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CONCORDIA¹ Methodology² for the creation and deployment of new courses and/or teaching materials for cybersecurity professionals

Abstract:

The purpose of this document is to propose a Methodology for designing and deploying courses for professionals while considering the specificities of the cybersecurity area. Based on this Methodology, new courses will be developed targeting mainly industry mid-level management and/or executives.

The document is developed in the framework of CONCORDIA project, WP 3, Task 3.4. and will leverage the EIT Digital expertise in developing skills for professionals while also considering best practices in the area.

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Executive Summary

Nowadays cybersecurity is not only a trending issue but also a very dynamic one. Under the light of many cybersecurity attacks that have caused havoc at European and International level and produced considerable damages, it became evident that cybersecurity shifted from an IT and operational matter only towards a business risk which needs to be continuously monitored and properly addressed.

The [Assessment of the EU's educational portfolio for professionals including the CONCORDIA ones](#)³ revealed heterogeneity both on the cybersecurity jobs market and on the cybersecurity courses offer. There is a variety of courses but not necessarily industry specific, especially the ones addressed to middle managers and executives, the main audience we are targeting. Besides, they cover mainly academic and technical knowledge and to a lesser extent business aspects and hands-on components for which the industry actors are interested in. The existing courses lack consistency in addressing a competence framework and a career path in their design thus making the effort of the individuals to choose the right course to cover their professional needs difficult. These findings were later confirmed by the ENISA report [Cybersecurity Skills Development in the EU](#)⁴ which “found that there are several issues affecting cybersecurity education, which include the lack of cybersecurity educators, poor interaction with the industry, little understanding of the labor market, outdated or unrealistic platforms in education environments and difficulties in keeping pace with the outside world.”

The Methodology proposed in this document aims at addressing these gaps by considering the actual needs of both the industry impacted by cybersecurity (e.g. Telecom, eHealth, Transport, Defence) and the industry professionals. It is aimed at complementing the existing [ENISA Good Practice Guide on Training Methodologies](#)⁵.

The document is structured in three chapters:

Chapter 1. provides an overview of the CONCORDIA findings so far with respect to the courses already offered by the consortium partners to the different categories of cybersecurity professionals, and the outcome of the CONCORDIA Feasibility study on existing Certification Schemes for skills⁶. The conclusions of these analyses are used to tailor the Methodology to the specificity of the cybersecurity domain.

Chapter 2. describes the process for designing and deploying a course while also describing its different steps and proposing a timeline for the process implementation.

Chapter 3. starts with introducing the topics of the Methodology. As these elements are sometimes specific to one step of the process but most of the time relevant to more than one

³ <https://www.concordia-h2020.eu/wp-content/uploads/2020/04/CONCORDIA-AssessmentOfCoursesT3.4-ForWebsite.pdf>

⁴ <https://www.enisa.europa.eu/publications/the-status-of-cyber-security-education-in-the-european-union>

⁵ <https://www.enisa.europa.eu/news/enisa-news/good-practice-guide-on-training-methodologies-published-by-enisa>

⁶ Planned to be published on the CONCORDIA website in June 2020

of them, the chapter continues with mapping the Methodology topics against the process' steps. It gets afterwards into the details of the Methodology topics by providing for each individual topics a rationale, a "How-to" non exhaustive guidance on its implementation, and an Example box pointing to a concrete case and/or providing useful links and suggestions.

The document ends with a check list summarizing the elements of the Methodology and could be used as a support for course providers in their work of developing new content.

Chapter 1. CONCORDIA findings so far

The CONCORDIA courses Assessment paper⁷

In view of assessing the existing CONCORDIA courses for cybersecurity professionals we first looked into the existing market framework and (1) outlined the key cybersecurity needs and challenge areas, (2) looked into the different cybersecurity competencies needed and some of the relevant courses offerings, (3) explored the market needs in terms of cybersecurity skills and (4) presented existing models in support of matching the companies needs with the skills offers. We then asked the CONCORDIA industry partners about their needs in terms of skills and technical people and check to which extent these are addressed by the actual CONCORDIA educational offer for cybersecurity professionals.

The summary of the conclusions relevant for designing a course methodology is as follows:

1. Target audience

More general cybersecurity awareness needs to be offered across different industries, not necessarily technical ones, thus targeting non-traditional cyber audience. In this respect the following topics could be envisaged: Economics of Cybersecurity within an organization, Cybersecurity for lawyers, Cybersecurity for eHealth, Cybersecurity for investors, and Cybersecurity for stakeholders /CEOs /CFOs.

2. Content

Content wise, the courses should be developed in relation to an agreed EU competence framework. They should be industry specific and built starting from clear learning objectives defined in direct collaboration with the targeted industry representatives. No matter the target audience within an industry is, a broad approach to the topic would be advisable, as to cover both technical and business knowledge. The weights of the different subjects should be balanced according to the specific profile of the target audience. The hands-on approach and real case scenarios adapted to the specific audience should be favored.

3. Language

Choosing English as the main language for teaching would open up the content to the whole European market thus increasing the overall courses offer for cybersecurity professional while also supporting the mobility of skills cross-country.

4. Format

The online format of the courses is preferred by the employers whereas the face-to-face format is the first option for the employees. A blended format would serve both interests.

⁷ <https://www.concordia-h2020.eu/wp-content/uploads/2020/04/CONCORDIA-AssessmentOfCoursesT3.4-ForWebsite.pdf>
www.concordia-h2020.eu

5. Certification

Undoubtedly, certifications are important in the process of recruitment of cyber professionals. Yet the in-house courses offered to the existing employees are not necessarily selected by the employers because of the certification option.

The CONCORDIA Feasibility study on existing Skills Certification Schemes⁸

During the last years, several surveys indicate an increase of dynamicity and complexity of cybersecurity landscape and a shortage of relevant competencies of the in-house personnel within the organizations in parallel with a general shortage of cybersecurity related skills on the market. The CONCORDIA Feasibility study on existing Skills Certification Schemes pointed to some elements relevant to the present work on developing a Methodology for content creation and deployment for professionals.

1. Skills gap – there is a need for a mix of knowledge and skills

The new [ISACAs 2020 State of Cybersecurity report](#)⁹ finds that companies are short-staffed and finding cybersecurity staff with the right skillsets continues to be difficult. According to the report, only 27% of the participants to the study say that recent graduates in cybersecurity are well-prepared. They also reported the top five skills gaps as being soft skills (32%), IT knowledge and skills gaps (30%), insufficient business insight (16%), cybersecurity technical experience (13%) and insufficient hands-on training (10%).

2. Certification – are important and bring added value

According to the [\(ISC\)² Cybersecurity Workforce Study, 2019](#)¹⁰, in the top of the most important qualifications for employment, cybersecurity certifications are ranked in Top 3, after relevant cybersecurity work experience and knowledge of advanced cybersecurity concepts. Besides, in building their cybersecurity teams, 70% of organizations give priority to training and promoting from within, according to previous [\(ISC\)² research](#)¹¹. 57% of them offer training and certification opportunities to employees to strengthen their teams. Almost half of organizations represented in the Cybersecurity Workforce Study are planning to increase their security training budgets within the year 2020.

Along with pursuing these and other cybersecurity skillsets, a majority of the survey's respondents say that cybersecurity certifications and training are important for maintaining and advancing their careers. The vast majority, 84%, are either currently pursuing cybersecurity certifications or planning to in the future.

3. Taxonomy – different approaches, none European wide

⁸ To be published in June 2020 on the CONCORDIA website

⁹ <https://www.isaca.org/go/state-of-cybersecurity-2020>

¹⁰ <https://www.isc2.org/-/media/ISC2/Research/2019-Cybersecurity-Workforce-Study/ISC2-Cybersecurity-Workforce-Study-2019.ashx?la=en&hash=D087F6468B4991E0BEFFC017BC1ADE59CD5A2EF7>

¹¹ <https://www.isc2.org/-/media/Files/Reports/Building-A-Resilient-Cybersecurity-Culture.ashx?la=en&hash=5BBBD1218138977BF7150E1593319F70B5670B6F>

www.concordia-h2020.eu

There are several approaches regarding a taxonomy of cybersecurity e.g., [ACM Classification System](#)¹², [NIST CSRC Taxonomy](#)¹³, [IEEE Taxonomy](#)¹⁴, ETSI TC-Cyber working group domains, IFIP TC11 Working Groups, IT-baseline protection catalog (IT-Grundschutz). Yet none of them is adopted at European level although they should be considered as a reference when developing courses for professionals.

The complexity of the cybersecurity domain also creates a complexity regarding the different skills and roles related to cybersecurity practice. When developing a course for cybersecurity professionals the Methodology applied would need to consider addressing the skills gap while placing the learning objectives into the context of a career path and the associated certification schemes.

The CONCORDIA assessment of 14 well-known certification schemes concluded with a list of 9 roles and specific levels not covered by them. As to complement the present Methodology, a framework for a CONCORDIA Skills certificate will be developed and aims to be piloted by developing a certification scheme for a Cybersecurity Consultant profile.

¹² <https://dl.acm.org/ccs>

¹³ <https://www.nist.gov/itl/applied-cybersecurity/nice/nice-cybersecurity-workforce-framework-resource-center>

¹⁴ <https://www.ieee.org/searchresults/index.html?q=taxonomy#gsc.tab=0&gsc.q=taxonomy&gsc.page=1>

Chapter 2. The process for designing and deploying a course

The proposed process has at its core an industry the industry needs in terms of upskilling their personnel and/or hiring skilled workers as to ensure a good return on training investment. The courses developed under this process will also help individuals interested in a career shift or development by gaining the specific knowledge and skills the industry they are targeting are looking for. Ultimately, the industry approach will also serve the courses' providers with respect to monetizing their work.

Process-wise we propose a staged approach which foresees the involvement of the industry in validating the most relevant profile(s) to be targeted by the course, defining the learning objectives, and piloting the first version of the course before opening it up to the European market.

The process for the creation of content and deployment of a course depicted is in Figure 2. It contains the following stages: ENGAGE, DEFINE, PRODUCE, VALIDATE and DELIVER. The outcomes envisioned to be reached after the individual stages are briefly named right under the associated stages. A time frame of eight months from the beginning of stage ENGAGE until the end of stage VALIDATE was estimated by the several course providers to be reasonable, with spending two month on DEFINING the right learning objectives and associated competencies and up to four months for PRODUCING the content for the course. An agile approach based on sprints would be foreseen for these two stages to ensure that the outcomes are responding to the specific industry needs.

Although during the ENGAGE and DEFINE stages, the interaction is mainly at the level of corporate representatives with decision power, it is important to remember that the knowledge and skills gained after following a course, including the associated certificate will stay with the individuals. So, if when DEFINING the content, the corporates inputs are very important, in the PRODUCE and DELIVER stages, the individuals' attitude towards learning would be mainly considered. Thus, the Methodology should consider both the organizations needs for upskilling their personnel and of individuals looking into advancing in their careers.

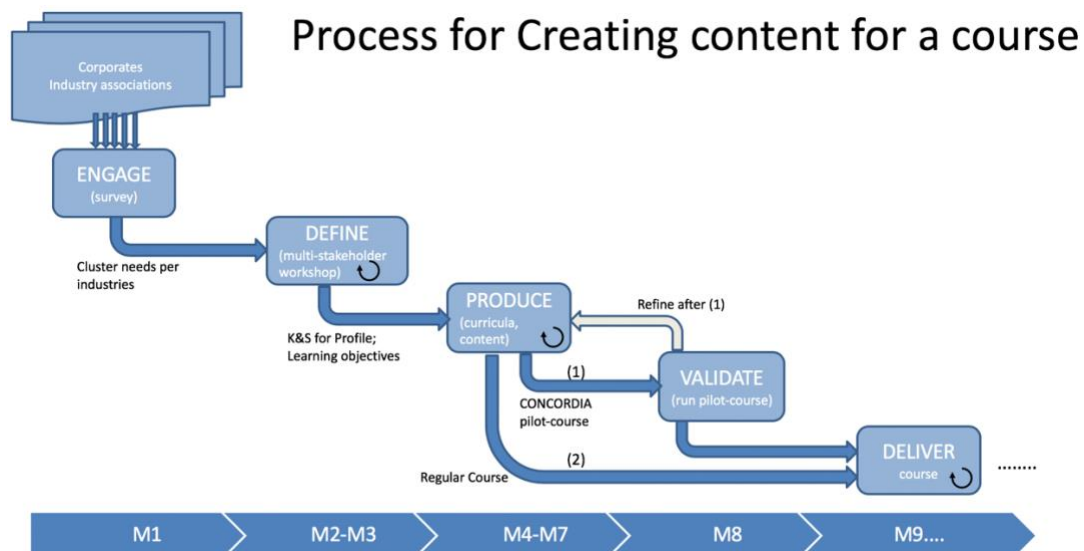


Figure 1: The process for designing and deploying a course

The ENGAGE stage is built around an Online Survey whose main objectives would be to validate the specific profiles to be targeted by the course, and to collect initial input on the learning objectives and the associated competences intended to be developed during the course. It will also help in identifying the actors interested in getting further involved in the process.

The DEFINE stage consists of organizing a multi-stakeholder workshop with representatives of different companies' from of the same industry sector or segment, during which the most in-demand profile is identified, along with the associated needed competences. Based on these elements, specific learning objectives are derived. In this stage, the format for the delivery of the content could be agreed and also the overall length of the course. The multi-stakeholder workshop will be followed-up by specific communication with the group identified in the ENGAGE stage. This will ensure that the outcomes of the workshop ran with a small group of industry representatives is validated by the community. This stage is estimated to be implemented in two months.

The PRODUCE stage builds on the outcomes of the previous step and consists of developing a specific curriculum and the associated content materials. This step is mainly led by academic actors but with support of representatives from the industry targeted by the course in order to ensure the relevance of the case studies and group exercises. Several iterations should be foreseen in this step, in order to ensure the different elements of the courses are adapted to the needs of the targeted industry. The elements to be assessed and adjusted would be the ones linked to (1) the time allocation for the individual learning objectives, (2) the split of the content between the different forms of delivery, (3) the selection of the case studies and input data for the group exercise. This stage will require approximately four months to be completed.

The VALIDATE stage represents the deployment of the first instance of the course as a pilot. Based on the feedback received from the participants but also from the different lecturers involved in the process, the course content and its deployment method will be refined if the case. The feedback collected after the VALIDATE stage could be also used in identifying new needs for skills development which could be further used in developing complementary courses.

The new course will then enter in the DELIVER stage, ready to be offered to different other professionals within the same industry. Some small refinements and/or adaptations could also be foreseen at this stage. They could be triggered for instance by the feedback collected following previous iterations of the course, the case-studies or simulations where participants might be required to propose some entry data prior to the course date, or to ensure it properly addresses the cultural differences of a specific group audience.

Chapter 3. The Topics of the CONCORDIA Methodology

The CONCORDIA Methodology proposes to develop courses for professionals targeting individual industries and their specific challenges. Cybersecurity is a horizontal topic and it could be argued that the majority of skills could be easily transferred from one industry to another. Yet, considering the audience targeted namely middle managers and executives or alike, a focus on specific industry challenges would be the recommended approach as to ensure that the competencies developed, and the skills acquired via the course would be applicable immediately.

The Methodology looks into addressing the following topics:



Figure 2: CONCORDIA methodology for creation of courses for professionals

Mapping the Methodology topics with the process stages

Some of the elements included in the CONCORDIA methodology are specific to one step of the process but most of the time they need to be considered from different angles depending of the specific step of the process to be deployed.

When mapping the different elements of the Methodology with the process for the production and delivery of a course we come to the following structure:

Methodology Topic	Process Stage	ENGAGE	DEFINE	PRODUCE	VALIDATE/ DELIVER
Understand your target audience		●	●		
Look into their needs		●	●		●
The course content			●	●	
Choosing the lecturers				●	
Lesson design				●	
The delivery strategy				●	●
Consider the evaluation strategy				●	●
The importance of certification			●	●	●
Looking into partnering		●	●	●	●

Figure 3. Mapping the Methodology Topics with the Process Stages

While some methodology topics are very specific to one stage in the process of developing and deploying a course - such as those linked to the actual producing of the content, most of them are covering at least two stages or three, mainly the sequence DEFINE-PRODUCE-VALIDATE. We ensure this way the topics are considered all along the process.

Implementing the Methodology topics - How-To

Understand your target audience

Associated Process Stages: ENGAGE and DEFINE

Adults like to be autonomous in their learning process. They have different backgrounds and professional experiences and have a good idea of their needs for professional development. They are goal oriented thus need to know upfront what a specific course can offer them. As professionals working in a company, they have limited time availability and defined budget for training. Thus, they are looking for practical information possible to be applied immediately in their daily work. Ultimately, they are looking for networking opportunities but also to have some fun.

On the other hand, the organizations interested to upskill their personnel, are looking for courses to be offered to their employees and which are close to their business needs and characteristics in terms of industry, size of organization, stage of development.

How-to:

- Do a desk research - check for the latest reports issued by well-known international cybersecurity organizations with respect to the gaps in the skills market.
- Engage with your target audience - target the group at large from the early stage of the process by collecting general information on their needs for knowledge and skills development. Views coming from different profiles within the same target group could

help in better understanding the needs for skills development based on their role (e.g. employer / employee / individual). The Engagement could take the form of an online survey or a webinar for instance.

- Consider gender-inclusive strategies - the gap in the skills market could be flattened by encouraging more women to start and/or develop a career in cybersecurity. Thus, it is important to consider having them considered and involved from the beginning of the process.
- Offer a platform for communication - build a network of professionals from different industries interested to staying in contact with your organization, and open to contribute further to the pool common knowledge.
- Consider the cultural differences - as the courses to be developed aim at addressing an international audience some specific factors would need to be considered such as countries / geographic area, language, traditional learning formats, timing for live online seminars, as they will influence the design of the course.

Example 1 – CONCORDIA course for Cybersecurity Consultant

Based on the conclusions of the Assessment paper and Feasibility study briefly described in the previous chapters we have identified the “Cybersecurity consultant” profile as relevant for the EU market. In view of validating this profile and for scouting the interest of the different actors in getting further involved in defining the specific needs in terms of knowledge and skills development, we have created a survey by using [EU Survey platform](#). The survey was shared with individual industry partners but also members of the industry organizations such as European CyberSecurity Organization (ECSO) and European SME Alliance. A two weeks’ timeframe was allocated for the collection of the feedback, during which the link to the survey was promoted also on social media (Twitter and LinkedIn). Via the survey we collected input from both cybersecurity professionals and the middle/senior managers thus ensuring a broader coverage of views.

Look into the needs

Associated Process Stages: ENGAGE, DEFINE and VALIDATE/DELIVER

Before deciding what is the topic of the new course to be developed, a needs analysis is required in order to identify unmet needs of the specific market with respect to the target audience. Different factors/trends can lead to the appearance of a new need for training in the cybersecurity domain, between them: technical developments, new cyberattacks, policy developments. The identified unmet needs with respect to the training would then need to be validated with the target audience in view of understanding the “[job to be done](#)¹⁵” as to create the right set of customer experience.

How-to:

- Do a market research - check for the existing courses addressing the different needs of the target audience. Look into the online offer and the face-to-face offer, on courses offered for free or against a fee, on general courses and tailored made courses, on location, timing and language used for teaching.
- Check for trends – market analysis but also new research areas mentioned in EU calls are a good indicator of the short- and medium-term needs for competences and, in turn, courses to be developed and offered to professionals.
- Cluster the needs per industry - the needs for upskilling/reskilling of cybersecurity professionals could differ from one industry to another. They will be reflected in defining the learning objectives and/or in selecting specific case studies. The physicians managing patients' files and working with medical devices sending information via WIFI would look for different knowledge than the investors in the cybersecurity startups and scaleups. Telecom industry companies and banking sector could prioritize differently the various cybersecurity threats. Check with specific industry representatives about their actual "pain" (such as specific assets needed to be protected) and the missing knowledge and skills within their organizations.
- Check for needs per profile - each job profile is characterized by a set of competencies-knowledge-skills. Direct communication with the HR representatives, CTOs of the companies, managers or individual professionals looking into learning about / developing a career in cybersecurity would help in narrowing down the previous findings with respect to the type of knowledge required thus supporting the process of defining the learning objectives.
- Seniority matters - building a career in cybersecurity follows a specific career path. The more a professional advances in their career, the more he/she needs to consider a holistic approach in developing his/her professional profile by including in their formation soft skills and business skills.
- Consider feedback loops - the needs could slightly change during the time between their initial identification and the deployment of the course. For instance, new attack trends and mechanisms could shift the attention of the industry to a different set of assets than the ones initially considered important. An agile approach with periodic sprints would ensure the relevance of the content presented during the course to the dynamic of the industry needs.

Example 2 – CONCORDIA course for Cybersecurity Consultant

We ran a survey asking different industries representatives to provide their views on the relevance of the Cybersecurity Consultant profile (or alike) for their organizations, the different areas this profile should be knowledgeable of in order to carry on the duties of the role effectively, the importance of having a good understanding of cybersecurity related business and economics topics, and the most critical cybersecurity related Technologies and the associated Cyber-attacks a specific industry is currently facing.

Following the input collected via the survey and having as background information the market research part of the Assessment paper and Feasibility study mentioned in the previous chapters, we run a multi-client workshop. The purpose of the workshop is to bring together the industry representatives interested to use the future course for upskilling/re-skilling personnel and academia representatives who will further develop the content as to define the Learning Objectives (the knowledge to be transferred and the skills to be developed via the course).

Useful links:

[cyberwiser.eu assessment tool](#)¹⁶

[e-Competence framework](#)¹⁷

[Cybersecurity workforce development toolkit](#)¹⁸

[NIST framework](#)¹⁹

[Cybersecurity Career Pathway](#)²⁰

The course contents

Associated Process Stages: DEFINE and PRODUCE

The specific needs identified for the targeted industry and for the specific profile would need to be mapped against the skills framework. As the courses for professionals are supposed to be short in order to ensure flexibility in following them, they would target to address a limited number of knowledge and skills. Hence, the needs identified in the previous steps could be clustered and planned to be addressed in a series of courses. This approach would be beneficial also if foreseen to attach the course(s) to a certification scheme.

How-to:

- Place the course in the big puzzle - think about your course as part of a portfolio - you can add more courses later.
- Define the learning objectives – we recommend targeting within a course for professionals between 2-4 learning objectives and to mix the knowledge needs from different cybersecurity framework areas. [NICE Cybersecurity Workforce Framework](#)²¹ (NICE Framework) which builds on cybersecurity profiles group the knowledge and skills in six main areas: Securely Provision / Operate and Maintain / Oversee and Govern / Protect and Defend / Analyze / Collect and Operate / Investigate. By planning to address knowledge from different areas would allow on the one hand address the needs

¹⁶ <https://www.cyberwiser.eu/cyberwiser-light>

¹⁷ <https://www.ecompetences.eu/>

¹⁸ https://niccs.us-cert.gov/sites/default/files/documents/pdf/cybersecurity_workforce_development_toolkit.pdf?trackDocs=cybersecurity_workforce_development_toolkit.pdf

¹⁹ <https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-181.pdf?trackDocs=NIST.SP.800-181.pdf>

²⁰ <https://www.cyberseek.org/pathway.html>

²¹ <https://www.nist.gov/itl/applied-cybersecurity/nice/nice-cybersecurity-workforce-framework-resource-center>
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of a larger audience, and on the other hand will help the learners understand the different dimensions of the business.

- Decide on the type and depth of knowledge to be provided depending on the target audience and their needs: check the syllabus of the course with the potential customers and decide on the weight ratio between the different learning objectives selected.
- Bring real life examples - look into the latest research and industry developments on the topic, identify relevant examples, and collect concrete figures. The participants to the course could be encouraged to bring their own cases to be debated in group.
- Keep your course up to date – focus on recent topics in the area of the course. Common knowledge is important to be covered, but latest developments on the topic keeps the course interesting.
- Ensure a balanced to needs content – split the time between teaching theoretical concepts and the practical information. Favor working on industry relevant case studies and, where feasible testing them in practice via hands-on/lab activities.
- Define the teaching language – we recommend using English as teaching language; yet, other languages might be considered, depending on the lecturer's languages skills, the format of delivery of the course, and the participants to the course. This option could be foreseen in case of Face-to-Face courses. In case of online content, subtitle in English should be included.
- Develop supporting materials in English – no matter the teaching language, it is recommended to develop the support documents in English as to ensure an openness to an international audience, both from the perspective of attendance of the course and of collecting feedback for further improvement.
- Suggest additional resources - provide links to other relevant complementary content – it will help the learners continue to improve skills after the course.

Example 3 – CONCORDIA course for Cybersecurity Consultant

We have chosen for the Cybersecurity consultant profile three learning objectives out of which two are technical and one linked to the business impact of the different measures taken or to be taken within the organization. The objectives will wear different weights in the course content development.

Objective 1 – THREATS

Update on the existing and emerging cybersecurity threats of the XYZ industry, the assets possible to be impacted, and the latest models of attacks.

Objective 2 – TECHNOLOGY

Become knowledgeable about specific technological threats (identified together with the targeted industry) by learning how to anticipate and prevent them, while developing proactive management skills.

Objective 3 – ECONOMICS and BUSINESS

Get an understanding of the economics behind cybersecurity activities within your organization. Learn about risk management and information security to protect the corporate reputation and preserve customer loyalty.

Based on the Learning Objectives, a selection of different knowledge and skills to be targeted by the course will be identified. The selection will also consider the level of importance of the specific knowledge and skills to the profile and their relationship with existing certification schemes.

Choosing the lecturers

Associated Process Stage: PRODUCE

The courses addressing professionals are often delivered by specialized trainers. Yet some others are offered by universities having as lecturers university professors. These are highly experienced in addressing theoretical topics and in presenting them in front of a large audience. They know how to structure the content and introduce the subjects in a gradual way by building on the previously acquired knowledge. This model works very well in universities where students have a similar level of knowledge on the topic. But this is not the case with a group of professionals – see the section “Understanding your target audience”.

How-to:

- Who's the lecturer? – when looking for courses, one of the important criteria considered by the professionals is the name of the lecturer(s). Are they experts in the topics they cover? Are they recommended by other experts? Did they get positive feedback from former courses? Are they collaborating with industry in large projects? A positive answer to these questions would increase the chances for the professionals to get immediate answers to acute questions, even beyond but in correlation to the learning objectives of the course.
- One lecturer or more? – we are advising delivering the course by more than one lecturer. On the one hand it would help ensure a certain dynamic of the flow of teaching by alternating the style and tone, or even for role playing; on the other hand, it would help cover broader teaching competences, specifically important in models where experimental, hands-on parts are envisaged. Furthermore, guest speakers could be envisaged to be invited to give short inspirational talks during the class. And when possible consider ensuring the gender-balance among pool of lecturers/speakers.
- Going digital – the model for course creation we are proposing in this Methodology foresees the development of content both for face-to-face sessions and online sessions. It is thus paramount for the lecturer to be at ease with using the different technologies to create and deliver content online.
- The professional speakers – passing the right information in an attractive way as to capture the audience and keep them engaged and interested in the whole duration of the

session is not an easy task. The success of a course sometimes is given by the quality of the delivery. The TED Talks are a good example on this matter.

- English as teaching language - proficiency in the language the course is taught is paramount. Since the present Methodology advocates for the availability of the course to the European market, it is strongly recommended to use English both when developing content and delivering the course. A very good level of English is specifically important in case of the online content. Alternatively, subtitles could be envisaged for the recorded content although this might be challenging when trying to mix the voice with the images, thus impacting the user experience.

Example 4 - Useful links

[CONCORDIA experts list](#) – could be checked for involving experts in delivering courses as lecturers or guest speakers

The [David JP Phillips TEDx talk “The 110 techniques of communication and public speaking”](#) explains and illustrates the 9 most important skills a communicator needs to master to deliver a message.

Course design

Associated Process Stage: PRODUCE

Once the content is defined in accordance to the needs of the target audience, the next step is about building the storyline of the course. The lesson design should look into the most appropriate way of splitting the content among the different modules and it goes hands in hands with the course delivery strategy.

How-to:

- Adapt the content to the client – the content identified during ENGAGE stage of the process is recommended to be split between – general modules (max. 70%) and tailored modules (max. 30%) – this structure would allow to cover both theoretical concepts relevant to the targeted profile (individual) and the targeted industry and also the specific needs of the client (individual/corporate).
- Define the course template – per topic, balance the theoretical concepts and the case studies / practical exercises while also specifying the frequency of testing the knowledge taught.
- Structuring the online modules – the online content is recommended to provide the main theoretical knowledge and concepts while also exemplifying them through well known cases. Depending on the subjects to be covered and the level on which they would be addressed, a pack of 4-6 topics could be covered in about 3 hours. Each topic would be the subject of a course module and could be packed in 3-4 videos of about 8-12 min long. The structure would foresee gate-tests after each module to ensure that the main

concepts where understood. Considering the different levels of mastering the English language at the EU level, the online lessons would be recommended to be backed with scripts/subtitles.

- Organizing the Masterclass (face-to-face/online live) – considering the lack of available time of our target audience, a Masterclass for professionals is recommended to be organized over 2 and maximum 4 days, depending on the number of learning objectives to be covered. Ideally the masterclass structure would be defined by applying an industry use-case driven approach. This will help backing the theoretical concepts with examples relevant to the participants. Thus, consider the **BringYourOwnCase** tactic and invite the learners to submit in advance their proposals for case studies and, where possible, foresee the usage of specific platforms to support addressing the selected use-case, to be worked individually / on small groups during the class.
- Consider using different tools – several tools like podcasts/ live interviews with experts or guest speakers/ recordings/ gamification could be envisaged to be used to vary the delivery strategy thus covering different learning styles. The decision on which tools will be used needs to be taken in the Design phase since it will influence the split of the content development process.
- Plan for the reusability of the content - keep reusability of the content and updates in mind as this might help you at a later stage to either offer similar courses for different industries or to build on the existing ones to teach advanced knowledge on the topic.

Example 5a – Structuring the online content

University of Twente – shifting a traditional course on a platform

A traditional 5 credits equivalent course was split into three smaller modules, each of 1 to 2 credits. This leads to an effort of 7 hours per week per module, for 8 subsequent weeks. The weekly schedule follows the same pattern: teaching followed by testing and exercises. A strict weekly schedule is necessary, to avoid the practice of postponing taking the course till the last minute.

Each week addresses one new topic via multiple videos with an individual length between 1 and 10 minutes. After the learner watched the videos, they take a number of multiple-choice questions, to test how well they understood the theory. Next they try to solve a number of practical exercises. These exercises should be performed within a virtual machine, to ensure everyone has the same version of tools. When possible, exercises are randomized. All exercises have more or less the same level of complexity, but it is advisable to develop a set of more complex questions, to allow better differentiation in grading of the learners.

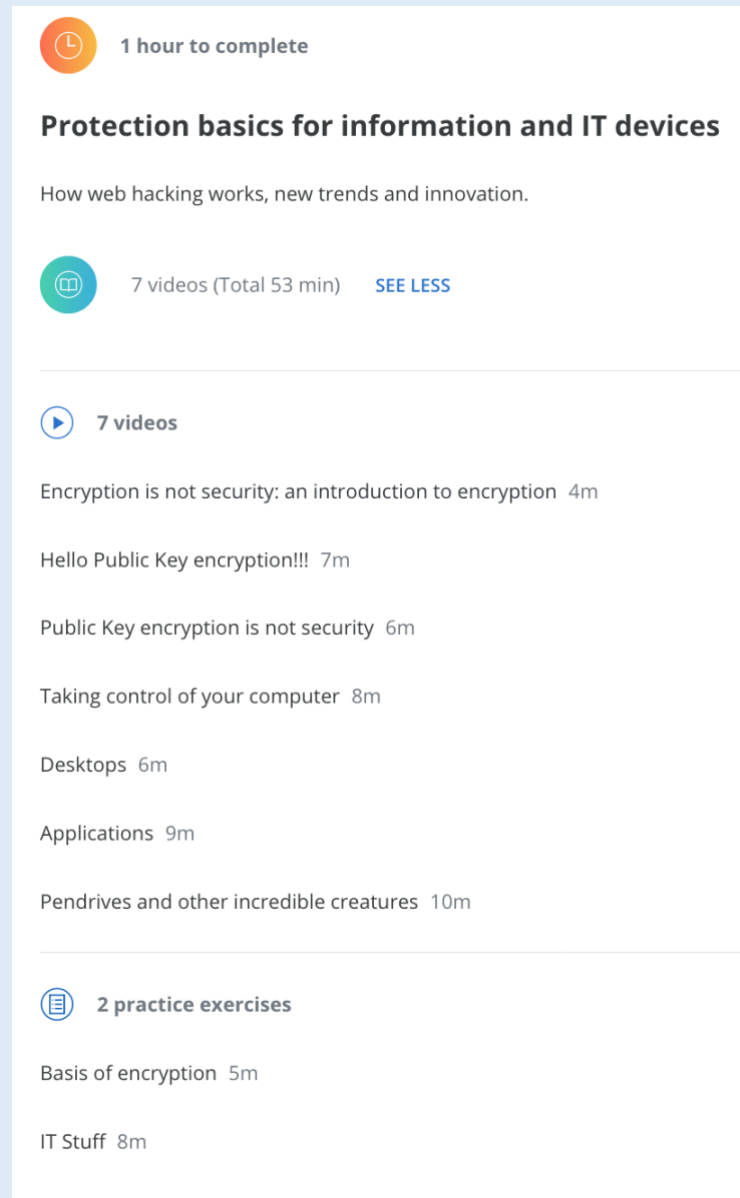
Since the course is exclusively online and the grades counts toward granting the credits, one challenge is to ensure that the participants have indeed themselves answered all questions. This challenge is currently overcome via individual lecturer-learner face to face talk.


Example 5b – Structuring the online content

“Cybersecurity Awareness and Innovation” course on COURSERA

<https://www.coursera.org/learn/cybersecurity#syllabus>


The online course is structured around 6 main topics. Each of the topics is explained in a series of 5-7 videos and the total estimated time to be spent on the topic is usually one hour, exercises included. An example of structure for a topic is depicted below.




 1 hour to complete


Protection basics for information and IT devices

How web hacking works, new trends and innovation.

 7 videos (Total 53 min) [SEE LESS](#)

 7 videos

- Encryption is not security: an introduction to encryption 4m
- Hello Public Key encryption!!! 7m
- Public Key encryption is not security 6m
- Taking control of your computer 8m
- Desktops 6m
- Applications 9m
- Pendrives and other incredible creatures 10m

 2 practice exercises

- Basis of encryption 5m
- IT Stuff 8m

The delivery strategy

Associated Process Stages: PRODUCE and VALIDATE/DELIVER

The employees are usually more prone to take face-to-face courses whereas the employers prefer to offer their employees access to online courses. Yet both categories agree that the exercises/ hands-on components are paramount in developing and testing the new skills acquired during a course. Considering that time is scarce for our target audience, the delivery of the content should be condensed within a short period of time. Besides, the present **Methodology proposes a blended approach** for delivery that allows benefitting from the advantages of both online self-paced courses and the face-to-face/live courses.

How-to:

- Build a safe environment – no matter the delivery channel used, safety and confidentiality should be ensured. The interaction within the group of learners and with the lecturer(s) should be open and the active engagement should be encouraged. Yet the lecturer would need to moderate the discussion and ensure a positive and respectful tone.
- Create a collaborative environment – consider setting up a forum for discussions that makes the learners feel that they are contributing as well as learning something new. Build a community and encourage the continuous exchanges on the topic of the course.
- Foresee mentoring and coaching activities - a continuous contact of the participant with the lecturer(s) during and after the course will help ensure the knowledge taught and the skills acquired will be correctly applied in the working environment. It will contribute towards building a long-term relationship between the individuals and the corporates with the course provider, beneficial for improving the current content and for easily identify new needs for upskilling.
- Delivering the online course:
 - Consider dynamic presentations – this could be realized by alternating between the image and the presenter, by including role playing between lecturers based on a scenario to introduce or exemplify some of the concepts taught
 - Create first the script and then the video, based on the script. If someone doesn't clearly understand the speaker's voice, could read the script which should have a logical and clear structure. If, on the contrary, the transcript follows the recording of the video and reflects exactly the lecturer's free presentation, we might end up in non-comprehensible phrases, especially when the speaker is not native in the language he is teaching. This will also make difficult the uptake (translation) in other languages.
 - Pay attention to the questions asked by the participants – the forum for discussions need to be animated and moderated, and the questions answered in a reasonable amount of time (e.g., 24h)
 - Consider using English language when developing the online content
 - When possible, consider cultural aspects when scheduling live talks or real time communication

- Assess the opportunity of using a Bot-teacher - According to some [studies](#)²², bot-teachers can be used to support and/or increase interactivity in a learning community and can play a role as a bridge among the learners and clusters in a learning network. Additionally, the findings also seem to support the idea that bot-teachers can decrease the number of lurker learners in MOOC environments because a bot-teacher attempts to start conversations with these learners by pulling them into other ongoing conversations.
- Delivering the Masterclass
 - The Masterclass is recommended to be organized off-line over a period of 2 to maximum 4 days. The Agenda should allow time for networking and building the community and could foresee, where possible, exchanges with local industry representatives. Yet, in some specific cases (see Coronavirus crisis) the Masterclass could be organized as a series of online events, coordinated live by the lecturer(s).
 - As the group of professionals attending the Masterclass might have a certain degree of heterogeneity with respect to the level of knowledge on the topic of the course, it is recommended to design and apply at the beginning of the class an entry quiz by using tools. It will help the lecturer allocate more time on the new knowledge while also framing the expectations in terms of knowledge acquired and skills developed of the participants by clustering them in categories like “within the scope”/”out of scope” of the course
 - Consider using specific open/proprietary platforms to support the case-studies collected from the participants prior to the course, via **BringYourOwnCase** action.
 - Allocate time at the end of the class and run a closing quiz to collect feedback on the content, on the teaching methods, on the lecturers.
- The blended approach - the CONCORDIA Methodology proposes a blended approach for the deployment of the courses based on the following structure:
 - The online module will be opened to participants 3 weeks prior to the Masterclass, with a recommended frequency for study of one-two topics per week. The online module would cover the main theoretical concepts. It is important to strongly encourage the participants to follow the online module before joining the Masterclass; this will help building a common language on the topic, bring the group to a comparable level of understanding of theoretical knowledge, and will ease the referencing to some topics/examples.
 - The Masterclass following the online module should go more in depth on the theoretical concepts and apply them on the specific cases relevant to the industry the participants are representing.

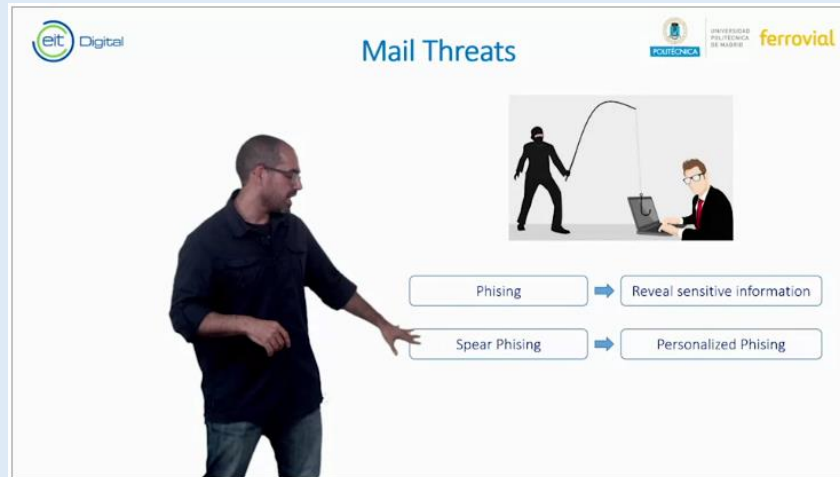
²² https://www.academia.edu/34459831/Bot-teachers_in_hybrid_massive_open_online_courses_MOOCs_A_post-humanist_experience?email_work_card=title

Example 6a – Delivering a course online

Cybersecurity Awareness and Innovation MOOC on Coursera platform

<https://www.coursera.org/learn/cybersecurity#about>

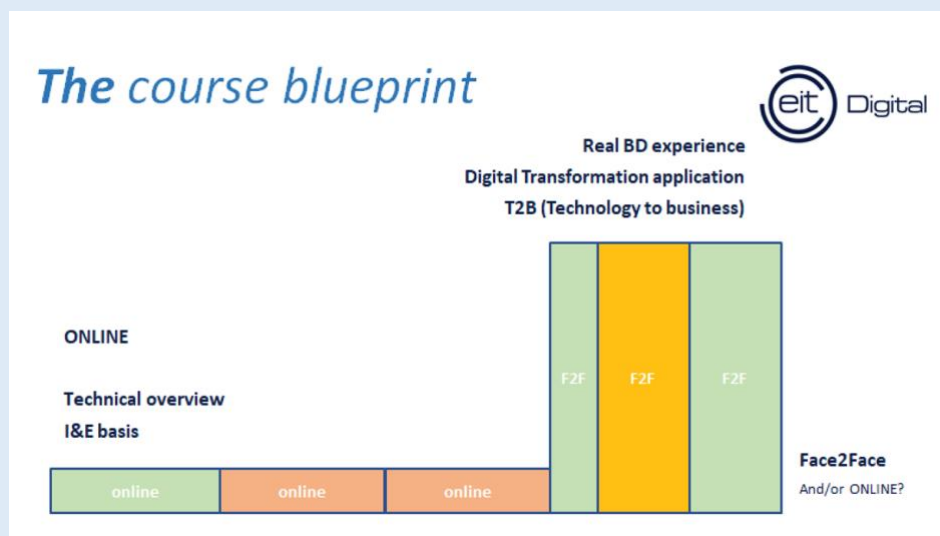
In this online course the lecturer’s image is combined with smart board images. This way it simulates the class course while also avoiding the shift between the lecturer and presentation or the exclusive usage of a PowerPoint presentation with background voice.



Example 6b – a Blended model for delivering courses

EIT Digital blueprint for deploying courses for Professionals

The model is based on a “3 weeks online + 3 days Face2Face” structure. The online module is accessible 3 weeks prior to the Masterclass. The topics taught online are opened sequentially, with a frequency of one per week. An important component of the Face2Face model is the Business Development (BD) experience which consists of interactions (presentations, exchanges and company visits) with the local companies performing in the industry relevant to the course.



Consider the evaluation strategy

Associated Process Stages: PRODUCE and VALIDATE/DELIVER

Evaluation of knowledge and skills acquired during a course is to be considered from the PRODUCE stage, in parallel with and in conjunction to the Lesson Design and Delivery Strategy. The Evaluation strategy both in terms of depth and form will be directly linked to the type of certificate decided to be attached to the course. For instance, a light form of certificate such as a Certificate of Completion would require a light level of testing with low to medium level of difficulty of the questions. Considering testing during and/or after the course completion would be useful not only for participants to check their level of understanding of the different concepts learned, but also for the lecturers as a form of feedback.

How-to:

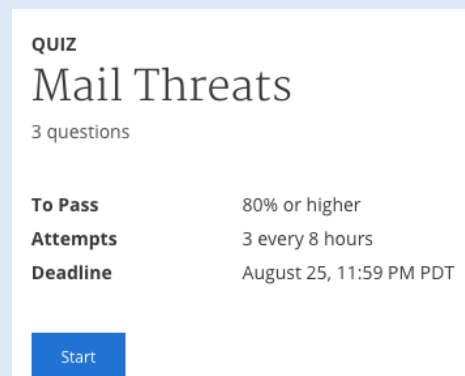
- Help prepare for testing - make clear the subject of the test and also the number of attempts a person can take it; some simulation via mini tests could be offered off-line as examples, including references to study materials for individual preparation
- Favor online testing - testing online has the advantage of offering instant results thus immediate feedback; besides it allows including different level of difficulties of the questions, include a minimum number of correct answers for passing the test, generating a new set of questions every time a test is retaken. It is advised to build a pool of 200% questions.
- Cyber-ranges as tests - some courses could be coupled with cyber-ranges. Specific scenarios could be developed and deployed in cyber-ranges format to be used as a practical evaluation method.

Example 7 – Testing the knowledge models

(A) – testing in view of Certification - PM² Certificates has been designed to certify knowledge of the PM² methodology at various levels. It gives detailed information to help decide on the type of test appropriate to the specific needs, and to help prepare for testing.

Example: <https://www.pm2alliance.eu/pm2-basic-certification/>

(B) – COURSERA light testing at the end of an online module:



QUIZ
Mail Threats
3 questions

To Pass	80% or higher
Attempts	3 every 8 hours
Deadline	August 25, 11:59 PM PDT

Start

The importance of certification

Associated Process Stages: DEFINE, PRODUCE and VALIDATE/DELIVER

Several surveys analyzed in the Feasibility study underline the value of Certification for Cybersecurity Skills as a solution to the industries needs in terms of hiring personnel with specific and practical skills, abilities and knowledge that would allow for them to perform the assigned tasks effectively.

The key advantages of a Certificate²³ valid also for cybersecurity skills are the following:

- Certification is a public statement or declaration that specific criteria have been met and that the competencies of the relevant profile have been proven to exist.
- Certifications are granted for a limited period of time and must be renewed to ensure that individuals continue to possess the competencies required to perform the job.
- Certification has a broader audience than a professional or academic course. The role of the certification is to prove, independently, that the competencies exist, without a consideration regarding how these competencies have been acquired.

How-to:

- Consider Certification from the beginning – a course offering a Certificate recognized by the community has more value thus more traction; when designing a course decide from the beginning the type of the Certificate you plan to offer to the participants and ensure to comply to the specific requirements.
- Choose the type of Certificate – there are different levels of certificates possible to be linked to a course, depending on the way its content was developed and on the method the associated knowledge and skills were tested: Certificate of attendance, Certificate of completion, Badge part of a Certification scheme, a formal Certificate issued based on specific standards. The Badges, for instance, could attest expertise building on the basis of past courses took with success
- Link to professional online profiles – offer the option of issuing the Certificate via a securely generated link such as blockchain and encourage people to share their success via social media. It will help them proving a live and evolving CV, a life-long learning attitude.
- Look for having the course endorsed – apart of the very specialized Certification schemes recognized internationally, other models of Certifications issued by highly credible organizations such as e.g., international education bodies, government body, security teams could be considered. Get in contact with the chosen organization and check for their standards upfront.

²³ GUIDELINES ON CONFORMITY ASSESSMENT – ISO/IEC 17024:2012, United Nations Industrial Development Organization, 2019.

Example 8 – Endorsing a Certificate with EIT Label

<https://eit.europa.eu/our-activities/education/eit-label>

The European Institute of Innovation and Technology (EIT) is an independent EU body.

EIT Label is a certificate of quality that is awarded only to excellent educational programmes.

Programmes, modules and courses that have the EIT Label build on five groups of quality criteria:

- *The EIT Overarching Learning Outcomes (EIT OLOs)*
- *Robust entrepreneurship education*
- *Highly integrated, innovative ‘learning-by-doing’ curricula*
- *Mobility, the European dimension and openness to the world*
- *Outreach strategy and access policy.*

Looking into partnering

Associated Process Stages: ENGAGE, DEFINE, PRODUCE and VALIDATE/DELIVER

Partnering in the context of the courses for professionals is multidimensional.

How-to:

- Partnering with corporates - the present Methodology pledges for the idea of developing the course based on specific industry needs; getting involved with the corporates from the targeted industry from the beginning of the process is paramount. It will help identifying the most relevant topics to be covered during the course while also identifying the associated case-studies to be worked on. The cooperation could go even further by tailoring the content to the specific needs of one or few companies thus transforming the process in a business agreement.
- Partnering with other course providers – depending on the learning objectives planned to be covered in a course, a partnership between more organizations having complementary expertise could be envisioned. This model could also be considered when looking into addressing different cultures or more regions, difficult to be covered by only one course provider.
- Partnering with experts – gurus, individual experts could bring an added value to the course mainly through their expertise. On the other hand, having a well-known expert lecturing live will attract a high number of participants to the course, with a positive impact on exchanges of expertise within the group and of networking in general.

- Partnering with event organizers – running the Masterclass in conjunction with a specialized event on the subject of the course will not only benefit of the cross-promotion but also of bringing together professionals interested in a wide variety of complementary-to-the-course topics. The attractiveness of the course will increase as it will offer collateral benefits thus increasing the value of the opportunity costs to the participants.

Example 9 – Partnering with industry and another course provider

*Cybersecurity 360 programme for Professionals in Europe and the US
- partnership between EIT Digital and UC Berkeley -*

<https://alumni.eitdigital.eu/sites/default/files/Cybersecurity%20360%20Fact%20sheet.pdf>

Cybersecurity 360 was a two-part executive education programme, jointly organized by UC Berkeley Executive Education and EIT Digital, which was deployed in both the United States and in Europe.

The first part of the programme (the U.S. module), took place in Berkeley, California and focused on online, platform and cloud services. The programme was taught by faculty partners comprised of industry leaders from the Silicon Valley community, such as [Mark Egan](#) (former CIO of Symantec and VMWare), [Lars Rabbe](#) (Yahoo's first CIO, also former IT Director for Steve Jobs), and [Andrew Isaacs](#) (Cybersecurity 360 U.S. Faculty Lead and Faculty Director of UC Berkeley's Center for Executive Education). The second part of the programme, the European module, consisted of a week in Munich, Germany and focused on network, hardware, and manufacturing. Its' faculty is comprised of industry leaders in Europe, such as [Manuel Carpio](#) (former CISO of Telefonica).

As an added benefit of having the programme taken place in Munich and the San Francisco Bay Area, participants also attended company site visits, including specific “Show and Tell” demonstrations of cybersecurity best practices from each region’s industry leaders (Salesforce in the US and Airbus in the EU).

Annex: How-to Checklist

Methodology items	Status To-do/Launched/Done	Observations
Understand your target audience		
Do a desk research		
Engage with your target audience		
Consider gender-inclusive strategies		
Offer a platform for communication		
Consider the cultural differences		
Look into the needs		
Do a market research		
Check for trends		
Cluster the needs per industry		
Check for needs per profile		
Seniority matters		
Consider feedback loops		
The course contents		
Place the course in the big picture		
Define the learning objectives		
Decide on the type and depth of the knowledge		
Bring real life examples		
Keep your course up to date		
Ensure a balanced to needs approach		
Define the teaching language		
Develop supporting materials in English		
Suggest additional resources		
Choosing the lecturers		
Who's the lecturer?		
One lecturer or more?		
Going digital		
The professional speakers		
English as teaching language		
Course design		
Adapt the content to the client		
Define the course template		
Structuring the online modules		
Organizing the Masterclass		
Consider using different tools		
Plan for the reusability of the content		

The delivery strategy		
Build a safe environment		
Create a collaborative environment		
Foresee mentoring and coaching activities		
Delivering the online course		
Delivering the Masterclass		
The blended approach		
Consider the evaluation strategy		
Help prepare for testing		
Favor the online testing		
Cyber-ranges as tests		
The importance of certification		
Consider Certification from the beginning		
Choose the type of Certificate		
Link to professional online profiles		
Look for having the course endorsed		
Looking into partnering		
Partnering with Corporates		
Partnering with other course providers		
Partnering with experts		
Partnering with event organizers		