:

EUROPEAN STRATEGY LEVEL: TEMPLATE ON EUROPEAN KACE TOPIC CONSOLIDATION

The following template has been provided as a guide to support the consolidation of information across the regional and national strategies for SE/RP in Central Europe.

This table provides a series of subject-areas and reference questions which can be used as a guide when the KACE Lead is providing a summary of the European Roadmap position related to the KACE topic area.

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Note: Partners are asked to provide one European Template related to the subject where the Partner is the KACE leader.

| EUROPEAN Roadmap for KACE TOPIC (TEMPLATE) | |
|--|--|
| KACE NAME | KACE topic |
| PARTNER NAME | KACE LEAD Partner |
| SUBJECT AREA | Reference Question |
| STRATEGY GOALS (MAX. 3000 CHARACTERS IN ENGLISH) | What are the European strategy goals that is relevant to the specific KACE Topic? |
| MILESTONES (MAX. 3000 CHARACTERS IN ENGLISH) | What are the key European-wide milestones that exist related to the KACE Topic, this could include certain goals related to the subject or production/access to certain funds; all which are time limited and subject-specific. |
| KEY FOCUS AREAS (MAX. 300 CHARACTERS IN ENGLISH) | Are there any specific technologies/sectors/methodologies which are being prioritised at the EU level? |
| PROGRAMME OPPORTUNITIES (MAX. 3000 CHARACTERS IN ENGLISH) | <p>What are the structural fund programme opportunities that exist at the EU-Level, which are relevant to the KACE topic.</p> <p>Please describe the programmes in the following manner:</p> <ul style="list-style-type: none"> ▪ Programme 1 <ul style="list-style-type: none"> ○ Programme Name: ○ Maximum funds available: ○ Programme Priority: ▪ Programme 2... |
| PROGRAMME BARRIERS (MAX. 3000 CHARACTERS IN ENGLISH) | Are there any barriers that exist to accessing structural fund opportunities at the EU-Level? |
| CURRENT PROJECT/ ACTIVITIES (MAX 3000 CHARACTERS IN ENGLISH) | <p>Please list all of the approved, high-quality projects or activities that are relevant to the KACE Topic which are currently occurring at the EU-Level.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/ Activity 1 <ul style="list-style-type: none"> ○ Project Name: ○ Project Acronym: ○ Summary of Project: ○ Total Project Funding ○ Funding Programme: ○ Lead Partner Name: ▪ Project/ Activity 2: ... |
| CURRENT PARTNERS | Related to the list of current projects/activities written above, please provide contact details for the <u>high-quality, high-performing</u> project partners working in this project. |

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| | |
|--|---|
| <p>(MAX 3000 CHARACTERS IN ENGLISH)</p> | <ul style="list-style-type: none"> ▪ Project 1 [Insert Project Acronym] <ul style="list-style-type: none"> ○ Partner 1: [Insert Partner Organisation Name] <ul style="list-style-type: none"> ▪ Contact: [Insert name of primary Strategic Partner (/Coordinator) of this organisation] ▪ Telephone: [Insert Telephone of Above contact] ▪ Email: [Insert E-Mail of Above Partner] ○ Partner2: [Insert Partner Organisation Name] <ul style="list-style-type: none"> ▪ Contact: [Insert name of primary Strategic Partner (/Coordinator) of this organisation] ▪ Telephone: [Insert Telephone of Above contact] ▪ Email: [Insert E-Mail of Above Partner] ▪ Project 2 [Insert Project Acronym] <ul style="list-style-type: none"> ○ Partner 1: [Insert Partner Organisation Name] <ul style="list-style-type: none"> ▪ Contact: [Insert name of primary Strategic Partner (/Coordinator) of this organisation] ▪ Telephone: [Insert Telephone of Above contact] ▪ Email: [Insert E-Mail of Above Partner] ○ Partner 2: [Insert Partner Organisation Name] <ul style="list-style-type: none"> ▪ Contact: [Insert name of primary Strategic Partner (/Coordinator) of this organisation] ▪ Telephone: [Insert Telephone of Above contact] ▪ Email: [Insert E-Mail of Above Partner] |
|--|---|

DOCUMENT CONTRIBUTIONS

| | | |
|----------|---|---|
| 1 | <ul style="list-style-type: none"> ▪ the name of the document; ▪ an associated organisation publishing the document, and; | <p>Summary of Document Purpose (max. 350 characters in English) Please provide:</p> <ul style="list-style-type: none"> ▪ a summary of the purpose of the database/document, specifically how it supported your writing of the aforementioned summary/how it would be useful for the 3DCENTRAL programme; i.e. it provides a list of all sustainable manufacturing projects at the EU level. ▪ a URL link to the document. |
| 2 | <ul style="list-style-type: none"> ▪ the name of the document; ▪ an associated organisation publishing the document, and; | <p>Summary of Document Purpose (max. 350 characters in English) Please provide:</p> <ul style="list-style-type: none"> ▪ a summary of the purpose of the database/document, specifically how it supported your writing of the aforementioned summary/how it would be useful for the 3DCENTRAL programme ▪ a URL link to the document. |

REGIONAL STRATEGY AND PROGRAM LEVEL: TEMPLATE FOR NATIONAL REGIONAL POSITION ON RESEARCH, TECHNOLOGY AND INNOVATION

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The following templates has been provided as a guide to support the consolidation of information across the regional and national strategies for SE/RP in Central Europe.

This template provides a series of subject-areas and reference questions which can be used as a guide when summarizing regional and national strategies/roadmaps for the general position of Research, Technology and Innovation.

Note: Partners are asked to provide one Regional/National Template related to their perspective on their Region or Nation's position on Research, Technology and Innovation.

| Regional/National Roadmap for Research, Technology and Innovation (TEMPLATE) | |
|--|---|
| REGION NAME | Insert Region name |
| COUNTRY NAME | Insert Country name |
| PARTNER NAME | Insert name of Partner filling out template |
| SUBJECT AREA | Reference Question |
| STRATEGY GOALS (MAX. 3000 CHARACTERS IN ENGLISH) | What are the strategy goals for the regional or national government for its research, technology and innovation agenda, which is specifically relevant to smart engineering or rapid prototyping? |
| MILESTONES (MAX. 3000 CHARACTERS IN ENGLISH) | What are the key milestones that exist in your region or nation related to research, technology and innovation, or specifically smart engineering or rapid prototyping. This could include certain goals related to manufacturing or production/access to certain funds; all which are time limited. |
| KEY FOCUS AREAS (MAX. 300 CHARACTERS IN ENGLISH) | Are there any specific technologies/technology branches/methodologies which are being prioritised in your region/nation strategy for research, technology and innovation? |
| PROGRAMME OPPORTUNITIES (MAX. 3000 CHARACTERS IN ENGLISH) | <p>What are the structural fund programme opportunities that exist at the regional or national level that is relevant to smart engineering or rapid prototyping (or relevant sub-sections of these themes as highlighted in the KACE system).</p> <p>Please describe the programmes in the following manner:</p> <ul style="list-style-type: none"> ▪ Programme 1 <ul style="list-style-type: none"> ○ Programme Name: ○ Maximum funds available: ○ Programme Priority: ▪ Programme 2:... ○ <p>Note: this section should focus on highlighting a range of funding programmes that exist which are open to your organisation or a group of organisations approaching to promote Research/Technology Transfer/ Innovation, in general.</p> |
| PROGRAMME BARRIERS (MAX. 3000 CHARACTERS IN ENGLISH) | Are there any barriers that exist to accessing structural fund opportunities in your region or nation? |

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| CURRENT PROJECTS/ ACTIVITIES (MAX 3000 CHARACTERS IN ENGLISH) | <p>Please list all of the approved projects or currently running activity that are relevant to smart engineering and rapid prototyping (or relevant sub-sections of these themes as highlighted in the KACE system), which are currently occurring in your region/nation.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/ Activity 1 <ul style="list-style-type: none"> ○ Project Name: ○ Total Project Funding ○ Funding Programme: ○ Lead Partner Name: ▪ Project/ Activity 2: |
| DOCUMENT CONTRIBUTIONS | |
| 1 | <ul style="list-style-type: none"> ▪ the name of the document; ▪ an associated organisation publishing the document, and; |
| 2 | <p>Summary of Document Purpose (max. 350 characters in English) Please provide:</p> <ul style="list-style-type: none"> ▪ a summary of the purpose of the database/document, specifically how it supported your writing of the aforementioned summary/how it would be useful for the 3DCENTRAL programme; i.e. this shows the key milestones of Austria's digitalization strategy ▪ a URL link to the document. |

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TEMPLATE FOR ROADMAPMING

The following templates has been provided as a guide to support the consolidation of information across the regional and national strategies for SE/RP in Central Europe.

This template provides a template which lays out each KACE Topic, and asks Partners to fill in their regional (if available) or national position related to each KACE Topic, along with key hyperlinks to the online location of these documents.

Note: Partners are asked to provide one full completed Template related to their perspective on their Region or Nation’s position on all the KACE Topics.

Regional/National Action Plan KACE Topic Contribution (Template)

| | | |
|----------------------------------|--|--|
| REGION NAME | Insert Region name | |
| COUNTRY NAME | Insert Country name | |
| PARTNER NAME | Insert name of Partner filling out template | |
| KACE NAME | Summary | Project/ Activity Name |
| 1. ADDITIVE MANUFACTURING | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |

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| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <ul style="list-style-type: none"> ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| 2. 3D DESIGN/ ENGINEERING/ SCANNING/ SIMULATION | <p>Current Status:</p> <p>Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |
| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | |

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| | | |
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| | | <ul style="list-style-type: none"> ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| 3. SMART AND FUNCTIONAL MATERIALS | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |
| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | |

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| | | |
|--|--|---|
| 4. DIGITAL LIFE | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |
| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | |
| 5. TECHNOLOGIES FOR SUSTAINABLE MANUFACTURING | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] |

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| | | |
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| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | <ul style="list-style-type: none"> ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: <p>▪ Project/Activity 2:</p> <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | |
| <p>6. VIRTUAL AND AUGMENTED REALITY FOR MANUFACTURING</p> | <p>Current Status:</p> <p>Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <p>▪ Project/Activity 1:</p> <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |

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| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <ul style="list-style-type: none"> ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| 7. VALUE-ADDED VIRTUAL SUPPLY CHAINS | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |
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| | | <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| 8. SMART SERVICES | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
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| 9. ROBOTICS (COMPONENTS, MACHINES AND INTELLIGENT ROBOTS) | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |
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| 10. MECHATRONICS (SENSOR, MONITORING AND CONTROL) | <p>Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: |

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| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: |
| | <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver.</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | |
| 11. CE BRAIN BASE | <p>Current Status:</p> <p>Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)</p> | <p>If you have advanced/intermediate operating experience in the topic, please list all of the approved projects or activities that are relevant to the KACE Topic which are currently occurring at regional/national level, where you/a trusted project partner is involved.</p> <p>Please describe the projects in the following format:</p> <ul style="list-style-type: none"> ▪ Project/Activity 1: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] ○ Total Project Funding ○ Funding Programme: ○ Lead Partner information [If relevant]: <ul style="list-style-type: none"> ▪ Organisation Name ▪ Contact Name ▪ Contact E-Mail: ▪ Contact Telephone Number: ○ Trusted Partner Information: <ul style="list-style-type: none"> ▪ Organisation Name: ▪ Contact Name: ▪ Contact E-Mail: ▪ Contact Telephone Number: ▪ Project/Activity 2: <ul style="list-style-type: none"> ○ Project/Activity Name: ○ Project/Activity Summary: [Max 500 Characters] |
| | <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> | |

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| | <p>Future Outlook:</p> <ul style="list-style-type: none"><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator<input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator<input type="checkbox"/> Competent Operation/ Knowledge Receiver.<input type="checkbox"/> Basic User/ Observational Capacity Only<input type="checkbox"/> No Interest | <ul style="list-style-type: none">○ Total Project Funding○ Funding Programme:○ Lead Partner information [If relevant]:<ul style="list-style-type: none">▪ Organisation Name▪ Contact Name▪ Contact E-Mail:▪ Contact Telephone Number:○ Trusted Partner Information:<ul style="list-style-type: none">▪ Organisation Name:▪ Contact Name:▪ Contact E-Mail:▪ Contact Telephone Number: |
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The information gathered with these templates are useful for following tasks:

1. Roadmap report – Information on EU level for KACE Topics and trends, regional situation,
2. Action plan –
 - a. Cooperation potentials – the template “Regional/National Action Plan KACE Topic Contribution” contents more detailed information concerning regional competence level and competence target and is wealthy for analysing the cooperation potential between regions. Also the validity of the prior elaborated table for the KACE working groups is proven by these detailed information.
 - b. Project information: especially the project related information target on existing projects can be integrated into the KACE action plan process and discussion.

| KACE Working Groups | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|------|
| | IDM | AFIL | CAM | EVO | IWU | WRS | TPL | PTP | PBN | KPT | PK |
| 1. Additive Manufacturing | ■ | X | X | X | Supp | X | X | | ■ | ■ | Lead |
| 2. 3D Design/ Engineering/ Scanning/ Simulation | Lead | ■ | X | X | X | X | ■ | ■ | Supp | X | ■ |
| 3. Smart and functional materials | ■ | X | X | X | Lead | X | ■ | ■ | | X | Supp |
| 4. Digital life | | ■ | X | Supp | ■ | ■ | Lead | X | ■ | ■ | ■ |
| 5. Technologies for sustainable manufacturing | ■ | Lead | X | X | X | X | Supp | ■ | ■ | X | X |
| 6. Virtual and augmented reality for manufacturing | Supp | X | X | X | X | Lead | | | | X | X |
| 7. Value-added virtual supply chains | | Supp | | ■ | X | X | X | Lead | | X | X |
| 8. Smart Services | | ■ | Supp | X | X | X | ■ | ■ | Lead | X | X |
| 9. Robotics (components, machines and intelligent robots) | | X | X | X | X | Supp | ■ | ■ | | Lead | X |
| 10. Mechatronics (sensor, monitoring and control) | | X | Lead | X | X | X | X | Supp | X | X | X |
| 11. CE Brain Base | | ■ | X | Lead | X | X | X | X | X | Supp | |
| | IDM | AFIL | CAM | EVO | IWU | WRS | TPL | PTP | PBN | KPT | PK |

The table gives information of the working groups being established in the framework of 3DCentral project. The information used as input is based on the contribution delivered by all the partners about

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the regional and national position with respect to the KACE topics (D.T.1.5.1). In particular, the different symbols used refer to a different level of involvement:

| | |
|---|--|
| X | Partners that have an advanced/ intermediate knowledge on the topic and can act as supplier or facilitator of knowledge transfer. |
| ■ | Partners that have a fundamental/basic knowledge on the topic and can act as receiver of knowledge transfer or in some cases also as facilitator. |
| | Blank cells indicate that the partner has basic or no operative experience on the topics addressed by the KACE. Anyway the partner could be interested in acquiring these competences. |

3. TRANSNATIONAL ROADMAP

General EU Strategies

Basic strategies on EU level meet various major tasks. As the most proper strategy regarding the intentions of 3DCentral project the "renewed EU industrial policy strategy"¹ shall be taken in to concern.

The core message of this strategic paper (sept. 2017) is reflecting on the rapidly changing environment of industrial success:

"The hallmarks of this new industrial age are the accelerated pace of economic, societal and environmental transformations as well as technological breakthroughs in areas like robotics, Internet of Things, artificial intelligence, energy systems and bio-economy. Automation, enabled by information technologies, is transforming traditional manufacturing processes and the nature of work. Industry is increasingly integrated in global value chains with strong service components. Emerging business models disrupt traditional markets."

Regardless of the economic figures the number of employees is decreasing and the demand of skilled workers and engineers is consequently growing.

European industry needs to *"remain mobilised to address changing value chains, sustainability challenges, shifts in global demand as well as remaining structural weaknesses in our business environment. SMEs remain particularly vulnerable. Many people remain without the skills needed for the industry of the future, including basic digital skills. The increasing productivity gap between technology leaders and laggards hampers potential growth and undermines economic and social convergence as well as territorial cohesion."*

"Europe's competitors are investing heavily in the upgrade of their industry; the investment rate in the EU has not yet returned to its historical average. At the same time, the EU's innovation gap with some countries is increasing and major economic players like China are starting to compete precisely in those higher added value segments where Europe does best."

The paper concludes in the general chapter: *"We therefore need to strengthen our industry's ability to continuously adapt and innovate by facilitating investment in new technologies and embracing changes brought on by increased digitisation and the transition to a low-carbon and more circular economy. But companies must do their part by upgrading the technology base, future-proofing business models, internalising sustainable development principles and embracing innovation."*

The core fundamental elements of this "renewed EU industrial policy strategy" are 6 tasks or topics viewed in the following picture. It has to be stressed that the 3DCentral project, submitted in 2015, meets 3 of this 6 elements: Going Digital, Innovation, International Dimension.

¹ Investing in a smart, innovative and sustainable Industry, A renewed EU Industrial Policy Strategy, COM(2017) 479 final, Brussels 13.9.2017.

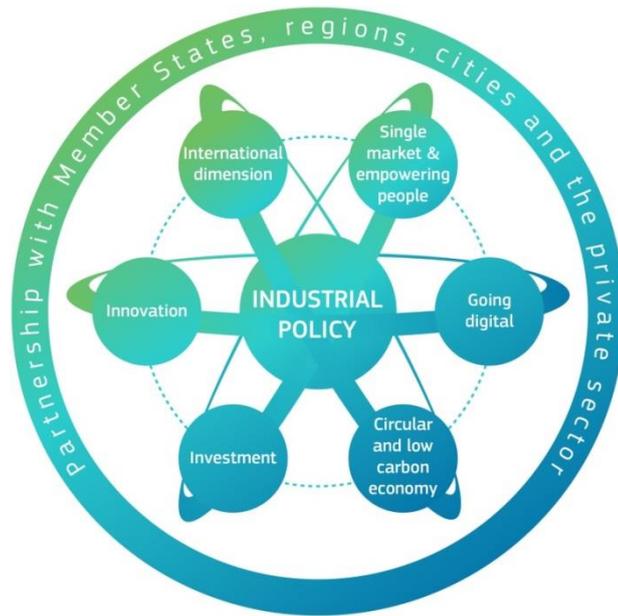


Fig 4. core fundamental elements of the "renewed EU industrial policy strategy"

Concerning the upgrading of the industry for the digital age it is stressed that:

"The future of industry will be digital. Digital transformation is at the core of the ongoing industrial revolution. Progress in technologies such as big data, artificial intelligence and robotics, the Internet of Things and high-performance computing is impacting the very nature of work and society as a whole. With the advent of digital technologies, the service component of industry is becoming ever more important. Boosting the uptake of smart technologies along and across industrial value chains and promoting firm growth is therefore key to Europe's growth and competitiveness."

and: *"Digital industrial platforms (e.g. industrial internet and industrial data platforms) will help to bring together different technologies and applications, facilitating the development of new products, processes, and in particular as well new business and service models. The Commission is launching dedicated calls to support their development in a number of areas such as automation and collaboration in manufacturing, high precision farming, and energy."*

Driving trend: Digitalization,

Regarding the identified 11 KACE topics, most of them can be subsumed within "Digitalization". Therefore very view strategic EU papers on the KACE topic level can be found, but one has to consider the digitalization strategies followed on EU level.

The European Commission presented with May 2017 the "Digital4Development", a strategy to mainstream digital technologies into European Union development policy, contributing to the achievement of the Sustainable Development Goals.

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For the last two decades the EU has been active in the promotion of digital technologies and services in partner countries, but has lacked an appropriate framework for mainstreaming and ensuring an effective delivery. The exponential spread and scale-up of digital technologies and services has profound global implications, creating opportunities for sustainable development and inclusive growth, but at the same time bring new threats and challenges. Digitalisation has an important role to play in a wide range of areas (e.g. gender, good governance, transparency and accountability, job creation and private sector development, access to micro-finance, education and health).

Commission services are committed to reinforcing the support for the development of digital technologies and services in the context of the EU development policy across four main priority areas:

1. promotion of access to affordable and secure broadband connectivity and to digital infrastructure, including the necessary regulatory reforms;
2. promotion of digital literacy and skills;
3. fostering of digital entrepreneurship and job creation; and
- 4. promotion of use of digital technologies as an enabler for sustainable development.**

Digital technologies and services are to be considered as a tool to achieve the objectives of the EU development policy. The Digital4Development approach will not be implemented in isolation, but as part and parcel of overall development strategies and the policy dialogue with partner countries and in partnerships involving the public and private sectors.

Interventions are estimated to have a huge transformative potential and could help impact the lives of people by:

1. boosting productivity and job creation.
2. empowering women and girls,
3. enhancing democratic governance and transparency, and
- 4. enabling other sectors (such as energy, agriculture, governance, education and health) to deliver their full potential**

The strategic working document concludes also, that *“finally, while digitalisation is considered of global interest and the added value of mainstreaming digital aspects applies to the entire range of development policy and action, it will not be possible to implement these measures in all partner countries at once, and not at the same pace.”*²

This position supports the intention of the 3D Central project to install a transnational structured system of thematic cooperation with the vision of connecting islands of innovation related to digitalisation technologies, f.i. smart engineering & rapid prototyping.

Focussing on the mentioned priority area 4 and the impact to enabling other sectors via digitalization technologies to deliver their full potential the path to the KACE topics becomes more visible.

Viewing the manufacturing sector, digital transformation is now responsible for changing the industry. Finally, industrial manufacturers are joining their counterparts and are moving to a digital world. Not since Henry Ford introduced mass production has there been a revolution to this scale. Now, manufacturing companies are using technology to improve flexibility of mass production and increase the ability of customized production.

Consumer expectations and the advent of connected devices and platforms are driving the persistent digitization of the manufacturing. While the majority of manufacturing executives acknowledge the importance of this transformation, only 5% of them are satisfied with their current digital strategies. The

² Digital4Development: mainstreaming digital technologies and services into EU Development Policy, COMMISSION STAFF WORKING DOCUMENT, SWD(2017) 157 final, Brussels, 2.5.2017

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industry continues to evolve in response to the challenge of ensuring the right products are delivered at the right price to the right person through a process of improved sophistication.

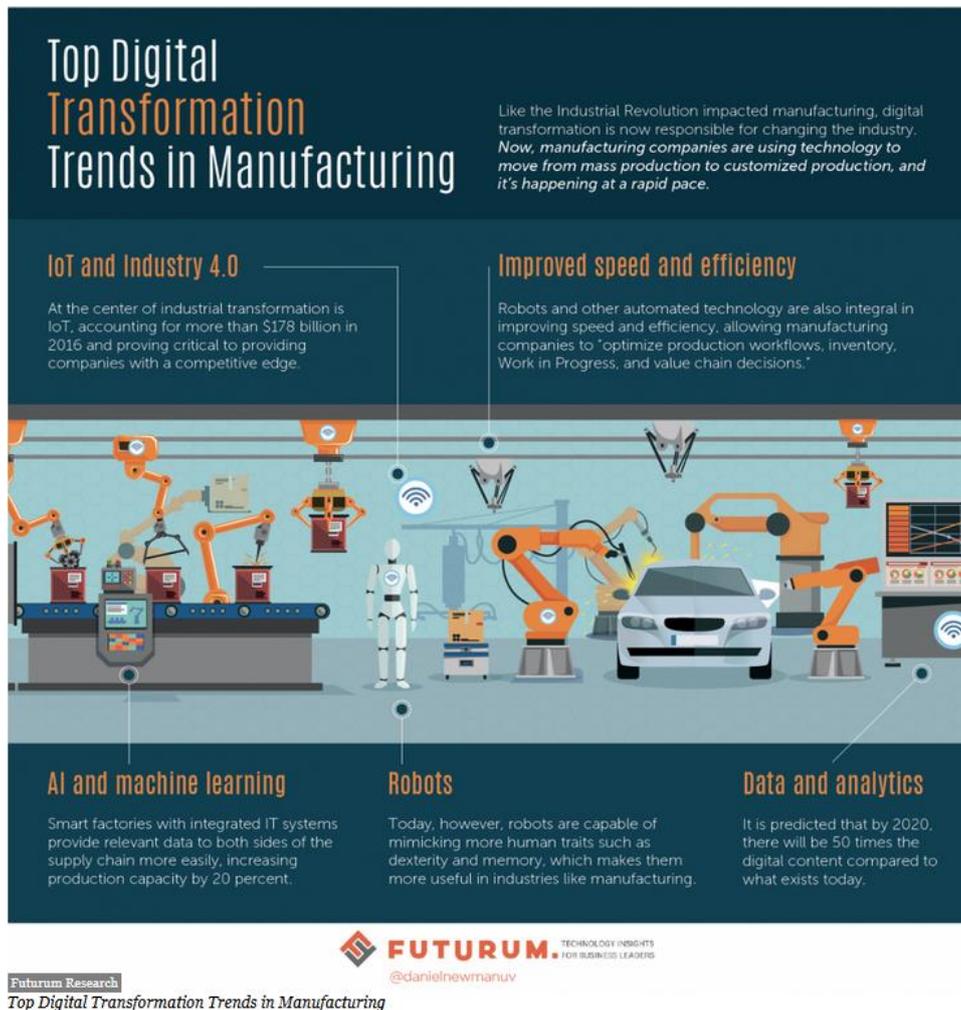


Fig 5. Digital transformation, trends in Manufacturing

In a brief section the driving factors and trends can be shown:

Digitalisation of Manufacturing - Trends & Drivers and linkage to KACE TOPICS

Customer demands

- Customer demand for product variety – Additive Manufacturing, Mechatronics
- Personalised products / services – Smart Services, Robotics, Mechatronics
- Faster response to needs - Smart Services, 3D Design + Simulations, Add. Manufacturing
- Added-value services - Smart Services, Digital Life
- Societal and economic pressure to increase sustainability – Sustainable Manufacturing

User industry pressures

- Increasing need for asset and resource efficiency - Sustainable Manufacturing
- Growing reliance on supply chain and need for robustness and tracking – Value added virtual supply chains
- Increasing security risks
- Shorter lifecycles Industry product - Additive Manufacturing, Mechatronics, 3D Design + Simulations, Virtual and augmented reality for manufacturing, smart and functional materials
- Value-added services throughout product life-cycle - Smart Services
- Increasing complexity: Products, production, data... Virtual and augmented reality for manufacturing, Value added virtual supply chains

KACE TOPIC EUROPRAN ROADMAP information Template:

For structural development of the concluding action plan for all the 11. topics (except Brain Base) a template with fundamental EU strategies and initiatives concerning the KACE topic has been elaborated. These information build the frame for the definition of relevant subtopics and strategic actions.

Example: Technologies for Sustainable Manufacturing

Strategy Goals: What are the European strategy goals that is relevant to the specific KACE Topic?

Energy and resource-efficient and low carbon technologies and the circular economy will be key drivers of innovation in SMEs. To remain competitive, manufacturing SMEs will increasingly need to rely on advanced manufacturing technologies for clean production enabling the development of new production processes. The High Level Group on Key Enabling Technologies (KETs) recommended in its report of June 2015 to ensure pan-European access of manufacturing companies to "premier-class" technology infrastructures in the field of KETs. As a first step, the Commission has published an inventory of existing technology infrastructures in the EU capable of providing SMEs with technology services and facilities in the field of KETs.

Through The Smart Specialisation Platform for Industrial Modernisation (S3P-Industry) the Commission will mobilise a wide range of advice and support services to offer continuous support to the interregional partnerships that have the aim to generate a pipeline of industrial investment projects following a bottom-up approach - implemented through interregional cooperation, cluster participation and industry involvement.

In this context, a key sub-area proposed for cooperation is the Vanguard partnership "Efficient and sustainable manufacturing". The ESM Vanguard pilot is aimed at overcoming the barriers limiting innovation transferring to industry innovative solutions coming from research and exploiting the potential of smart specialization in order to promote new efficient and high value-added supply chains. ESM European pilot plants have the potential to support companies in breakthrough technologies and applications in the field of:

- De-and Re-manufacturing for the Circular economy.
- Energy Efficiency
- Sustainable material and surface treatments

What are the key European-wide milestones that exist related to the KACE Topic, this could include certain goals related to the subject or production/access to certain funds; all which are time limited and subject-specific.

- Rapid deployment and up-scaling of advanced sustainable manufacturing technologies. This broad milestone captures the application of a range of technologies and processes and the means by which it can drive the growth of new start-ups and the regeneration of existing manufacturing sectors.
- The need of shifting to digital factories (also capturing the Industry 4.0 concept) is widely shared and covers a range of issues around digitalisation of
 - production, complex production systems, networked manufacturing, transformation of factories into factories of the future, etc.
- The need to adopt clean and sustainable technologies and enhance resource and energy efficiency are a recurring theme and there is a marked emphasis on both reduction and reuse of

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materials as well reducing high levels of energy consumption or using the challenges posed by global 'megatrends' to develop new competitive processes. A sub-theme here is the need to reduce transportation costs and improve logistics.

- A fourth stylised milestone is visible around the theme of new business models (including service innovation), production customisation, individualism, etc. in manufacturing. A number of regions pointed to the need to adopt new business models with a higher service content in order to foster structural change; while others noted that product customisation and individualism offered opportunities but also challenges related to smarter product design methods, shorter production runs and the adopting of improved manufacturing strategies
- Internationalisation and supply chain management in the global economy constitute the fifth most common milestone with issues related to reshoring and organising total value chains for OEMs highlighted; as well as the need to improve poor internationalisation strategies of manufacturing SMEs.
- Training and skills for advanced manufacturing are a concern in at least half the regions responding, with the need to develop industrial training methods that allow adaptability of the workforce and faster knowledge transfer highlighted. Creating the demand for innovative skills and developing novel curricula are
- viewed as critical elements in an advanced manufacturing strategy.
- Science-business co-operation & improving research & innovation infrastructure are related factors view as an important 'foundation' for future advanced and sustainable manufacturing development. A common theme under this broad heading is the need to develop and make more accessible to companies pilot lines and laboratories. Rather than bilateral contract research type activities, the need for the development of 'wider manufacturing communities' is called for in order to shorten the time from research to application of technologies.
- Finally a minority of regions point to access to finance and participation to EU programmes as a challenge.

Key focus areas - Are there any specific technologies/sectors/methodologies which are being prioritised at the EU level?

At European level, the main Roadmaps of the sustainable manufacturing sector (EFFRA, SPIRE, IMS2020, EUMAT, FOF) all mentioned as key focus area:

- Circular Economy: technologies/ methodologies (disassembly, mechanical comminution, chemical recycling, material characterization) and sectors (electronics and white goods, automotive and aeronautics, textile and heavy machinery and wind energy industries, representing roughly the 50% of the total manufacturing turnover in EU.)
- Energy and resource efficient manufacturing including LCA, forming, cutting, joining, assembly, simulation software, waste heat management in different sectors (machine tooling, automotive, toys, consumer electronics, medical devices...)
- Sustainable materials and production processes technologies/methodologies (coating solutions, composite materials engineering, recycling and material recovery) and sectors (optic, photonic, packaging, automotive, white goods, biotech, food)

Nat. & Reg. Strategies => general cooperation and transfer potential
 Reg. Competencies + Partner Competencies => Project cooperation potential

The Template “Regional/National Action Plan KACE Topic Contribution” selected the information concerning the in the 3D CENTRAL project involved regions regarding each KACE topic as described in chapter 2. Methodology.

The knowledge status of the region is declared and also the competence level which is aimed for.

Viewing the Stuttgart Information regarding the KACE topic additive manufacturing, the status is intermediate but they would like to improve to become an leading Knowledge supplier. This means on one hand that they will be interested in trainings ant Tech & Inno camps but also there is potential for transfer actions from Knowledge supplier (f.i. Styria) to Stuttgart partners.

Stuttgart

Germany
 Wirtschaftsförderung Region Stuttgart GmbH, PP6

Current Status:

Current Knowledge Level in Region/Nation, delete as appropriate:

Advanced Operating Experience (Supplier/Facilitator)

Intermediate Operating Experience (Supplier/Facilitator)

Fundamental Operating Experience (Facilitator/Receiver)

Basic/No Operating Experience

Future Outlook:

Advanced Operation/ Leading Knowledge Supplier/Facilitator

Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator

Competent Operation/ Knowledge Receiver.

Basic User/ Observational Capacity Only

No Interest

The coloured marks show in green the regions with high competences and as shown above the regions, which are willing to improve their situation. But in times if rapidly changing technologies one has to work also to keep the knowledge position. Viewing this information table the colours show quickly the regions with cooperation potentials and the transfer options on an general level. This Information is helpful for generation and discussing the action plans for each KACE topic.

| Region Name | Styria | Südtirol | Lombardy | Sachsen / Saxony | Stuttgart |
|----------------------------------|---|---|--|--|---|
| Country Name | Austria | Italy | Italy | Deutschland / Germany | Germany |
| Partner(s) | CAM + EVO | IDM Südtirol | PP2 - AFIL | Fraunhofer IWU | Wirtschaftsförderung Region Stuttgart GmbH, PP6 |
| 1. Additive Manufacturing | <p>Current Status:</p> <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input checked="" type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> <p>Future Outlook:</p> <p><input checked="" type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <p>Current Status:</p> <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input checked="" type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> <p>Future Outlook:</p> <p><input type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input checked="" type="checkbox"/> Competent Operation/ Knowledge Receiver</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <p>Current Status:</p> <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> <p>Future Outlook:</p> <p><input checked="" type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <p>Current Status:</p> <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> <p>Future Outlook:</p> <p><input checked="" type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> | <p>Current Status:</p> <p>Current Knowledge Level in Region/Nation, delete as appropriate:</p> <p><input type="checkbox"/> Advanced Operating Experience (Supplier/Facilitator)</p> <p><input checked="" type="checkbox"/> Intermediate Operating Experience (Supplier/Facilitator)</p> <p><input type="checkbox"/> Fundamental Operating Experience (Facilitator/Receiver)</p> <p><input type="checkbox"/> Basic/No Operating Experience</p> <p>Future Outlook:</p> <p><input checked="" type="checkbox"/> Advanced Operation/ Leading Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator</p> <p><input type="checkbox"/> Competent Operation/ Knowledge Receiver</p> <p><input type="checkbox"/> Basic User/ Observational Capacity Only</p> <p><input type="checkbox"/> No Interest</p> |

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The main outputs are the overview of the cooperation potential, which gives a more detailed overview than the basic table elaborated in the earlier stage of the project. The selected data show the following picture:

| REGIONAL/NATIONAL ACTION PLAN KACE TOPIC CONTRIBUTION | | | | | | | | | | | |
|---|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|------------------------------------|-----------------------------------|
| Region Name | Styria | Südtirol | Lombardy | Sachsen / Saxony | Stuttgart | Slovenian Western Region | Eastern Slovenia | Vas county | Malopolska | | |
| 1. Additive Manufacturing | Competence Level 10 (Regional/NTA) | |
| | Competence Level 9 (Regional/NTA) | |
| | Competence Level 8 (Regional/NTA) | |
| | Competence Level 7 (Regional/NTA) | |
| | Competence Level 6 (Regional/NTA) | |
| | Competence Level 5 (Regional/NTA) | |
| | Competence Level 4 (Regional/NTA) | Competence Level 4 (Regional/NTA) |
| | Competence Level 3 (Regional/NTA) | Competence Level 3 (Regional/NTA) |
| | Competence Level 2 (Regional/NTA) | Competence Level 2 (Regional/NTA) |
| | Competence Level 1 (Regional/NTA) | Competence Level 1 (Regional/NTA) |
| | Competence Level 0 (Regional/NTA) | Competence Level 0 (Regional/NTA) |

Fig 6. Regional competence situation and aimed tasks

The Template “Regional/National Action Plan KACE Topic Contribution” also contains project information, which can be integrated into KACE action plan or help to discuss ideas and compare them with existing activities.

All the sampling of information is targeting to enable the project group to generate a KACE Action plan based on fundamental information with the interested regions and partners involved. The transfer potentials are visible and can be integrated into the KACE action plans as well as the gathered project information.

4. ACTION PLANS FOR KACE TOPICS

For generating the action plan for each KACE axis a working description had been generated, how to start developing the KACE ACTION PLAN in a constructive manner. The template as an instrument is useful from the first starting input to develop defined subtopics and further on defining KACE ACTIONS and it will be used in WP3 for generating and planning capitalization activities as well as for transfer activities. Therefore the KACE action plans are working instruments as “Plans under progress” and configured to be used as basics for further cooperation, independent of 3DCentral project extend.

Visualisation

For discussing complex issues, visualisation is essential. Therefore, the ACTION PLAN is an Excel-template to keep the overview on the various actions proposed or already defined.

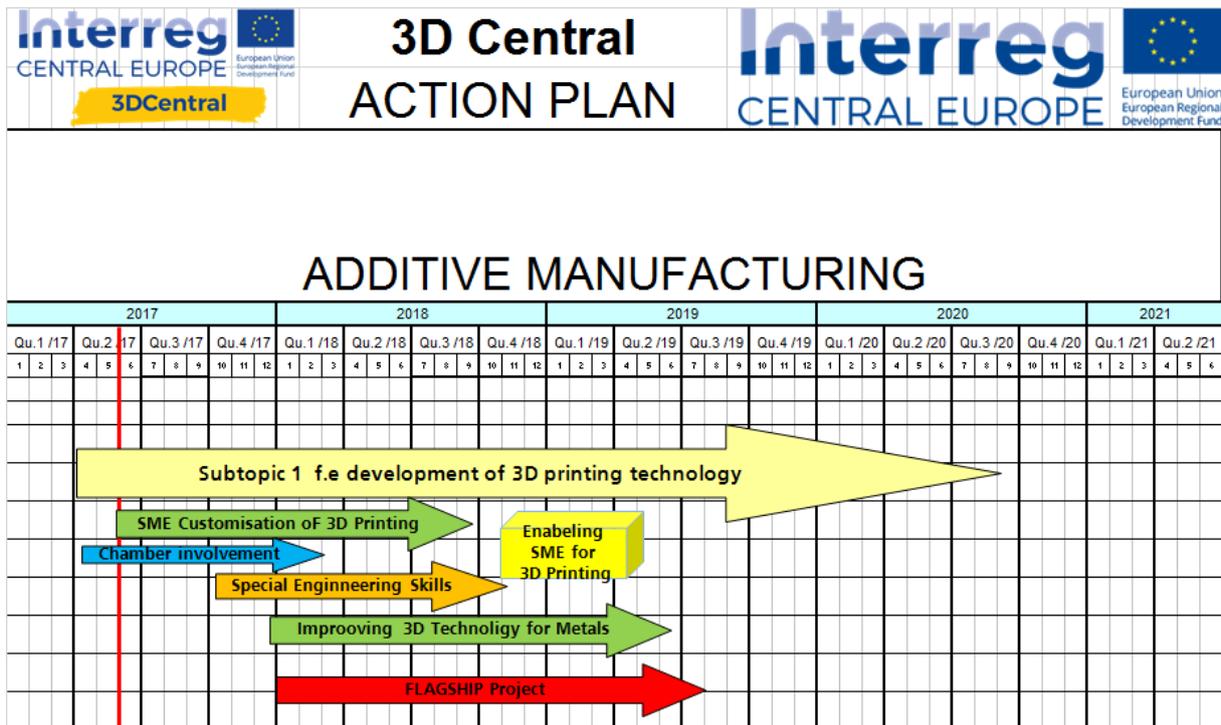
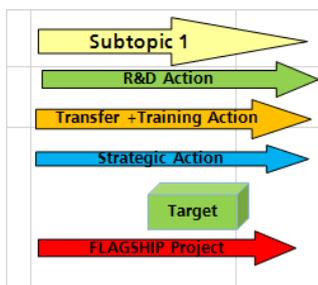


Fig 7. KACE action plan instrument

Visualizing the time line the yellow arrow show the subtopic for a specific KACE topic (here f.e. part of Additive Manufacturing).

The further Arrows show proposed or defined actions, which contribute to the development of the subtopic.

These actions can be R&D actions, transfer and training Actions or strategic actions. They are visualized by arrows also and enable to show the time schedule but also the common contribution to a target (box).



This visualization helps to show different approaches supporting the subtopic and enable to discuss the time related priorities for suggested actions.

Additionally there is a special colour for the identified flagship project, which is important element of 3D Central project.

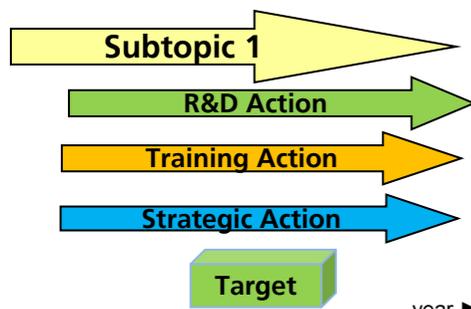
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The Action plan instrument provides a table for each subtopic to describe each actions in more detail.

| KACE TOPIC | | fe. Additive Manufacturing | | Input / Comments for Discussion |
|-------------|--|----------------------------|--|---------------------------------|
| Subtopic 1: | | XXXXXXXXXXXXXXXXXX | | |
| Nr. | Action | Cat | Description | |
| 1 | SME Customisation for 3D Printing | R&D | R&D Project to improve 3D printing utilisation for easier applications in SME | |
| 2 | Engineering Skills | Trainee | Special trainee programmes for SME to improve 3D printing knowledge and application skills. | |
| 3 | Chamber involvement | Strategic | Involvement of relevant Stakeholders to promote and support the overall target as f.e. Chamber of commerce etc.. | |
| 4 | Enabeling SMEs for aplyind 3D Printing technologie | Target | Target is to enabele SMEs for applying 3D printing technologie | |

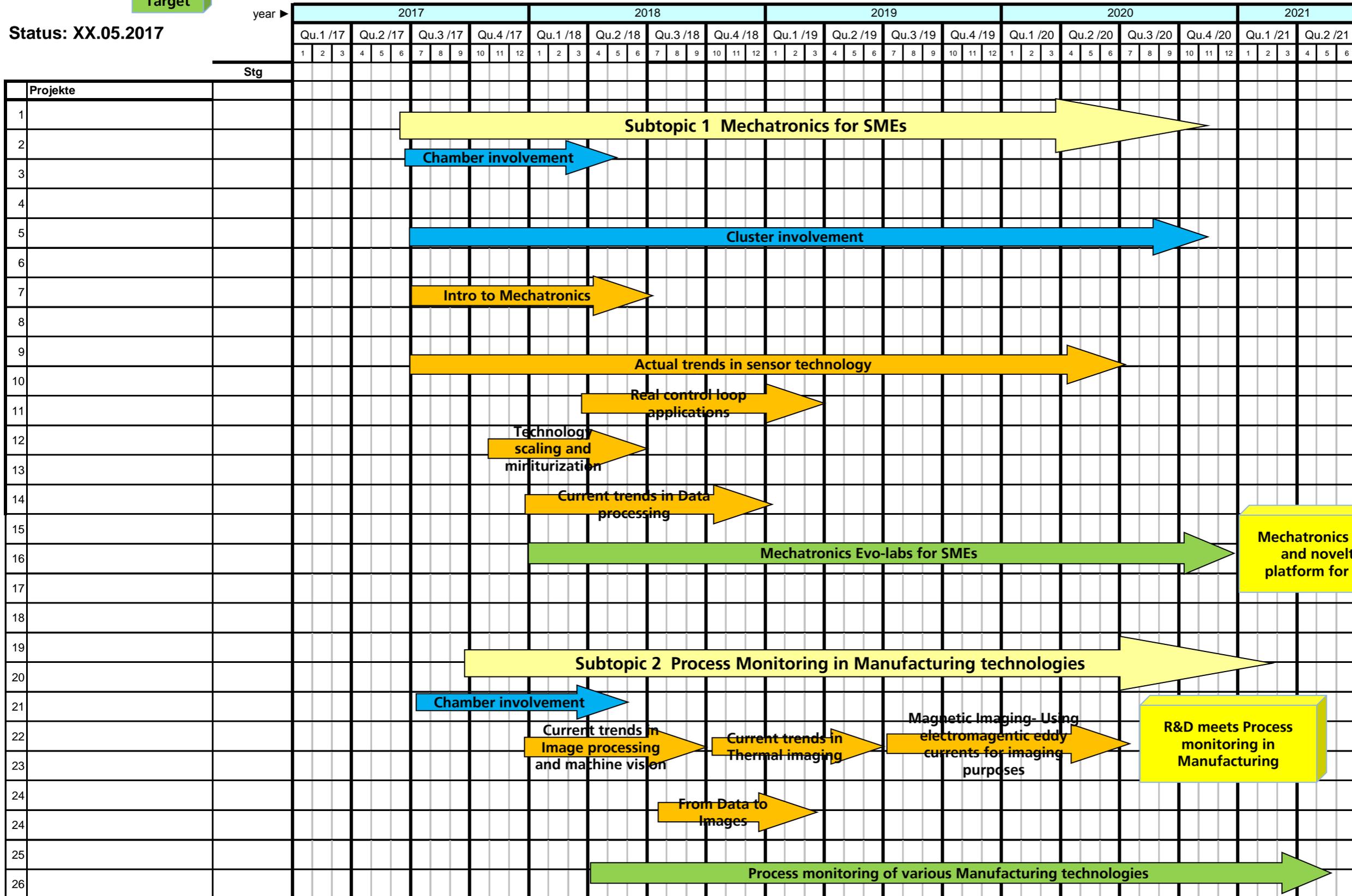
It enables also to note helpful comments and will be useful to sum up KACE topic discussions to develop this ACTION PLAN step by step to the actual stage.

Additionally you will find in the EXCEL-template a time schedule on the subtopic tables. This will help to step in to more detailed planning, if some interesting common activity shall be discussed. This will be probably helpful at future stages of the ACTION PLAN and contribute to WP3 to capitalization activities.



Mechatronics

Status: XX.05.2017



Mechatronics trends and novelties platform for SMEs

R&D meets Process monitoring in Manufacturing

KACE TOPIC

Mechatronics

Subtopic 1:

Mechatronics for SMEs

| Nr. | Action | Cat | Description |
|-----|---------------------------------------|-----------|---|
| 1 | Mechatronics Evo-labs for SMEs | R&D | R&D Project to improve SMEs abilities to embrace novelties in the field of Mechatronics. The project will result in the development of an interactive laboratory and an evolving training program and training tools. Possible participants in this project are regional and european mechatronics clusters or cluster with interest, big industry partners with SME suppliers or service providers, Universities and training centers, Vocational and insitutional training associations, technology parks, etc.... The end result of the project could be the implementation of several training labs and programs on local levels across Europe. |
| 2 | Intro to Mechatronics | Trainee | Series of workshops and trainings that will introduce participants to what mechatronics is and where it is applied in real life; using examples such as 3D Printers, Robotics, Driver assistant systems etc... |
| | Actual trends in sensor technology | Trainee | Series of trainings that will introduce participants to new trends in sensor technology with focus on: 1) The working principle, 2) The Interfacing, 3) the application. The training will take place in a laboratory enviroment, with real practical examples |
| | Real control loop applications | Trainee | Workshop or series of trainings/lectures on real control loop applications: temperature control, conveyor tracks, motor control, sensor output control and optimization (accelerometers, gyroscopes)... This is intended to give SMEs and startups involved in the topic an overview on the state of the art and an honest look at possible limitations. |
| 3 | Technology scaling and miniturization | Trainee | Lectures/Workshop on the topics of technology downscaling, from a mechanics and electornics point of view, with focus on examples of mechatronics systems. This is intended to give SMEs and startups involved in the topic an overview on the state of the art and an honest look at possible limitations. |
| 3 | Current trends in Data processing | Trainee | Lectures/Workshop on the the current state of the art in Data Processing for Mechatronics system, and a look into future trends. |
| 9 | Chamber involvement | Strategic | Involvement of relevant Stakeholders to promote and support the overall target as f.e. Chamber of commerce etc.. |
| 10 | Cluster involvement | Strategic | Involvement of relevant Mechatronics and other Clusters to promote and support the overall target as f.e. Chamber of commerce etc.. |

KACE TOPIC

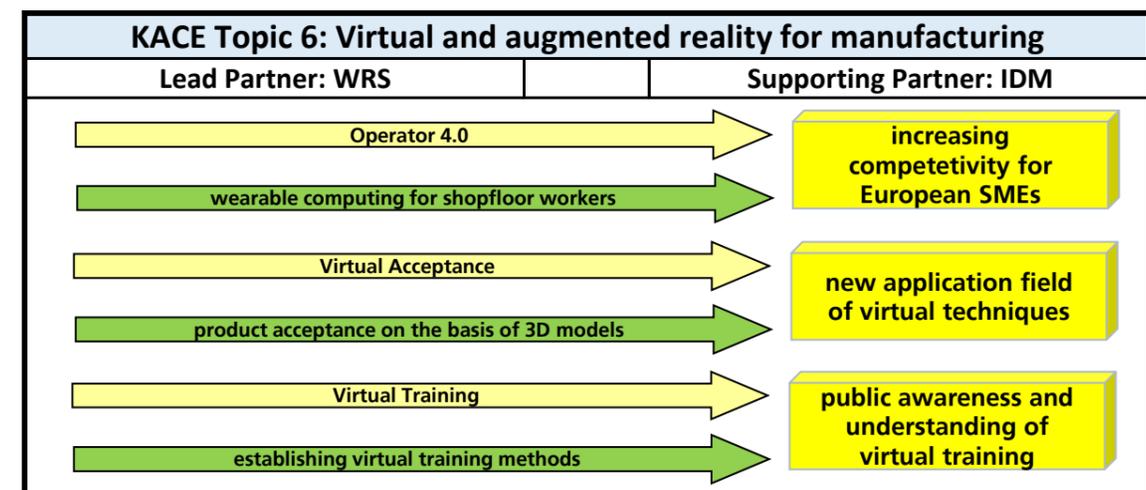
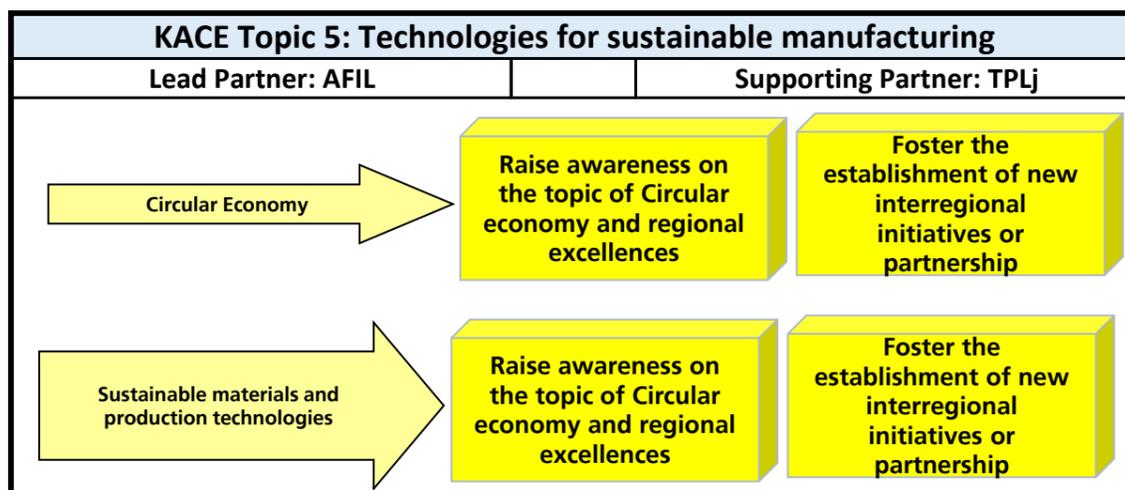
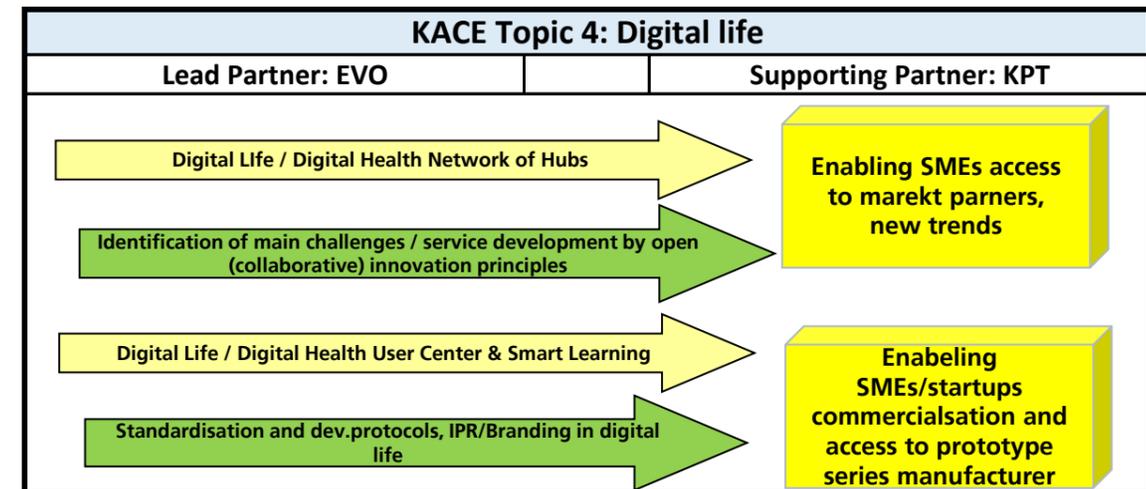
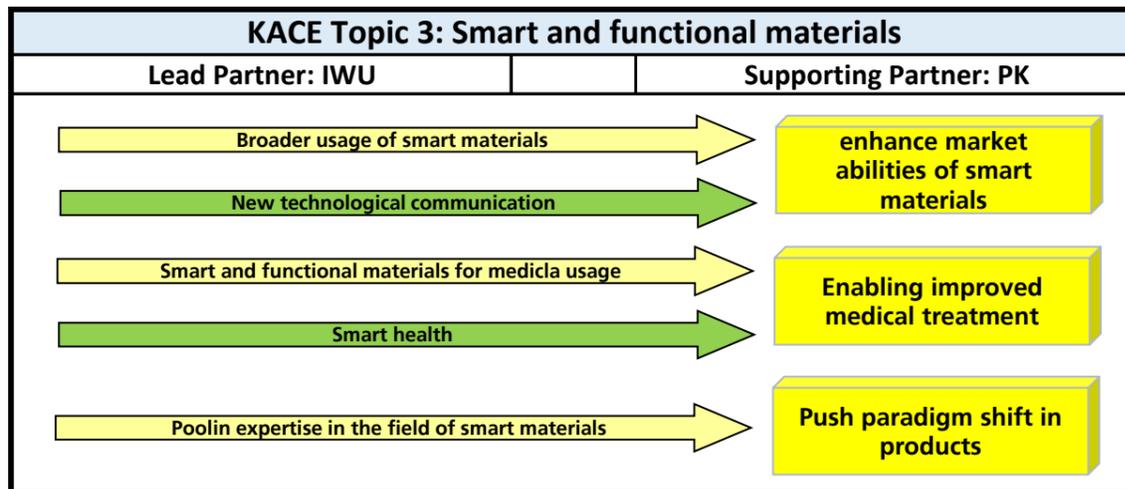
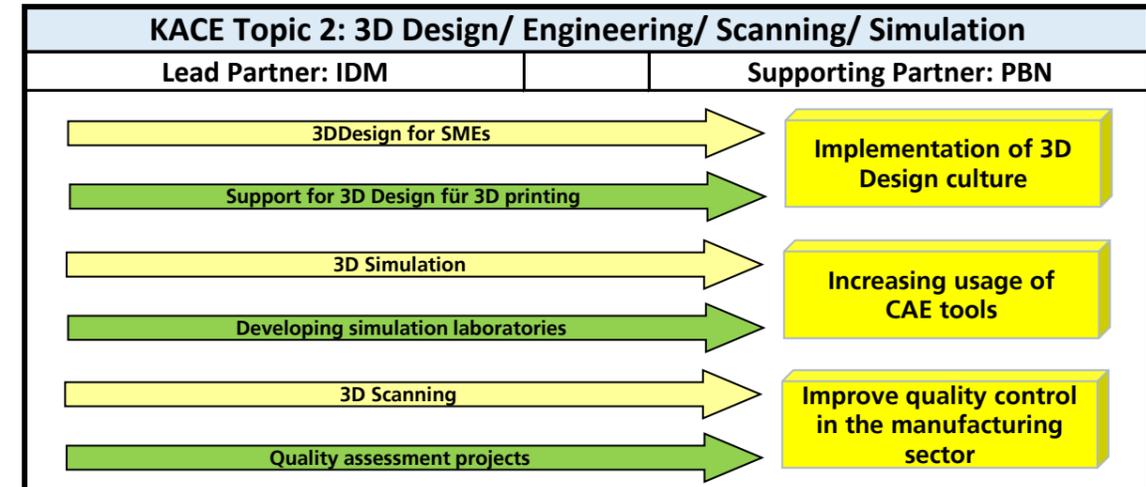
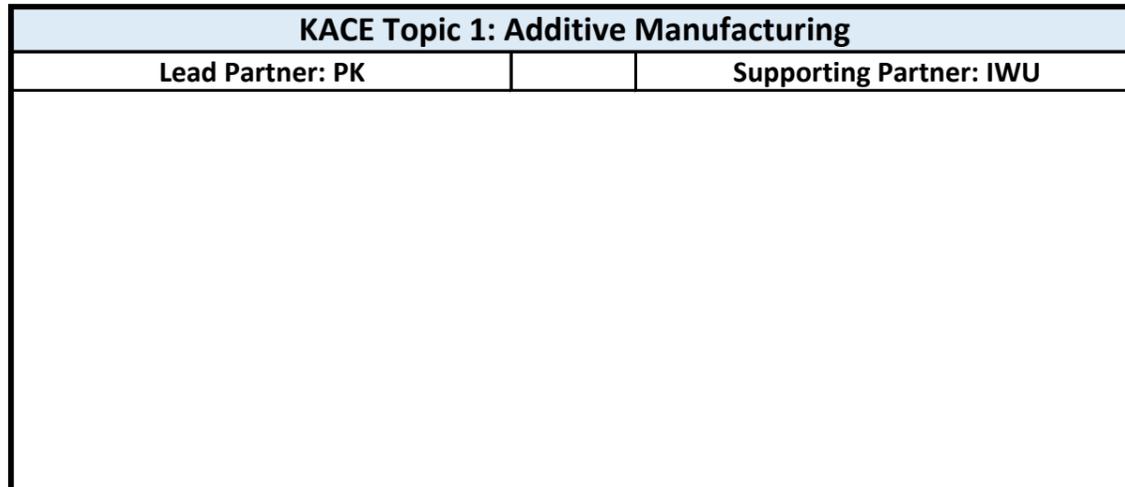
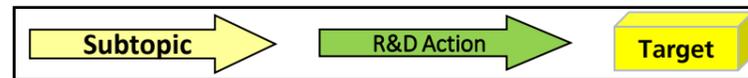
Mechatronics

Subtopic 2:

Process Monitoring in Additive Manufacturing (AM)

| Nr. | Action | Cat | Description |
|-----|--|-----------|--|
| 1 | Process monitoring of various AM technologies | R&D | R&D Project to implement process monitoring systems in various Classical technologies, such as milling etc..., and Additive manufacturing technologies, such as laser sintering, laser melting, fused filament fabrication etc.... This will be especially relevant in areas where the cost for monitoring was traditionally deemed too high or unnecessary, such as low volume production or low cost machinery. The aim of the project will be the development of these monitoring systems, preferably also so they can be retrofitted on existing manufacturing systems and technologies. This could lead to great savings in materials, and time, especially when unsuccessful parts can be detected and stopped at an early stage of the process. This would lead to great reductions in material and time waste, and have a huge economical and environmental impact. Process monitoring in running process would also allow for active intervention in running processes, which would result in error avoidance and produced parts optimization which is necessary for the realization of high precision printed parts for example. Suggested monitoring methods may include optical, thermal, electromagnetic. etc.. depend on the manufacturing technology in question. |
| 2 | Current trends in Image processing and machine vision | Trainee | Lectures/Workshop on the the current state of the art in Image processing and machine vision. |
| 3 | Current trends in Thermal imaging | Trainee | Lectures/Workshop on the the current state of the art in Thermal imaging |
| 4 | Magnetic Imaging- Using electromagnetic eddy currents for imaging purposes | Trainee | Introduction through Lectures/Workshop to what electromagnetic eddy currents are, and how one can use them for imaging purposes |
| 5 | From Data to Images | Trainee | Workshop on the current state of image processing techniques, and how one can move from relatively simple data sampling to more complex images and possible model reconstructions, for e.g. for output comparison, and process monitoring |
| 6 | Chamber involvement | Strategic | Involvement of relevant Stakeholders to promote and support the overall target as f.e. Chamber of commerce etc.. |
| 7 | R&D meets Process monitoring in Manufacturing | Target | Introducing R&D personnel and interested parties, to conventional and non conventional methods of process monitoring |

D.T1.5.1 Actions Draft- Summary Part 1



D.T1.5.1 Actions Draft- Summary Part 2

