A new Master Course in Applied Computational Fluid Dynamics

D1.3 - IDENTIFICATION OF EXISTING VET COURSES IN THE SUBJECT AREA AND DEMAND FOR INTERNSHIPS IN THE PARTNER COUNTRIES

WP1 - Identification of similar curricula and needs assessment in the subject areas

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Contents

Introduction: The purpose of this framework

This report aims to record the existing professional/VET courses (where available) in the Asian HEIs (in Malaysia, Thailand and India), as well as, their regions' needs in terms of required professional skills in Applied Computational Fluid Dynamics.

In that context, the structure of the report firstly presents the methodological framework in which the partner countries examined the current situation of the sector in terms of existing training programs and skills needs in the current personnel working in the industry.

The report includes the findings of an extensive desk research that our Team Members have conducted as well as those of a qualitative research.

Our analysis is aligned to the main guidelines stated out in the APPLY application. More specifically, we are reporting the existing professional training courses (where available) in the three regions in terms of required professional skills in Applied Computational Fluid Dynamics and we are mapping the training needs of existing personnel aiming at the future participants of the Applied Computational Fluid Dynamics training courses and internship. Our approach includes the study of related occupational profiles in the three countries, with the intention of understanding the differences in the profiles and their relation to skills, i.e. Digital Skills.

Having structured a solid background of knowledge, based on the above analysis we are ready to step further into answering the key question of whether the existing VET Course in the three countries are aligned and provide adequate skills and knowledge to cover new sectoral needs.

Our VET Course review for the three countries, has been conducted within a systematic approach that has taken into consideration:

•The name, history and classification of each VET Educational system that is providing a specific in Applied Computational Fluid Dynamics course or related Courses has been identified and enlisted,

•The Learning Outcomes, the total duration of each Course and its content

1.0 Methodological Framework

The purpose of creating a common harmonized methodological framework was **the identification of existing professional training courses in Applied Computational Fluid Dynamics in the Asian partner countries**. In particular, this **methodology** functioned as a guide within the **Work Package 1** in order to meet the needs of the three participating countries Thailand, Malaysia and India including:

- **A qualitative research aiming to Applied Computational Fluid Dynamics**
- **A methodology implementation plan**
- **Guidelines for performing the data collection**
- **Interview templates**

This **common research framework** was used in the study across the **three participating countries** ensuring the best possible **coherence and consistency of findings**. It secured transparency and comparability of findings – especially related to the **qualitative surveys**. It played the role of a **step-by-step handbook** with specific milestones to facilitate and transfer know-how to the partners who may not be specialized in research activities.

1.1 Research phase

The Partnership agreed to **map the current offered VET Course in Applied Computational Fluid Dynamics** in **Malaysia, Thailand and India**. The template below used to depict the important criteria set. In order to identify solid information, the desk research aimed to present the **appropriate details** responding based on **significant criteria**. As there are multiple representatives per country, the research activities were divided among the partners in country teams. Therefore, the partnership **documented the data according to the following criteria**:

Country	Provider	Category of Provider	Curriculum	Programme Level NQF	Brief Description of Curriculum	Learning Outcomes	Online / Blended learning / Traditional face to face	Duration	Foundation / Revision Year	Intercultural Skills	Digital Skills	Reference - webpage
Include the country where the Cource / Curriculum is offered	Insert the name of the provider that is offering the Course / Curriculun	Choose the Category of the Provider, bewteen the following options: 1. Vocational Training Institutes 2. Other Institutes (please specify)	Provide the name / Title of the Curriculum	Provide the NQF equivalent name of the Curriculum	Please provide a brief description of the Curriculum, not exceeding the length of 1.000 characters	Please identify the Learning Outcomes of the Curriculum in the following format: LO1: Learning Outcome description LO....: Learning Outcome description LOx: Learning Outcome description	Please state the educational strategy selected	Please describe the duration of the curriculum	Please provide the Foundatio/ Revision Year of Provider's curriculum	Please answer with "Yes/No". For answer "Yes" please describe briefly these skills	Please answer with "Yes/No". For answer "Yes" please describe briefly these skills	Please insert the official website link of each curriculum

Through this mapping, a coherent analysis in Applied Computational Fluid Dynamics was identified, providing evidence for the skills gap analysis presented below in the country reports' section.

From the mapping of current VET Course in Applied Computational Fluid Dynamics, more than 50 programs were identified and analysed in the three partner countries.

The need for professional/VET training programs in Applied Computational Dynamics in terms of required professional skills in Applied Computational Dynamics is the most obvious result of the mapping. The programs are analysed and presented in the next section but the completion of the template itself indicated the great need to use a common language in terms of terminology between the European and Asia partners as a difficulty was identified in analysing some terms such as the Work-based Learning.

1.2 Qualitative analysis on Applied Computational Fluid Dynamics

Within the scope of this project, in regards to the **qualitative analysis,** partners used **focus groups** based on the same focus group guidelines to collect information from Applied Computational Fluid Dynamics esfocusing on the training needs of their personnel aiming them to participate in the professional training component of the Applied Computational Fluid Dynamics project that is to be developed at a later project stage.

Conduction of focus groups

Focus groups were crucial **tools** in order to conduct a **detailed** and **in-depth qualitative analysis**. These tools provided the **necessary information** and documented the details from persons with an insight into Applied Computational Fluid Dynamics.

Design and Scope

Target group

The participants were carefully selected and included businesses from the Applied Computational Fluid Dynamics

Duration

Interviewers and interviewees had to project **approx. 1,5-2 hours** to conduct the focus group.

Structure

The order of the questions and their exact wording are, however, largely **up to the interviewer**. The interviewees were motivated to **answer** in as much **detail** as possible; aspects that the interviewee raised him/herself were further explored.

The **focus groups** were carried out by the Asian Universities' members of staff or related experts, who provided a broad view on the topic and represent the state of knowledge. The interviewer selected and **consulted significant persons** in at least **4 targeted companies in the country**. To convince people to take part in the interview partners phoned them directly and explained the purpose and possible benefits.

Place

Focus group discussions took place online through sending a softcopy of the questionnaire to the different participants via email.

2.0 Guidelines for performing data collection

Focus Groups[1]

In a **qualitative interview**, questions were open-ended (i.e., require more than a yes/no answer), neutral, sensitive and understandable. This method helped the respondents to **build up confidence** and **generated rich data** that subsequently developed the discussion further. The provided guideline contains suggestions for questions, taking into account all the **necessary aspects or topics of the Applied Computational Fluid Dynamics project**.

As far as possible, **all aspects were addressed in the course of each discussion**. The order of the questions and their exact wording were, however, up to the interviewer. **The interviewees were motivated to answer in as much detail as possible**.

3.0 Focus groups and mapping of training courses templates

Focus group interview guide

The focus group interview guide provided a set of indicative questions covering the main aspects needed to gain enough information of the existing training needs of the personnel working in the food industry.

FOCUS GROUP INTERVIEW GUIDE

Name of the participant:

Organisation/Company:

Sector

Position in the organisation/company:

Years of professional experience in the Food Industry field:

Introductory questions

- The Applied Computational Fluid Dynamics is rapidly changing. What were the **characteristics of the new model** that is being shaped according to your point of view and professional experience?
- How do you think your organisation/company will be **affected by the changes** in the near future?
- What **changes** do you see in the Field?

[1] Richard A. Krueger (2002). "Designing and Conducting Focus Group Interviews", University of Minnesota

- What is the role of your country's educational institutions in equipping young graduates with the required **skills and competences**? What do you think is missing?
- How well prepared do you think you are to **meet the market needs**?

Field Skills Gaps Exploratory questions

- Recruitment of skilled employees in Applied Computational Fluid Dynamics is an increasing problem. What do you think should be the **ideal profile of an employee** in the Field?
- What do you think are the **main skills missing** from the current employees?
- Are you familiar with the term **"soft skills"?** Can you name some of them?
- Are you satisfied by the **soft skills and competences** of your employees?
- Are you satisfied with the **number of employees** your organisation/company employs?
- What **actions** do you take as an organisation/company **to train your employees**?
- How do you **assess the performance of your employees** in terms of soft skills?
- Would you please let us know, what is **your opinion on the current offered curricula** in Applied Computational Fluid Dynamics? What do you think is missing?
- What changes have you brought as an organisation/company to meet the Applied Computational Fluid Dynamics?
- What is your opinion on **career days**? Do you find them useful?

Internship Demand &Course design input

- Would you please let us know, what is your opinion on the **current offered curricula** the Applied Computational Fluid Dynamics?
- Would you please let us know, what is your opinion on the **teaching methods** and educational structures the Applied Computational Fluid Dynamics?
- Do you think current **teaching methods are innovative**, **promote creative thinking** and **autonomous learning**?
- Do you think that current learning material equips the learner with **adequate knowledge** to meet labour market needs?
- What type of professionals do you believe the field needs and lacks mostly?
- Would you like to assist the Apply Partnership in the design of training course via offering your input during their design?
- Would you be willing to host an internship for an Indu4.0 learner during the delivery of the learning programme?

Exit questions

- What **solutions** do you propose for the Sector to **meet current needs**?
- If you could summarize in three words the **challenges your Field is facing**, what would they be?
- If you could summarize in three words the **profile of a successful employee**, what skills would you put first?
- Would you like to be updated through the project implementation period about?
- Ind 4.0 events and activities?

4.0 Country Report: Malaysia

1.1 Focus Group: Organization and Structure

Part 1: Introductory Questions Findings

The key findings addressed the main changes introduced to new Applied Computational Fluid Dynamics model and how these changes affect the different industries. The sector has already been adopting these changes successfully providing an opportunity for the sector to be more effecient, yet it will require the companies to invest more in their technology infrastructure. Moreover, these changes will be more evident in: 1)Method/technique to simplify load work in field; 2) Participation of the young generation, Z gen in business; 3) Increase in capital cost to absorb new method in fastening work duration; and 4) Better time management and increase productivity;

Part 2: Sector Skills Gaps Findings

The basic key findings of the part 2 of focus groups, showed that the current employees miss a business expertise which will help them be more effecient, while more management skills are needed; and, in the agricultural sector, the current employees lack automation and technology skills. In order to try and bridge the gaps in skills, companies in the health sector provide a set of compulsory training to be attended by each individual staff, with certain sets of training for competency skills that need to be fulfilled on yearly basis. Training and refreshment courses are provided for new and old employees; and companies promote continuous learning with continuous learning schemes and provide training for capacity building, knowledge and skills. They also arrange trainings to improve/update the skills of employee and are receptive to approve requests of trainings e.g. Motivation Camps.

On the other hand, there are some missing components the current offered curricula in Applied Computational Fluid Dynamics; including: effective communication skills, problem solving skills, data analysis, practical courses, and robotic system and management.

Part 3: Internship Demand & Course design input Findings

The basic key findings showed that the majority of participants believe that the current teaching methods are innovative and that the material is sufficient. Nevertheless, participants believe that the curricula need to be in a state of constant change to adapt to the rapid changing environment.

Professional Training Courses Provision in Malaysia. A systemic approach

- **Level 1 VET Training Schemes**

Malaysia Skills Certificate Level 1: Competent in performing a range of varied work activities, most of which are routine and predictable.

- **Level 2 VET Training Schemes**

Malaysia Skills Certificate Level 2: Competent in performing a significant range of varied work activities, performed in a variety of contexts. Some of the activities are non-routine and required individual responsibility and autonomy.

- **Level 3 VET Training Schemes**

Malaysia Skills Certificate Level 3: Competent in performing a broad range of varied work activities, performed in a variety of contexts, most of which are complex and no routine. There is considerable responsibility and autonomy and control or guidance of others is often required.

- **Level 4 VET Training Schemes**

Malaysia Skills Diploma Level 4: Competent in performing a broad range of complex technical or professional work activities performed in a wide variety of contexts and with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and allocation of resources is often present.

- **Level 5 VET Training Schemes**

Malaysia Skills Advanced Diploma Competent in applying a significant range of Level 5: fundamental principles and complex techniques across a wide and often unpredictable variety of contexts. Very substantial personal autonomy and often significant responsibility for the work of others and for the allocation of substantial resources features strongly, as do personal accountabilities for analysis, diagnosis, planning, execution and evaluation.

Mapping of training programs in Malaysia

Higher Education Institutes

In the first place, the ***Razak Faculty of Technology and Informatics, UTM*** provides 4 training programs for talented students. The first program is a series of workshops for **"Data Science with PYTHON".** The main purpose of this workshop is to gain the interest of students, academics, industry and the public to learn about python programming for analytical data purposes. The entire series of the workshops 20 days and was conducted face-to-face. These workshops contained 10 modules; which are:

1. MATH, & PROGRAMMING FUNDAMENTALS

2. EDA, PANDAS & SCIPY
3. LINEAR REGRESSIONS, SCIKIT-LEARN, GRADIENT DESCENT, & MODEL FIT
4. LOGISTIC REGRESSION, NLP, AND WEB SCRAPING
5. SQL, DATABASES, & CLASSIFICATION
6. APIS, TREES & ENSEMBLE METHODS
7. PCA, CLUSTERING, KMEANS & AWS
8. BAYESIAN INFERENCE
9. MODELLING FOR TIME SERIES
10. INTRO TO BIG DATA AND SPARK

The second program is a tutorial workshop on **"Deep Learning Research".** The aim of this tutorial workshop is to promote deep learning and let participants understand the basics and some advanced topics on deep learning with some hands-on experiences on programming and experiments. The workshop lasted 2 days and was conducted face-to-face, and it contains introductory overviews of deep learning research, theoretical backgrounds, mentoring sessions, together with practical sessions using Python and PyTorch.

The third program offered by this institution is a short course on **"MINITAB Statistical Software: Experimental Designs for Robust Product/ Process Optimization".** The aim of this short course is to understand how to construct an experimental design using MINITAB as a vehicle to a robust product and process optimization. It covers the terms of the TAGUCHI Static and Dynamic designs, Design of Experiments (DOE) and Response Surface Methodology (RSM) to be wisely fit the input of orthogonality and variation minimization. Variation context as noise function and simplifying the statistics into practical or real application are some of the responses highlighted by the audience. The course lasted 1 day and was conducted face-to-face, and the participants were expected to learn about:

1. How far I can stretch my parameter setting for optimum results?
2. How to explore the relationships between several Explanatory Variables and one or more Response Variables?
3. How reliable, clean and optimized the data is?
4. Which region should be explored and which should not?
5. How should I start the experiment and get it RIGHT at the first time?

The fourth program offered by this institution is a workshop on **" Python for data analytics: Beginner Level".** The aim of this workshop is to engage the participants on the fundamental of data analytics, storytelling and data analytics, and moving forward to predictive data analytics. The workshop lasted 2 days and was conducted face-to-face, and the participants were expected to learn about how:

1. To apply data analytics fundamental in solving real case problems
2. To develop a interactive data visualization using story telling concept
3. To apply predictive data analytics in solving real case problems

The fifth program is provided through ***Universiti Teknologi Malaysia (UTM) School of Mechanical Engineering*** and is known as **"Computational Fluid Dynamics Workshop".** It combines the commercial software (ANSYS FLUENT) and the open source software (OpenFOAM).

Sixth program is **"CFD and Wind Tunnel (Beginner Level)"** by USAINS Holding Sdn. Bhd. and which is a course for professional engineers, academicians, and researchers. It aims to expose learners to CFD wind measurement tools and teach ways of solving fluid flow problems using theoretical and practical methods.

Governmental & International Agencies

The ***PSDC Academy*** provides an online training on **"Applied Computational Fluid Dynamics: Transformation Towards Industry4WRD (The Industry4WRD Readiness Assessment Intervention Programme)".** The training aims explore the adoption of Applied Computational Fluid Dynamics across several technological fields – in line with Malaysia's Ministry of International Trade and Industry's (MITI) Industry4WRD Blueprint. The course is conducted online and lasted for 3 months, and the participants were expected to:

1. Discuss the adoption, disruption and revolutionizing effects.
2. Suggest solutions for your business, factory or workplace pain points via Applied Computational Fluid Dynamics technological pillars.
3. Analyse the design principles and implementation strategies for the solutions you identified.
4. Visualise new roles and skills needed for transformed business processes and factory operations.
5. Reflect on the importance of adopting best practices for you, your business and industry.

Vocational Educational Institutes

There are a number of private vocational educational institutes that offer training programs in Malaysia.

The biggest of such institutions is ***Malaysia Smart Factory (MSF)*** which provides 10 training programs. The first program is **"Smart Factory Technical Overview: Enabling Technology for Industry".** The main purpose of this program is to offer essential knowledge and demonstration of enabling technologies and competencies that facilitates the implementation of digital transformation for Applied Computational Fluid Dynamics. The program lasted 2 days and was conducted face-to-face. From this program the participants were expected to:

1. Understand the enabling technologies of a smart factory and cyber-physical systems;
2. Identify the platforms supporting industrial IT within the 3 main areas; cloud-based applications and services, big data and analytics, smart operation technologies.
3. Understand the underlying technologies for digital factory, insights in digital twin and digital product memory.

The second program is **"PLC Essentials for Smart Factory".** There are 3 levels of this program: 1) fundamental which lasted 4 days and taught participants aim of this program is to for the students to learn about: Programmable Logic Controllers (PLC) Overview, PLC Programming using Ladder Diagram, Programming with Logic Operations, Programming with Timers, and Programming with Counters; 2) Intermediate which lasted 2 days and taught participants aim of this program is to for the students to learn about: Programming with Function Blocks, Programming with Data, and Programming with Analog Signals; and 3) Advanced which lasted 3 days and taught participants aim of this program is to for the students to learn about: Programming with Sequential Control using GRAFCET and PLC Program Simulation using Factory I/O. From this program, the participants were expected to be:

1. Able to determine the hardware and software requirements for Programmable Logic Controllers (PLC);
2. Able to construct the PLC Input and Output (I/O) wiring diagram;
3. Able to connect sensors and actuators to a PLC; Able to construct a basic PLC Program;
4. Able to run tests to validate the constructed program and to ensure compliance with the required operation.

The third program is **"Operational Technologies Fundamentals - Data Generation".** The main purpose of this program is to expose the participants to theoretical fundamentals and demonstrations of information technology related to smart factory competencies and processes, followed by hands-on and remote learning activities to support application of competencies acquired. The program lasted 6 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to connect sensor(s) and the IoT Gateway to a PLC controlled tower light system;
2. Able to utilize Node-Red to read and visualize data;
3. Able to implement MQTT for mobile and web-based notification and alert generation.

The fourth program is **"Operational Technologies Fundamentals - Overall Equipment Effectiveness (OEE) for Smart Factory".** The main purpose of this program is to expose the participants to theoretical fundamentals and demonstrations of information technology related to smart factory competencies and processes, followed by hands-on and remote learning activities to support application of competencies acquired. The program lasted 6 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to discuss the feasibility of implementing OEE into an existing production process;
2. Able to identify and define the OEE variables from an existing production process;
3. Able to perform calculations using the data collected and OEE generic formulas to derive the OEE value of a production process;
4. Able to setup a generic OEE implementation for an existing production process Able to implement MQTT for mobile and web-based notification and alert generation.

The fifth program is **"Operational Technologies Fundamentals - Cyber Physical Systems (CPS) based Automation".** The main purpose of this program is to expose the participants to theoretical fundamentals and demonstrations of information technology related to smart factory competencies and processes, followed by hands-on and remote learning activities to support application of competencies acquired. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to understand the fundamentals of RAMI 4.0;
2. Able to apply PLC Programming to reflect a CPS-based automation;
3. Able to apply PLC Programming through state charts, UML and Function blocks;
4. Able to apply PLC Programming to test and validate CPS-based function blocks

The sixth program is **"Operational Technologies Fundamentals - Cyber Physical Systems (CPS) based Communication Systems".** The main purpose of this program is to expose the participants to theoretical fundamentals and demonstrations of information technology related to smart factory competencies and processes, followed by hands-on and remote learning activities to support application of competencies acquired. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to configure a CPS-based Communication System;

2. Able to utilize the OUC Function Block to enable TCP device to device communication;
3. Able to understand the fundamentals of industrial ethernet and its utilization as an industrial fieldbus2.

The seventh program is **"Operational Technologies Fundamentals - IoT Gateway".** The main purpose of this program is to expose the participants to theoretical fundamentals and demonstrations of information technology related to smart factory competencies and processes, followed by hands-on and remote learning activities to support application of competencies acquired. The program lasted 4 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to set up and configure an IoT Gateway network for machine status monitoring;
2. Able to utilize a flow-based development tool to for visual programming;
3. Able to rapidly develop dashboards for visualizing data from a PLC-based system.

The eighth program is **"Information Technology Fundamental - Machine Data Logging and Visualization for Smart Factory (Part 1)".** The main purpose of this program is to overview of Machine Data Logging and Visualization methods; Utilize Node-Red to store machine process information and sensor data with timestamp information into an on-premise database (such as MySQL DB); Utilize Node-Red to store machine process information and sensor data with timestamp information into a device directory using log files (.TXT / JSON format); Utilize Node-Red to display real-time data and retrieve historical data from an on-premise database. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to apply the knowledge, techniques and tools to log data generated from a machine for monitoring and visualization;
2. Able to apply the knowledge, techniques and tools in generating, logging, and visualizing data;
3. Able to store machine process and sensor data with timestamp information into log files and on-premise database (such as MySQL DB), using Node-Red.

The nineth program is **"Information Technology Fundamental - Machine Data Logging and Visualization for Smart Factory (Part 2)".** The main purpose of this program is to introduce the cloud-based data storage and visualization; configuration and setup of an online data storage platform; utilize Node-Red, MQTT protocol and/or REST API to store and retrieve sensordata information with synchronized timestamp from a cloud service data storage platform. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to store machine process and sensor data with synchronized timestamp information and retrieve data from a cloud-based service data storage platform using Node-Red, MQTT protocol and/or REST API;
2. Able to utilize Node-Red to visualize sensor historical data from an on-premise database (MySQL DB), and real-time data from a PLC-based system in an operational technology network;
3. Able to utilize Node-Red and a cloud-based service visualization platform to create dashboard(s) that displays sensor historical data that are sourced from an on-premise database, and/or display real-time data using MQTT communication protocol;

The tenth and last program offered by this institution is **"Information Technology Fundamental - Data Analytics Essentials".** The main purpose of this program is to overview of Machine Learning and Data Mining Process; Data Exploration, Machine Learning Algorithms; Decision Tree and Overfitting; Production Quality Prediction and Dashboard (Visualization); Overfitting and Feature Reduction; Overview of Machine Learning

Tools and Platforms. The program lasted 6 days and was conducted face-to-face. From this program the participants were expected to be:

1. Able to apply basic knowledge, techniques, and tools for machine learning; Able to apply machine learning algorithms - Linear Regression, Decision Trees, Random Forest and K-Means;
2. Able to utilize data analytic tools to perform data exploration, preparation, and develop models to visualize the useful information from a dataset;
3. Able to create and evaluate a suitable model, discover overfitting, scoring, and make predictions based on the dataset analyzed.

The second biggest institution is ***iTrains Malaysia Sdn Bhd*** which provides 7 training courses. The first course is **"Certified Data Science Specialist".** This course combines a good balance of theoretical knowledge and practical application where participants will learn the processes of gathering, cleaning and handling data. Key data science and big data concepts are taught using case study references to reinforce learning. Upon completion of the course, participants will be able to perform basic data handling tasks, collect and analyze data, and present them using industry standard tools. The course lasted 5 days and was conducted face-to-face. From this course the participants were expected to:

1. Identify the appropriate model for different data types.
2. Create your own data process and analysis workflow.
3. Define and explain the key concepts and models relevant to data science.
4. Differentiate key data ETL process, from cleaning, processing to visualisation.
5. Implement algorithms to extract information from dataset.
6. Apply best practices in data science and become familiar with standard tools.".

The second course is **"Machine Learning for Business Intelligence".** This course introduces the field of ML and describes the well-known processes, algorithms, and tools for one to be a successful ML practitioner. Participants will be able to build skills in data acquisition and modeling, classification, and regression. In addition, participants will also get to explore highly essential tasks such as model validation, optimisation, scalability, and real-time streaming. The course lasted 2 days and was conducted both online and face-to-face From this course, the participants were expected to be:

1. Introduced the basic concepts and practical applications of Machine Learning algorithms
2. Provided with the capability to identify the long-term impact of ML to businesses
3. Helped to apply ML algorithms to their own real-world problems.".

The third course is **"Introduction to Deep Learning with NVIDIA GPUS".** This course provides the opportunity to learn the latest techniques on how to design, train, and deploy neural network-powered machine learning in your applications. Participants will explore widely used open- source frameworks and NVIDIA's latest GPU-accelerated deep learning platforms. The course lasted 3 days and was conducted face-to-face. From this course, the participants were expected to be:

1. Introduced to the concepts of Deep Learning (DL)
2. Understand the approaches to Object Detection using DIGITS
3. Perform Deep Learning technique for Image Segmentation
4. Understand Deep Learning Network Deployment
5. Explore Medical Image Segmentation using DIGITS
6. Introducing Deep Learning with R and MXNET
7. Introducing RNNs Deep Learning

8. Perform Signal Processing using DIGITS
9. Explore Deep Learning with Electronic Health Record".

The fourth course is **"Introduction to AI for Business Executives ".** This course provides complete coverage of the key aspects and topics in AI today, including how all the technologies fit together into a complete solution, the applications of AI such as image and speech recognition, search, clustering, optimisation, prediction, and understanding data, and how executives can start on their AI journeys. The course lasted 2 days and was conducted both online and face-to-face. From this course the participants were expected to:

1. Acquire an understanding of the key trends in AI and how these are influencing the future of business
2. Identify which areas of your business are ripe for automation and digital transformation
3. Gain confidence in the management of AI projects
4. Identify the pitfalls and ethics concerns associated with AI".

The fifth course is **"Certified Cyber-Security Specialist".** This course focuses on creating information security individuals who are trained in protecting, detecting and responding to threats on the network. The course lasted 5 days and was conducted face-to-face. From this course the participants were expected to:

1. Analyze and establish security requirements for your systems/networks.
2. Defend systems against unauthorized access, modification and/or destruction.
3. Configure and support security tools such as firewalls, anti-virus software, patch management systems.
4. Define access privileges, control structures and resources.
5. Perform vulnerability testing, risk analyses and security assessments.
6. Identify abnormalities and report violations.
7. Oversee and monitor routine security administration.
8. Develop and update business continuity and disaster recovery protocols."

The sixth course is **"Data Analytics for Practitioner".** This course offers a comprehensive hands-on experience, exposing trainees to practical analytical perspectives and detailed methods of handling data using the ideal analytical tools. The course lasted 3 days and was conducted face-to-face. From this course the participants were expected to:

1. Incorporate text analytics over corresponding areas of commercial and retail production.
2. Enhance the efficiency of customer behavioural modeling.
3. Strengthen understanding in Text Analytics and Data Science.
4. Grow the value-add of operations for higher management.".

The seventh course is **"Certified Internet of Things Specialists (CioTs)".** This course will help you gain adequate knowledge on IoTs. You will be able to understand the potential of IoTs for our society, in terms of impact on the lives of billions of people and on the world economy. You will also understand the underlying technology that powers IoTs, as well as the challenges that comes with such technologies. We will explore many Real life examples of IoT devices that are commercially available, and you will have a glimpse of the future of IoTs. The course lasted 3 days and was conducted both online and face-to-face. From this course the participants were expected to:

1. Explain what is the Internet of Things
2. Understand how IoT devices interact together and with users
3. Learn about the protocols used by IoT devices

4. Discover the different platforms that are available to develop applications
5. Learn about commercially available devices that are already using the Internet of Things
6. Understand the current challenges of the Internet of Things
7. Understand Visual Analytics, and predictive analytics with IoT".

The third institution is ***Dream Catcher Group of Companies*** which provides 5 training programs. The first program is **"Data Science for Beginners".** The main purpose of this program is to embrace data analytics thinking paradigm. The program lasted 2 days and was conducted face-to-face. From this program the participants were expected to:

1. Identify potential data driven tasks and projects in the attendee's organization
2. Formulate a work flow for a data analytic project
3. Collect data and storing data-sets
4. Perform simple exploratory analysis on data
5. Select suitable tools for data visualization and building predictive models.

The second program is **"Deep Learning Foundations and Applications".** The main purpose of this program is to review the basics of machine learning common practices and models, after which we will then dive into the theory, the practice, and the applications behind deep learning. During hands-on sessions, which will be conducted using Python, we will be using a number of libraries including Keras/Tensorflow, OpenCV, NumPy/SciPy, scikit-learn, and matplotlib to construct our deep learning system examples. For hands-on sessions, we will be using Google Colab cloud instances to train and evaluate deep learning models. The program lasted 3 days and was conducted face-to-face. From this program the participants were expected to:

1. Learn data science and machine learning standard practices, work-flow, and common machine learning models
2. Discover state-of-the-art convolution neural network (CNN) architectures and how to apply transfer learning
3. Build deep learning systems for real-world applications including defect detection and autonomous driving
4. Evaluate and improve the performance of deep learning systems
5. Investigate different tasks in the application of CNNs to computer vision including localization and segmentation.

The third program is **"Rapid Prototyping/ Smart Manufacturing Solution with Industrial IoT and Data Analytics".** The main purpose of this program is to teach participants about the concept along with all the enabling technology such as cloud computing, big data, AI and IoT. In addition to the concept, this course focuses on sharing the tools and techniques for the participants to develop Applied Computational Fluid Dynamics(IR4.0) solution prototypes rapidly as part of proof-of-concept process. With the working prototype, the participant has better understanding of IR 4.0 project implementation challenges and determine the right enabling technology for IR 4.0 project before rolling out it in bigger scale and investment. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to be:

1. Learn about the concept along with all the enabling technology such as cloud computing, big data, AI and IoT.
2. Learn about IR 4.0 tools and techniques for the participants to develop Applied Computational Fluid Dynamics(IR4.0) solution prototypes rapidly as part of proof-of-concept process.
3. Learn ELK for data analytics purpose:

4. Understand the concept and features of ELK
5. Set up ELK
6. Use ELK to perform data analytics.

The fourth program is **"Information Security for IOT Devices".** This program is an introductory course to information security, that is targeted at embedded systems engineers with a focus on aspects of security that are peculiar to the embedded systems world. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to learn about:

1. Information security building blocks
2. Data communications security
3. Data storage security
4. Access security
5. Basic security attacks and analyses

The fifth program is **"Wireless Technologies for Internet of Things".** This program begins with the overview of the internet of things, market drivers, use cases and requirements. The end-to-end IoT architecture and wireless technologies for IoT are introduced. The course then dives into the low power short range technologies, including NFC, RFID, Bluetooth, ANT+, Z-Wave, ZigBee, 6LoWPAN, WirelessHART, IEEE 802.11 ah. A comparison between the short range technologies is made. The course then discusses in detail the low-power wide-area technologies, for both unlicensed and licensed operations. The technologies such as LoRa, Sigfox, EC-GSM, LTE-M and NB-IoT are presented in-depth and compared. Then, the protocols and security requirements for IoT are highlighted. The course concludes with a summary of wireless technologies for IoT, key decision criteria and a preview of the 5G massive IoT vision. The program lasted 2 days and was conducted face-to-face. From this program the participants were expected to learn about:

1. IoT market drivers, use cases, and requirements
2. IoT architecture
3. Low-power short-range wireless technologies
4. Low-power wide-area unlicensed technologies: Sigfox and LoRa
5. Low-power wide-area licensed technologies
6. LTE-M
7. NB-IoT technology
8. Comparison of wireless technologies and applications
9. Protocols and security in IoT
10. 5G and massive IoT".

The fourth institution is ***Quandatics Academy*** which provides 2 training courses. The first course is **"Machine Learning and Predictive Analytics".** This course incorporates a mixture of advanced analytics concepts and hands-on exercises which will guide students through the methodology to implement data analytics projects to improve machine availability and production planning. The exercises will be carried out using state-of-the-art analytics tools. The essence of this course – the analytical methodologies to turn data into foresights will be the key to sustainable innovation in a smart manufacturing environment. The course lasted 4 days and was conducted face-to-face. From this program the participants were expected to:

1. Articulate equipment anomaly, predictive maintenance, and production forecast scenarios
2. Understand the concepts of machine learning and build sophisticated prediction models
3. Identify relevant data sources and perform common data preparations

4. Evaluate model quality to relate back to business requirements.

The second course is **"Modern Data Engineering in The Cloud".** This course is designed for anyone who wants to perform data integration and management tasks. Participants work on projects to monitor the process and database changes. In addition, participants would also learn about how cloud technology is able to help IT to reduce hardware dependencies, software management etc. The course lasted 3 days and was conducted face-to-face. From this program the participants were expected to:

1. Understand and execute the concept of Extract, Transform and Load (ETL)
2. Perform data integration process and manage the tasks given
3. Monitor the process and database changes
4. Understand the importance of cloud technology.

Next, there are several institutions that provide 1 program each. First, ***INNODATATICS SDN BHD*** which provides the **"Certificate on IRT Programme".** This course teach participants about the fundamentals behind IR 4.0 and its applications, expose decision-makers of corporations to technological advancements such as the Industrial Internet of Things (IIoT), Cloud Computing, IaaS, PaaS, SaaS, MBaaS, Big Data, Machine Learning, Autonomous Lean Manufacturing, Artificial Intelligence, Cyber-Physical Systems, Cognitive Computing, Augmented Reality, Blockchain, 3D printing, Robotic Process Automation, Factory 4.0, Uipath Tool and Blue Prism. The program lasted 5 days and was conducted face-to-face. From this program the participants were expected to:

1. Be familiar with cloud computing and Robotic Process Automation
2. Understand key technologies related to IoT and industrial applications of Data Analytics
3. Learn about Cyber Security and Cyber-Systems from the industrial systems perspective
4. Know the use of Machine Learning and Artificial Intelligence using Big Data
5. Appreciate the role of leadership combined with technology.

Second, ***SGS (Malaysia) Sdn Bhd*** which provides the program **"Certified in the 4th Industrial Revoltuion Foundation".** The program lasted 1 day and was conducted face-to-face. From this program the participants were expected to:

1. Understand the concept of 4th Industrial Revolution
2. Be aware of the principle of IR4.0 and readiness of the organization
3. Learn the method of Implementation of IR4.0
4. Use the IR4.0 technologies for productivity and quality improvement.

Third, ***Penang Skills Development Centre*** which provides the program **"Transformation Towards Industry4WRD+F:F".** This course is designed to enable stakeholders to nurture future-proof talent, and empower decision makers to develop the knowledge and skills needed to stay-ahead and remain relevant. Gain the competitive advantage to thrive in studies, career and workplace as one embrace Applied Computational Fluid Dynamics. The program has a flexible duration of 20-25 hours over 3 months and was conducted online through an open learning platform. From this program the participants were expected to develop a deeper, functional understanding of Applied Computational Fluid Dynamics., and recognise the technological pillars underpinning the revolution, emerging trends, challenges, and its applications.

Fourth, ***IOTSATA Sdn Bhd and CPSRG UTM*** which provides a workshop on **"INDUSTRIAL INTERNET OF THINGS (IIOT)/ APPLIED COMPUTATIONAL FLUID DYNAMICS (I4.0)".** The main objective of the workshop is to produce Operating Technology System Integrator (OT) and Information Technology Professionals (IT) to fill

the market gap for Project implementation in IoT Industry and Applied Computational Fluid Dynamics.The workshop lasted 1 day and was conducted face-to-face. From this workshop the participants were expected to learn about:

1. Introduction to IoT, Industrial IoT & Industry.
2. Introduction to IIoT Field Devices, Controllers and Gateways.
3. Node-Red as IoT Programming, Configuration and Dashboard Tool.
4. Node-Red Dashboard for User Interface
5. MQTT as IoT Communication Protocol.
6. IoT Mobile Application Development
7. IoT Web/Cloud Applications Development
8. Connectivity of IoT Mobile, Web/Cloud
9. Application to IIoT Controller/Gateway.
10. Managing IoT Security
11. Final task for Industrial IoT Prototype Application.

Fifth, ***PSDC Academy*** which provides **"Applied Computational Fluid Dynamics: Transformation Towards Industry4WRD (The Industry4WRD Readiness Assessment Intervention Programme)".** The main objective of this program is to explore the adoption of Applied Computational Fluid Dynamics across several technological fields. The program lasted 2 months and was conducted online. From this program the participants were expected to:

1. Discuss the adoption, disruption and revolutionising effects of Applied Computational Fluid Dynamics
2. Suggest solutions for your business, factory or workplace pain points via Applied Computational Fluid Dynamics technological pillars.
3. Analyse the design principles and implementation strategies for the solutions you identified.
4. Visualise new roles and skills needed for transformed business processes and factory operations
5. Reflect on the importance of adopting Applied Computational Fluid Dynamics best practices for you, your business and industry

Sixth is ***Tertiary Courses Malaysia,*** a Human Development Resources Fund (HDRF) approved training provider and subsidiary of ***Tertiary Infotech Sdn. Bhd.*** offers "**OpenFOAM"** training through online and face-to-face modalities. The aim of the program is to arm learners with flexible physical modeling codes so that they are able to deliver fast, accurate results in a wide range of CFD and multi-physics applications.

Seventh, ***Perpetual Solutions*** provides the course **"SD-WAN, SDN & NFV for Network Operators".** The course comprises critical sections from two of our most popular courses in this topic area, then heads into a technical deep-dive of a key SDN/NFV use case: the Software Defined Wide Area Network (SD-WAN). The course lasted 5 days and was conducted online via a virtual classroom. The course includes the standard components of SDN and NFV Fundamentals and Engineering courses, with the added benefit of the following topics for SD-WAN:Is SD-WAN the major SDN/NFV Application? What SD-WAN Reference architectures exist?Investigating the building blocks for SD-WAN, Transport-independence of the Underlay Network, IP-based Virtual Overlay Network, How to ensure service assurance of SD-WAN connections? What is Application-Driven Packet Forwarding for SD-WAN connections? Ensuring High Availability of SD-WAN Services, Applying Policy-based Packet Forwarding for SD-WAN, Do we need WAN Optimization, and how to implement this function? What are the SD-WAN Network and Service Components? What are the SD-WAN Deployment Scenarios? And selecting an SD-WAN Solution, a vendor review.

Eighth, a private company ***MyCae Technologies Sdn. Bhd.*** offers "**Fluid Dynamics and Heat Transfer: Analysis and Design"** which is a training for energy and civil/structural engineering professionals. It is about analysis of advanced finite elements, computational fluid dynamics, and designing vibration control and monitoring solutions. As such it educates on;

1. Analysis of static and dynamic structures and mechanical systems with linear and nonlinear geometric, material or contact behaviors
2. Analysis of steady sand transient state external and/or internal fluid flow problems with laminar or turbulent characteristics
3. Analysis of steady and/or transient state heat transfer problems

Finally, ***CAD Vision System*** provides "**Solidworks Flow Simulation (CFD)**" training via online and face-to-face delivery modalities. The Program is designed to train product engineers on how to make technical decisions using CFD technology in the Applied Computational Fluid Dynamics era. It educates learners on;

1. SOLIDWORKS Flow Simulation (fluid flow and heat transfer)
2. To use the SOLIDWORKS simulation to run "what if" scenarios and analyze effects of fluid flow or heat transfer processes.
3. Compare design variations and make better decisions so as to create products with superior performance

6.0 Country Report: Thailand

6.1 Focus Group:

Part 1: Introductory Question Findings

The findings give important insights into how few sectors will be transformed through revolutions. Global events like climate change will continue to introduce new shifts to the field of metrology and simulation remains a critical component in weather monitoring. Novel testing and measurements are key requirements in the job position and technical skills are important for the industry. Energy sector will continue to be under pressure to reduce use of fossil fuels and support sustainable alternatives like wind and solar. Efficiency in this sector requires building information databases on energy practices as cost of fuel is anticipated to fall further. Companies will invest more in data science to achieve efficiency and stay competitive. The packaging and manufacturing industry demands innovations that will solve problems efficiently and process analysis is a strategic skill for managers in these areas. Additionally, the rapid evolution of simulation software in the compressor manufacturing industry will facilitate introduction of new models of compressor HVAC systems that cost much less because the development time and process is shortened.

Part 2: Sector Skills Gaps Findings

Skill gaps are also identified across sectors like in the metrology department where innovation and technical computational mechanics (solid and fluid) skills are reported to be demanded but in short supply. Data appropriation skills will further be needed in the energy sector as companies invest more in data science. Similarly, administrative and analytical skills are important to manufacturing process managers of packaging

industries. In these contexts, employees are offered onsite training and encouraged to develop individual problem-solving skills. Skill growth is tested by comparing employees' sufficiency at performing activities. Design thinking, deep-basic, simulation, research, and soft skills are in shortage in the HVAC systems manufacturing industry. Competency improvement, 360-degree evaluation, interviews, and observations are strategies used to evaluate employee performance in HVAC manufacturing. Educational institutions fail to produce graduates with the training appropriate for modern industrial challenges for the compressor systems sector.

Part 3: Internship Demand and Course Design Findings

Most participants mentioned that the curricula should impart practical skills to prepare learners for industry challenges. The theoretical learning approach which is dominant in Thailand's education system is a huge limitation to achieving competency in the real-world work context. Creativity, innovativeness, and problem solving need to be emphasized in course designs as they are demanded in almost all the sectors. Majority participants agree that the education offers a basic job-entry qualification but does not equip graduates with sufficient knowledge to navigate other contextual and modern challenges of the job.

6.2 Mapping of Programs in Thailand

A brief outline of the VET courses offered in Thailand can help with mapping learning terrain for employees and learners looking to acquire demanded skills.

VET Courses and Training Programs

First, the national research institute ***MTEC*** provides a "**FEA (Solid and fluid)"** curricula which offers skills in;

- Computer-aided engineering for industrial problems
- Finite element analysis
- Computational fluid dynamics
- Heat transfer problems
- Structural problems
- Fluid flow problems
- Vibration problems

Secondly, an "**Advanced Training on Two-Way Fluid Structure Interaction Workshop (Two-Way FSI)**" professional training program is provided by ***KMITL*** which is a public university. This is a course on coupling solid and fluid simulations (one-way and two-way) which provides practical skills applicable in CFD contexts. Soft skills are also integrated in the one day training program which is administered via the traditional face-to-face delivery mode.

Thirdly, ***DECC*** which is a National Research Institute offers "**Computational Fluid Dynamics"** professional training course that provides hands-on CFD skills.

Fourth, ***MSC Software*** a private company provides "**MSC Nastran Aero-elasticity**" program based on a multi-physics curricula. The online program educates on complex challenges of CFD like combining aero-elasticity analysis and structural analysis effects.

Additionally, ***PSU*** public university offers the "**Flow-3D: The solution of CFD Application**" training for simulating flow as well as other CFD skills.

7.0 Country Report: India

7.1 Focus Group:

Part 1: Introductory Question Findings

The overall engineering industry will gear towards applications that simplify engineering challenges and solve them easily. New models will be mostly computational-based signifying the importance of simulation methods in the sectors future.

Part 2: Sector Skills Gaps Findings

Computational skills are in short supply and even for the ones available the quality is still low. Only engineering learners receive training on computational skills in institutions. The engineering industry needs employees with creativity, problem-solving, interpersonal, and soft skills. Organizations have training initiatives for employees to acquire industry-relevant skills and periodical monitoring and evaluations are commonly performed to assess competency.

Part 3: Internship Demand and Course Design Findings

The findings show that curricula do not sufficiently meet market labor demands. They are more theoretical and do not facilitate learner creativity and innovativeness. In order to meet the labor market needs, there needs to be a shift to practical learning methods. Computational skills should also be taught in the education system.

7.2 Mapping of Programs in India

Vocational Training Programs

First, ***Niharika Institute of Computational Engineering*** has a curriculum which offers three courses namely; (i). **Industry Oriented CFD Analysis Course** (ii). **Advanced Course on Automotive CFD Analysis** (iii). **Advanced Course on CFD Analysis** (Aerospace and Defense). Learners get exposure to of topics like;

1. CFD fluid dynamics, gas dynamics, aerodynamics,
2. CFD analysis on radiators, condensors, charge air cooler, disk brake cooling.
3. CFD analysis on aircraft engine component, Aerodynanic CFD analysis.

Next is ***FOSSEE - IIT Bombay***'s **CFD and OpenFOAM** curriculum provided as a summer fellowship program for six weeks. Learning is tailored mostly based on the individual applicants skillset needs.

Thirdly, ***Fluid Control Research Institute*** offers the "**Course in Computational Fluid Dynamics**" training.

Moreover***, PSG College of Technology*** also provides the "**Course in Computational Fluid Dynamics**" which encompasses topics like; Introduction to CFD, Governing Equations, CFD Techniques, and Hands on CFD tools.

Quality Improvement Program for Faculty

First, the ***Centre for Continuing Education, IISC Bangalore*** provides **"QIP Short Term Course On Computational Fluid Dynamics (CFD)"** training. This equips learners with knowledge on how to describe fluid-flow and heat transfer mathematically, equations for conserving mass, energy, chemical, and momentum and then partial differential equations classifications. The learners are expected to;

1. Understand the fundamental methods comprising CFD,
2. Get training in applying CFD tools to practical problems using live demonstrations on the CFD Software

Secondly, ***Indian Institute of Technology Bombay (Department of Civil Engineering)*** provides the "**QIP Short Term Course on Computational Fluid Dynamics (CFD)**" which aims to educate Civil Engineering learners on; introduction to computational modeling and methods, fundamentals of computational fluid dynamics and coupled problems, computational methods in solution of CFD equations, introduction of new computational approaches, introduction of inter and multi-disciplinary problems, and tutorials on various CFD problems.

Other Higher Education Institutions

Techzilon Training Solutions offers "**Master Diploma in CAE & CFD with Internship**" program that equips learners with hands-on training for various CFD modules.

7.0 Summarising the key points to be addressed

Having presented and identified the existing professional/VET courses (where available) in the Asian HEIs Malaysia, Thailand and India, we are summarizing below the main findings per country.

Malaysia

In the **Country Report of Malaysia,** there were a wide variety of VET courses offered by educational institutions, as well as, governmental and vocational enterprises. Most of these programs were centered around new technologies and their applications in different fields.

In the *Focus Groups in Malaysia* there are several challenges that face each of the fields included in the interviews

Thailand

In Thailand country report, it was found that curricula used in the country do not stimulate creativity, problem-solving, or prepare graduates for challenges of modern industries. This is because it is more theory-based than practical. Quite a number(five) of government and private institutions were identified to be offering VET courses focused on CFD.

In the *Focus Groups in Thailand,* few sectoral challenges were identified from the interview analyses.

Metrology sector	Energy Sector	Manufacturing sector
Solid and fluid computational skills needed	Companies actively seeking data scientists as they seek to grow databases	Analysis and innovativeness are key skills Design thinking, deep-basic, and simulation are demanded but in short supply

India

Several institutions , both private and public, were identified to be offering VET courses. The curricula falls short of meeting engineering market labor needs and should always be revised to meet modern industry challenges. Computational skills should also be prioritized in educational curricula because demand for them is rising. Demand for applications solving engineering problems will continue to be a phenomenon in industry.

8.0 ANNEXES

ANNEX 1. Participants list template

MSc Course in APPLIED COMPUTATIONAL FLUID DYNAMICS

Focus group Interview Nr. xxx

[Location], [date]

A/A	Name	Organization	Field of Expertise	Telephone number	E-mail	Signature

ANNEX 2. Common template on APPLIED COMPUTATIONAL FLUID DYNAMICS-Qualitative research

Introductory Information

Description:

Introductory paragraph: Please state in no more than 10-15 lines the main aim of this certain discussion and provide a brief on its synthesis and rationale behind selecting the participants

Name of Interviewee(s)	
Purpose of the Focus Group	Please state in brief the main goals of the focus group
Date and time	
Place	
Number of participants	
Facilitator/s	Name: Contact details:
Signature of Facilitator	
Interviewee(s)	Name: Contact details:
Signature of Interviewee(s)	
Duration	

Main points findings

Part 1: Introductory Questions Findings	
Key findings (20-30 lines)	•
Part 2: Sector Skills Gaps Findings	

Key findings (20-30 lines)	•
Part 3: Internship Demand &Course design input Findings	
Key findings (20-30 lines)	•

Profile of participants

Participant Nr. 1	Name: Age group: Years of expertise: Educational background: Short bio: (no more than 5 lines)
Participant Nr. 2	Name: Age group: Years of expertise: Educational background: Short bio: (no more than 5 lines)
Participant Nr. 3	Name: Age group: Years of expertise: Educational background: Short bio: (no more than 5 lines)
Participant Nr. 4	Name: Age group: Years of expertise: Educational background: Short bio: (no more than 5 lines)

Participant Nr. 5	Name: Age group: Years of expertise: Educational background: Short bio: (no more than 5 lines)

Conclusions and recommendations

- **Description:**

Please identify the main strengths and limitations of the discussions and provide a short summary of no more than 20-25 lines with regards to conclusions and policy recommendations