



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

D.T1.5.1 PP3 CAM	Version 1
	11 2017

Prepared by PP4 CAM Document prepared within the activity A.T1.5 as deliverable D.T1.5.1

REPORT – Executive Summary

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

Content

1.	INTRODUCTION	. 2
2.	METHODOLOGY	. 4
	European strategy level: Template on European KACE Topic Consolidation	. 5
	EUROPEAN Roadmap for KACE TOPIC (TEMPLATE)	. 6
	Regional strategy and Program level: Template for National Regional Position on Research, Technology and Innovation	 . 7
	Regional/National Roadmap for Research, Technology and Innovation (TEMPLATE)	. 8
Te	emplate for Roadmapping	10
	Regional/National Action Plan KACE Topic Contribution (Template)	10
3.	TRANSNATIONAL ROADMAP	22
4.	ACTION PLANS FOR KACE TOPICS	30



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:



High-level KACE Descriptions		
	Technologies for additive manufacturing and hubrid technologies for	
1. Additive Manufacturing	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



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



The roadmap is targeting on visualizing the common interests ion 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.



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

г

EUROPEAN Roadmap for KACE TOPIC (TEMPLATE)			
KACE NAME KACE topic			
PARTNER NAME KACE LEA	AD Partner		
SUBJECT AREA	Reference Question		
STRATEGY GOALS	What are the European strategy goals that is relevant to the		
(MAX. 3000 CHARACTERS IN ENGLISH)			
MILESTONES	What are the key European-wide milestones that exist related		
(MAX. 3000 CHARACTERS IN ENGLISH)	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	Are there any specific technologies/sectors/methodologies		
(MAX. 300 CHARACTERS IN ENGLISH)	which are being prioritised at the EU level?		
PROGRAMME OPPORTUNITIES	What are the structural fund programme opportunities that exist at the EU-Level, which are relevant to the KACE topic.		
(MAX. 3000 CHARACTERS IN	Please describe the programmes in the following manner:		
ENGLISH)	 Programme 1 		
	 Programme Name: 		
	 Maximum funds available: 		
	 Programme Priority: 		
	Programme 2		
PROGRAMME BARRIERS	Are there any barriers that exist to accessing structural fund		
(MAX. 3000 CHARACTERS IN	opportunities at the EU-Level?		
ENGLISH)			
CURRENT PROJECT/	Please list all of the approved, high-quality projects or activities that are relevant to the KACE Topic which are currently		
(MAX 3000 CHARACTERS IN	occurring at the EU-Level.		
ENGLISH)			
	Please describe the projects in the following format:		
	Project/ Activity 1		
	• 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.		



(MAX	3000 CHARACTERS IN		
ENGL	SH)	 Project 1 [Insert Project Acronym] 	
		 Partner 1: [Insert Partner Organisation Name] 	
		 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] 	
		 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] 	
		 Partner 1: [Insert Partner Organisation Name] 	
		 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] 	
		 Contact: [Insert name of primary Strategic Partner (/Coordinator) of this organisation] 	
		Telephone: [Insert Telephone of Above contact	
	Email: [Insert E-Mail of Above Partner]		
DOCU	MENT CONTRIBUTIONS		
1	 the name of the document; 	Summary of Document Purpose (max. 350 characters in English) Please provide:	
	 an associated organisation publishing the document, and; 	 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	 the name of the document; 	Summary of Document Purpose (max. 350 characters in English) Please provide:	
	 an associated organisation publishing the document, and; 	 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



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 Reg	gion name	
COUNTRY NAME	Insert Cou	Insert Country name	
PARTNER NAME	Insert nam	ne 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 CHARAC ENGLISH)	TERS IN	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 CHARAC ENGLISH)	TERS IN	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		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).	
		Please describe the programmes in the following manner:	
		 Programme 1 	
		 Programme Name: 	
		 Maximum funds available: 	
		 Programme Priority: 	
		 Programme 2: 	
		0	
		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.	
PROGRAMME BARRIE	ERS	Are there any barriers that exist to accessing structural fund	
(MAX. 3000 CHARAC ENGLISH)	TERS IN	opportunities in your region or nation?	



3DCENTRAL - Catalyzing	Smart Engineering	g and Rapid	Prototyping
-------------------------------	-------------------	-------------	-------------

CURR ACTIV	ENT PROJECTS/ ITIES	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.	
(MAX ENGL	3000 CHARACTERS IN ISH)		
		Please describe the projects in the following format:	
		 Project/ Activity 1 	
		 Project Name: 	
		 Total Project Funding 	
		 Funding Programme: 	
		 Lead Partner Name: 	
		Project/ Activity 2:	
DOCU	MENT CONTRIBUTIONS		
1	 the name of the document; 	Summary of Document Purpose (max. 350 characters in English) Please provide:	
	 an associated organisation publishing the document, and; 	 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. 	
2			



TEMPLATE FOR ROADMAPPING

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	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: Project/Activity 1: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]:	
	Current Knowledge Level in Region/Nation, delete as	 Organisation Name Contact Name 	
	Advanced Operating Experience (Supplier/Facilitator)	Contact E-Mail: Contact Telephone Number:	
	□ Intermediate Operating Experience (Supplier/Facilitator)	• Trusted Partner Information:	
	□ Fundamental Operating Experience (Facilitator/Receiver)	 Organisation Name: Contact Name: 	
	Basic/No Operating Experience	 Contact E-Mail: 	

		Contact Telephone Number:
	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	Project/Activity 2: Project/Activity Name: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Telephone Number: Contact Telephone Number:
	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format:
2. 3D DESIGN/ ENGINEERING/	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	 Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information:
SCANNING/ SIMULATION	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	Organisation Name: Organisation Name: Contact Name: Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Telephone Number: Contact Telephone Number: Organisation Name: Organisation Name: Organisation Name:

		Contact Name: Contact E-Mail: Contact Telephone Number:	
	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: • Project/Activity 1:	
3. SMART AND FUNCTIONAL MATERIALS	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	 Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Name: Organisation Name: Contact E-Mail: Contact E-Mail: Contact Telephone Number: 	
	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	 Project/Activity Name: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: 	

4. DIGITAL LIFE	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: Project/Activity 1: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding			
	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	 Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: Contact Name: Contact Name: Contact E-Mail: 			
	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	 Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: 			
5. TECHNOLOGIES FOR SUSTAINABLE MANUFACTURING	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: • Project/Activity 1: • Project/Activity Name: • Project/Activity Summary: [Max 500 Characters]			

	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	 Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: 			
	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	Contact E-Mail: Contact E-Mail: Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Contact Partner information Name Contact E-Mail: Contact Telephone Number: Contact E-Mail: Contact Telephone Number: Contact Telephone Number: Contact E-Mail: Contact E-Mail: Contact E-Mail: Contact Telephone Number: Contact Telephone Number:			
6. VIRTUAL AND AUGMENTED	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: • Project/Activity 1: • Project/Activity Name: • Project/Activity Summary: [Max 500 Characters] • Total Project Funding			
REALITY FOR MANUFACTURING	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	 Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: 			

	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	Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact Telephone Number: Tusted Partner Information: Organisation Name:				
		Contact Name: Contact E-Mail: Contact Telephone Number:				
7. VALUE-ADDED VIRTUAL SUPPLY CHAINS	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: Project/Activity 1: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding				
	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	 Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: Contact Name: Contact Name: Contact Name: Contact Name: Contact E-Mail: 				
	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	Contact Telephone Number: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact Telephone Number: Ortact Telephone Number: Trusted Partner Information:				

		Organisation Name: Contact Name: Contact E-Mail: Contact Telephone Number:
8. SMART SERVICES	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English) 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	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. Please describe the projects in the following format: Project/Activity 1: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]: Contact Name Contact Telephone Number: Organisation Name: Contact E-Mail: Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity 2: Project/Activity Summary: [Max 500 Characters]
	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	 Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: Contact E-Mail: Contact Name: Contact Name: Contact Telephone Number:

9. ROBOTICS (COMPONENTS, MACHINES AND INTELLIGENT ROBOTS)	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	If you have advanced/intermediate operating experience in the topic, please list at 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. Please describe the projects in the following format: • Project/Activity 1: • Project/Activity Name: • Project/Activity Summary: [Max 500 Characters] • Total Project Funding • Funding Programme: • Level Destine information [K sclevent]			
	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	Organisation Name Contact Name Contact Name Contact E-Mail: Contact Telephone Number: Organisation Name: Organisation Name: Contact Name: Contact E-Mail: Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters]			
	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	 Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: Contact Name: Contact Name: Contact Telephone Number: 			
10. MECHATRONICS (SENSOR, MONITORING AND CONTROL)	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	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. Please describe the projects in the following format: Project/Activity 1: Project/Activity 1: Project/Activity Name: Project/Activity Summary: [Max 500 Characters] Total Project Funding Funding Programme: Lead Partner information [If relevant]:			

	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	Organisation Name Contact Name Contact Name Contact E-Mail: Contact Telephone Number: Organisation Name: Organisation Name: Contact Name: Contact E-Mail: Contact E-Mail: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters]			
	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	 Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name: Contact Name: Contact Name: Contact E-Mail: Contact Name: Contact Telephone Number: 			
11 CE BRAIN BASE	Current Status: Please provide a summary of the regional/national position that exists related to this specific KACE Topic (max 1000 characters, in English)	If you have advanced/intermediate operating experience in the topic, please list a 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. Please describe the projects in the following format: Project/Activity 1:			
11. CE BRAIN BASE	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	Organisation Name Contact Name Contact Name Contact E-Mail: Contact Telephone Number: Organisation Name: Organisation Name: Contact Name: Contact Name: Contact Telephone Number: Project/Activity 2: Project/Activity Name: Project/Activity Summary: [Max 500 Characters]			

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	 Total Project Funding Funding Programme: Lead Partner information [If relevant]: Organisation Name Contact Name Contact E-Mail: Contact Telephone Number: Trusted Partner Information: Organisation Name Contact Telephone Number: Organisation Name: Contact Name: Contact E-Mail: Organisation Name: Contact Telephone Number:
--	---

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	•	х	х	Х	Supp	х	х			•	Lead
2. 3D Design/ Engineering/ Scanning/ Simulation	Lead		x	х	x	x			Supp	x	
3. Smart and functional materials		x	x	х	Lead	x				х	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	х	x	Lead				х	x
7. Value-added virtual supply chains		Supp			x	х	x	Lead		x	х
8. Smart Services			Supp	х	X	х			Lead	Х	Х
9. Robotics (components, machines and intelligent robots)		x	x	х	x	Supp				Lead	x
10. Mechatronics (sensor, monitoring and control)		x	Lead	х	x	x	x	Supp	x	x	x
11. CE Brain Base			х	Lead	х	х	х	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

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.



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.

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."*

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

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.



Top Digital Transformation Trends in Manufacturing

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 (exept 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

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 Compentencies => 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.



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		Südtirol Lombardy		Stuttgart	
Country Name	Austria	Italy	Italy	Deutschland / Germany	Germany	
Partner(s)	Partner(s) CAM + EVO II		PP2 - AFIL	Fraunhofer IWU	Wirtschaftsförderung Region Stuttgart GmbH, PP6	
	Current Status:	Current Status:	Current Status:	Current Status:	Current Status:	
	Current Knowledge Level in Region/Nation, delete as appropriate:	Current Knowledge Level in Region/Nation, delete as appropriate:	Current Knowledge Level in Region/Nation, delete as appropriate:	Current Knowledge Level in Region/Nation, delete as appropriate:	Current Knowledge Level in Region/Nation, delete as appropriate:	
	Advanced Operating Experience (Supplier/Facilitator)	Advanced Operating Experience (Supplier/Facilitator)	Advanced Operating Experience (Supplier/Facilitator)	Advanced Operating Experience (Supplier/Facilitator)	Advanced Operating Experience (Supplier/Facilitator)	
	Intermediate Operating Experience (Supplier/Facilitator)	Intermediate Operating Experience (Supplier/Facilitator)	Intermediate Operating Experience (Supplier/Facilitator)	Intermediate Operating Experience (Supplier/Facilitator)	Intermediate Operating Experience (Supplier/Facilitator)	
1. Additive	Fundamental Operating Experience (Facilitator/Receiver)	Fundamental Operating Experience (FacilitatorReceiver)	Fundamental Operating Experience (Facilitator/Receiver)	Fundamental Operating Experience (Facilitator/Receiver)	Fundamental Operating Experience (Facilitator/Receiver)	
NA	Basic/No Operating Experience	Basic/No Operating Experience	Basic/No Operating Experience	Basic/No Operating Experience	Basic/No Operating Experience	
Manufacturing	Future Outlook:	Future Outlook:	Future Outlook:	Future Outlook:	Future Outlook:	
0	Advanced Operation/ Leading Knowledge Supplier/Facilitator	Advanced Operation/ Leading Knowledge Supplier/Facilitator	Advanced Operation/ Leading Knowledge Suppliet/Facilitator	입 Advanced Operation/ Leading Knowledge Supplier/Facilitator	Advanced Operation/ Leading Knowledge Supplier/Facilitator	
	Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator	Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator	Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator	Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator	Intermediate Operation/ Fast Follower Knowledge Supplier/Facilitator	
	Competent Operation/ Knowledge Receiver.	Competent Operation/ Knowledge Receiver.	Competent Operation/ Knowledge Receiver.	Competent Operation/ Knowledge Receiver.	Competent Operation/ Knowledge Receiver.	
	Basic User/ Observational Capacity Only	Basic User/ Observational Capacity Only	Basic User/ Observational Capacity Only	Basic User/ Observational Capacity Only	Basic User/ Observational Capacity Only	
	No Interest	No Interest	No Interest	No Interest	No Interest	

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:

Region Name	Styria	Südtirol	Lombardy	Sachsen / Saxony	Stuttgart	Slovenian Western Region	Eastern Slovenia	Vas county	Małopolska
Cranity Harn Partner (4)	Anits CAM LEVO	tedy ICM Siddeni	hely PD - AFIL	Deserved/Conservery Transferfile (00)	Generaty Witholbolbolbolarney Region Statupet fielder, 196	Steweis Technology Park Ljubljana	Streets Pomarja Technakay Park	Bargary Parena Paritons Nacwark Association	Priced Staken Technikogy Park
	Convertises beings i now in Englandiation, dalers as opportunity	Canna Kasalespe Level is Reportation, cales as aposporer	Curvers viscou edge sovel in Regionalization, deven an expeription	Conner Economical per Local In Bagins Marins, Asians as represente	Curver Rescueige Level in Regionalization, delaw an appropriate		Garen Envillege Level is Tepperformer, obles en conceptor	Curve Exceletion Level in Report Level on Celeter an appropriate	Convert Knowledge Level in Region Mattan, delete w oppoptiele
	g Avenue Operating Department Department and the pro-	O Assessed Consensy Considers (Considerationality) O Intermediate Operating Department (Supplier/Constant)	p Alexand Develop Develop Supples Testinger)	la verse na constant desta la constanta de constantes. Interneticas Operaios Departos de palentes (constantes)	B parameters (densing processes (problem, second		Constraint Operating Experience (Supplier Englisher) Intermediate Operating Experience (Supplier Englisher)	Character Constructions (Supplier Technics) Claring and Specify Department (Supplier Solitation)	D. Astronol Connectory Connector (Supplier Continue) D. anomatians Operating Experience (Supplier Continue)
1. Additive	11 Factorers: Operating Experiment (Editors/Revolut) 10 Detection Operating Experiment	g: Exercises: Opening Provident (Substantioner) () Serieha Converge Developer	Forderset Opering Experiment (Section Review) Effective Operating Dependent	n Frederica da Canada y Parcines a Parlitata Beraranj Di Casistio Canada Españesa	 Fundamental Questing Provinces (Fundate/Fundate) Electric Operating Dependence 		117 antonios Operang Suprimus Carl Basel Succioni Management Superior S	gg Faceworks Operating Pacework (Facebook Review) (1 Desichts Operating Repetition	 Paralamenta Operating Transieria (Paralamenteriane) Distriction Construing Dependence
Manufacturing	France Collect III Address Copering Learny Socially Geglin Tables	How Orders D Anneous Operation Looking Knowing Days within 1988	"dan Udan. B Adamad Opeans" padag terevalja Depherbastane	Managed Cond of Look of Kundulas Cap while take	 Marcolater, B. Abusted Operator Londer Develops Department and 		Hunn Octors Anarost Cassi at Leiding Fixelety Supplement oper	Fran Orden D'Anarosi Condin' Lasking Knobilge Sapi ethini 144	Frans Oriken. 10 Anwent Open an Look op Knowing Loop when iden
	C interned also Decision? Facilitations: Electricity Magnitudines to as 11 Decision Transition Researches Researches	 Martinelia Operatori Fact Fall over Kanderge Supplier Fall over Farren et al. Sander Fill environ Residen 	2 Printmetics Openition Paul Policies Gravitage Display Tracillation Openities Openities Receiving Receives	D demedials Operation That Tollows Knowledge Regides Feshicas Canadam Operation International Service	2 Manualus Operature Part Policee: Revealge Brages Paulikas - Competent Operature Revealing Review		X stannidale Specialor Part Falorie Knoblege Bagelor Part John 1 Consponer Operation Research Provider	D. Namedala Operation' has the own Rissofedge Dappi attack lador Of Paragenetic Residuel Alexandro Resider	B. Harmdole Operator "Fact " alone histoledge Cupil et Taol ador D. Cargoner: Darisker Hare wijs Resider
	Differe Caref Strenderer Centry Dity Diffe Manual Convertinger	C Beer Unit Dearstone Capity Dity D to bloos	2 Basis Over Clear velocid Capacity City 2 North ed.	Disea Unit Oneroland Capity Dh) Diseand	2 Beau Direct Observational Deput & Org 2 Rev Hand Converting		D feet Gen Strend and Canady Srip D Te Month Canad Strend	D Sear Can' Orenatin's Capacity (24) D th Manual David Orena	U tear una' dearait en Capelly 54; U te base: Devel Deve
	Current Exampledge I new In Region/Factory, dollars as oppropriate 2: Access of Spacing Days according also Factors	Guerra Konstelay Level is Reportantias, mines an opargonae (C-Anamon Generality Transmission (Repoles/Traility)	Carrier reasonings in the Region States, denor as appropried In Advanced Operating Department (Suppler Collision)	Carmen Konselection I worth Neglection on, and we are appropriate (1 Advanced Concerning Dependence (Despine) [®] acidemic)	Convert Resolution from the Basic of Action , Arize an Appendice (E) Also and B Converting Response on (Science of Science)		Career Knowledge Level in Registricities and experiments registration. Automore Career and experiment (Suppler Facilities)	Guerra Develope Level is Region Karan, onlines an oppopulars (CAN-action Reporting Concellence GraphicsTacilitate)	Contract Constrainty I will in Tergine Markey, distance and appropriate Character Constrainty Constraints (Character Character Character)
2. 3D Design/	C Harred de Dansing Expension (September Melo)	D. Herredale Opening Digeners (Supported Relation)	D Homeles Opening Science (Stadio Technic)	A Harmitele De sing bijerense (Deplecties Hele)	E Minimulan Operating Experience (Supplex Facilitate)		 Harmshale Upwaing Experience (Sag) with a Material The transmit Faces on Constant of the Brandwise 	1 Differendels Densing Department Support for Index of Functionary Department Technologies.	U warned de Denning Depresente Stagi a frecidades De Desteueur d'Annae Depresente De Brenz Berning
Engineering/	D Dedo/in Opena og Coordense Federe Dednek	(1) Seeks?-a Canad yo,Canadawa Fedano Baltanti	C Dar a No Operating Departments Falsers Conflords	D Date for Darveing Experience Fotore Outback	C Baric No Operating Departments Induse Outlinds		C) Tanic Ca Connel no Coordenne Falano Dadicale	D Selection Operating Experience Entrary Dathersh	El Candolta Egunal y Esperienze Fotoro Datlante
Simulation	2 Aniara Gades Lasing Calify Spoketao tau O Harndala Usubal fastra ang Kawing	D Anna on Operator Look of Rocking Tage of the lists D Monwhell Operator's all tologic Rocking	C Administ Operation Country for avoid in the deviation of the second se	D Ahun Al Uankat Links II ank da Vastathiri Ma Birlanadol Operani heli teknol Keleksa	E Abun al On and Looky travidy tophotoxic ac- Distriction Operator Test follow: travidge		Anvaront Constant Londong Kondong SupplexTable table X Harmatala Operator Francisk was Knowledge	D Anna ne Const al Louis y Raving Lagrama data D Maradad Davian (no.) 1 dina Englata Lagrama data	D. Anward Constant Looking Havebage Easy of the Island
	Diget structure O Dregener Darober Kracelys Broker D Beet Dar Structure Casely Dily	Big de Affrick (1999) Di Caregolant Operation Honorauge Beration Di Boue, Gené (Operation: Operation)	D Concerned Constant Constant Constant D Concerned Constant Constant Constant D Base Const Characteristic Constant	Conversion Operation States and a second sec	Corporation Constant Constants Density 2 November 2 November November 2 November 2 Nove		Diget Vice can Disperate Device Annually Broke Disker Can Downlass Capady Tely	D Dergelant Dansdorf Holes alge Reisean D Derge Land Obersid all Cape 47 (3-6)	E Congeser Operated Incoming Resour U. (See Conf Operation: Capital (19)
	Convert Dessei Convert Dessei Convert Desselväge Lavel in Regionitistice, delere or	Converting Sealers Converting Sealers Converting Sealers	Constant Constant Since Const May with Lost & Parical Miles device as perception	(Che Balva) Corres Cella Cares Knowledge Lewin Rober Total, John as aparentary	Chanter and Constitution of the Constitution o		ETTR ROAM: Cares Data Cares Frederige Land a Republic an other se	David Case Carvel Const Carvel Condege Level is Report to an object to appoints	O fa base Daves Dese Cares Excelete Levils Report Natio, celes et apportes
	S Administ Operang Dage was (Supple Tablation) D Harmah Ar Dansley, Digen was (Supple Facilitation)	D. Asserved Operating Experience (Supplex/Tacilitate) D. Horne Aufe Domaing, Experience (Supplex/Tacilitate)	() Allowed Denting Downers (Sep enflict later) Distances (Conding Downers, (September)	les Adverses Cancelso Flow Reck (Replays Technol) Di Konnelles (Apres og biger and Supplember Adver	D Abarast Densing Departure (SepterTechting) B Mennetike Operang Departure (SepterTechting)		Capitalisti C. Actorizat: Operating Copielance (Supplex Tacilitate) Hermodule: Operating Experience (Supplex Fuel Island	D Advanced Operating Disperience (SuppleetTechnon) D Maxweddier Specifieg Department (Supplicities Refer	D Azaroni Operaç Tanines (SepterTadiros) Bi Harminie Tanàng Esperanci Sagi atau Adri
3. Smart and	C) Factoriseral Operating Dispetience (Facilitates/Receiver) C) Descrite Operating Dispetience	(): Fancienero: Operating Disperieros (Tacilitano Taceler) (): Disebolho: Operating Disperieros	C Fundermental Operating Experience (Find to the Reserve) C Base affect operating Experience	D Forderweit Constant Constants (Facilitate Research D Search S Sparsing Experience	 Distributed Operating Department (Cast Interflacebox) Distributed Operating Departments 		 Cardonavas Cones no Coordinato Cardinato/Resolu- Cardonau Operating Coperante 	C D Cardenaeral Operating Distribution (Cardinator/Personal) In The Lance States of Cardinates	D. Fundamental Operating Transforms (Techters) Resolut) D. Sealonial Operating Experience
materials	Fater Orlink 2 Abarta Nyodes Loa sydewray: Sgeleffae Isla	fexe Orket O Anaros Opastari Lading Kenkaga Sagrafian Ada	Lan gang Dyen ang ganan, tang proversit ganapangana.	fere Orke: B for and Condard Laws, Naviday, Spyrathic Life	Dispect Operation and a provide product on the second seco		Pasar Oriket O Assarsk Opinion Los aj Rosting Sigdia Tati sta	Fran Orker D.Ananii Upadari Ladog Kenikiga Segi ofini Ma	Гаха Сикин () Легали Орлайин Слайну Кхийнур Хурготон Айл
	D Hannah Az Densker' her i here Knowerge Degel witzel sone D Doopeen Darosser' Knowedge Rossier	D. Hannahde (Jacoba) i tel tel ava Kankdar Septéne Folkoso D. Sangeent Operation i Nose espa Receiver.	2 bisnessis Operation had halow forwadje Supier Calibra 2 Garpene Operatio Devietge Ricewe	Di Konsekile Geranes Ines Indere Kreekile Gegeles Ficilitzen Di Canaren Operatios Kroolerge Receive	B Manadate Operation Fast Indexes Fasteday Supples Tectilities Compared Operation Receiving Receive		S Marriel de Deute et techniser Keninge September aan D Derpeen Osrassel Ansverge Recear.	Di Kornaladi (barusa) hali hilawa Kasakita, Basi ofusi laka Di Serpeen Operatori kasunga Reckar	 Barreshdy Dynamini and Farmer Newburg, Dagtartion Index Distription Dension Hoseways Research
	E Board Share Canada and Canady Brits 11 No. 84 Anna C Review States	D bloc Usaf Otomatiane Capitaly Day 10 % kenori Oromatiane	2 Balo Over One wood Galory Ony - Notaera Carvet Mater	Disk Uni Okoné sel Sapaty (94) Ola karol Divet Désa	2 Bit of the Conservational Galaxity Org - No server Convert Datas	Carvert Status	D Sear User Universities Capacity (File 11 Technology Careet States	Distancia can' distanti ana Gapanéy Gay Ng Selamat Convet Distan	O dice Cash Disertation Capacity Only 17 Na Kennet Cannat Status
	Current Rook edge Lavel in Regionitation, dalers an oppropriate IS Adverse Operating Disorderice Depthe Testimon	Current Encodedge Level in Report full on, colete an appropriate D Advanced Opening/Transferors (Suggles/Tacilities)	Convert Arow edge Lovel in Region/Aston, down as appropriate C Advanced Operating Department (SupplemThat Love)	Current Konzeledge Lawelin Region/Notion, delete an appropriate O Advanced Expending Experience (ExperientReditions)	Current Reputadge Lawier Region/Asson, delaw as appoption El Advanced Danating Eligenience (Suppler) ⁴ as Reput	Connet Republics Law In Report More, John as separative El Advanced Connet y Experience (Cospiler Technet)	Carent Elsoviedge Lavel is Reportitation, cable as espina for: C. Accencie: Operating Diporterios (Depiles Teolitzan)	Current Encodedge Level in Report Nation, caledo as aporprista. D.Advanced Operating Capacitance (Sagalan Taolitano)	Current Knowledge Lawel in Report Nation, delete as appoptiate. El Antarioni Operating Transferor (Segoles/Teolitism)
	O Investigation Densing Department (Department and Resign)	 movedies Danzing Experience (Dapper Statistics) Testamore Operating Transience (Dapper Statistics) 	 Interventer Operating Transform (Suggles Technic) Discharter & Discourse Discourse Conferences 	Characteristics Operating Departments (Supplier/Delivery) of Caracteristic Counting Countiers (Caracteristics)	D Internation Operating Departments (Supplier Technics) (p. Decknowned Operating Developer Conference Operating Section	B Internation Operating Coperation Standard State) (5) Internation Counting Department (Coupling Touling) (1) Taxionesis: Opening Tourisms	e) Conversion Specify Dynamics (SepterCacture) Containers Spectra Spectra Statistics	D. annualise Specify Departure (Support in Seal) D. Second Specify Departure (Departure Specify)
4. Digital life	C Dado/ a Cpeaking Experience Extensi Cellenki	R. Ban en Spaining Commun. Ream Orders	- Bar cNi-Opening Department Main Dalate	D Data No Dansing Experience Frank Option	C Barichie Operating Expensions Fature Catolok	D Dariettis Operating Experience Marie Called	Praelida House of Colfadoria Conarig Contesta Proce Octor	No the Part Constant and the Part of the P	D. Serácita Carca y Españeira Francúska:
	S. Adamoni Operativ Lancing Constants Diggl effort Ven Cl. Marineli de Danska 1 Fact Fallows Kanslergi	D Asserbet Open on Leading Hooferge Supplet" as been this reacted of the sizes" Fail Failers Neederly.	C Advanced Operation Leading Reporting Supplet Facilitates C Manuscular Operations Facil Follows Grantedge	D Advanced Episod on Leading Knowledge Suppl et Pool Data D Hanna Kali - Qena Kno Fall - Hanna Knowledge	D Advanced Deraston' Leading Konstedge SupplexTactions (2) Maximum Control Field Select To weakly	 Advanced Djarvaket Geneting Dravings Stagdingt scholar Stagdingt scholar Stagdingt Scholar Stage 	B Adamper Openies Lad aptonology Dept «Collyns Annalde Quester Sal Edines Russkip	D Advanced Operation Leading Norwindow Supplem The Islam	El Anarcel Operani Leading Novietge Supplementations
	GlepherFool year D Dompsker: Dansdorf Krayledge Rossen D Boaol yn M Demokran: Capacity Dely	Skynikef Folktov 16. Scotpilet (Dendor): Roviege Resiler 13. Skot (Skyl Stans Kanel Capital Off	Display Switten R Compared Operatory Encodedge Facebox 1: Box of the of Educe worked Granics Ong	De pales Facilizzo 14 Competen Operator, "Onos espe Tacener. 13 Facili Unix "Obues d'anti Cagne dy Ordy.	Compared Operation Encoding Electrics Compared Operation Encoding Electrics Class Rest Operational Departs Only	Segret Statement Composed Operation' Encodedge Facewar Clinics Operations' Encodedge Facewar Clinics Operational Segret (Silver	Supplier Technics D Dempleer Operation' Rook edge Receiver D Rook User' One work was Digarchy Drift,	D Complete Der statel Habelleige Receiver. Spiller im V Die wysierer Ogenike Dieg	D Competent Operation' Hook experiences O Scienciscos' Observational Cognitive Cognitive Color
	Convert Development Convert Development	tt Mellows: Carney Social	(INVERVE) Carent Malar	nta kver Deni Deni	- No word Convertigation	- Rowerst	17 Webser	Disklass: David David	O 'a kevel Davet Satur
	equipade 11 Animon Opening Transverse (Suppley Technon)	Caref Evolety Look a Report was, easily an approximate Character Opening Transferry (Suppley Tasking)	Development of the set	Convert Knowledge Lawrine Region Ration, Index on Agregation (g. Adversed Kapisal og Kapislande (fa. giller Tecilland)	Di yana a timata yana a yana ya timata yana ya shiniyan.		Approved (proving) ² specieure (Sugale of with sur)	Connel Executing Level is Report Ratio, exists as appropriate CONTRACTOR Conners (Connect Congress Technic)	Cores Devices Devices Topor Nation, datas as aparentes 19 Actives Opening Topologic (Sugar Tacilizas)
5. Technologies	D Partanena Operating Dipeteron (PathrassRepere)	is favoreers Opening Score of School (Score)	Produced Dynamy Exercise (Super-reduce) Produced Dynamy Dynamics (Fac betweener)	D Parterente Opening Experies a Pacificanties and	C Practice and Density Density (September (September))		C Administra Oreaning Experience C Technical Covering Experience (Technical Section)	IS Taxaners Operating Experience (Technologies)	D * adverse Opening Transiente (Tackson/Receive)
for sustainable	D Basicilia Operating Econtense Federa Ordinak	C Describ Open op Transleron Francúckou	2 Ben tille Opening Deprintes Fans Datum	D Denistia Danaing Digarana Falar Calitan	2 Benefite Operating Doperation Fillers fillering		E Contractor Concernent Contractor For an of Advant	D Select a Constig Dependence Free Callers	O Senicita Constig Experience For a Online
manufacturing	D feine ter Openen bat geften ber ber ber	 D.Artweise Open and Look of Excellence Cappion and an interview Sandywaite (Tail Falsure Kinetery) Sandwitzellowe 	R Administ Connect and provide Department on American Connector For Follow Francisco Samer Contest	A Anne of Conder Links (Noted provide provide by The second of provide from 7 direct Knowledge Standard Technice	Produced Device Config Provide Spatial and Research Constant Test Prices Associate Same Configuration		Neglis Fair and In december Constant Fair Fallows Knowledge Sandar Fair Ann	DAtartes Constant Looking Freedom Lappins and a star Linearce Ran Derickins Frei Fahwer Reislenby Sings of Fedinary	D Anarosi Operan Lank y Freedorp Cap when day graver day (he sheri for fit was he shery Supported hav
	D Deepster Unexter Forwards Torona, F Deck Land Derver and Capacity Day D Scilland	R. Dargelant Develop / Develop the serve of Serve / Serve / Develop was Copiedly Dely D. St. Reserve	Computer Operation Providing Teams They like Commission Country Only Discover	D Company) Operation (Counting of Taxin vie. - (Darde Trave) Observed and Gran by Orb, Citing Investor	2 Computer Operation Floridage Florence Flore Board Characterial Departs, Only 2 No. Marcel	-	El Dergalari Garaberh Garaige Never. 1 Telebiliert Derser and Orgenity Bill; 10 De Resert	B. Chrysleri Dynaleri (izwają Tarsov. 1 Dodržavi (Donoverse Copicky Dily D la Prese	 Gargater, Derekter februnge Bannen. Diskolster Oberwarten Operaty Dely. Diskolster Oberwarten Operaty Dely.
	Carried States Carried States Level in Report Salar, dalvia or according:	Canad Solar Canad Frankrige Land in Negar Folders, solvie as operande.	Canadi Marin Canadi Talov adje Lond a Hajen Maton, dolata sa adjespina.	Constitues Constituedada Levin Ngao Natao akki a ugagada.	Career Make. Career I to avoid ye Lover er Hagine Maker, delka va angespreis.		Care & Recolution Land + Report Alex raids as appropriate	One of Mana Consult Proceedings London Stepse Trailing, safely as appropriate	Daniel Haras Ganed Histolige Lewins Opportfallan, dikks as uppopula.
6. Virtual and	 Administ Opening Dopenics (Supplicities) and intervention (Supplicities (Page of the Rest) 	D Answord Opening Drawners (Supples Pacifians) or anyone first discusing Drawners (Drawin Conitional)	2 Advected Operang Experience (Supplements below) go kewenedary Operang Topologica-(Segular Toplary)	U Advanced Operating Experience (Supplex) Pecalitation (g) intermediate Operating Experience (Supplex) Pecalitation	W Advanced Upwareng Experience (Supplements Mater) Anternative Operating Superiences (Supples Tacilitates)		Anarost Opening Expension (Supples Pacifiate) or anomalian Opening Expension (Supples) and a later	D'Anarosi Opiral sy box week (Suplisi faciliare) e Li herowikes Opiraleg Psychiaes (Suplisi faciliare)	D. Atomost Constituy Dependence (SepterPacifics) grammedian Operating Dependence (SepterPacifics)
augmented	Diference Operation (Sectors (Sectors))	D * a damental Operating Sciences (* aciditata (* kovine) D Musetta Canadi ny Sole Innis	D Funder and Country Expension (Fac Hala Notario) D Res (No Questing Statements)	D For dama that Counting Department (For Water Galery and D States For Descring Reports Are	C Purchasterial Operating Expension Proceeding Statements C Reviews (Species) Statements		D * adarteria Operating Science ov (Calification of a)	Differential Operating Streament (Facilities (Secure)	O Hardenstal Operating Experience (Recificate Vicevier) O recenter Operating Second
reality for	Paran Geletek S. Adminis Operation Take as dowings Dept a Francisco	Trans Orders D. Ascerce: Open and Looking Developing Days art an isote	Traine Cale sole C Adden and Operation C and ing all activity to gather Technology	Texes Cellinis El Advectel Constant Lociting Riscolegy Dept within their	Talas Caludi B Aboural Decidian Lealing Kouveries DeputerTallison		Para to Oxford 17 Advanced Operation I and aphilosology 20 galar Fund and	Train Onlose Childrand General Leading Knowledge Sage within Kene	First in Cardinals ET Advantual Caraline in Landing Konstelling in Caral Infinite Theorem
manufacturing	is investiges descalant find Fallows Knowledge SupplierTechteter ED Despaket Operation 1 Scientific Norveel	 Intervediate Operation? Fait Fait way Knowledge Supplied Pacifications Distribution Operation? Networks (Sciences) 	g Enernedize Operation For Follows Kraudelige Staplins in a Mater D. Campanel Operation Forwhelp Texave.	g memotives Constraint Fact Tableve Knowledge Opplex Facelists: D Constraint, Operation (Rosef arguman vie.	- Kommelize Operation File Follows Resolution Supples Statilities 2 Compared Operation File Wedge Follows		is a second and the close that the work involved and Supplier that case III Despite to be adden to avoid a factorier.	Conservations Specifics' See Endower Revolution Supplier Endower # December Specifics' See algo the server.	 proceedings Discretized That Tail wave Revealed per Supplement of Inter- Coll Computers Discretized Tailor and protocols.
	n Suis-Care Standard and Carelly 24) D 16 Féann	C Sedel Josef Chevron and Coparity (14) C 16 Masser	- Bers Horr Charactered Separty Ony Discovered	o Sea Lou Olova wi Agea) ork Sita trave Rest Rese	- Reis Barr Churchend Zepart, Org Citis Wared		11 Tools, Canal Channel and Cage By 214; 23 To Person	Contendencies and Capacity Soly Difference Descent Desce	El Solation Denvelos Capado Dily El 16 Venes Denvelos
	Caneel Reveluege Level in Region Batters ender av agregation El Acurcos Openaling Engenerico (Supoko Faceback)	David Knolog, Levil is Republican colds as opposide D Anarot Oppologican and (Replace address)	Canar, Greenby Lord & Republice, does to append. B Administ University on the Materia	Const Knowledge Lowin (Togen Red av, d. A.C. av operation) Di Aberend Const op Expension (Depine) av Melan)	Gener franklyr owr e Roykellade, Alex os opepea. B Alexad Owney bogen ar Copiella (dae)		Caned Knowledge Lood in Repartment of order of appropriate Animored Operaling/Experience (Scippin (* activity)	Canad Receiving Look in Pages Relation of the Anappropriate Differenced Canad systems were oblights ("welling)	On and Knock dyn Lawler (byrw Nafar), difelo yn synogedd. U Arwr oel Upard sylfang wr oe (blagwerherffang)
7. Value-added	X warrandian Dan ying Departure (Depart Archine)	D. marriedina Specify Department (Supplier Socialization) D. Farlander Constant Specific States (Second	C Intervention Operating Statesters (Supples Technics)	() Internetional Density Department (Department internetion)	 Preventiere Opwering Distributer (Depther Techterer) Frankrisheld Opwering Frankrishe Frankrishe Frankrisher 		 memodian Durining Dipatence (Deplicit acidate El transmission Operating Streets or 	c) Differentiate Departure (Supplier Defined)	() www.edus.com/dop.Com/exis.(Copile/Cocilized) () Fundamental Constant Fundamental Fundamental Constant () Fundamental Constant Fundamental Fundamental Fundamental Constant () Fundamental Constant Fundamental Fun
virtual supply	to Reactin Capital og Dan Konz Transe Californi	Bulleton Contraction and Contraction	Dis eNo Questing Digeneres Nam Datable	th Ease the Outwalking Experience Training Collingers	о Вака Мо Орегия у Бархино. Разв Сабой:		Provident Control Concernor Provident Control Concernor Provident	Billion Charles Contract of Contract	O Brains General Devices Texes Order:
chains	1) Access of Operation Contract working the prior for item X. Marriedale Distation Tract for over Knowledge.	 O. Assessor Operators Usaling Knowledge Support Sociation D. Herredisk Document " and Editors Knowledge 	g Alexand Da Charl volk providen in pakelle drove E known in Operator fan helene Grovedpe	(1) Alexand Device of Config Residency (Equilibrium) III. Heredials Devices' that Follows Residence	g Alexan Darchert vollig Konsteller lingsbolfvill von Erhernelen Operfox Pathfoliover inzvielge		2 Annen Gesterline für einer ein Sectoriseten Ditermitien Desperifientitil zum Knollege	Different Constant Looks Knowledge Support Station	O Average Constant and a New York of Applications
	Replative late 11 Deepart Da class Knowly: Review 13 Deep Jeer Visional are Capitaly Dity	Replication data n Caraoten Operation Handley Relation III Diec Long Statement and Canady Dity	Segment without - Comparison Operators Recording Records 2 Basic Over Characterization Copyrights	Dageley Tacillator In Carageteen Operation Income angli Resolue In Dage, Carel Obertalistic Capacity Dith	Despire the Mills Compared Operation Databasis Review 2 Basic Over Observational Databasis Org		Replicited star Compared Devolution Grantides Review El Sear Cawl Startial and Capacity Soly	(g Tangalan Djarobar Kolonako Roman (g Tangalan Djarobar Kolonako Roman () Dana Land Obarobar Kalonako Din	A Company Operator in service Review D Dear Case' Operators Capacity Dity
	D 34 942451 Converting States Converting States	D Sk karat. Group Viela	2 Nordand Genetitation	Dirakası. Genelonu	Choward Constant Constant Constant Constant Constant Constant		Clares Cons. Cares Cons. Cares Excellence I and a Report way when a	D States Constant States Const	U Nekkon General States Anne Konstates Levis Netwolkers and a second
	B Annen Operan Dane un Geneter Dalten in Geneter Daten in Berten	D. Alexandr Opening Taxabase (Taxabas) D. Harredide Daviding Experience (Sagilantine Hales)	- Advanced Operating Depression (SupplierFor Instan Differences Operating Expension (SupplierFordinan)	(1.Abased Caroling Capelone (Capelor) willing R. Harmbele Caroling Digeners (Capelor) (Am)	- Ada and Devoting Experiment/SupplierForthersp R Manualain Operating Experiment (SupplierForthers)		Angengenite 11 Anvenue Operating Disprimers (Bageline Tacilitate) 1 Herrichtle Operating Beginnene (Sageline Fried Balan	() Assessed Canading Transferor (Supplier Tacilitate) Di Harmadala Danaing Dapanama (Supplier Tacilitate)	D. Asteriord Carenary Teachers (Deader) Tealbard) B. Narredold Careling Department (Dags of the Balas)
8. Smart	C) Taxamera: Operating Transverse (Tailleonetheoder) C) Stationis Operating Coordinate	g Texanoria Operang Teanarian (Teldraw Reiser) D Salahia Operang Diperang	p Distances Dances Experience ("a laseflacence) - Dat cNo Opening Diporator	Cl. Tarban et Constag Content (Tablet Status) O Calcho Constag Digetmon	 Districtional Questing Experiments (Carriers and Section) Elawic No Operating Experiments 	·	er Caronivers: Operang Dapeters Maciliator/Gacetaet (2. Salachis Operang Dapeters)	g: Facework: Opeway Taxolic in (To Browtherser) (2) Descript Opeway Dependence	D. Factorieuro Operang Transferor (Factorieur) D. Sedenia Operang Experience
Services	Potrie Colleck R. Adminis Commits Lawing Anwings Right of Coll Vita	Heave Orders. D'Anarcee Opene on Landing Knowledge Sapp and an Iberr	"-dan Oal wA. D'Adamad Operation' Leading Resolution Suppler Pacifications"	reax Collon. D'Athenset Constant Leading Knowledge Slapshelftod tabar	nduar O datak. D Adamad Operation' Leading Harvindge Supplet Technon		Proce Order Constant Statistic Revelope El Anterio Constant Statistic Revelope Deptember Statistic	Picker Ockers D'Antaroné Operatori Landing Krowiłedze Supplertifac Ibator	Hoxis Ocker. El Anaront Operatori Leading Handedar Supplet"an debr
	D Harris Batt Da start find Farmer Harrison Gigsliw Tasli van D Derpolert Operator fiktorvedge Generer	D. Honne Buth Operation (* 2017 di evan francéska) Skyniker Fanlinger ID Competent Operation (* Nationalitys Resolver)	C & Barrenson Constant Fort Follow: Its sensity Suppler Condeter R Constant Constant Fordedal Factory	B. Konsekste Operation 7 al 1 deviet New Kinge Degelen Pacification D Competien Operation "Rooklege Cacelor.	El Fernandez, Operate el Fort Follows for enfolge Seguir d'An Marin El Comparer d'Operation El Sociedade Fiscalisa		Digefini Teol lain Danator Filan Valge Rooking Digefini Teol lain D Dempiner Danator Filanviage Rooking	() Here kar Operation Field Ander Kriek ap Stephenster R. Derenker Derenker in eine alle Terener	B. Wern Kath Dockson Fact Fallware Recording (Exploring) links D. Derpotent Dockson Facts explicitly Records)
	In these on which each age of a peaky they a the Research Denset Sectors	gt Rosei in de Die system Canada Diey. 17 % Konner Dernet Solari	- Rect that Characteria Galaxy Gry Historica Carent Clater	r Fank Universitet Capitaly (Ed.) Interkover Ocean State	 Back Barr Oranelised Davids One No more a 		to he action for waters Capacity 204y a file interest Capacity States	C Policit Serie Observations Capacity (SH) In the Research Connect Connect	O Posit Cost Observations Capably Dily IT for Internet Control Operation
9. Robotics	Convext Reportedge Level in Region/Soliton, delete an Appropriate. ID Accarbon Opening Disperance (Supplex Technology)	Clanud Knocketge Land in Thepartfullon, solete an oppropriate D'Attantion Opening State beiox (Seguiles/Facilitate)	Convert for every stige Level in Cogner Soliton, device an appropriate C. Advanced Operating Experience (Supplementation)	Conset Knowledge Level in Taglor Tail in, fidels an appropriate. Al Advanced Openalog Coperations (Copiers/Tacillator)	Control for monitor large of the providence of the sea appropriate. It Advanced Operating Experiences (Supplicities catery)		Careet Knowledge Level in Regarithation, califie an appropriate ELAnamont Openialing Expenses of Expoles/Techtory)	Current Kinseletige Level in Topper Fraters, solide an appropriate D'Antarces Cipical og Experience (Supples?#collitate)	Curved Knowledge Level in Tagtor Matters, dakke as oppoptiale. ED Attarcest Operating Experience (Experient address)
(components,	C Inserved are Operating Dispersions (Supplier/Tacilitate) (3) Taxanserval Operating Dispersers, Pacificate Stocker)	Di memediate Operating Department (Supplemble Relation Di frantamental Operating Disartimeter (Facilitater Receiver)	C Internetion Operating Experience (SupplexTections) 8 Excelored at Denoting Experience (Fac (Interfacation)	D Hernelise Operating Expension (SupplerFacilities) D Fundamental Operating Coordinate (Facilitate Facilitate)	8 Internetics Operating Topolarce (SupplierFactors) C Publication Operating Department (Factors)		 memodule Densing Diportence (Supplier Pacified) Contention Constitution 	D memodate Operating Dependent (Suppler/Text Indust (5 Fundaments Operating Dependence (Fundament/Incoment)	B memodate Dorating Department (Supplember Balan) D Turdament Operating Departments (Technol Technol)
machines and	C Statofik Openting Experience Federer Gelfenk	M Marcin Control Control of Contr	E Ban allo Opening Deparate Film Datak	D Denistra Danaing Experience Faces Colline	2 Barbilo Operaty Diperente False Dalwa		El Sancha Cpesting Esperience El Sancha Cpesting Esperience	D Sealor's Canading Experience From Oxform	O Seecha Operatop Experience Faces October
intelligent	C Anterior Operation Last split solvings Support to Bats of Maximum Re-Devict of Taxa Polices Newslogs	C Anterest Operation Londing Facebodge Tapp at Pacifiate to recover \$45 Operation 1 on Tailware Streadings	2 Administry Operations Consider Straving in Experimentary International Operations Field Performance International International International International International International International International Internati	R Anne of Court of Lindig Knowledge Sage when take of Anne Alan Operation For Takewa Knowledge	2 Adamsed Operation Loading Vincendige Supples/Technice () Encoded and Constrained Technical Supples/Technical		Di Anton Ser Opene de Ladorgo conserge Staples fruit alla gi ferrinel de Danaliset Taxi Facture Hondorgo	D'Anarost Constant Leading Knowledge Cappi of Tax Balan Trinsmerkan Operation First Failwer Knowledge Singal of Failback	D. Ansered Count on Leading Receiving: Dags within Index (p. neuronakae Counting Tax Fall ware knowledge Suppl of Section 7.
robots)	C Dempilieri Operatori Azerondya Nesere 11 Tenio - Keni Diseoretari Capacity Dely	D Consider: Densiter' formelige fersive g Steel See Densiter Canada Day	R Company Constant Franking Taxave The others Chrystelevel Taxave, Ory	D Campalian Operation "Revolution Review. O Casile Down Observational Respective Only.	Compte & Operation Recycling Decimin Date Born Observational Capacity One		E Dempileri Operation' Gravindar Neuron. 11 Testi Land' Operation Coperaty Soly	R Gregoliet Openier's beweige to over 11 Tesle Island Oberevensing Copecity Dely	E Computer Operation' Faces eight Techniel. El Sank Loand Oberwaie eine Copicity Daly.
	Carvest States Carvest Networkedge Level in Region/Sellice, dates on	Cannot States Cannot Receiving Lond in Neparitation, Givin as operated	Carteri Hatan Carteri Gravadge Lont e Hagenflator, doleta sa ageopera.	Constitutes Constitutes	Career Madeu Career Madeu Career I de evindge Loni e Mage officion. Antos va espoperio.		Ower Super Care of Knowledge Land + Thy articles, sinds as	Consed Status Consed Status Consed Filmonicity Level + Super Rulan, coluir as operateda	Denned Marcon Oceand History Bys Landin Vegner Hallon, daktor as uppropriate.
10.	IT Accuracy Opening Department Standar Techany	D Anarost Operating Dependent (Supples Pacificate) (Contents date Operating Department (Supplex Decision)	R Advected University Experience (Cappion Text Mater) Intervention Operating Transfersor (Seguine TextBester)	R Anarose Covering Commune (Super- Super-S	R Advanced Uperating Experience (Copy of the Mater) Intervention Operating Displayers, Stephen Technology	1	Anarost Construction whom (Supples Pacificator) in investmention Controlog Experience (Supples Can Inte	D.An arout Constitut Expension (Supplex Pacifiant) p. an experience Constitut Experience (Supplex Facilitate)	 An aroun Operating Environments (Supples Products) Brownedies Contains Environment (Supples Products)
Mechatronics	E hantamental Operating Experience (Incidence/Access)	E tantenina Quinteg Soloninos (hokasis)konin)	E Fundemantal Considing Experiments (Fund Salas Hearren)	D hardwardal Opening Desenses (hardwarf leaved)	E Funder and Donalog Expressive (Fas. (Id. 8) Accesso)		Chatameta Operang Expension Paranteriorena)	Enandemental Operating Sciences (Notifies (Notifies)	La mandamental Operating zonominos (healtánovideover) O de antis Parados de Anneses
monitoring and	Farm Gefect 8 Acarese Operation Last 10 Annuage 2 Acarese Operation Last 10 Annuage	Frank Oxford O Advanced Openian Excelling Elevativity Stags within their	Taxe Dates () Advant Dates, sales Movela Syder advant	Tasar Calence (1 Antorial Constant Lindig Kwishings Capt of the Sale	"an Cable () About Durbe " seleg Kevis be Dyde Tailines	1	First M Oxford S. Accessor Operation Last activations And the Second	First w Oederse Chalantine Carolina and Landing Conversion Carel and An Isaan	Texas Ordenic El Adversol Cysae av Look y Navelege Capital Sala
control)	is increasing the start fail for the second point of the second point of the second se	n menedias Specificat Part Palawarit soleniya Supate Participas Prince Participas	 Intercenter Operation Fast Deliver Hawings Stephen Research Description Constraint Fast Intercent 	C Falsenetiker Operation Politics Politics Konstellige Stagelee Technice The second Operation of Technics (Technic	 Intervention Operation Fait Policies Rescelips Support Residence Policies Research) a menunkan dan olar fari farawa Karakage Dagilar taki taki Milanan dan selara di karaka dan se	D. served as Operator Two Fill was in a deep Gap of the base of the set of the set of the set of the set.	g: werne dass Operation / Text 7 of sour According of Applied Text Inter-
	Co Donis Uniter Diamont and Capacity Diffy Co Tel Primer	D. Sale - Sale Disease has Called St. Dily. D. Sale Install	- Dar a Mari Characterial Capacity City 2 No. Wared	C Data David Channel and Capacity Deb. D Ta Bread	- Revellow Churchest Space, Ora 2 No. Wave		CL Tarde Linker Steward and Capacity 2nd; CL Tarde Heimer	D Stale L and Obers, and Obers 2(309) D The Monter	El Cande Lond' Chever, el sela Capacita (Crèt) El Ta transmi
	Carrent Resolution Low Configuration of the en- oppropriates:	General Revelop, Louis Hoge Maters Collins, opposite Difference: Constrainty and Antonio Mandaland	Canon forwings been a Regulation, does as approved. C Administ Constant Digate and Manifest Inter-	Good Kookidg Locin Rigor Nation Bible at openado. D Africa di Goodine Speninger Parente Parente de Adria.	Circuit forwindign town in Program Material Advances appropriate C Advanced Operating Experience - Materia March Materia		Carel Knowing Loof + Republishes of the as appropriate Difference Constant provides a film that a	Canad Ricekety, Lood in Apple Balan, Colde as opposite Differenced Constrainties and a Name of a March	Gund Mickey Local Style Balancekie angegede. G. Astron Constructioners (Namis Construction)
	U karnel de Constra boenne (Supinite dele	D Harredule Dening Department (Sapt office Hales)	U Historica Operating Science (September 2008)	ff Harmade Denning Lowence Harp offen Meni	R biternelein Opering toperator (Supplemented tota)		C warmed de Conste p Depresent (Depres'e Mar	R nurredale Opening Dipersone (Suppletion Hafe)	A Maradale Downing Dopress (Capitalise Sales)
11. CE Brain	C Search Control (Control Facilitate Nation) C Search Control (Control Search Control Facility Control (Control Search Control (Control	Distanting Operating Contents (Technic Wooles) Distanting United by Son Anna Distanting Operating	2 Boo Shi Gening Spanny Den and 2 Boo Shi Gening Spannor Sam Danki	Director Control Control Control (Notific Factor) Director Control Barrison	2 New Party Operang Expension (Part Mathematic 2 New Oliv Operang Expension 2 New Details		Dise Colorist physics	Josef a Contraction of Contract (Contract) Difference (Contract) Difference (Contract) Difference (Contract)	U dear for Constitutions and U dear for Constitutions and Frank Onker
Dase	C Advanced Dynamical and a proceeding the photon in a second	Chevalet Constant Looksy Rooksy Loop of the fide Commission Constant I for constitutions	 Schwarzel Operation Landry for everying the principal distance Researching Operation Taxa Tolicon House data 	D'Alverad Opvid af Leideg Nikolsky, Digel a Voor aan 16 metrik kei Dersteel fast fallowe Kroviedge	Colores of the exect state proceeding to poly the data of the internation Operation That Follower Countries		B Anaros Opedini Ladin Kushing Napla Kusi Sus Turnedas Operation Part Fillow Kushidar	D.Amator Conduct Looksy Havekap Explorition Inte	D America Constant Looking Rooking, Easy of Aurilda
	ng ya Afran San 13 Despute I Operatie I fa wordyn Menswe 13 Despute I Dansen wa Operaty SAJ	to per effections D De sector: De rector face approximation D De sector Dennis and Dennis De Constant de sector	Experient and the second and a second fraction of the second seco	D Constant Operant Konducty Plants D Constant Operant Konducty Plants D Sear Operand and Coperary Sea	Congest & Canadian Newbog Rooms Congest & Operation Newbog Rooms Chart Mary Characteristic Capacity Ory		D Despite (Openine' Greening: Room D Despite) Openine' Greening: Room D Date: Law Disease are Capitly Dity	D Daspides (An size "Gamings Texator. D Senio: Sen" Disavelaria Capitaly Dily	O Dargelan Darakat Gawago Boave. El Desi Luel Desvelora Capitaly Dely

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 furtheron 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 Exceltemplate 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 sub topic 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.

	SDCerri	Iai		
	KACE TOPIC		fe. Additive Manufacturing	Input / Comments for Discussion
	Subtopic 1:		XXXXXXXXXXXXXXXX	
Nr.	Action	Cat	Description	
1	SME Custimisation for 3D Printing	R&D	R&D Project to improve 3D printing usibilisation for easier aplications in SME	
2	Engineering Skills	Traine	Special trainee programms for SME to improove 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	

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

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.





KACE TOPIC



Mechatronics

Nr.	Subtopic 1: Action	Cat	Mechatronics for SMEs Description
1	Mechatronics Evo-labs for SMEs	R&D	R&D Project to improve SMEs abalities 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 trainng 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 trainng centers, Vocational and insitutional trainng associations, technology parks, etc The end result of the project could be the implementation of several trainng labs and programs on local levels across Europe.
2	Intro to Mechatronics	Trainee	Series of workshops and tranings 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 tranings 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 traninngs/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

Nr.	Subtopic 2: Action	Cat	Process Monitoring in Additive Manufacturing (AM) Description
1	Process monitoring of various AM technologies	R&D	R&D Project to implement process monitoring systems in various Calssical technologies, such as milling etc, and Additive manufacturing technologies, such as laser sintering, laser melting, fused dilament fabrication etc This will be especially relevant in areas where the cost for monitoring was traditionally deemed too high or unecessary, such as low volume production or low cost machninery. 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 unsucsessful 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 enviromental impact. Process monitoring in running process would also allow for active intervenece in runninge 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, electromagnetical. etc depensign 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 electromagentic 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 processuing 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	Strategio	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	arget	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



Subtopic R&D Action Target







D.T1.5.1 Actions Draft- Summary Part 2



Subtopic R&D Action Target







