EDIH4UrbanSAVE

Skills & Training Description & Curriculum

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EDIH
For urban interconnected supply and value Ecosystems

www.edih-hamburg.de

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Artificial Intelligence Center Hamburg e.V., Germany	ARIC eV
Digital Hub Logistics GmbH, Germany	DigiHub
Hochschule fuer Angewandte Wissenschaften Hamburg, Germany	HAW
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Skills & Training Description & Curriculum

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Executive summary

This deliverable describes the services related to the pillar "Skills & Training Description & Curriculum" in the European Digital Innovation Hub for urban interconnected supply and value Ecosystems[1] (EDIH4UrbanSAVE) to bring value to the target group for the mission and leveraging existing ecosystem players and services. It is based on what was described in the proposal and Grant Agreement (GA). In the deliverable the documentation of innovative skill enhancing formats, curriculum and ideas for developing certificates are presented. The original plan was to provide the deliverable in English and German and a corresponding Wiki. However, the planned Wiki functionality can be replaced with the structure and the content (German and English) of the EDIH Hamburg website[2] without loss of information in order to avoid duplication of the data.

While some of the services also referred to as formats described are still in the planning status, a number of services are also presented that are already in operation. After a brief overview based on a skills & training services catalogue, the various formats are presented in more detail, also describing the topics covered by the content and highlighting the value of service for the participants.

[1] In the following text, EDIH4UrbanSAVE is also referred to as EDIH Hamburg.

[2] EDIH Hamburg, https://edih-hamburg.de

Table of contents

List of figures

List of tables

1. Introduction

The EDIH will prepare the European society and economy and place Europe at the forefront of sustainable tech development and the twin transition (digital & green). Therefore, important new and established innovation actors and the education sector have joined forces across clusters and industries. The EDIH Hamburg will contribute to the twin transition (green & digital) of local SMEs, small mid-caps and public sector organisations (PSOs) with a portfolio based on existing local competencies, covering the key digital technologies of AI (Artificial Intelligence), HPC (High-Performance Computing), cybersecurity, distributed infrastructure and digital skills, including, where relevant, their environmental impact. A large-scale digital transformation of the metropolitan region of Hamburg will be facilitated by "skills and training" formats.

1.1 Goals

Local SMEs, small mid-caps and PSOs will be able to acquire the required core **competencies** in the key technologies AI, HPC, cybersecurity and digital skills in a demand-driven manner as well as learn about respective **methods** (e.g., agile development, design-thinking, technology road mapping) and a proper **innovation mindset** (open innovation and human-centred approach). Training and teaching activities will be based on modern methods from experience-based learning (e.g. bootcamps) as well as e-learning and blended learning, using state-of-the-art software and hardware (e.g., AR/VR, collaboration platforms, etc.). Overall, outcomes to be achieved include: need-based (further) education is on offer, awareness and skills on future topics among the young and aged is raised, skilled workers are offered an opportunity to play an active part in the digital transformation and, by extension, in their own future work environment, generally, the level of digital skills and the local human capital is raised, the shortage in skilled workers in the short and long term is alleviated and through the positive effects on human capital businesses are enabled to undergo digital transformation and to innovate.

2. Services for Skills & Training

Based on the target groups' needs, their context and these attributes, we identified how the key technologies of ADCH (AI, Digitisation, Cybersecurity, and HPC) have the potential to transform SMEs and public services. In what follows, the activities of the EDIH in the skills & training services are described in more detail in Figure 1.

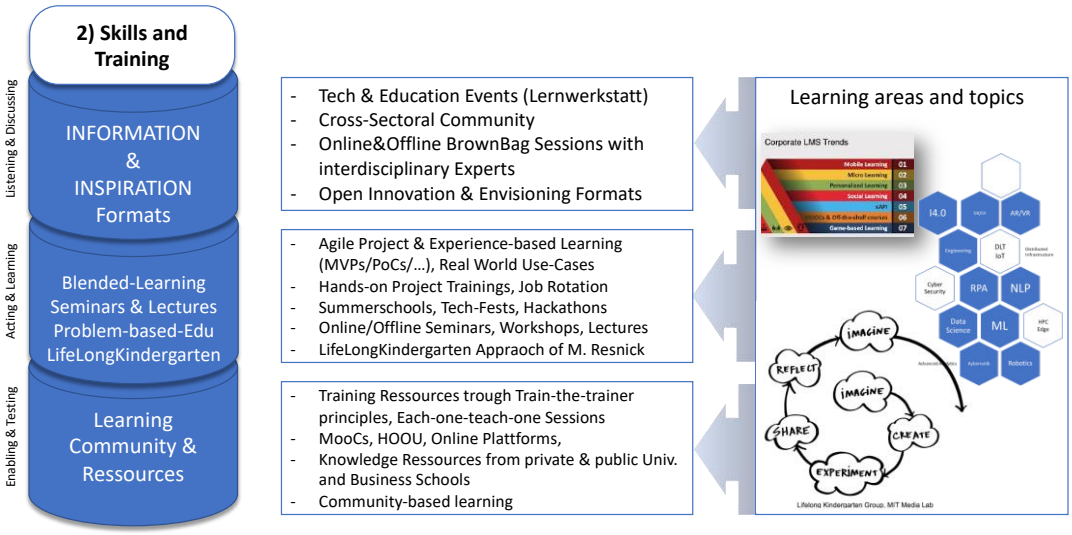

Figure 1: EDIH Hamburg service portfolio for Skills & Training

The service portfolio, depicted above, is divided into three levels, in which different types of interaction, learning and cooperation with the intended target groups (Logistics, Aviation-, Transportation-, Maritime-Industry, Services, Crafts & Food Industry and the public administration, integrated via the Public Private Partnerships) are promoted. These are information formats for different skill levels (e.g. brown bag sessions, webinars, cross sectoral community events), in which the target groups are rather inspired and "consume", up to hands-on implementation and education formats, in which the competencies are imparted through concrete "doing" (e.g. identifying real world use- and business cases, summer schools, workshops, implementing, experimenting) in the joint innovation laboratories such as the ARIC "AI Lab/Showroom", "Cyber Security Portfolio", "Creative Space for Technical Innovations", "Homeport Lab" or the "Digital Logistics Lab" and other training facilities (e.g. Institute for "Responsible AI") that will be established.

The first level of services is formed by "Listening & Discussing" formats that provide information about the key technologies ADCH (e.g., in expert lectures, tech sessions, deep dives and interactive meetups) and focus in particular on interdisciplinary exchange, networking in showrooms and innovative environments such as in the DigiHub, ARIC, or the innovation lab network of the EDIH Hamburg consortium.

The second level is formed by the "Acting & Learning" and "Advice & Matching" offers. Here, activities are compiled that actively involve the ecosystem, ensure interdisciplinary exchange (including demo days, hands-on session, hackathons, etc.) and publicly demonstrate applications to a broad target group that are already in use or are already being tested in pilots.

The third level supports the measures and offerings of the first two levels. The innovation community is built up analogously, which bundles experts, use cases and network access. EDIH tech scouts will network bilaterally with experts to enlarge this community (ARIC already has >360 AI, HPC, Big Data, Cloud digitalisation experts in the community). The creative industries (artists, musicians, designers and other creatives) will be involved, in particular through the cooperation partner Cluster *Kreativwirtschaft*, with which the consortium is already working intensively (e.g., in workshops series "AI & music" and "AI & arts"). This creates a creativity-promoting mix between tech and art that breaks up usual thought patterns and has a focused people-centred approach.

The second level is formed by the "Acting & Learning" and "Advice & Matching" offers. In these formats, the target group is activated through interaction, collaboration and joint learning. Methods from Design Thinking, agile development, SCRUM, DEVOPS, MLOPS among others, are used and collaboration is promoted. In the pillar "Skills & Training", blended-learning concepts and train-the-trainer models are applied and self-developed in this level (e.g., data literacy courses). Problem and project-based learning helps to focus on transfer of knowledge, strengthening practical relevance and competencies that are needed in the real world. Therefore, a joint applied academy (certificate courses) is planned.

2.1 Skills & Training Services Catalogue

The condensed list of Skills & Training (ST) services is listed in Table 1.

ST-1:	Basic and expert workshops for key technologies
ST-2:	HPC, AI, cybersecurity, digitisation blended learning workshops: video, documentation for lecture, hands-on with experts
ST-3:	AI in logistics, AI in public administration, AI in smart cities, AI in supply networks, AI in crafts; domain-driven trainings & workshops
ST-4:	Certificate course for key technologies (enabling each-one-teach-one and train-the-trainer methods for company empowerment) & overall ST-curriculum
ST-5:	Tech demonstration workshops for enabling technologies

Table 1: Skills & Training Service Catalogue

2.2 Skills & Training Service Formats

This section takes a closer look at the services and formats already planned for the ST pillar shown in Figure 1. The five services ST-1 to ST-5 are described in terms of formats, focus, and partner involvement. General methodical format development guides are not included here, materials for operation are handled so far by each partner individually. The entry formats (e.g., workshops at the basic and expert level) are essentially also embedded into a consulting process in which, tailored to the current practice, needs, goals and challenges of enterprises or organisations are assessed in meetings/interviews in order to obtain an overview of potentials. This approach and an enterprise tech check-up are the basis to develop a strategy and EDIH Hamburg service road-map to include sector and technology trends, business models, etc. towards organisation development goals, gains, risks, priorities and resource allocation. An outcome for the organisation is an overview of suitable key technologies with their requirement and concrete strategy road mapping steps: use case development, secure funding, identifying partners, event and networking opportunities.

2.2.1 Basic and Expert Workshops for Key Technologies (ST-1)

Partner: HITeC	**Title:** An insight into the field of HPC	
est. Duration: 60 - 120 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: online presentation	**Focused on key technologies:** HPC	**Status:** planned /in preparation
Stakeholder from SME/PAs side:	those with a need for HPC	
Requirements for participation:	strong IT affinity	

Description of *An Insight into the field of HPC*:

HPC (High-Performance Computing) systems are used when a simple PC or a single workstation is no longer capable of performing the required computations or analyses of big data volumes in a reasonable amount of time. In traditional HPC, a corresponding task is split and processed in parallel on the compute nodes of an HPC system, which shortens the runtimes. A single compute node is roughly comparable to a powerful PC. Simply put, many compute nodes are then connected via a high-speed network to build an HPC cluster system. HPC represents a key technology for solving complex problems. In the context of the presentation, examples are given of typical tasks that are processed with an HPC cluster.

The impressive progress of the performance (measured in Floating Point Operations per Second (FLOPs)) of HPC systems will be shown with the evolution of the Top500 list[3] (established in 1993) of the most powerful supercomputers, which is updated twice a year. The typical architecture of current HPC cluster systems is described at a basic level. A further topic of the presentation will be the execution of parallel programs on a cluster system. Unlike using a simple PC, the users of HPC systems compete for the expensive resources of the cluster. Workload managers are meant to manage these resources with an appropriate scheduling so that users are treated fairly. The concept of the presentation is based on ideas for the HPC-Führerschein (HPC Driving License in English) from the PeCoH (Performance Conscious HPC) project[4] and on ideas presented on the EDIH Network eLearning platform in a webinar[5] by Laura Morselli.

Value of service:

The participants of the training will acquire skills and will learn about

- the hardware components of an HPC cluster and their functions
- parallel computer architectures, in particular: the distinction between shared and distributed memory systems
- I/O architectures used in HPC environments: local, distributed, parallel and hierarchical file systems
- how the performance of parallel programs may be assessed
- FLOPS which is the key measurement unit for the performance of HPC systems, and its pitfalls
- Moore's law and its significance for performance frontiers in modern HPC
- the definitions for key terms: speedup, efficiency, and scalability
- Amdahl's law and its significance for performance frontiers in modern HPC

[3] TOP 500 – The List, www.top500.org, retrieved in May 2023

[4] Performance Conscious HPC, www.hhcc.uni-hamburg.de/pecoh.html, retrieved in May 2023

[5] Available at https://elearning.edihnetwork.eu/user/view.php?id=79&course=10, retrieved in May 2023

- overheads for communication and synchronization that are introduced by parallelization
- other sources of parallel inefficiency: load imbalances, hardware effects
- how workload managers control the unattended background execution of programs or jobs, respectively, by the help of job queues
- typical scheduling principles (e.g., first come first served, shortest job first) to achieve objectives like minimizing the averaged elapsed program runtimes, and maximizing the utilization of the available HPC resources

Partner: HITeC	**Title:** An introduction to cyber security	
est. Duration: 60 - 120 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: online presentation	**Focused on key technologies:** Cyber Security	**Status:** planned /in preparation
Stakeholder from SME/PAs side: those with a need for improving the security of their IT systems and workflows		
Requirements for participation: none		

Description of *An introduction to cyber security:*

Cybersecurity is important to protect sensitive information and privacy. The aim is to improve trust and to avoid financial losses (for example, due to phishing or ransomware). Cybersecurity is a cornerstone of Europe's digital connectivity and a priority for the EU. Humans are considered the "weakest link in the chain" when it comes to preventing the spread of computer viruses, for example. The presentation is intended to raise the awareness of the participants for security topics by means of examples and to transfer corresponding best practices.

Besides physical security, topics such as password policies, SPAM, phishing, trojans, ransomware, VPNs (Virtual Private Networks), and backups will be covered. Furthermore, the basics of a PKI (Public Key Infrastructure) are discussed, where digital certificates and cryptographic algorithms are used to ensure the confidentiality, integrity and authenticity of information (e.g., of emails) transmitted via public networks. The concept of the presentation is also based on ideas presented on the EDIH Network eLearning platform in a webinar[6] by Darius Bufnea and Alexandru Kiraly.

Value of service:

The participants of the training will acquire skills and learn about

- why cybersecurity is important
- viruses, trojans, malware, ransomware, malicious links, fake links, spoofing attacks, etc. and why the careless clicking and careless running of programs can be dangerous
- identifying suspect files
- that non-malicious software can contain (human) bugs, which can be exploited in a malicious way
- how disk encryption protects the stored information in case of loss or theft (e.g., of a notebook) from foreign access
- locking the computer before leaving it unattended
- password policies to create strong passwords and the benefits of 2FA (two-factor authentication)

[6] Available at https://elearning.edihnetwork.eu/user/view.php?id=79&course=9 , retrieved in May 2023

- never using the same password for different systems/services
- regular updating of apps and the operating system to improve the security of the environment
- why VPNs are not protecting privacy and are not a security improvement per se
- how virtual machines can improve security
- using email certificates to digitally sign emails and prevent email fraud
- how important it is to create and keep backups

Partner: HITeC	**Title:** An introduction to Machine Learning	
est. Duration: 120 - 240 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: Workshop	**Focused on key technologies:** AI	**Status:** planned /in preparation
Stakeholder from SME/PAs side: for those with a need for solving problems based on Machine Learning		
Requirements for participation: none		

Description of *An introduction to Machine Learning:*

In classical simulation systems, a code-driven approach is usually in the foreground, with which a large number of equations, as they are typically created for the models of real-life problems, are solved with the help of numerical methods. Machine Learning (ML) is a subset of AI (Artificial Intelligence) that, in contrast, is based on a data-driven approach generating knowledge from experience, so to speak, and recognizing patterns after a training phase on representative sample data. These patterns are then transferred in the sense of a generalization for the analysis of further unknown input data, for example for decision-making or classification.

Deep Learning, a major topic of the workshop, is a subset of ML and is based on neural networks to mimic the learning of the human brain with corresponding algorithms. Three training types can be distinguished: a) Unsupervised learning to automatically group data by their correlated properties, b) supervised learning to handle labeled data by explicitly assigning properties in the training phase to the current input (e.g. for classification), and c) reinforcement learning based not on data sets but on rewards for "good actions" in the interaction with the environment during the training phase. The concept of the workshop is based on ideas for an AI training course held earlier at HITeC by Sven Magg and on ideas presented on the EDIH Network eLearning platform in a webinar[7] by Laura Morselli.

Value of service:

The participants of the training will acquire skills and learn about

- terms and concepts of AI
- data-driven AI
- which problems ML can solve
- what requirements data must satisfy
- evaluating the results after training and validation
- overfitting of parameters, which leads to the loss of generalization capability
- a checklist for a successful ML project
- typical roles in a ML project
- steps to implement a proof of concept or a prototypical ML system

[7] Available at https://elearning.edihnetwork.eu/course/view.php?id=23 , retrieved in May 2023

- challenges for ML applications, for example, that a large amount of data is needed for the algorithm to generalize, that the learning is domain specific, that it is not possible to interpret the large number of parameters of the trained neural network even for experts

Partner: HAW		**Title:** Current topics in digital transformation	
est. Duration: 30 - 60 minutes (lectures) and 2 - 4 hours (workshops)	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry		
Format: Seminar		**Focused on key technologies:** ADCH	**Status:** planned /in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in ADCH			
Requirements for participation: none			

Description of *Current topics in digital transformation:*

Information transfer and further qualification of SMEs and PSOs are in focus to build up competencies in relation to digital transformation. Two formats are relevant here:

- Compact seminars to provide basic knowledge and initial thematic contact, such as lectures, (interactive) webinars, video series, digital fact sheets, glossaries and info brochures.
- In-depth workshops which, in addition to a theoretical part, also include the application of the acquired knowledge by means of practical examples and enable the participants to transfer the learned knowledge to their corporate context.

Value of service:

The services cover the following topics in terms of content; already developed or planned content is listed below:

- Digital strategies for SMEs
- Virtual and augmented reality: possible applications and business models
- Data Driven Business through Weibull Analysis
- Economic and ecological sustainability
- Work 4.0: qualification, organization and skilled workers
- Virtual and Augmented Reality in Training and Education
- Robotic Process Automation
- Horizontal and vertical networking in value chains
- Retrofit
- Smart warehouse - digitalization in intralogistics
- Resilience in value networks
- Artificial intelligence in logistics
- Supply chain risk management

Partner: TUHH	**Title:** Digitization Strategies, Sustainability and Supply Chains ("Inform")	
est. Duration: 30 - 60 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: "Inform"	**Focused on key technologies:** Digitization, AI, and Logistics	**Status:** planned /in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in Digitization and Logistics		
Requirements for participation: none		

Description of *Digitization Strategies, Sustainability and Supply Chains ("Inform"):*

In cooperation with the Mittelstand-Digital Zentrum (MDZ) Hamburg[8], the Institute of Business Logistics and General Management at TUHH offers various provider- and cost-neutral formats to promote the digitalization of small and medium-sized enterprises (SMEs). The formats cover the thematic areas ("strands of action") (1) Digital strategies, (2) Sustainability through digitalization, (3) Work 4.0, (4) Interconnecting in Value Networks, and (5) Economic efficiency and resilience. These topics are supported by the AI trainer working at TUHH, who provides information and qualification formats on specific issues with a focus on the use of artificial intelligence. This format is predominantly online.

Value of service:

The target of the format "Inform" is to promote the acceptance of digital transformation among SMEs in order to break down barriers and obstacles to digitalization and to provide impetus for the first important steps. Various lecture formats are offered to present potentials, barriers, success factors and changes resulting from the use of digital technologies. The aim is to focus on the practical benefits of various concepts and technologies. TUHH is currently offering formats in the areas of "Digital Strategies", "Sustainability through Digitalization", "Work 4.0", "Interconnecting in Value Networks", and "Economic Efficiency and Resilience in Supply Chains". Current topics include:

- How does the transition to a circular economy succeed?
- More than just recycling – how circular economy succeeds through standards and standardization.
- Carbon accounting: how digitalization can help you determine emissions in the supply chain
- Resilience – how supply chains and companies become resilient to crises.
- Crises, shortages, bottlenecks - tackling them in 60 minutes with AI?
- Sustainability week on corporate purpose, circular economy, carbon accounting and resilience and digitalization in the context of sustainability
- Technology and innovation management for SMEs (in planning)

Partner: HWK	**Title:** Current topics in digital transformation ("Info Event")	
est. Duration: 60 - 120 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: "Info Event" (online/in presence)	**Focused on key technologies:** AI, Digitisation, Cybersecurity	**Status:** in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in current topics of digital transformation		

[8] https://www.kompetenzzentrum-hamburg.digital, retrieved May 2023

Requirements for participation: none

Description:

The information events specifically designed to provide small and medium-sized enterprises (SMEs) with a low-barrier entry to digitalization topics. The scope of topics covered in these events is wide-ranging and dynamic, reflecting the evolving nature of digital technologies and their application in business processes. Our info events are designed to keep businesses informed about the latest developments in digitalization, offering practical solutions to implement these technologies in their operations. This service not only helps SMEs keep pace with the digital era but also provides the necessary tools and knowledge to excel in it.

Value of service:

The HWK information events service aims to offer quick and efficient overviews of relevant digitalization topics in an engaging manner. Not only do these events provide valuable insights, but they also create an open platform for SMEs to discuss and exchange ideas, fostering a collaborative environment to drive digital transformation. Examples of the areas covered include

- paperless office transformation
- implementation of ERP, CRM and DMS software
- agile project management
- automation of office tasks such as automated billing, digital fabrication including 3D printing, and AI usage in office tasks

By attending these events, companies can enhance their digital competency, improve operational efficiency, and gain a competitive edge in today's digital marketplace.

Partner: HWK	**Title:** Current topics in digital transformation ("Experience Exchange")	
est. Duration: 1 - 3 hours	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: "Experience Exchange" (in presence)	**Focused on key technologies:** AI, Digitisation, Cybersecurity	**Status:** in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in current topics of digital transformation		
Requirements for participation: none		

Description:

Experience Exchange creates a valuable forum for small and medium-sized enterprises (SMEs) and craftspeople to share insights, ideas, and best practices around digitization topics. The service is designed to facilitate the sharing of knowledge and experiences in the context of digital transformation. It presents a unique opportunity for businesses to discuss common interests, challenges, and potential projects while networking with like-minded peers in their sector.

Value of service:

The Experience Exchange Service covers a wide variety of digitalization topics, allowing participants to delve into specific areas of interest or explore new digital trends. Whether the discussion revolves around the implementation of

- AI in office tasks,
- the transformation towards a paperless office,
- or the integration of digital fabrication techniques such as 3D printing,

this platform provides a vibrant space for collaborative learning and idea generation. Moreover, these events enable participants to learn more about the range of services and resources available as part of the EDIH project. By facilitating direct exchanges between SMEs and craftspeople, this service fosters a community of digital learners and innovators.

Ultimately, the goal of the Experience Exchange Service is to support businesses in their digital journey by providing a platform where they can gain insights, share experiences, and collectively contribute to the evolving narrative of digital transformation in the SME and craft sectors.

2.2.2 HPC, AI, Cybersecurity, Digitisation Blended Learning Workshops (ST-2)

Partner: TUHH	**Title:** Digitization Strategies, Sustainability and Supply Chains ("Qualification")	
est. Duration: 90 - 240 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: "Qualification"	**Focused on key technologies:** Digitization, AI, and Logistics	**Status:** planned /in operation
Stakeholder from SME/PAs side: for those with a need for those with a need for improving their skills in Digitization and Logistics		
Requirements for participation: none		

Description of *Digitization Strategies, Sustainability and Supply Chains ("Qualification")*:

In workshops and training courses, participants learn how to design change processes in a playful way, for example using Lego Serious Play.

Value of service:
The aim of the format "Qualification" is to create technical and methodological competences for SMEs to implement digitization projects. Qualification to identify areas of application for digitization, to conceptualize and implement applications. Current topics include:

- Company meetings with a difference: How can the LEGO® SERIOUS PLAY® method help?
- Digital approaches to implementing carbon accounting along the value chain
- Using future-oriented business models as a competitive advantage (in planning)

2.2.3 AI Domain-driven Trainings (ST-3)

Partner: ARIC	**Title:** ARIC Insights	
est. Duration: 120 - 240 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: Workshop	**Focused on key technologies:** AI	**Status:** in operation
Stakeholder from SME/PAs side: Present Current AI Topics and Technologies and their Applications		
Requirements for participation: none		

Description of *ARIC Insights*:

In this format a partner with deep insight holds a workshop in current AI topics.

Value of service:
Insights are provided for a variety of relevant questions, e.g.:

- Ethics and AI Bias: Artificial intelligence has no prejudices, feelings or emotions and yet we hear again and again about AI systems that discriminate against or even favour groups of people. It seems that AI acts in a discriminatory and racist way, but where does this come from and how can it be changed? In this workshop, we will show you why AI is never completely unbiased, when a so-called bias is desired and when it is not. We will look at what can and must be done in AI projects to counteract unwanted bias and what else we need to consider to train as ethically as possible.
- ChatGPT[9]: Hardly any AI development in recent years has made as many waves as ChatGPT, the textbot developed by OpenAI[10] that is supposed to solve pretty much any task: whether it is school essays, technical lectures or the development of executable computer programs. The product promise, like any disruptive technology, borders on magic: you type your request into the chat window and ChatGPT spits out the solution. Within the first 5 days of its release in November 22, over 1 million people worldwide signed up to rub shoulders with the magic lamp of knowledge for once and (another concomitant of mass success) caused the OpenAI servers to overload. Is this more than an ingenious marketing coup? Is the super chatbot that is supposed to open up the land of knowledge for us the expected breakthrough of an easy-to-use AI for the masses? And: Does OpenAI threaten the quasi-monopoly of global knowledge organization that Google has built up over the past decades? These are the questions we want to address in the ARIC workshop: Is ChatGPT the ultimate disruption for Artificial Intelligence?
- Who is liable for AI errors? Even an AI can make mistakes. Under which circumstances the provider is liable has been controversial so far. The EU Commission has now presented a draft AI liability directive that should provide clarity. Experts explains the new set of rules and the consequences for companies.
- Framework conditions for AI projects: What executives need to know. What are the expectations and what is the understanding? Which tasks can be solved with AI and which are better left unsolved? What and how are the evolutionally steps, efforts and teams for AI Project including: PoC / MVP, Data, Approach – effort, IT landscape, Costs / ROI – make or buy.

2.2.4 Certificate Course for Key Technologies & Overall ST-curriculum (ST-4)

Partner: ARIC	**Title:** Techniques in Artificial Intelligence	
Duration: Lectures: 2 sessions / week, 1.5 hours / session	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: Course	**Focused on key technologies:** AI	**Status:** to be developed
Stakeholder from SME/PAs side: this course is to provide a mathematically rigorous introduction to these developments with emphasis on methods and their analysis		

[9] https://openai.com/blog/chatgpt, retrieved in May 2023

[10] https://openai.com, retrieved in May 2023

Requirements for participation: Mathematics for Computer Science

Description of *Certificate Course for Key Technologies*:

This is a graduate-level introduction to artificial intelligence. Topics include: representation and inference in first-order logic; modern deterministic and decision-theoretic planning techniques; basic supervised learning methods; and Bayesian network inference and learning. Besides the lecture, a praxis part will allow to solve a problem set with implementations in Python.

Value of service:

Grading and Certificate: The work for this course will consist of 4 take-home project assignments and two exams. The projects will count for 50% of the grade, and the exams, 50%. With a passing Grade a Certificate will be issued. The course content is adopted from the MIT 6.825 course. The Course may be altered in reverse learning style with an emphasis on problem-based teaching, where lectures are provided as online recording.

We anticipate the adoption of this course concept to other topics in AI as well as Cybersecurity and HPC based on demand. In the whole, the different formats and the learning content will represent the curriculum. On the basis of, for example, multiple-choice tests, appropriate certificates can be issued with the corresponding questionnaires, which still have to be developed for this purpose.

2.2.5 Tech demonstration workshops for enabling Technologies (ST-5)

Partner: HAW	**Title:** Current topics in digital transformation	
est. Duration: 45 - 120 minutes	**Target Group:** all (Startups, Craft, Public, Administration, Logistics, Industry	
Format: Demonstration	**Focused on key technologies:** Distributed Ledger Technologies, Data analytics, Sensorics, AI	Status: planned / in operation
Stakeholder from SME/PAs side: for those with a need for improving their skills in ADCH		
Requirements for participation: none		

Description of *Current topics in digital transformation*:

The work package is concerned with the (further) development of demonstrators for the illustrative presentation of theoretical concepts in order to promote a practical understanding of the possibilities, limits and interrelationships of the use of technology in the subject areas dealt with. The demonstrators also serve as a stimulus for exchange with SMEs and public administrations at conferences and trade fairs and as a starting point for further communication.

Planned topics or application scenarios for demonstrator development include:

- Carbon accounting in supply chain management, order-related visualization of emissions along the supply chain and demonstration of the impact of strategic decisions, e.g., choice of location or means of transport
- Use of distributed ledger technologies such as blockchain to increase transparency in complex supply chains
- Increase of resilience of value chains through supply chain risk management

Value of service:

The aim of the "Demonstration" format is to demonstrate the use of digital technologies using practical case studies. To this end, the TUHH regularly presents software and hardware demonstrators, for example on the use of cyber-physical systems, artificial intelligence, or the introduction of modern data analysis. Current topics include:

- The smart cold chain – Ensure the quality of your goods.
- Improving production and logistics with AI
- Introduction to supply chain analytics – how to harness data in your business.
- Implementing carbon accounting digitally with the digit-S3CA demonstrator (in planning)

3. Summary

In this document we described the motivation, focus, and developed formats for the pillar Skills & Training, which are in parts ready for operation. The innovation ecosystem, the needs of the target groups, and the concepts of the formats were also described. Furthermore, the topics that are covered by the (planned) content are given and especially the value of service for the SMEs/PSOs or participants, respectively, is highlighted. For services in trial and operation we plan to collect feedback and go through a continuous service improvement process.

Glossary

Notions defined in this glossary are specific for this document only.

Notion	Meaning
ADCH	AI, Digitisation, Cybersecurity, and HPC
AI	Artificial Intelligence
AR	Augmented Reality
ARIC	Artificial Intelligence Center Hamburg
ChatGPT	Chat Generative Pre-trained Transformer
DigiHub	Digital Hub Logistics GmbH
EDIH	European Digital Innovation Hub
EDIH4UrbanSAVE	European Digital Innovation Hub for urban interconnected supply and value Ecosystems
EU	European Union
FLOPS	Floating Point Operations Per Second
GA	Grant Agreement
HAW	University of Applied Science
HITeC	Hamburger Informatik Technologie-Center
HPC	High-Performance Computing
HWK	Handwerkskammer Hamburg
MDZ	Mittelstand-Digital Zentrum
ML	Machine Learning
MVP	Minimal Valuable Product
PA	Public Authority
PeCoH	Performance Conscious HPC
PKI	Public Key Infrastructure
PoC	Proof of Concept
PSO	Public Sector Organization
ROI	Return of Investment
SME	Small and Medium Enterprises
ST	Skills & Training
TUHH	Technical University of Hamburg
VPN	Virtual Private Network
VR	Virtual reality