3Skill Sync for SME4DD

Report created using the Recommendation System and selective analysis of the results

September 2023 - v4

This report provides a comprehensive overview of the Skill Sync tool created in the EIT AI Community of the Cross-KIC Strategic Synergies project and its ability to identify knowledge gaps between countries and various roles. Our primary objective is to enable organisations to fill these gaps by recommending courses that are tailored to their specific needs.

In this report, we have analysed the data stored in our database and categorised the expertise of different countries into three role categories: ***Manager***, ***Technical***, *and* ***Non-Technical***. Our recommendation system then identified the skills that are currently lacking in each country and made course recommendations to address these gaps.

Our analysis of the Skill Sync tool has revealed valuable insights on the knowledge gaps of different countries and roles. We have found that France and Italy have a knowledge gap in the managerial role, where both countries lack technical and legal skills such as data management and contract law expertise, while excelling in project management and business analysis areas.

Moving forward, we suggest that policymakers, educators, and organisations use the Skill Sync tool to identify skill gaps and take the necessary steps to fill them. With its vast database and powerful recommendation system, the Skill Sync tool can help organisations thrive in today's dynamic business environment.

Table of contents

1. About the Skill Sync tool

1.1. Description

The EIT KICs have embarked on a groundbreaking collaborative effort, resulting in the establishment of the EIT Community on Artificial Intelligence. This innovative initiative brings together seven EIT KICs, leveraging their collective expertise and resources to address two key objectives. Firstly, the initiative aims to harness the power of Artificial Intelligence (AI) for economic growth in a manner that prioritises safety and control. Secondly, it strives to equip European companies with essential AI competencies, thereby contributing to the futureproofing of the EU job market. This ambitious endeavour underscores the commitment of these KICs to fostering innovation and skills development in AI on a transdisciplinary level.

As part of the EIT Community on Artificial Intelligence framework, the collaborating EIT KICs have unveiled the Skill Sync tool. This advanced platform revolutionises the way AI education and skill development are approached. With access to a substantial global database comprising over 20,000 courses and around 1,000 startups supported by EIT, the Skill Sync tool offers a comprehensive perspective on Artificial Intelligence (AI) education and entrepreneurship. This extensive repository enables the assessment of workforce expertise within companies featured in the database. Furthermore, it facilitates the strategic identification and recommendation of AI related educational courses based on diverse criteria such as subject, provider, location, and duration. The tool's sophisticated recommendation system not only identifies skill gaps within companies but also proposes relevant courses to bridge these gaps effectively.

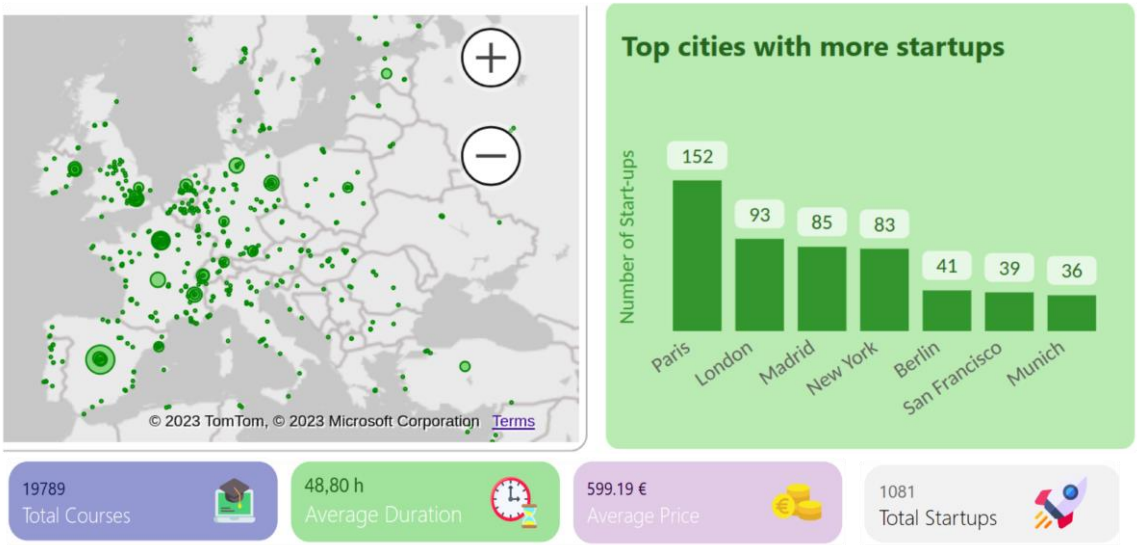

***Figure 1**: Overview of the Skill Sync tool content. The map shows the set of startups working in the selected fields, some supported by EIT KICs. This is a screenshot of the live Skill Sync interface taken at a specific time and the data is not the same used in this report.*

1.2. Technology

The following scheme reflects the dataflow of the tool from the moment the data is obtained until the recommendation is obtained:

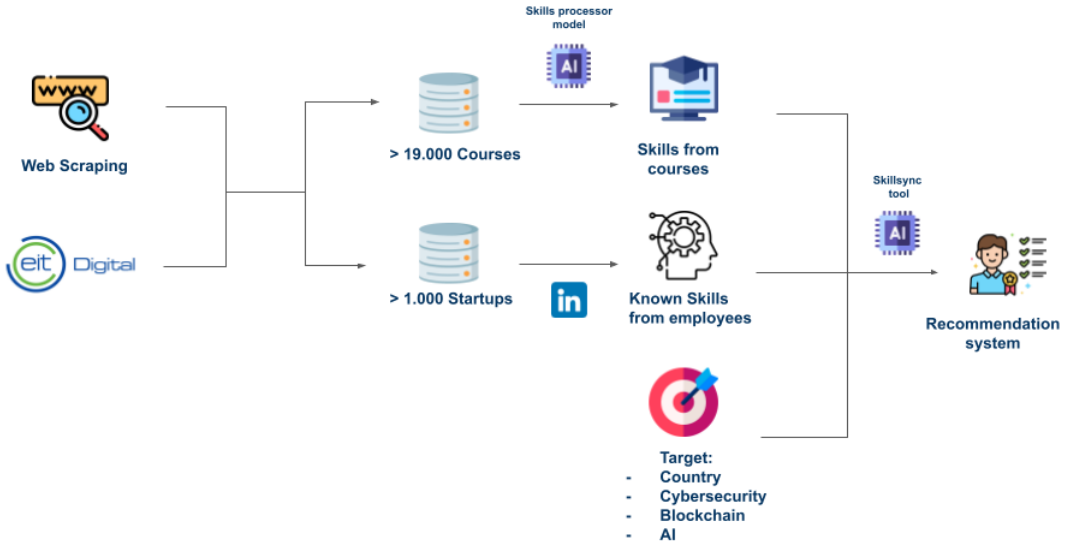

***Figure 2**: Data flow and modules.*

The Skill Sync tool aims to recommend courses based on companies' skills gaps. To carry out this recommendation, the system uses several artificial intelligence models, which will be explained below:

- Skills processor model: This machine learning model aims to detect the skills of the courses that are in the database. This type of models, which find relationships between the constituent parts of language, are called NLP models. The input that the model receives are the titles and descriptions of the courses. As output, the model returns the skills of those courses with a percentage (probability of that skill being learned in the course).

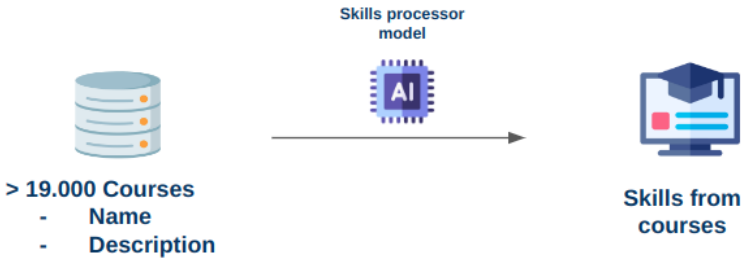

***Figure 3**: Graphic scheme of skill processor model whose input with the name and description of the course and the output the skills that are learned in this course.*

- Skill Sync tool: This model is in charge of the recommendation system. The objective of this recommendation algorithm is to obtain courses for the organisations.

To recommend courses, the system uses a cosine similarity model, which makes it possible to obtain, in terms of distance, the similarities between organisations according to the sector to which they belong. In other words, the system will obtain the missing skills in an organisation based on the average skills of the organisations around it.

The inputs to this model are the skills of the courses, the skills of the employees of the organisations and a set of values called target. This set of values performs the function of comparing different organisations in a specific sector (**Cybersecurity, Artificial Intelligence** and **Blockchain**), in a specific country and the type of role specified (**Manager, Technical** and **Non-Technical**).

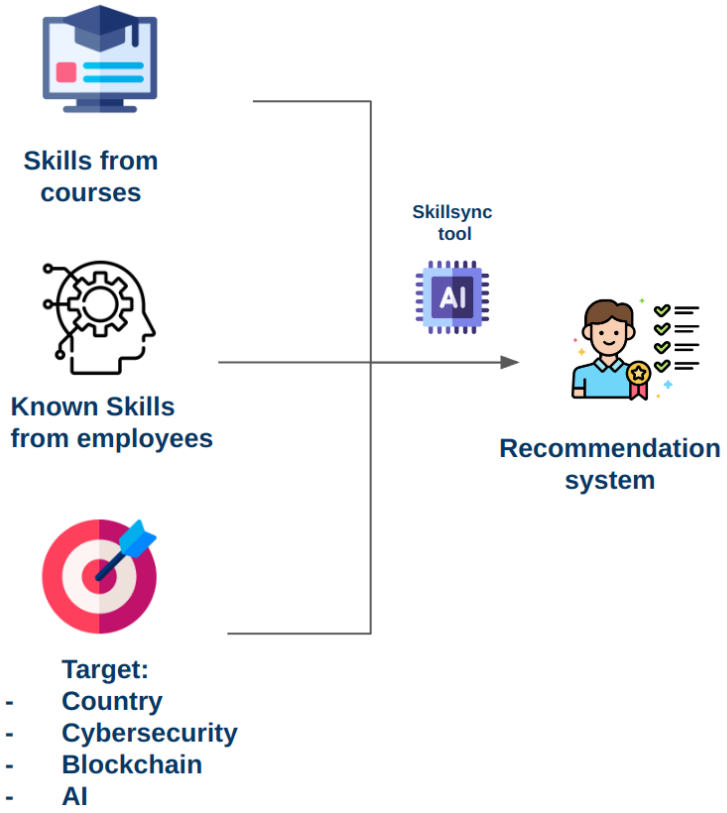

***Figure 4**: Graphic scheme of Skill Sync Tool. The model receives skills from courses and employees and targets to get the recommendation courses for each organisation.*

1.3. Relation with ESCO ontology

The database captures the knowledge of the mapped (e.g. educational institutions and workforce within start-ups) through the concept of *skills*. Skills are identified and estimated through NLP (Natural Language Processing) and AI models. The NLP model identifies the skills mentioned in the course description and returns the equivalent ESCO[1] skills for courses.

[1] ESCO (European Skills, Competences, Qualifications and Occupations) is a multilingual classification of skills, competencies, qualifications and occupations. It was developed by the European Union to provide a common language and reference framework for describing qualifications and competencies in a way that is clear and understandable across different countries and education systems. In our project, we use ESCO as the standard nomenclature to normalise and compare the skills and

For startups, employee data from the companies' public LinkedIn profiles are crawled and normalised using another AI model to their respective ESCO skills. By comparing the normalised ESCO skills of both courses and businesses, the Skill Sync tool identifies lacking skills in each company and produces tailor-made recommendations on courses that teach those skills.

In order to normalise the skills found in both employees and courses using the IA model, the ESCO database is used. The total number of skills contained in ESCO is 13,890. In the analysis a subset of these skills will be used which are competences of the ESCO roles chosen for the analysis. Once the skills have been obtained, we want to be able to categorise them by area (**Cybersecurity, Blockchain** and **Artificial Intelligence**) and by role (**Manager**, **Technical** and **Non-Technical**).

The relationships between the ESCO roles and the areas of focus of the study (**Cybersecurity, Blockchain** and **Artificial Intelligence**) can be found in the following Appendix. The relationships between the ESCO roles and the categories (**Manager, Technical** and **Non-Technical**) can be found in the following Appendix.

1.4. Adaptation for SME4DD

The Skill Sync tool has been adapted so that it can dynamically make recommendations according to the specific target. With the help of the EIT team, trainings have been held and the database of organisations has been enriched with a significant number of SMEs so that a specific recommendation can be made according to the following criteria:

1.4.1. Target categories (SME)

- **Managers**: Managers plan, direct, coordinate and evaluate the overall activities of enterprises, governments and other organisations, or of organisational units within them, and formulate and review their policies, laws, rules and regulations.
- **Technical**: Information and communications technology professionals conduct research; plan, design, write, test, provide advice and improve information technology systems, hardware, software and related concepts for specific applications; develop associated documentation including principles, policies and procedures; and design, develop, control, maintain and support databases and other information systems to ensure optimal performance and data integrity and security.
- **Non-Technical**: Rest of professionals.

1.4.2. Target Verticals

The recommendation system will focus on the emerging technology areas of **Cybersecurity, Artificial Intelligence** and **Blockchain**.

occupations of the startups and courses in our database. This enables us to accurately identify the skills that a startup lacks and recommend courses that can help fill the gap. More information: https://esco.ec.europa.eu/en/classification.

1.4.3. Target Countries

The Skill Sync database allows for a focused analysis of a set of countries. For this study we have focused on the analysis of organisations in the countries of **France**, **Sweden**, **Hungary** and **Italy**.

2. Caveats

It's important to provide a disclaimer regarding the data used for the analysis, as it encompasses several sources which can potentially carry inherent biases and instances of inaccurate representations.

2.1. LinkedIn

While LinkedIn serves as a valuable source of professional information, it's worth acknowledging that profiles on the platform might not always accurately reflect the true nature of individuals' experiences, skills, or affiliations. Biases related to

- **Self-reporting**: both employees and companies complete their own LinkedIn profiles. Any company *can input any kind of information, truth or false* (for example, **size** or **location** of companies and courses obtained from LinkedIn). Employees can report wrong skills or, in many cases, exaggerate them.
- **Selective presentation**: organisations included in this report *are not randomly sampled* from the total population existing in the regions of study, but are the product of specific loads to the database provided by both EIT Digital, EIT Health, and the courses organisations (that are obtained from course aggregators like **Shortcoursesportal** and **Class Central**, our main sources for course data).

2.2. Shortcoursesportal and Class Central

- **Selective presentation**: with the exception of manually added courses (SME4DD courses, for example) all courses included in this study are scraped from the most common course aggregators: Shortcoursesportal and Class Central. It means that a high risk of selective presentation exists in this report, as *the selection of the courses available in these platforms may not be at random*, but based on a selective criteria designed by these aggregators, and based on a commercial relationship between courses providers and these platforms.

  For instance, courses offered by organisations based in **France** and **Italy** are relatively less represented in comparison to those offered by **UK** organisations. Similarly, this observation applies to **Hungary** and **Sweden** as well. It's important to note that while **Sweden** does have some representation, given the smaller size of these countries, it's expected that the number of courses may be comparatively lower..

- **Location mislabeling**: it is also important to acknowledge that, even if the courses are extracted from the named platforms, courses location is extracted from LinkedIn, based on the location of the organisation providing the course. Furthermore, many international organisations providing courses and training have offices located in one or more European countries, like is the case of organisations with a large number of courses like Coursera, Data Camp, or Future Learn. As we use the LinkedIn location to infer the location of the courses, *there is a large number of international courses that are mislabeled as Europeans*. To mitigate this, the final sample of the top

recommended courses have been carefully performed by the authors of this report to get rid of courses that are not representative.

2.3. Machine Learning

It is also important to note that the skills and courses detected and recommended by Skill Sync Artificial Intelligence engine are generated automatically as a result of a statistical learning process and that the tool and algorithms are still under active development, so some results may not be relevant. For example, a skill could be wrongly predicted for a course, or not normalised properly in a LinkedIn profile.

3. Database Description

The database on which the tool has worked can be differentiated into two different data sets: Courses and Startups.

3.1. Source of the data

3.1.1. Startups

The previous database, with around **300** startups working in the field of AI, has been maintained and updated with new companies in the field of **Cybersecurity** and **Blockchain**, reaching a total of approximately **1,500** startups. The majority of companies are supplied by the EIT team and are affiliated with the EIT KICs. However, there is a subset of Swedish companies selected from the 100 fastest-growing SMEs in 2022, indicating that they achieved a growth rate of at least 100 percent between 2018 and 2021

The database has been tagged with the corresponding set of competences based on the personal profiles of their staff published on LinkedIn. During the adaptation of the tool to the new competences, the Artificial Intelligence model has been improved. This model is used to normalise the competences tracked from LinkedIn of startup employees into official ESE competences. So far we have a good set of labelled training (~**14,000** training examples).

3.1.2. Courses

A DB of more than **20,000** courses offered worldwide, both in-person and online, from a wide range of providers, obtained from the most up-to-date online databases aggregating publicly available information. The AI courses included in the database range from undergraduate and postgraduate programs to distance learning and exam preparation courses and other international educational resources. The database stores detailed information from the courses hosting platform, teaching organisation, provider, URL, and characteristics (duration, price, language, ...). These courses have been extracted both manually from particular sources and automatically from online education platforms, including the following Studyportals and Class Central:

name	category	url
studyportals	statistics	https://www.shortcoursesportal.com/search/course/statistics
studyportals	mathematics	https://www.shortcoursesportal.com/search/course/mathematics
studyportals	financial-mathematics	https://www.shortcoursesportal.com/search/course/financial-mathematics
studyportals	biotechnology	https://www.shortcoursesportal.com/search/course/biotechnology
studyportals	bioinformatics-biostatistics	https://www.shortcoursesportal.com/search/course/bioinformatics-biostatistics
studyportals	applied-mathematics	https://www.shortcoursesportal.com/search/course/applied-mathematics
studyportals	adult-education	https://www.shortcoursesportal.com/search/course/adult-education
studyportals	educational-psychology	https://www.shortcoursesportal.com/search/course/educational-psychology
studyportals	educational-leadership	https://www.shortcoursesportal.com/search/course/educational-leadership
studyportals	coaching	https://www.shortcoursesportal.com/search/course/coaching
studyportals	business-management	https://www.shortcoursesportal.com/search/course/business-management
studyportals	computer-science-it	https://www.shortcoursesportal.com/search/course/computer-science-it
classcentral	cs	https://www.classcentral.com/subject/cs
classcentral	data-science	https://www.classcentral.com/subject/data-science
classcentral	programming-and-software-(	https://www.classcentral.com/subject/programming-and-software-development
classcentral	infosec	https://www.classcentral.com/subject/infosec

***Figure 5**: Courses platforms and categories of the educational fields gathered.*

3.2. Companies Statistics

As of *29 August 2023*, the database has a total of 2,585 european organisations distributed thus:

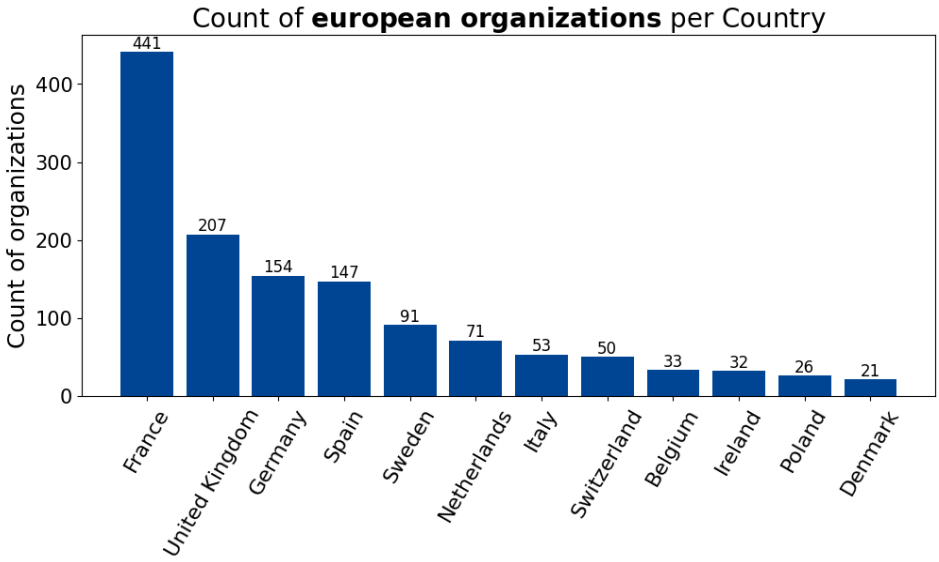

***Figure 6**: Number of organisations in the database distributed by countries. Grouping all non european organisations.*

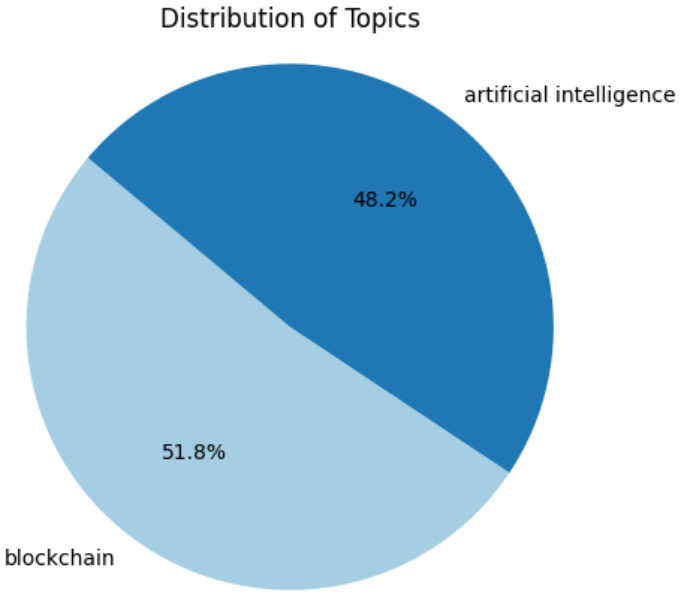

***Figure 7**: Number of organisations in the database distributed by topics.*

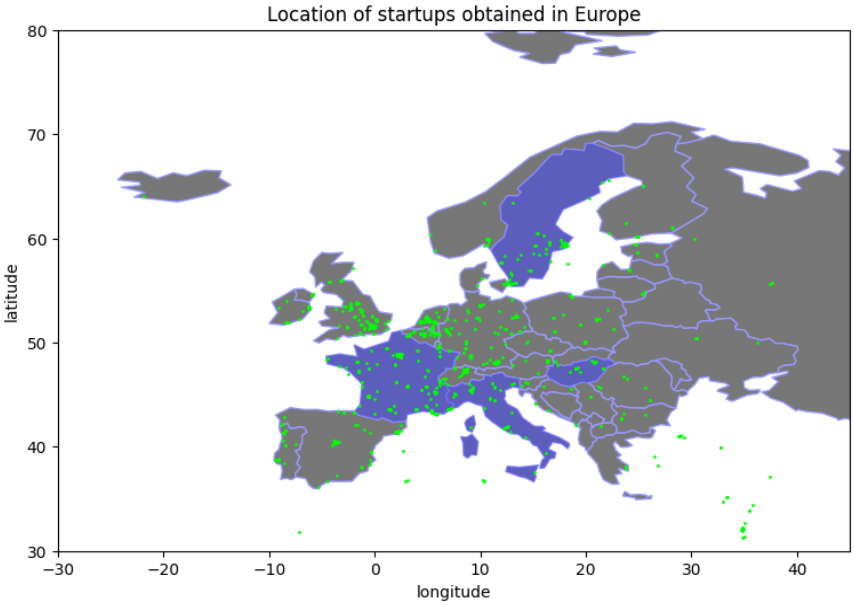

***Figure 8**: Map distribution of the organisations. In a highlighted colour, the countries where we are focusing the study.*

Having seen the distribution of organisations globally, an analysis is made of the organisations whose country is one of those chosen for the study: **France, Sweden, Italy** and **Hungary**.

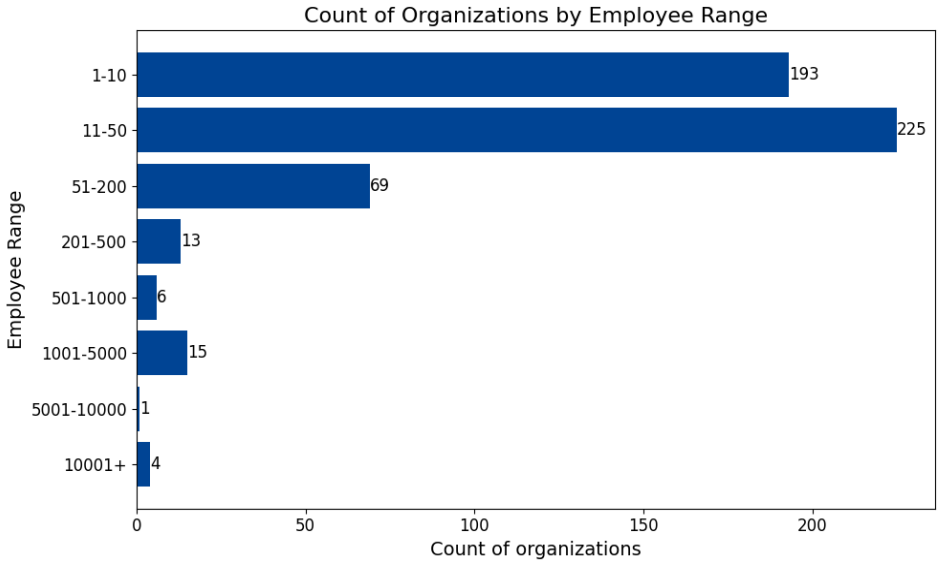

***Figure 9**: Number of organisations used for the analysis grouped by range of employees.*

Having obtained the organisations by country, the objective is to obtain the skills of the employees of each organisation grouped by country.

In order to obtain the skills of the organisations, the skills of the employees are obtained through their LinkedIn profile. For the analysis it must be taken into account that not all organisations have a complete LinkedIn profile, nor do their employees.

Below is an analysis of the comparison between the total organisations obtained and the organisations that do not contain employees with whom the skills can be obtained:

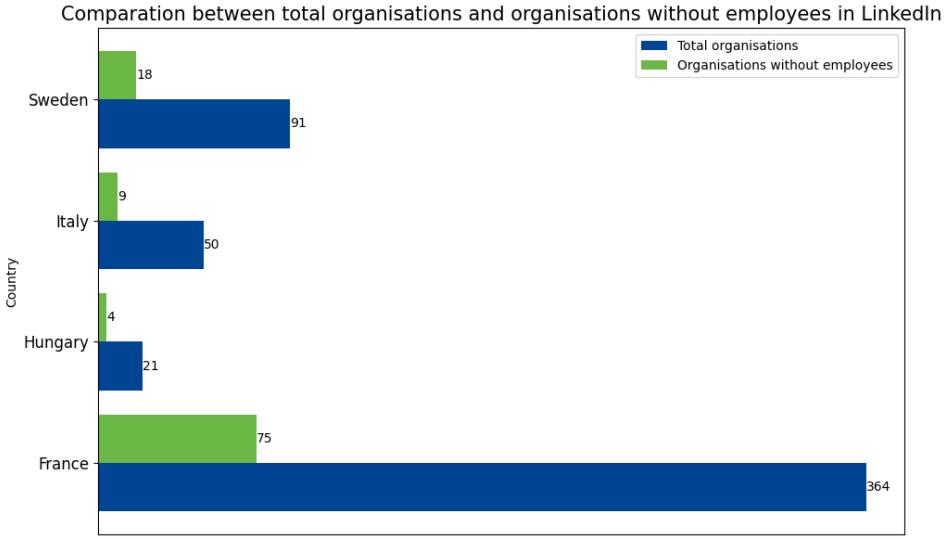

***Figure 10**: Number of organisations in the database for the target countries. Green highlights represent the number of organisations without employees.*

As can be seen in the graph, approximately 10% of organisations have no employees on their LinkedIn profile. This can be for several reasons, among them, that the employees that belong to these organisations do not have a LinkedIn profile or that the profiles do not state that they belong to that organisation.

Analysing the organisations according to the number of employees, the total number of employees per country is shown below. For the analysis it is necessary to obtain a representative sample of employees who have an up-to-date profile with their skills.

The following graph shows the number of employees per country with at least one skill in their profile.

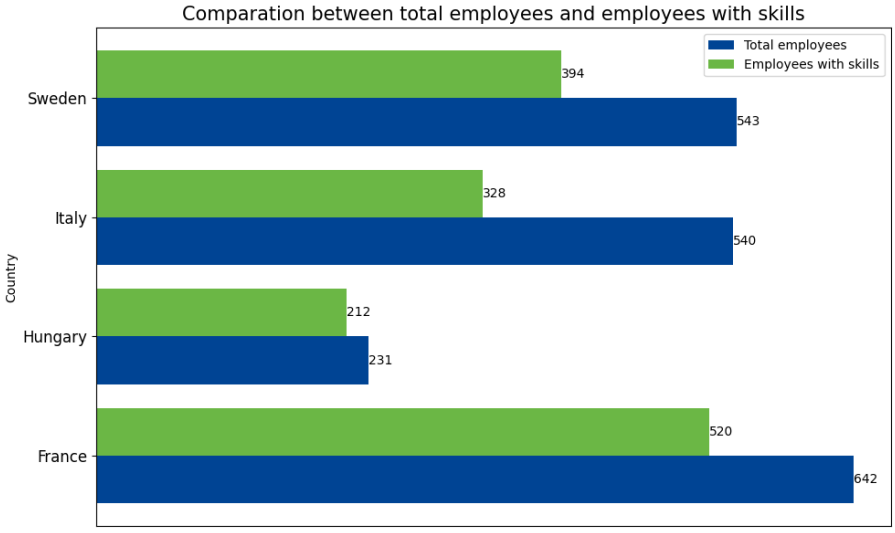

***Figure 11**: Number of organisations in the database for the target countries. Green highlights represent the number of employees per country with at least one skill in their profiles.*

According to the results obtained, we see that the total number of employees in **Italy** diverges greatly from the number of employees who have at least one skill in their profile.

3.3. Courses Statistics

As of *23 August 2023*, the database has a total of **2,745** courses distributed in europe as follows:

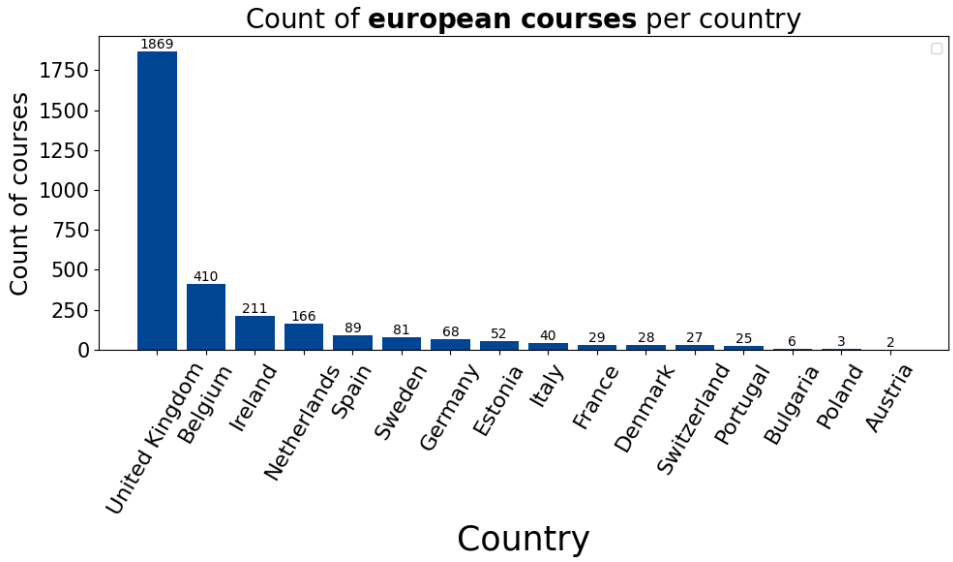

***Figure 12**: Number of courses grouped by country.*

> ***Note**: The rest of the courses do not have a defined location because the organisation delivering the course does not establish a course location.*

In our database we have the duration of the courses, which allows us to analyse the courses according to the number of hours the course takes.

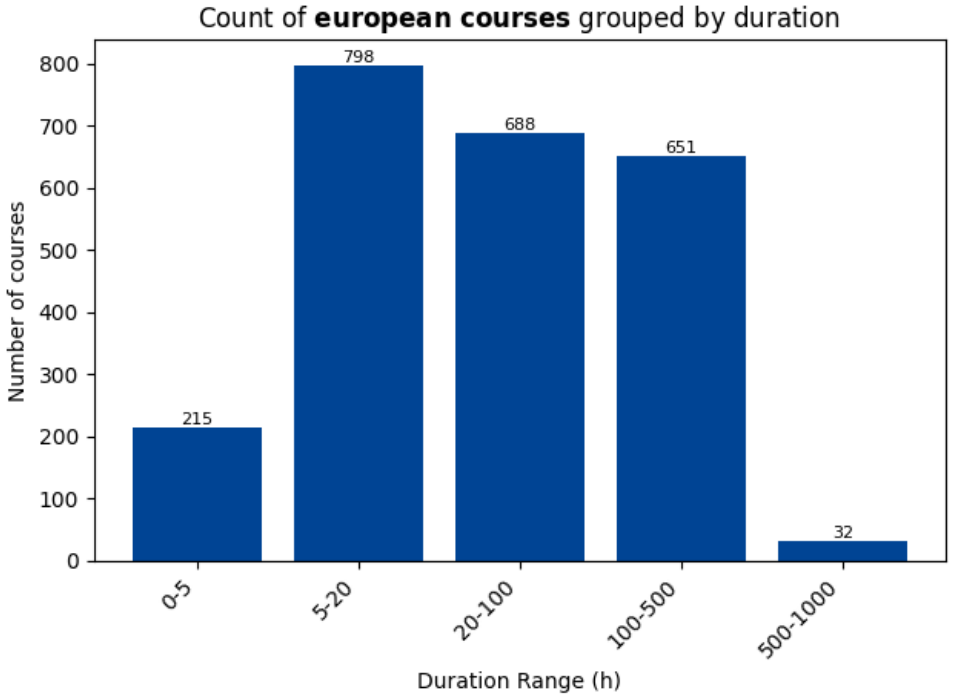

***Figure 13**: Number of courses grouped by total duration in hours. Only european courses selected.*

Along with the localisation of the course, the language in which the course is taught has been obtained. Below is a table with the number of courses per language.

Language	# Courses
English	2,681
Spanish	3
Estonian	1
Korean	1

***Table 1**: Number of courses grouped by languages.*

The following graph represents the number of courses grouped according to price range.

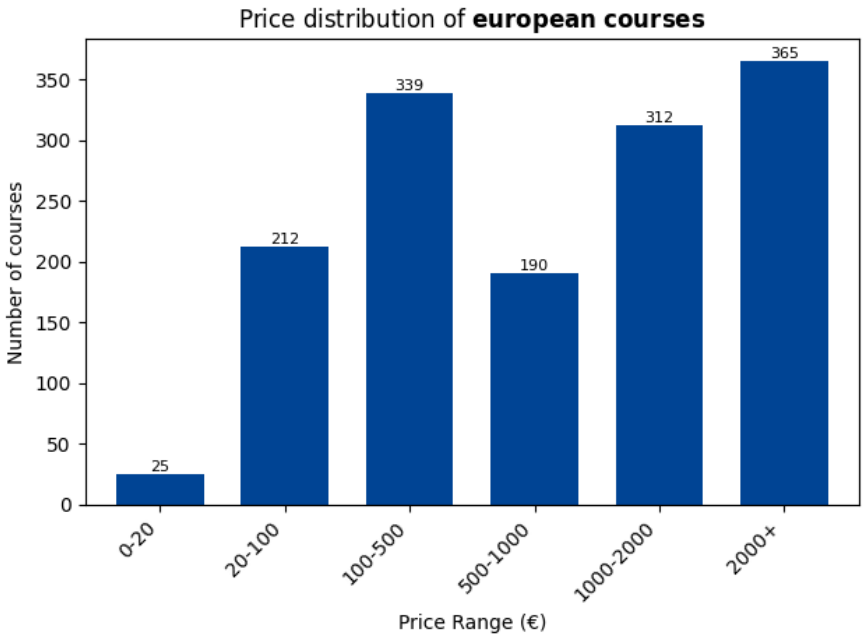

***Figure 14**: Distribution of courses by price range. Only European courses have been selected.*

In order to enrich the analysis of the courses obtained in the database, the top skills that the Artificial Intelligence model detects as skills in the technology sector obtained by taking the courses are shown below.

It should be remembered that this Artificial Intelligence model detects the skills learnt thanks to the courses by means of the name and description of the courses.

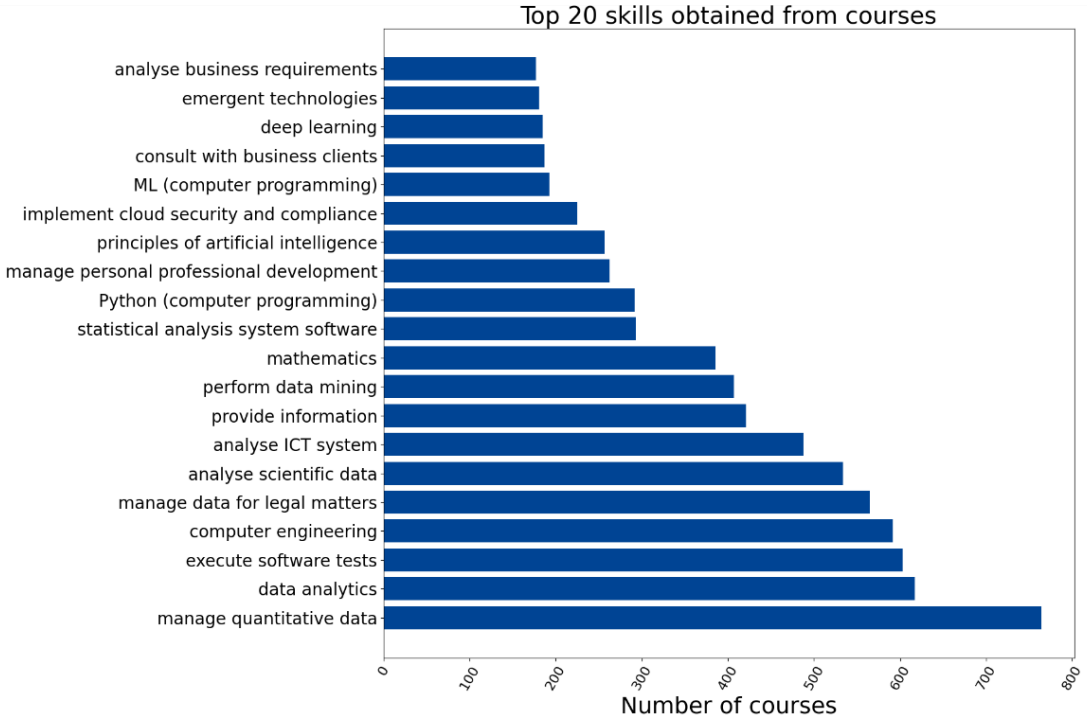

***Figure 15**: Top 20 skills obtained from courses through the artificial intelligence model.*

Some of the courses come from academic organisations. In order to see a comparison between the number of academic and non-academic courses, the number of courses is represented below according to whether they belong to a university or not.

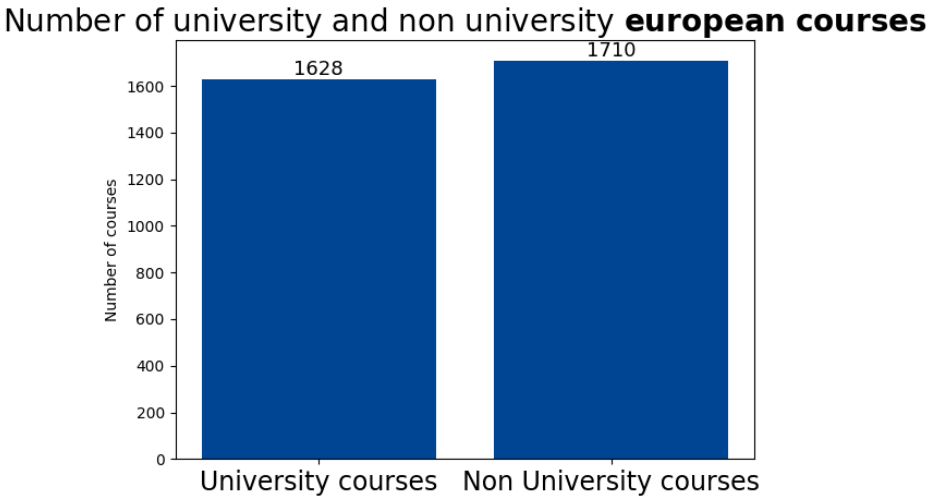

***Figure 16**: Number of European courses grouped by type of educational organisation: University vs Non university.*

The following scatter plot is intended to represent the relationship between the duration of courses in hours and the price of courses.

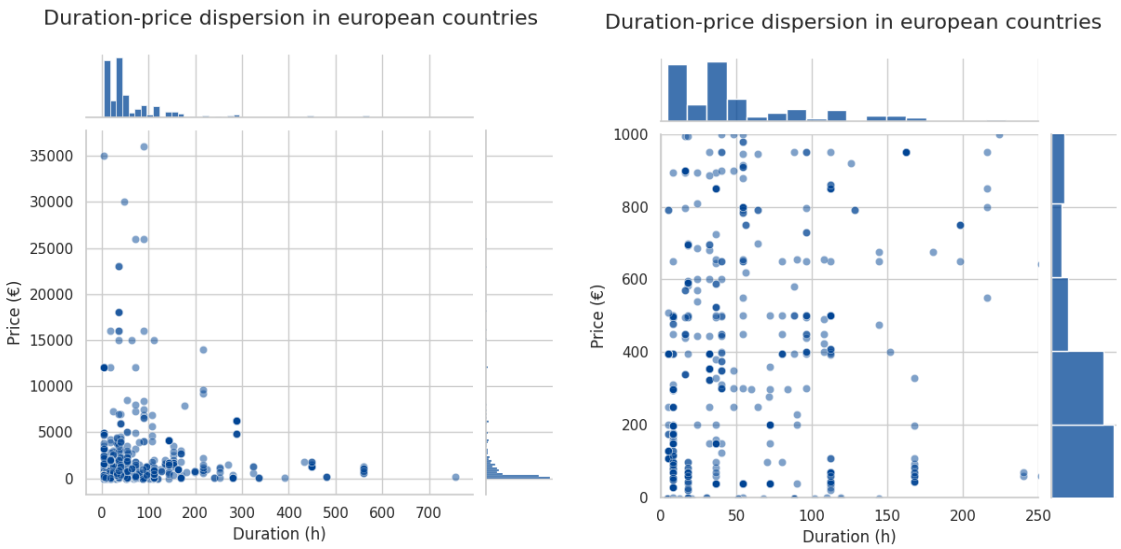

***Figure 17**: Scatter plot of the relationship between duration on the X-axis and price on the Y-axis for European courses. The graph on the **left (original)** shows the original distribution. On the **right (zoom)**, the graph is constrained on the X and Y axes to accurately obtain the distribution in most courses.*

4. Professional Categories

In order to categorise the skills obtained through the courses and the employee profiles of the organisations, the ESCO ontology is used. This ontology will make it possible to categorise these skills into **Manager**, **Technical** and **Non-Technical** by means of the occupations defined by ESCO.

In other words, by relating the Esco roles with the categories that the study will focus on, a relationship will be obtained between the skills obtained and the category to be studied.

This section is dedicated to the selected ESCO roles and the analysis of the knowledge and skills related to the ESCO profile.

4.1. Manager

The role of a manager in the technology sector is that of a professional who holds a leadership and management position within a technology-related organisation. These managers play a pivotal role in the planning, organisation, coordination, and supervision of activities and teams related to technology within the company. Their aim is to ensure that technological projects are efficiently developed, that set objectives are achieved, and that the pace of innovation within the industry is maintained.

Given the role of a manager in the technology sector, the following ESCO roles have been correlated and presented in the following table:

ESCO Role	Category
chief data officer	Manager
business intelligence manager	Manager

ICT information and knowledge manager	Manager
ICT operations manager	Manager
ICT resilience manager	Manager
ICT security manager	Manager
chief ICT security officer	Manager

***Table 2**: ESCO roles included in this study that belong to the Manager Professional Category.*

The following list is a summary of the skills analysed for manager-related roles:

Sample of skills for Managers
information architecture
manage ICT data classification
information security strategy
business intelligence
MDX

***Table 3**: Sample of 5 skills belonging to the Manager Professional Category.*

For a complete list of skills, see the following Appendix.

4.2. Technical

The role of a Technical profile in the technology sector is that of a skilled professional responsible for the hands-on implementation, maintenance, and troubleshooting of various technical systems and equipment within a technology-oriented company. These technicians play a crucial role in ensuring the proper functioning of technology infrastructure, diagnosing and addressing technical issues, and contributing to the overall operational efficiency of the organisation's technological processes. Their expertise is essential for the successful execution of technology projects, adherence to quality standards, and the seamless integration of new innovations within the sector.

Considering the significance of technicians in the technology sector, the subsequent ESCO roles have been correlated and are presented in the following table:

ESCO Role	Category
ICT intelligent systems designer	Technical
bioinformatics scientist	Technical
data warehouse designer	Technical
big data archive librarian	Technical
data quality specialist	Technical
database designer	Technical
computer vision engineer	Technical
data analyst	Technical

ESCO Role	Category
data scientist	Technical
database integrator	Technical
database developer	Technical
ICT security administrator	Technical
ICT security engineer	Technical
blockchain architect	Technical
blockchain developer	Technical
digital forensics expert	Technical
embedded systems security engineer	Technical
ethical hacker	Technical

***Table 4**: ESCO roles included in this study that belong to the Technical Professional Category.*

The following list is a summary of the skills analysed for manager-related roles:

Sample of skills for Technical Profiles
Haskell
Erlang
manage ICT data classification
information structure
SAS language

***Table 5**: Sample of 5 skills belonging to the Technical Professional Category.*

For a complete list, see the following Appendix.

4.3. Non-Technical

In the landscape of the business domain, the function of a professional covers an extensive spectrum of duties linked to diverse managerial and strategic facets. These individuals bring their acumen to areas such as planning, execution, analysis, and innovation within market-driven organisations. Their engagement is essential to the smooth functioning of business processes, the advancement of entrepreneurial strategies, and the achievement of corporate goals. By actively playing their roles in these domains, they collectively reinforce the evolution and success of projects and companies.

Given the diverse responsibilities undertaken by Non-Technical professionals in the technology sector, the ensuing ESCO roles have been identified and are presented within the subsequent table:

ESCO Role	Category
ICT business analyst	Non-Technical
data protection officer	Non-Technical

ESCO Role	Category
data entry clerk	Non-Technical

***Table 6**: ESCO roles included in this study that belong to the Non-Technical Professional Category.*

The following list is a sample of the skills analysed for Non-Technical roles:

Sample of skills for Non-Technicals
propose ICT solutions to business problems
systems development life-cycle
internal risk management policy
identify customer requirements
business requirements techniques

***Table 7**: Sample of 5 skills belonging to the Non-Technical Professional Category.*

For a complete list, see the following Appendix.

5. France

In the next section, we will conduct a detailed analysis of data collected from various companies in Europe, with a focus on those located in **France**. This initial examination aims to clarify our dataset's composition and provide context for our subsequent analysis of skills. Our primary goal is to offer a clear overview of French companies in our dataset and compare their key metrics to their European counterparts. This will help us gain a thorough understanding of the sample used for our study, including any potential biases or nuances that may affect our skills analysis. This preliminary exploration covers aspects like sample size, employee count, and technology domains. It serves as an essential foundation for our more in-depth investigation into the technological skills found in these companies. We will also include graphs displaying key metrics of the specific sample used for the later skills analysis, following the map showing the geographical distribution of the French companies in our database.

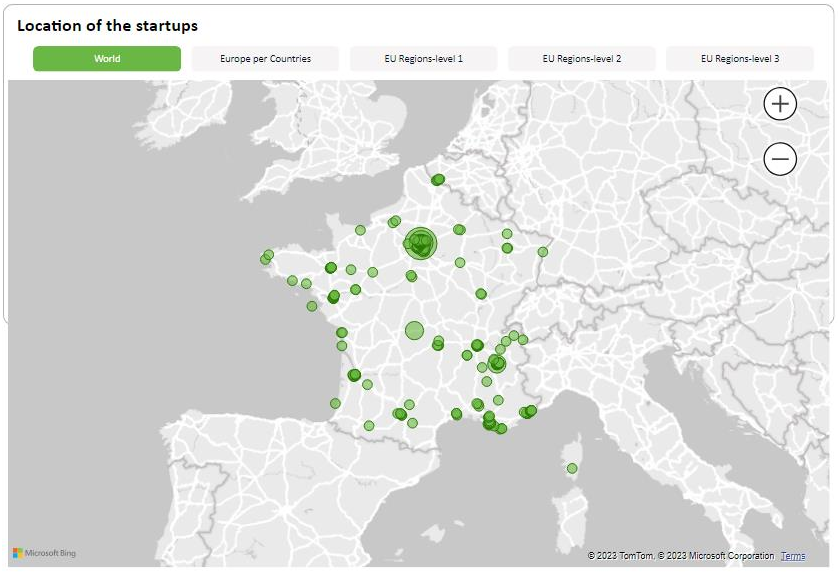

***Figure 18**: Screen capture from the geographical view of the Skill Sync displaying the organisations located in **France**.*

The plot below illustrates the size distribution of the companies sampled in our database. The green bars represent organisations located in France, used for the later analysis, while the blue bars represent the count of organisations in the rest of Europe. The majority of companies in our database fall within the small to mid-sized range.

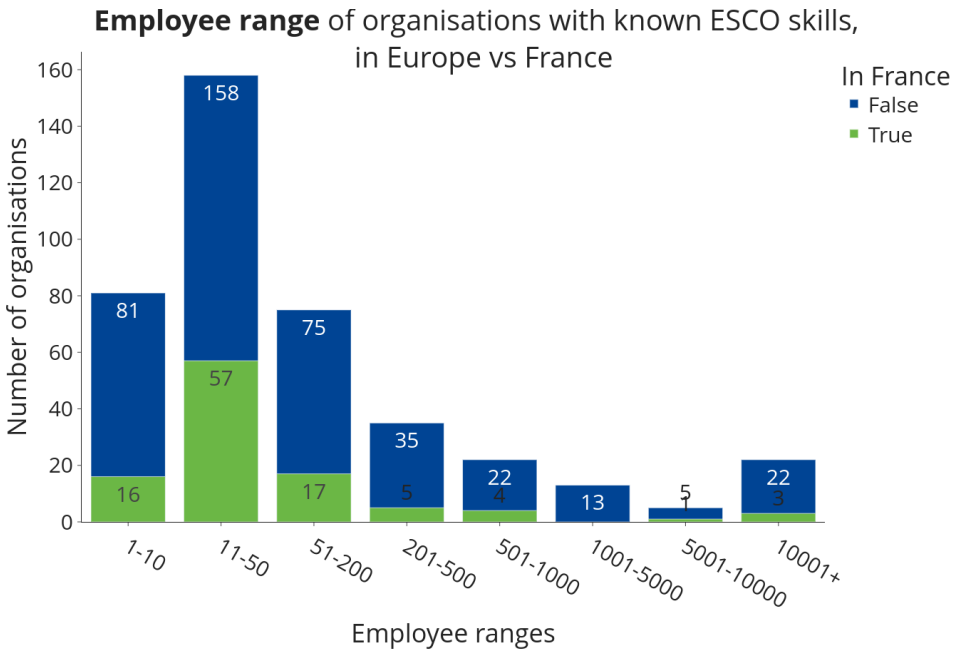

***Figure 19**: Comparison of Employee Counts. **French** Organisations vs. European Counterparts.*

The following plot helps understand the sectors of expertise of the sampled organisations. It is noticeable that the data capturing has been focused in key sectors which include the technology sector, healthcare and biotech sectors, and finance.

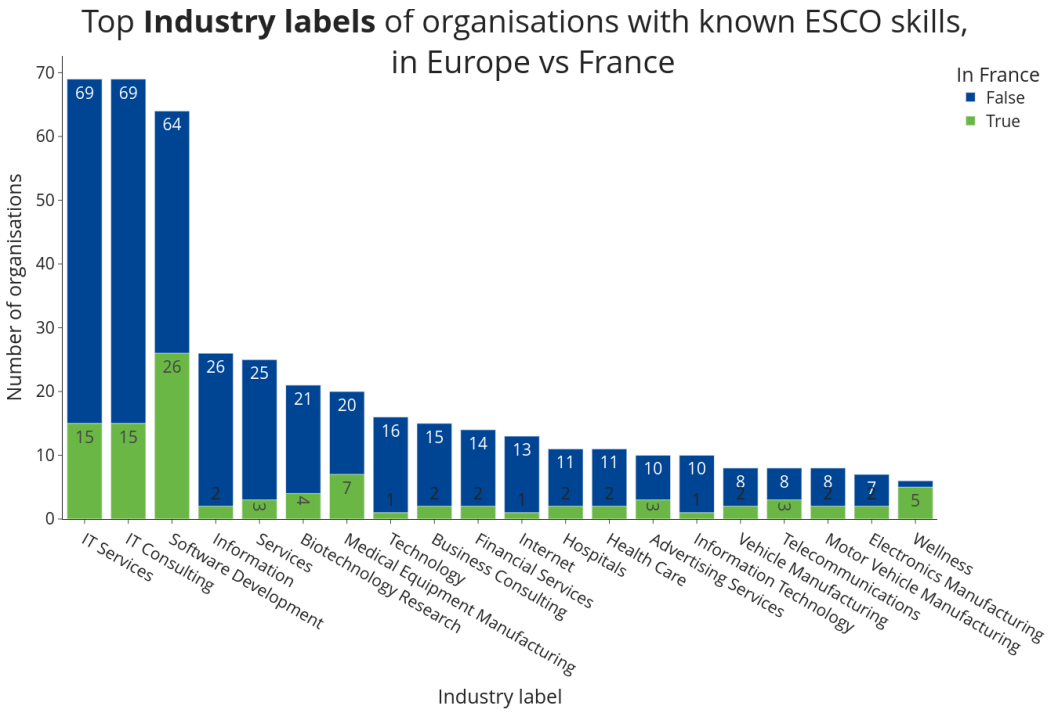

***Figure 20**: Comparison of Industry. **French** Organisations vs. European Counterparts.*

5.1. Current Expertise

In the following section, we provide a detailed analysis of the skills found in specific areas important for today's technology landscape: Artificial Intelligence, Blockchain, and Cybersecurity. Each part of this analysis looks at the most common skills among French companies, sorted into three job categories: Managers, Technical Specialists, and Non-Technical Personnel. This examination offers a focused look at the expertise of the sampled French companies in these important fields, as derived from our sample data.

5.1.1. Artificial Intelligence

5.1.1.1. Manager

The following chart displays the key **Artificial Intelligence** related skills identified for **Manager** positions in **France**. The skills present in SME4DD courses are highlighted in **green**:

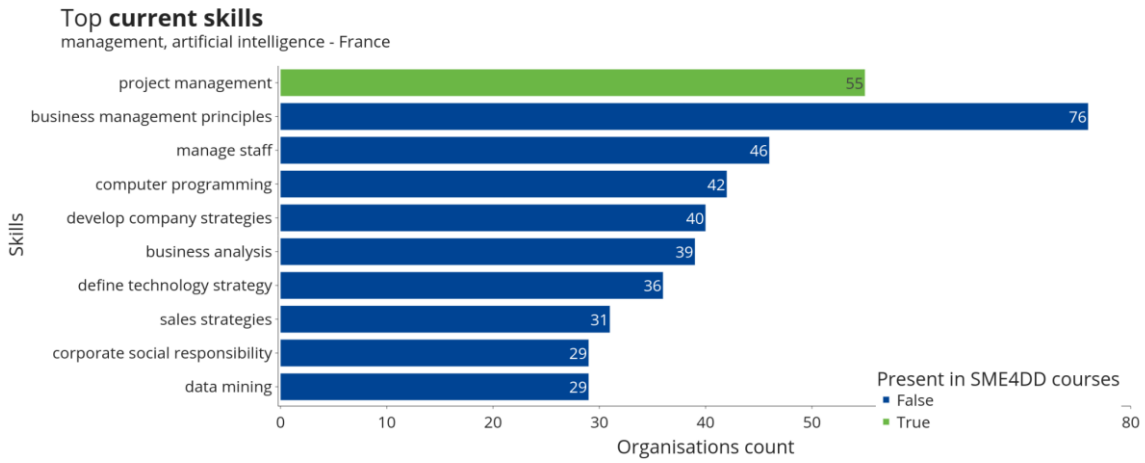

***Figure 21**: Key **AI** skills identified for **Manager** positions in **France**.*

5.1.1.2. Technical

The following chart displays the key **Artificial Intelligence** related skills identified for **Technical** positions in **France**. The skills present in SME4DD courses are highlighted in **green**:

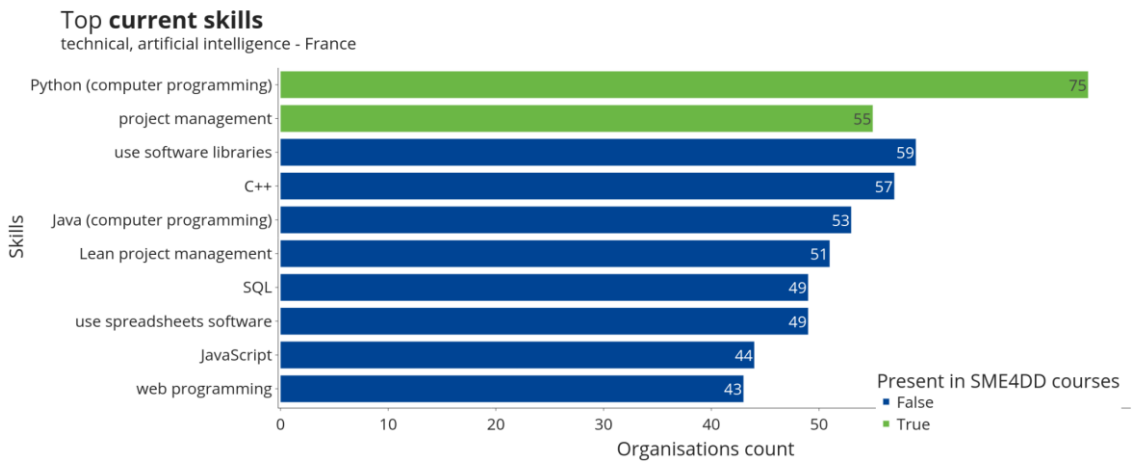

***Figure 22**: Key **AI** skills identified for **Technical** positions in **France**.*

5.1.1.3. Non-Technical

The following chart displays the key **Artificial Intelligence** skills identified for **Non-Technical** positions in **France**:

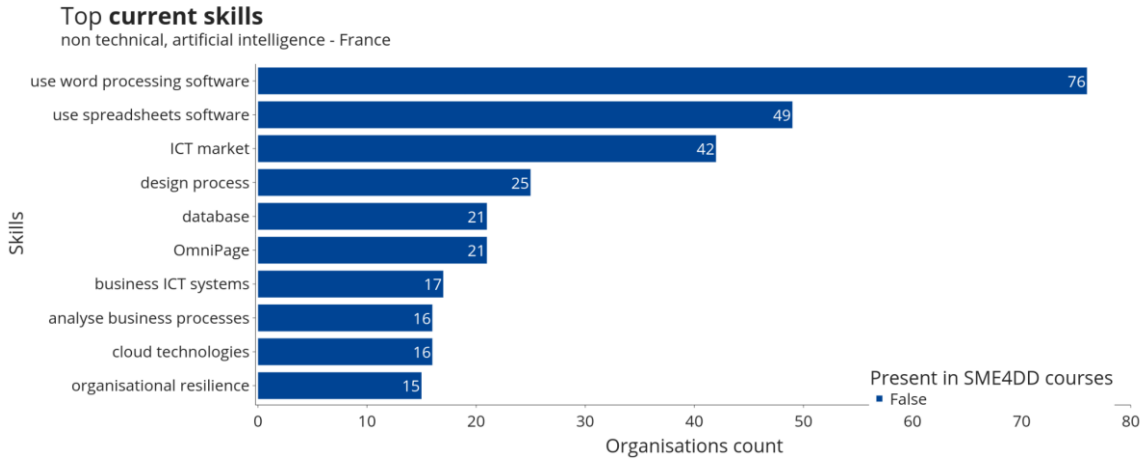

***Figure 23**: Key **AI** skills identified for **Non-Technical** positions in **France**.*

5.1.2. Cybersecurity

5.1.2.1. Manager

The chart below showcases the essential **Cybersecurity** skills for **Manager** roles in **France**. Skills covered in the SME4DD courses are highlighted in **green**:

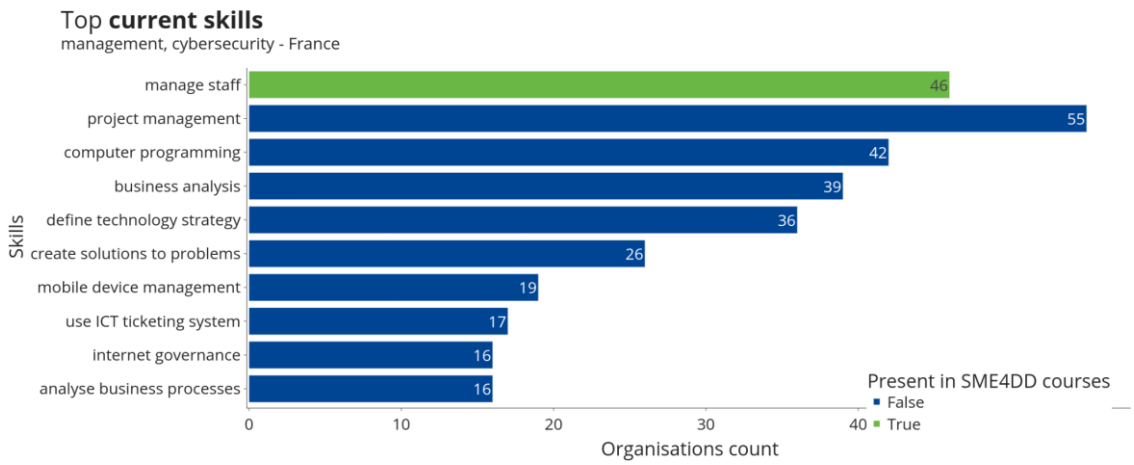

Figure 24: *Key* ***Cybersecurity*** *skills identified for* ***Manager*** *positions in* ***France****.*

5.1.2.2. Technical

The chart below showcases the essential **Cybersecurity** skills for **Technical** roles in **France**. Skills covered in the SME4DD courses are highlighted in **green**:

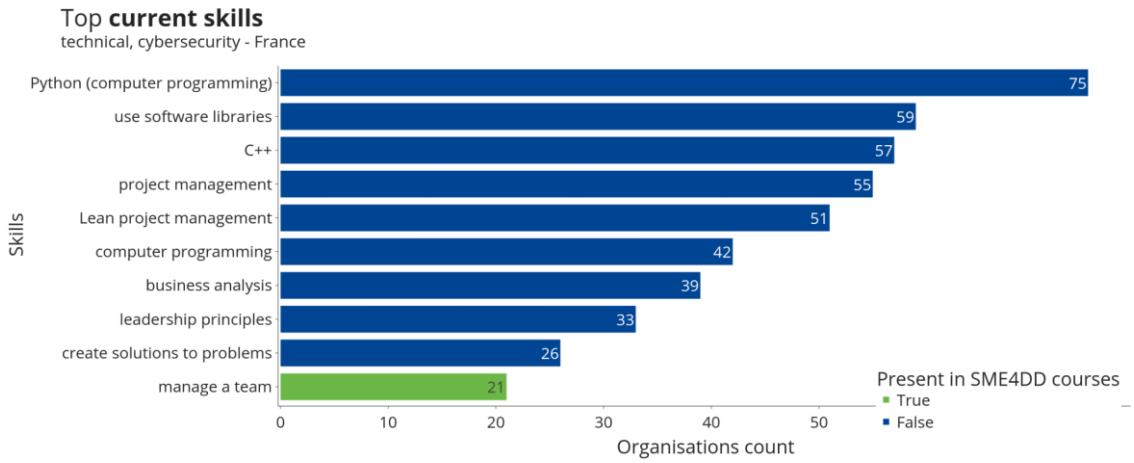

Figure 25*: Key* ***Cybersecurity*** *skills identified for* ***Technical*** *positions in* ***France****.*

5.1.2.3. Non-Technical

The chart below showcases the essential **Cybersecurity** skills for **Non-Technical** roles in **France**. Skills covered in the SME4DD courses are highlighted in **green**:

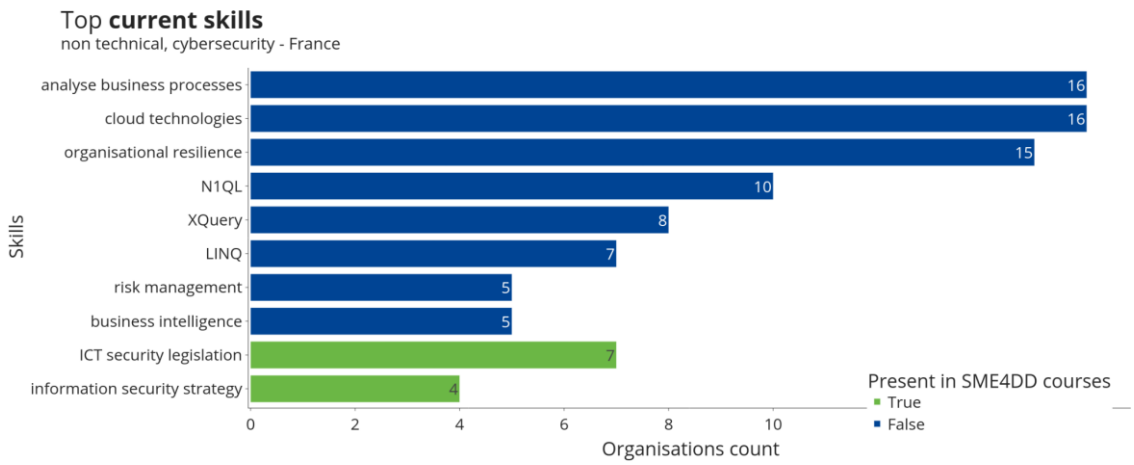

***Figure 26**: Key **Cybersecurity** skills identified for **Non-Technical** positions in **France**.*

5.1.3. Blockchain

5.1.3.1. Manager

The following chart displays the key **Blockchain** related skills identified for **Manager** positions in **France**:

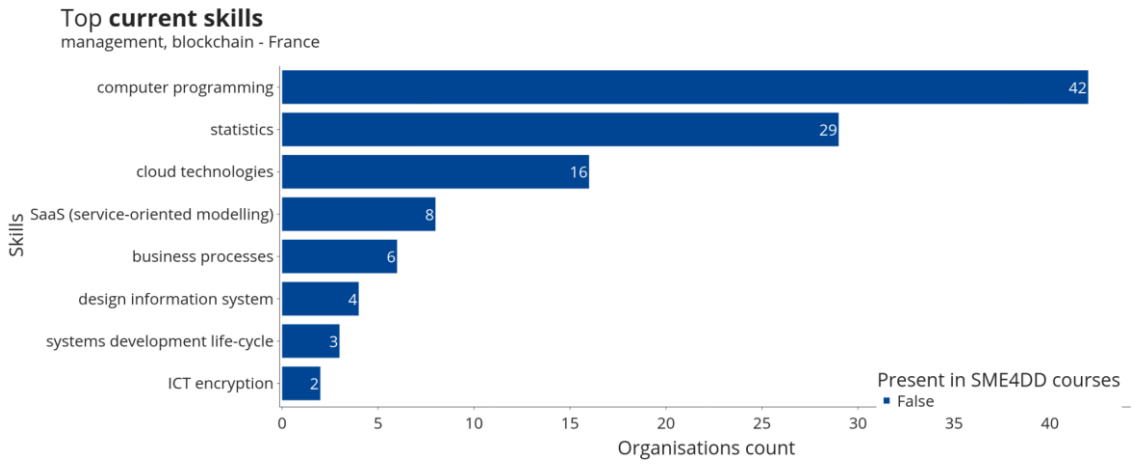

***Figure 27**: Key **Blockchain** skills identified for **Manager** positions in **France**.*

5.1.3.2. Technical

The chart below showcases the essential **Blockchain** skills for **Technical** roles in **France**:

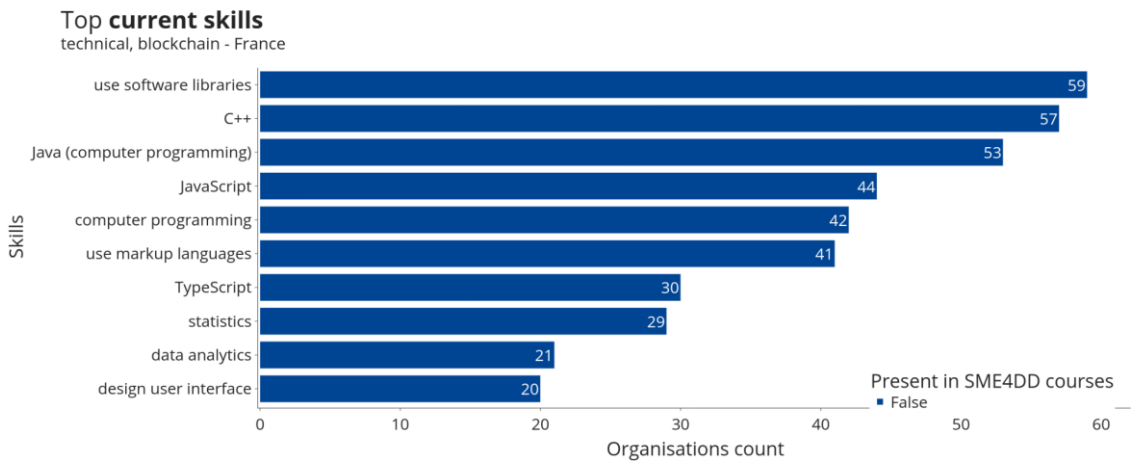

***Figure 28**: Key **Blockchain** skills identified for **Technical** positions in **France**.*

5.1.3.3. Non-Technical

The chart below showcases the essential **Blockchain** skills for **Non-Technical** roles in **France**:

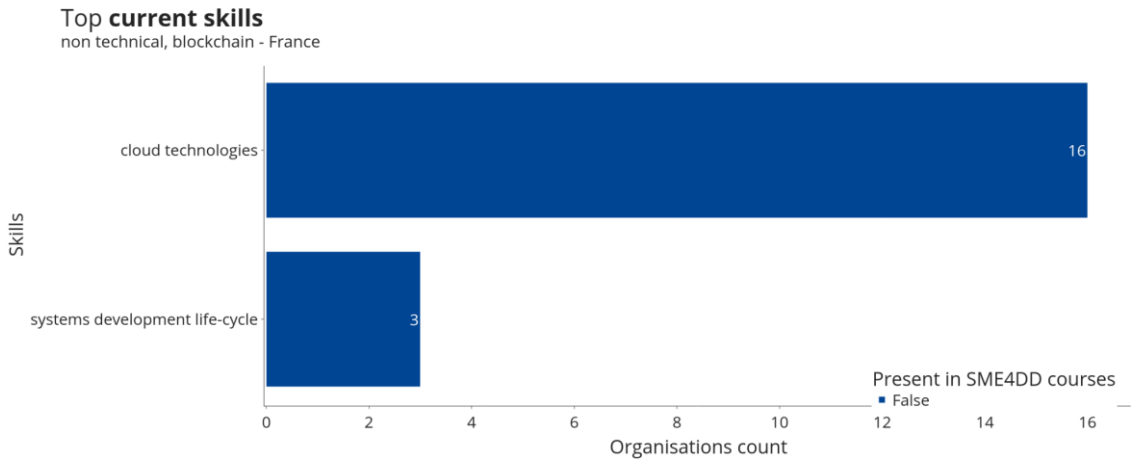

***Figure 29**: Key **Blockchain** skills identified for **Non-Technical** positions in **France**.*

5.2. Lacking Expertise

Moving on to the "Lacking Expertise" section, we shift our attention from current capabilities to areas where each country needs further development to meet the modern European standard.

In this analysis, we aim to identify the specific areas of deficiency in Artificial Intelligence, Blockchain, and Cybersecurity. We not only discuss the skills that need improvement but also highlight those covered by the SME4DD set of courses. Additionally, we offer a thorough overview of the existing European competence courses in our database, giving a comprehensive view of the knowledge landscape to inform each country's strategic efforts in upskilling.

5.2.1. Artificial Intelligence

5.2.1.1. Manager

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Manager** roles in **France**.

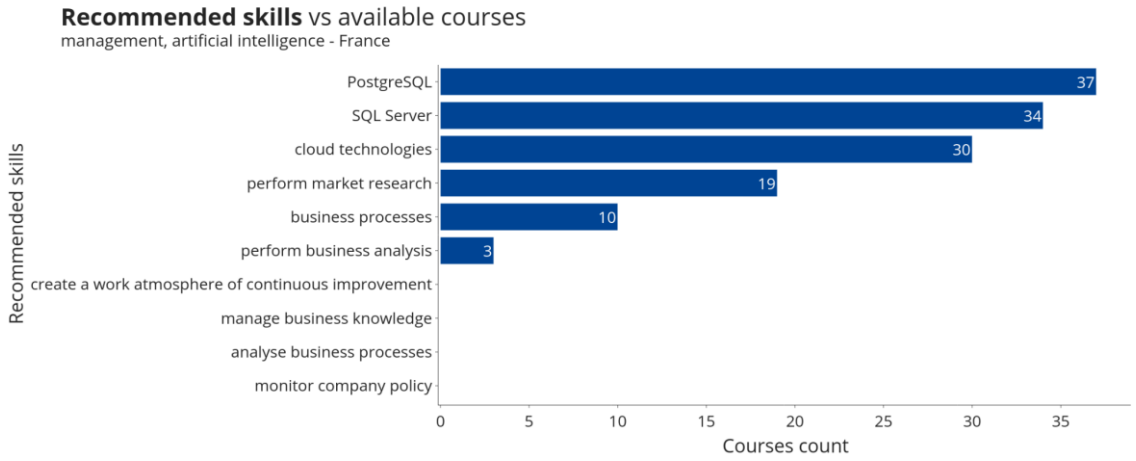

***Figure 30**: Number of courses teaching **AI** recommended skills for **Manager** positions in **France**.*

Delving deeper into the analysis of these courses, the subsequent set of visual representations showcases them according to various parameters: geographical location, language of instruction, teaching methodology, duration, and cost.

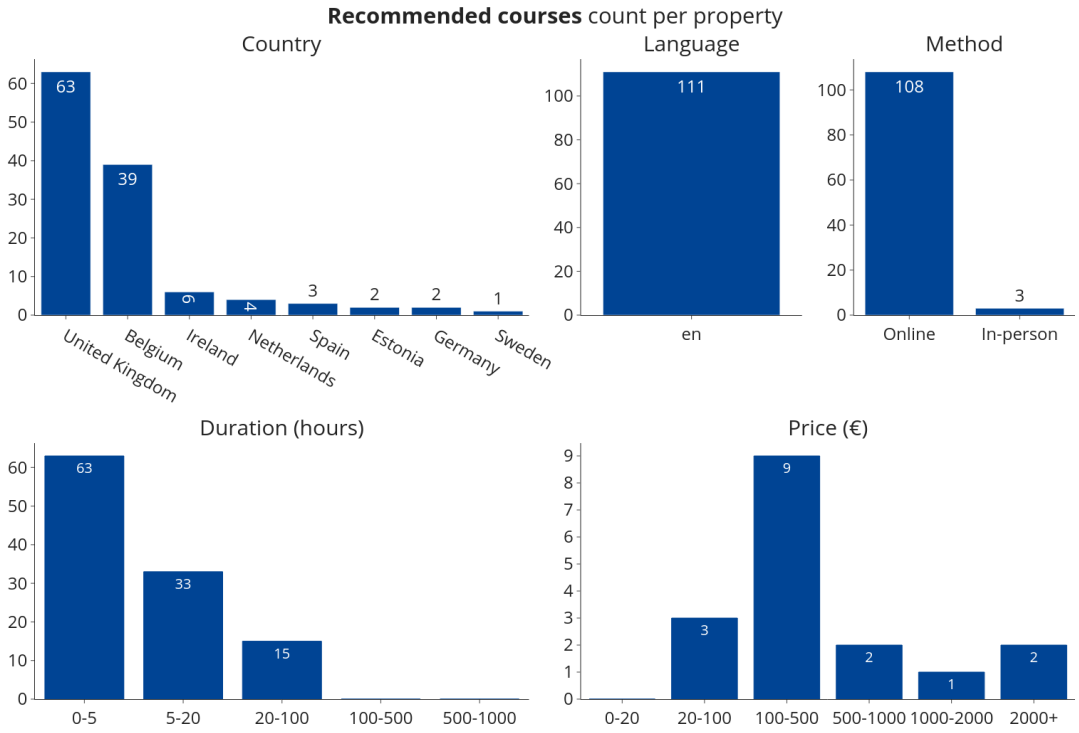

***Figure 31**: Features of courses teaching **AI** recommended skills for **Manager** positions in **France**.*

The table below presents a curated list of courses that impart the recommended **Artificial Intelligence** related skills for **Manager** roles in **France**. For each course, you'll find its name, a concise description, a direct link to the course's official webpage, and the skills identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- business processes
url	Improve Your Business	This Improve Your Business course from Warnborough College is a quick guide to improving your business – learn the techniques and cover all your bases to make your business soar to greater heights. Recognising Problems – Where Things Go Wrong?...	- business processes
url	Econometrics of Networks	Econometrics of Networks at Vrije Universiteit Amsterdam will combine online lectures with hands-on empirical and programming exercises. Become acquainted with different statistical methodologies for analysing networks while learning how to see these different methodologies complementing each other.Learn to model network problem situations mathematically, and adapt the methods learned to new situations at hand.Be able to recognise, understand, and analyse societal and business problems in which networks are central…	- business processes
url	Business Operations	To ensure success in business, you need to begin with a strong foundation of skills and knowledge in various aspects of business operation and planning. This Business Operations course from Warnborough College covers vital topics such as finance, record keeping, financial management, business planning, mistakes to avoid, and more. Finance…	- perform business analysis
url	SQL for the Web	This course provides a comprehensive introduction to SQL. By the end of the SQL for the Web course from Warnborough College, the student should be able to easily understand all the major aspects of SQL. Fundamentals of SQL…	- SQL Server

***Table 8**: Courses teaching **AI** recommended skills for **Manager** positions in **France**.*

5.2.1.2. Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Technical** roles in **France**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

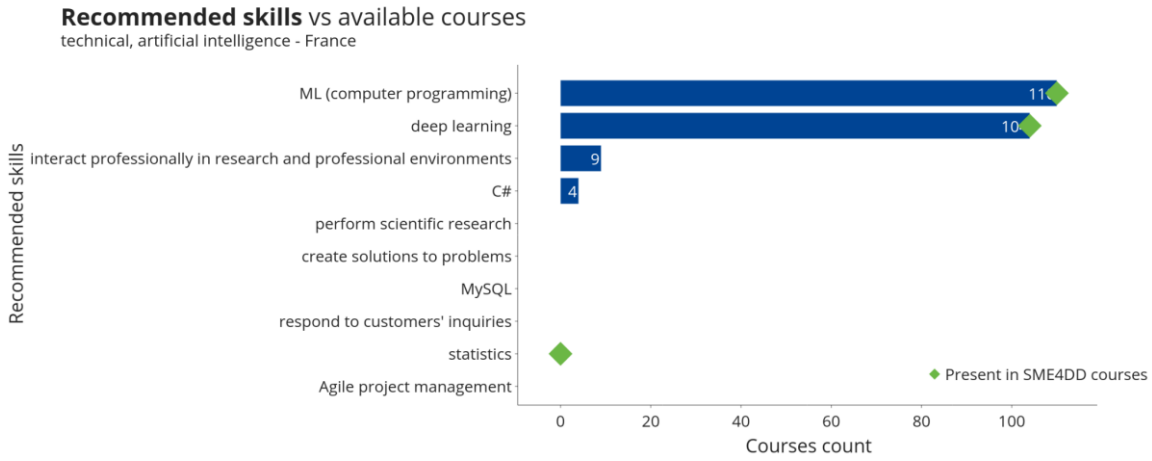

***Figure 32**: Number of courses teaching **AI** recommended skills for **Technical** positions in **France**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

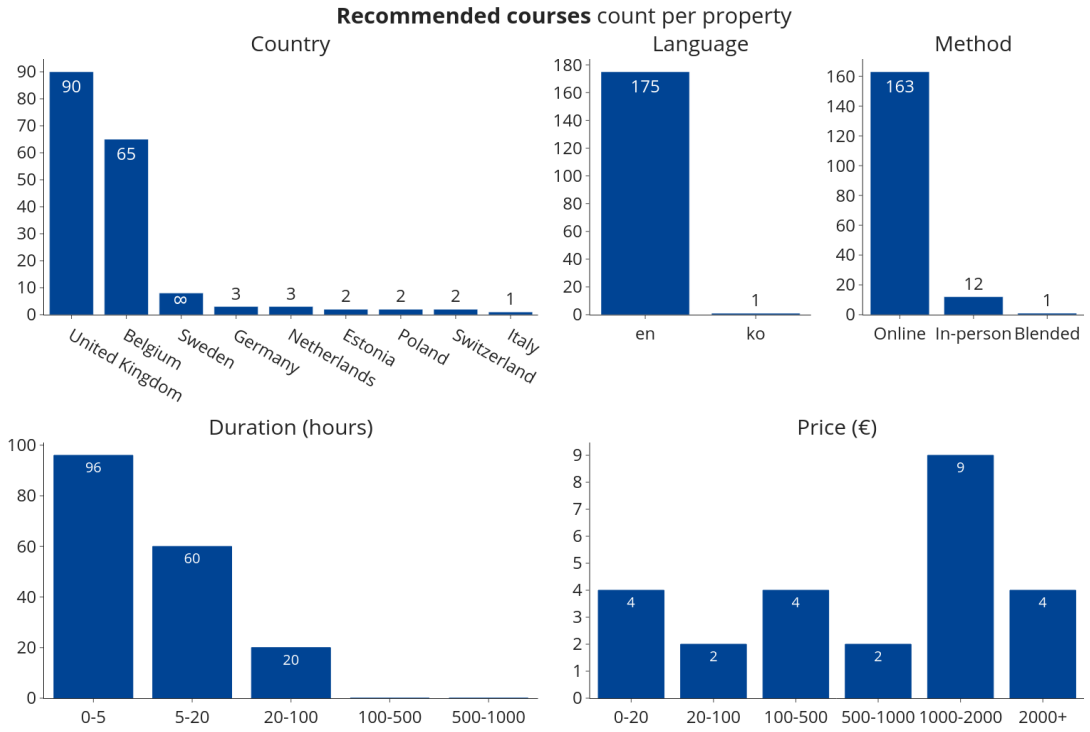

***Figure 33**: Features of courses teaching **AI** recommended skills for **Technical** positions in **France**.*

The table that follows offers a carefully selected compilation of courses tailored to equip individuals with the essential **Artificial Intelligence** related skills for **Technical** positions in **France**. For every listed course, we provide the course name, a succinct overview, a direct hyperlink to its official website, and the specific skills as pinpointed by the Skill Sync AI engine, drawn from the course's metadata.

Link	Name	Description	Skills
url	Gamification Workshop	Gamification is a process that helps you create interesting, interactive and fun content from the mundane by adding game-inspired elements. The best part about gamification is that it can be applied to many aspects in life, the fields of business, marketing and education being just a few examples. The Gamification Workshop course is offered by Tallinn University…	- interact professionally in research and professional environments
url	Applied Machine Learning Systems - Advanced Principles and Practice	University College London (UCL) offers the Applied Machine Learning Systems - Advanced Principles and Practice programme. deep learning deep reinforcement learning generative adversarial networks future directions in machine learning engineering…	- ML (computer programming) - deep learning
url	Introduction to Programming	Students in the Introduction to Programming course from Vrije Universiteit Amsterdam will learn about an approach to research that engages artistic expression, scholarly investigation, curiosity, and experimentation…	- C#
url	Predictive Analytics using Machine Learning	Learn how to build predictive models using machine learning…	- deep learning - ML (computer programming)

***Table 9**: Courses teaching **AI** recommended skills for **Technical** positions in **France**.*

5.2.1.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Non-Technical** roles in **France**.

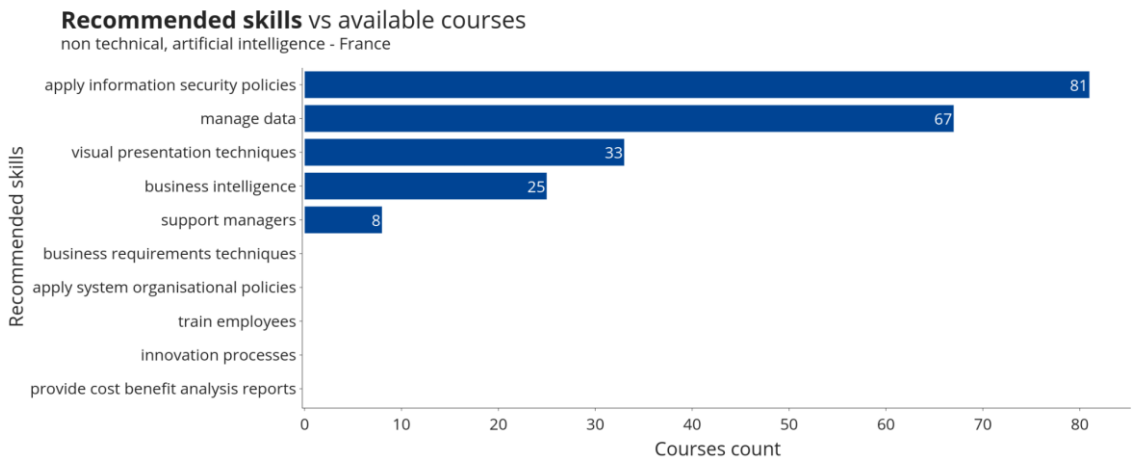

***Figure 34**: Number of courses teaching **AI** recommended skills for **Non-Technical** positions in **France**.*

Upon conducting a thorough analysis of these courses, the upcoming series of visual illustrations presents them based on multiple criteria. Specifically, these graphics categorise the courses in terms of their geographical location, the language employed for instruction, the approaches adopted, the length of the course, and the associated fees.

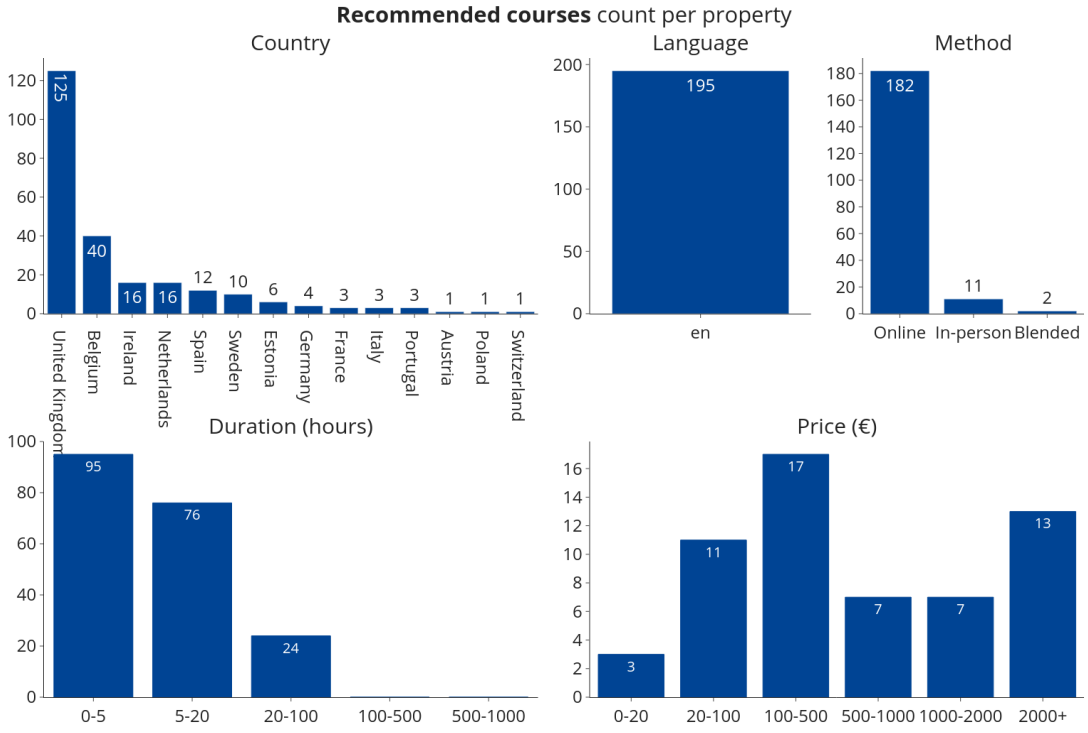

***Figure 35**: Features of courses teaching **AI** recommended skills for **Non-Technical** positions in **France**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Artificial Intelligence** related capabilities for **Non-Technical** roles within **France**. For each course highlighted, we furnish not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's comprehensive metadata.

Link	Name	Description	Skills
url	Testing IT-systems	Through the Testing IT-systems course offered by Luleå University of Technology, you will learn to plan, carry-out and evaluate testing of IT systems. You will gain an understanding of different test techniques and their strengths / weaknesses. The content of the course focuses on how a test activity should be planned, implemented and documented…	- support managers
url	Advanced Industrial Networking and Data Communications	This Advanced Industrial Networking and Data Communications programme at IDC Technologies is designed to help students to understand the principles behind the measurement of parameters for the proper monitoring and control of equipment. Introduction to Ethernet…	- manage data - apply information security policies
url	Designing Web Landing-Page for Entrepreneurship	In this Designing Web Landing-Page for Entrepreneurship course from Tallinn University, the students will learn how to design a web landing-page that can be used for entrepreneurship. At the beginning of the course, the students will select topics of their own interest and develop their idea into a working solution. At the beginning of the course, the students will select topics of their own interest and develop their idea into a working solution. The resulting landing-page can suit business, entrepreneurship, or research-related goals…	- visual presentation techniques
url	Data Analytics	By undertaking the Data Analytics programme from CareerFoundry, you will learn all of the skills, tools, and processes you need to become a data analyst. Data Analytics in Practice…	- manage data
url	Improve Your Business	This Improve Your Business course from Warnborough College is a quick guide to improving your business – learn the techniques and cover all your bases to make your business soar to greater heights. Recognising Problems – Where Things Go Wrong?...	- business intelligence

***Table 10**: Courses teaching **AI** recommended skills for **Non-Technical** positions in **France**.*

5.2.2. Cybersecurity

5.2.2.1. Manager

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Manager** roles in **France**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

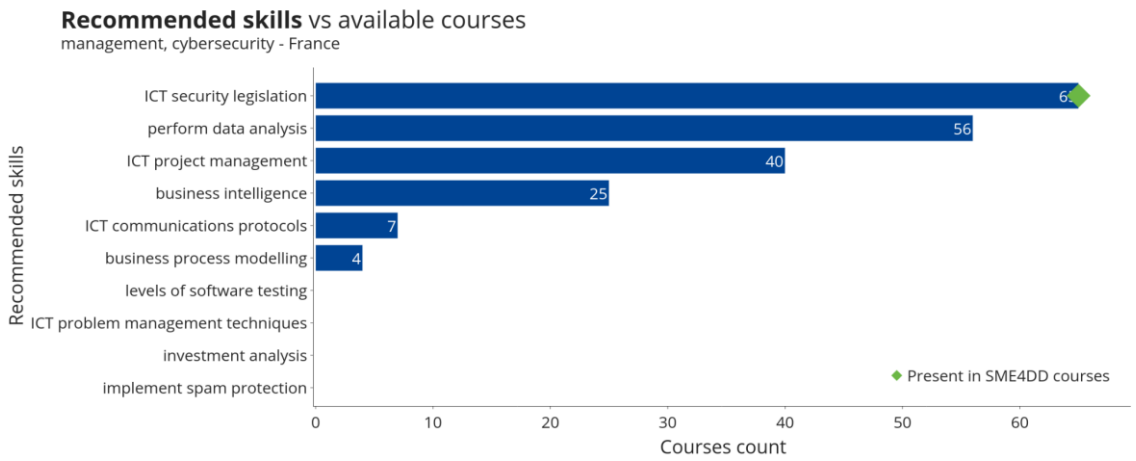

***Figure 36**: Number of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **France**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

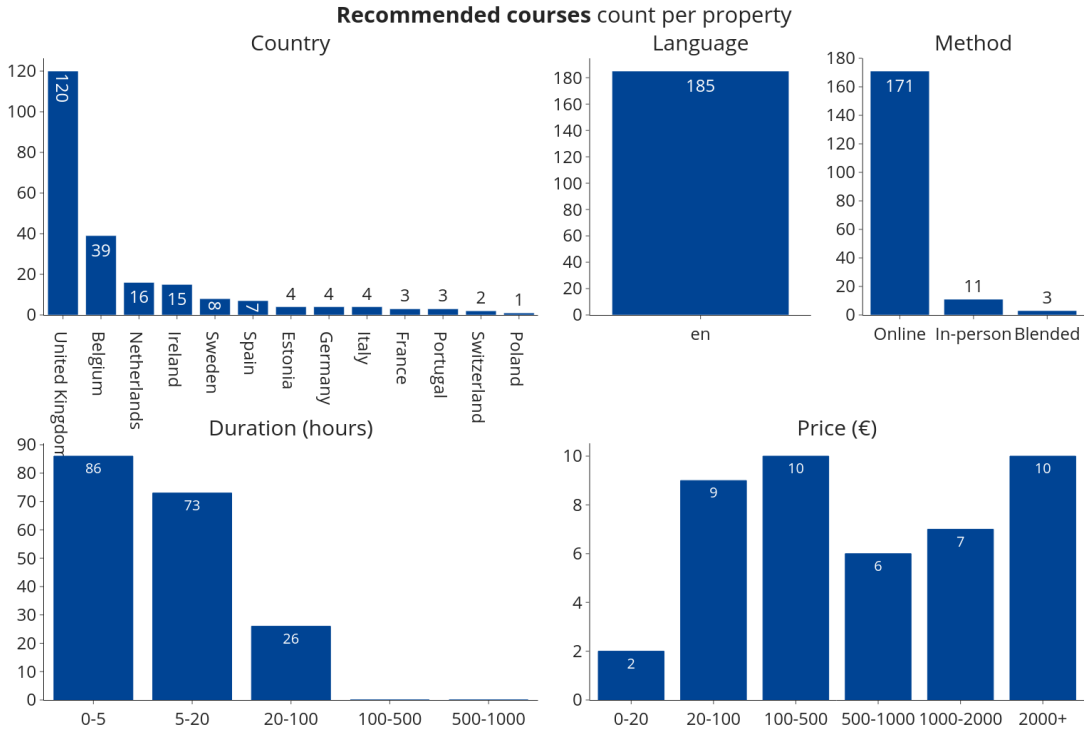

***Figure 37**: Features of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **France**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Manager** roles within **France**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	AI and Cybersecurity	In the AI and Cybersecurity course offered by Örebro University, you will learn the different uses of AI for defending and attacking an IT-system, from biometrics for authenticating legitimate users, to fuzzing attacks for crashing vulnerable targets. Core concepts of cybersecurity…	- ICT security legislation
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- business intelligence - perform data analysis
url	CSCU - Certified Secure Computer User	Want the necessary knowledge to tackle various computer and network security threats? Then the CSCU - Certified Secure Computer User course offered on The Learning People platform is for you! Security…	- perform data analysis - ICT security legislation
url	Business Operations	To ensure success in business, you need to begin with a strong foundation of skills and knowledge in various aspects of business operation and planning. This Business Operations course from Warnborough College covers vital topics such as finance, record keeping, financial management, business planning, mistakes to avoid, and more. Finance…	- business intelligence - business process modelling
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- ICT security legislation

***Table 11**: Courses teaching **Cybersecurity** recommended skills for **Manager** positions in **France**.*

5.2.2.2. Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Technical** roles in **France**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

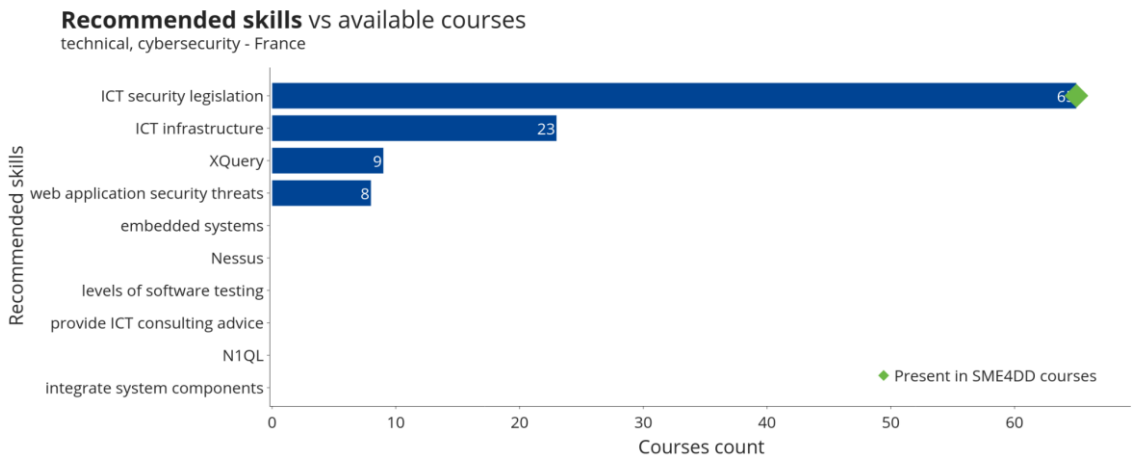

***Figure 38**: Number of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **France**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

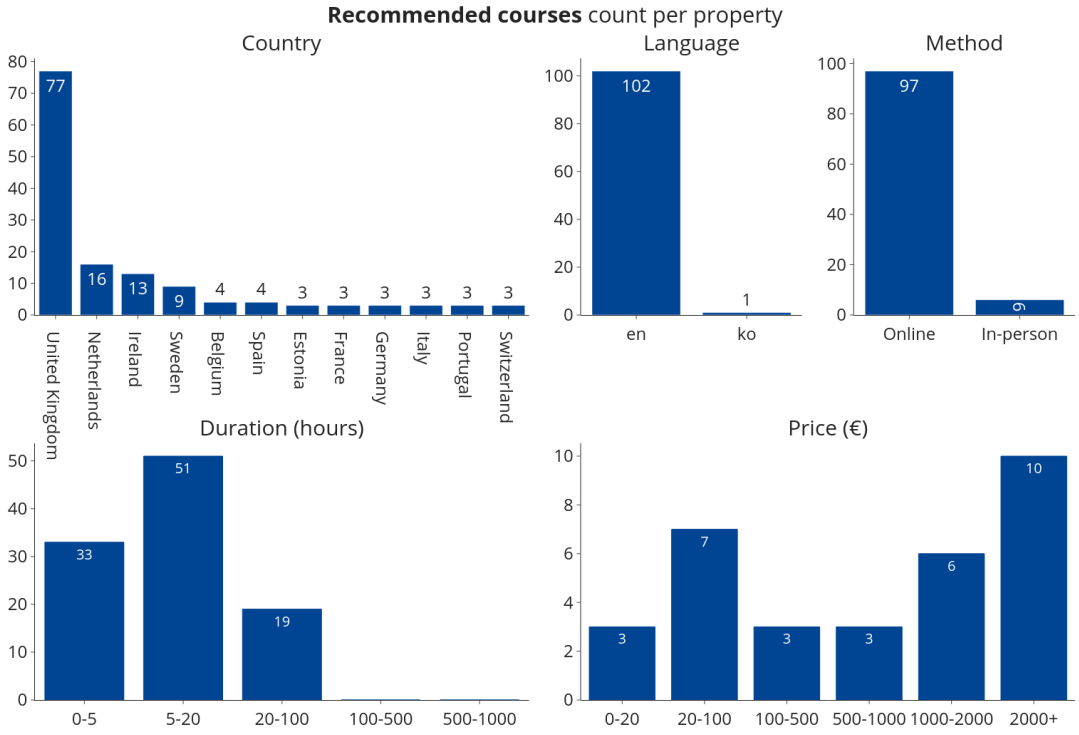

***Figure 39**: Features of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **France**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Cybersecurity** capabilities for **Technical** roles within **France**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Network Defence Management Overview	Explore the basic requirements of network defence management with Network Defence Management Overview at Coventry University by FutureLearn. An overview of network defence management…	- ICT infrastructure - ICT security legislation
url	Cyber Security Economics	Learn how to make better decisions about security and IT by using state-of-the-art economic tools, security metrics and data analytics…	- ICT security legislation
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and… operations. This course is certified by CPD UK. Module 0: Getting started…	- ICT security legislation
url	CSCU - Certified Secure Computer User	Want the necessary knowledge to tackle various computer and network security threats? Then the CSCU - Certified Secure Computer User course offered on The Learning People platform is for you! Security…	- ICT security legislation
url	Website Development	Web Site Development has become a huge industry; and there is high demand for developers who can bring results. Join the Web Site Development course from Warnborough College to become one. Writing a Web Site (HTML)...	- web application security threats

***Table 12**: Courses teaching **Cybersecurity** recommended skills for **Technical** positions in **France**.*

5.2.2.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity** skills for **Non-Technical** roles in **France**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

***Figure 40**: Number of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **France**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

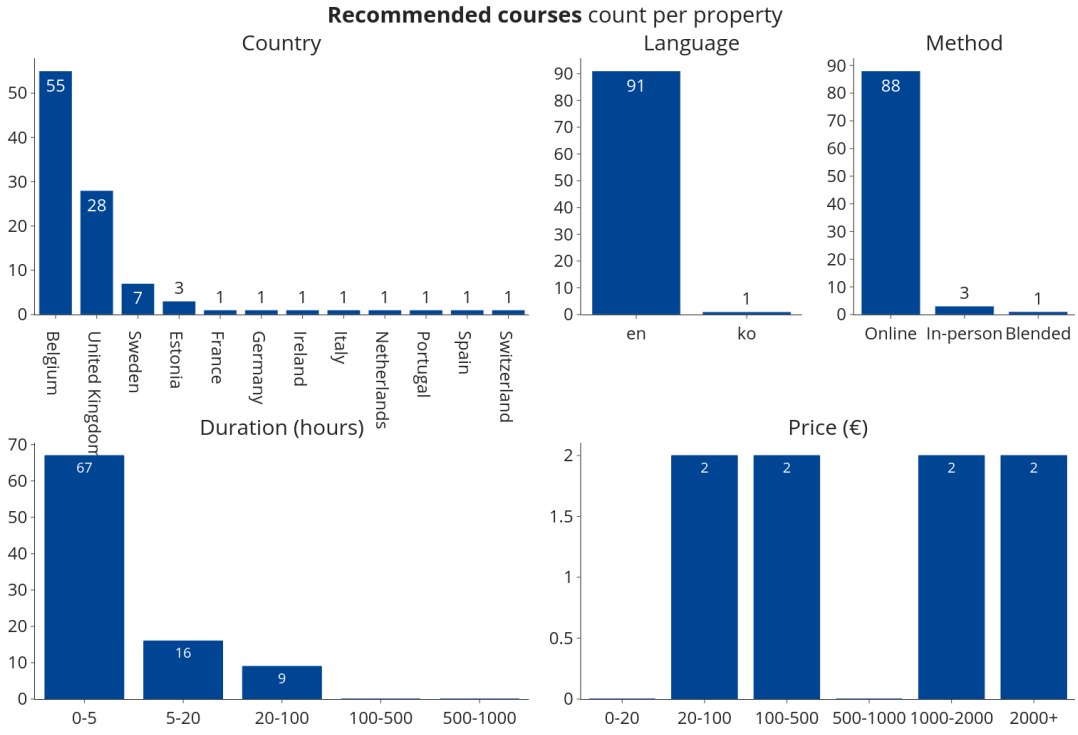

***Figure 41**: Features of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **France**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Non-Technical** roles within **France**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular

skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- legal requirements of ICT products
url	CSCU - Certified Secure Computer User	Want the necessary knowledge to tackle various computer and network security threats? Then the CSCU - Certified Secure Computer User course offered on The Learning People platform is for you! Security…	- legal requirements of ICT products
url	Cyber Security	This Cyber Security PGDip programme from University of Essex Online explores the key trends within this high-demand field, developing your technical and practical skills to deal with the range of cyber security issues that can arise within an organisation. Launching into Cyber Security…	- legal requirements of ICT products
url	Data Science for Climate Change	Learn how to use data science and big data to make crucial decisions that can help fight climate change…	- unstructured data
url	Data Mining	In the Data Mining course offered by Örebro University, we aim to cover the most applicable topics of understanding the data. exploratory data analysis (such as preprocessing, visualisation, and statistical techniques)...	- unstructured data

***Table 13**: Courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **France**.*

5.2.3. Blockchain

5.2.3.1. Manager

The chart below presents the number of courses that teach the recommended **Blockchain**-related skills for **Manager** roles in **France**.

***Figure 42**: Number of courses teaching **Blockchain** recommended skills for **Manager** positions in **France**.*

> ***Note**: Although there are **two skills recommended** by the system, there are no courses in the database specialised into teaching these skills.*

5.2.3.2. Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Technical** roles in **France**.

***Figure 43**: Number of courses teaching **Blockchain** recommended skills for **Technical** positions in **France**.*

> ***Note**: Although there are **two skills recommended** by the system, there are no courses in the database specialised into teaching these skills.*

5.2.3.3. Non-Technical

The chart below presents the number of courses that teach the recommended Blockchain skills for Non-Technical roles in France.

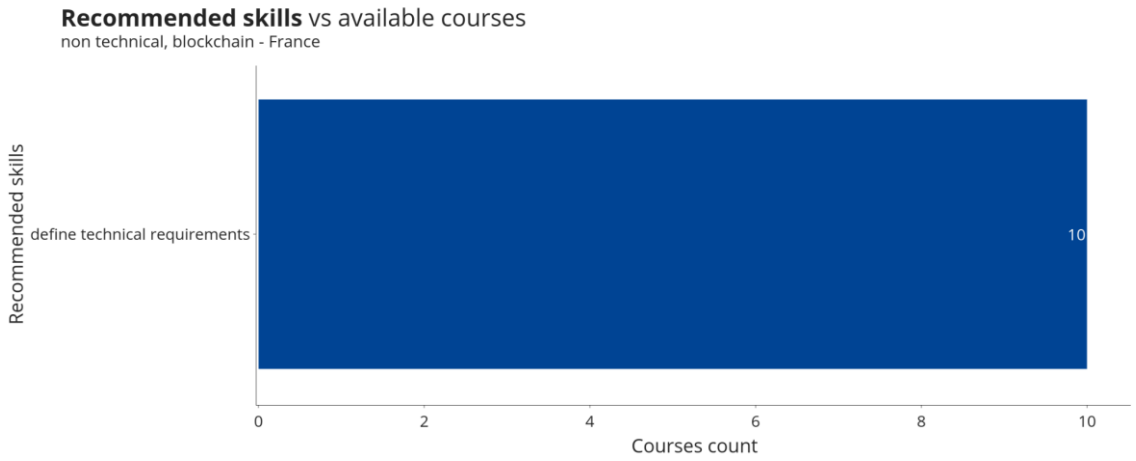

***Figure 44**: Number of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **France**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

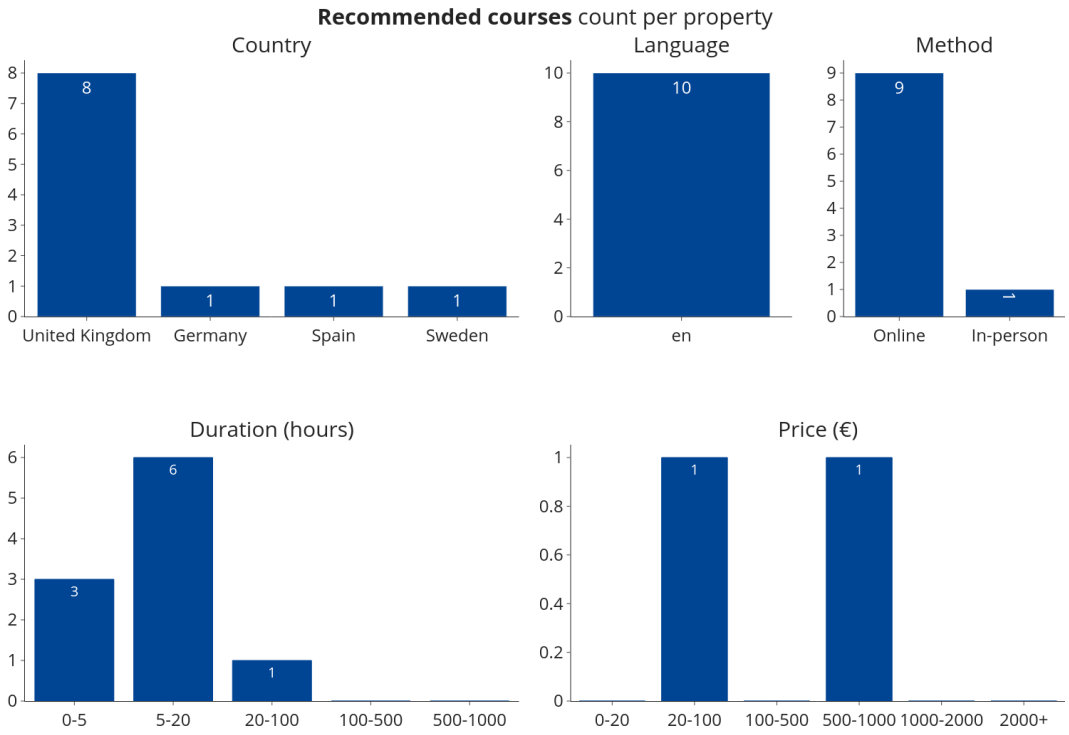

***Figure 45**: Features of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **France**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Non-Technical** roles within **France**. For each course, we show not only its name but also a concise description, a direct link to its

official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Modern Cloud-Project with Java	Each group in this Modern Cloud-Project with Java course at TU Berlin will develop an Web-Application that runs in the cloud. Requirements engineering Source code managementWorking in a teamJava-Framework Spring boot Running Containers with DockerManage DatabasesAutomatic testsFront-End development with HTML, JavaScript and CSSCould Environments	- define technical requirements
url	Data Mining for Industry	The Data Mining for Industry course offered by Luleå University of Technology will introduce you to data mining and how it might enable businesses to drive better business results by analysing their different data using predictive and prescriptive tools. machine learning techniques for classification, regression, and clustering	- define technical requirements

***Table 14**: Courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **France**.*

5.3. Conclusion

5.3.1. Missing skills per Categories on the targeted Verticals

The following is a summary of the key points found in the identification of lacking skills, given the sample of French SMEs selected for the analysis:

For managers, there's a gap in their technical skills, especially when it comes to handling databases, cloud services, and AI-related market data. The selected companies should focus on improving their business knowledge, including skills in Business Analysis, Process Optimization, and Strategic Knowledge Management. On the technical side, there's a need for more advanced AI techniques (like machine learning and deep learning) and stronger research abilities. Also, customer-focused and agile project management skills could be better. The sampled non-technical roles should work on better data management, visualization skills, and understanding Business Intelligence.

In the field of cybersecurity in French SMEs, a similar pattern emerges. All roles could benefit from a better understanding of cybersecurity laws and software testing. Managers should improve their data analysis and business intelligence skills to adapt to changing security landscapes. Technical roles should focus on mastering technical infrastructure and areas like embedded systems and web app security. Non-technical roles should work on handling unstructured data and improving information organisation, which is important in both AI and cybersecurity.

In the blockchain industry, everyone should prioritise proficiency in software libraries. Managers and technical professionals should focus on providing clear technical

documentation, while those in non-technical roles should emphasize user documentation and precise technical requirements.

5.3.2. Skills covered by the SME4DD courses with respect to the target audience

We can see marked with a green diamond in the previous plots the skills covered by the SME4DD courses, and in the Annexes at the end of the document the actual list of skills per course is provided.

When analysing SME4DD courses, we found that they include a specific managerial skill that is also offered by other European courses in our database. This skill is related to understanding ICT security legislation is, which relevant in the field of cybersecurity. Importantly, this skill is beneficial not only for technical roles but also for improving proficiency in cybersecurity as a whole.

These courses provide participants with a strong understanding of technical aspects, particularly in the area of Artificial Intelligence. They cover important topics such as Machine Learning (ML), deep learning, and statistics. However, it's worth noting that these courses do not adequately address the skills needed to fully grasp Blockchain technology. This is consistent with the gap observed in our available sample of European courses on the same subject.

5.3.3. Skills needed on the market but not covered by the SME4DD courses

In the preceding bar plots illustrating deficient skills, the absence of a green mark signifies skills not addressed by the SME4DD courses. When we analyse the SME4DD courses and the skills gap in the market, we can find significant gaps in various sectors and role categories. In the field of Artificial Intelligence, both managerial and technical roles lack proficiency in several areas, including database management (PostgreSQL, SQL server), cloud technologies, market research, business analysis, and continuous improvement. Similarly, in the realm of Cybersecurity, roles face gaps in skills such as data analysis, ICT project management, software testing, and understanding ICT communications protocols. In the Blockchain sector, there are shortages in technical competencies like smart contract development and software component libraries across all role categories.

5.3.4. European courses covering the missing skills identified

There are a good number of European courses available in our database for both Artificial Intelligence and Cybersecurity recommendations. Most of these courses are online and taught in English, making them accessible to French SMEs. However, the number of courses decreases as their duration gets longer, with the majority being short, between 0-5 hours, and none exceeding 100 hours.

Unfortunately, we couldn't find any courses that offer recommended skills for the Blockchain sector, whether for managers or technicians. For non-technical roles, there are fewer courses

available in this analysis, but they also tend to be in English, online, and have a duration of less than 100 hours.

6. Italy

In the following section, we conduct a thorough examination of data collected from various companies across Europe, with a specific focus on those based in Italy. This analysis helps us understand the composition of our dataset and provides context for our skills analysis.

Our main goal is to provide a clear overview of Italian companies in our dataset and compare them to their European counterparts. This helps us gain a better understanding of the sample we are studying and uncover any potential biases or nuances that could impact our assessment of skills and competencies.

This initial exploration covers aspects like sample size, employee distribution, and the industries Italian companies are involved in. It also looks at where these companies are located in Italy. This sets the stage for our in-depth analysis of the prevalent technological skill sets within these organisations.

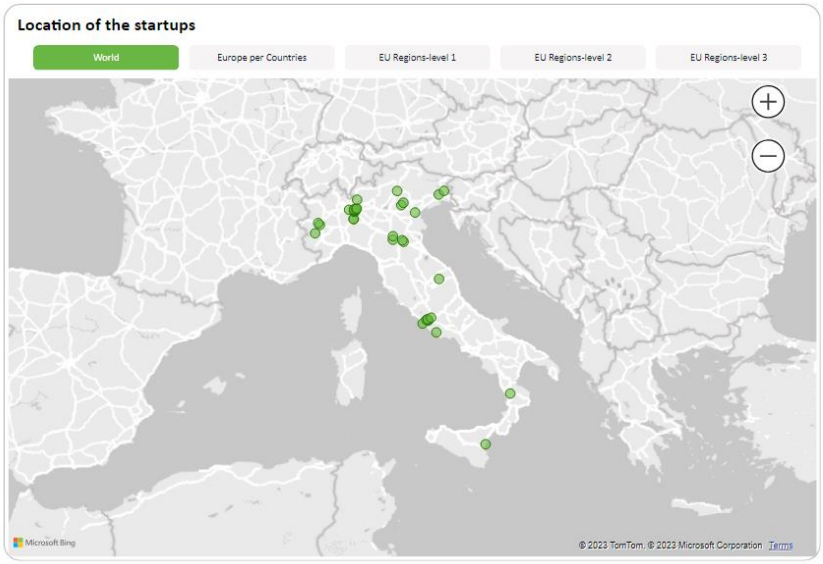

***Figure 46**: Screen capture from the geographical view of the Skill Sync displaying the organisations located in **Italy**.*

The chart below displays the distribution of company sizes in our database. The green bars represent Italian organisations, which we will analyse later, while the blue bars represent companies from the rest of Europe. Most of the companies in our database are categorised as small to medium-sized.

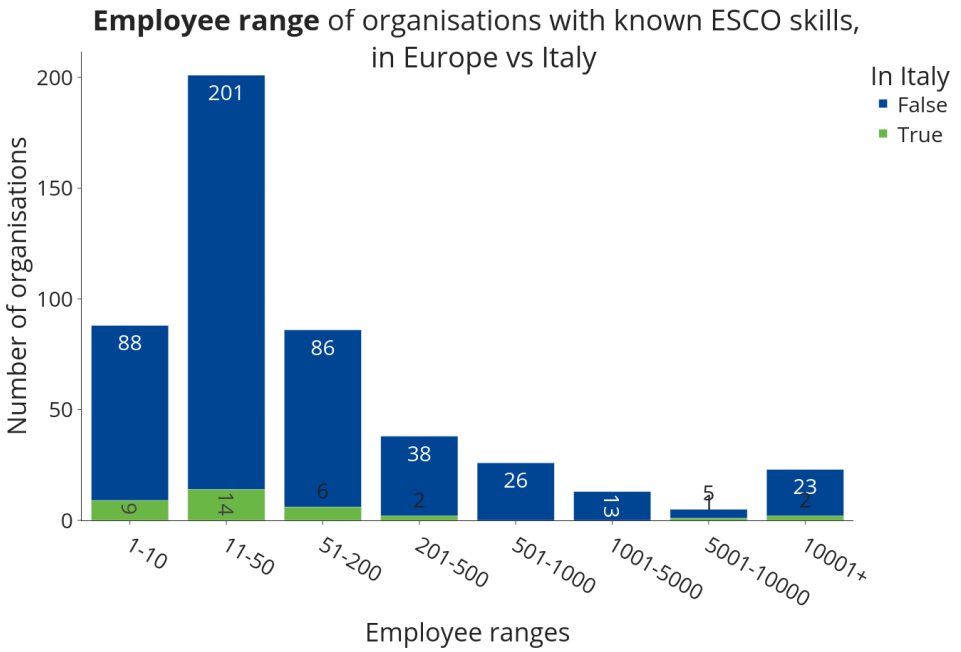

***Figure 47**: Comparison of Employee Counts. **Italian** Organisations vs. European Counterparts.*

The chart below provides insights into the sectors of expertise among the sampled organisations. It's evident that our data collection has concentrated on specific key sectors, including technology, healthcare, biotech, and finance, as well as electronics and vehicle manufacturing.

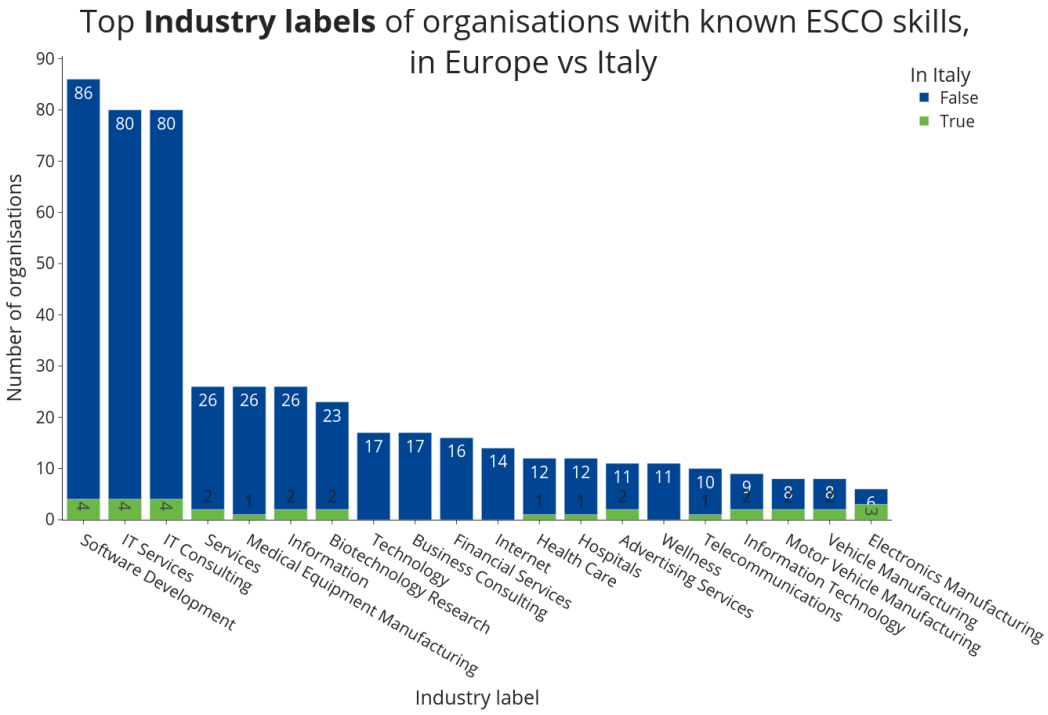

***Figure 48**: Comparison of Industry. **Italian** Organisations vs. European Counterparts.*

6.1. Current Expertise

In the upcoming "Current Skills" section, we will closely examine the skills currently prevalent in key technology sectors: Artificial Intelligence, Blockchain, and Cybersecurity. Each subsequent subchapter will provide a detailed look at the most prominent skills observed in Italian companies, categorised into three roles: Managers, Technical Specialists, and Non-Technical Personnel.

This analytical journey aims to provide a focused exploration of Italy's technological expertise, based on the companies we've sampled, in these crucial areas. Through this detailed analysis, we aim to reveal the specific skills landscape of the country and highlight the roles that play a significant role in driving its technological capabilities.

6.1.1. Artificial Intelligence

6.1.1.1. Manager

The following chart displays the key **Artificial Intelligence** related skills identified for **Manager** positions in **Italy**. The skills present in SME4DD courses are highlighted in **green**:

***Figure 49**: Key **Artificial Intelligence** skills identified for **Manager** positions in **Italy**.*

6.1.1.2. Technical

The following chart displays the key **Artificial Intelligence** related skills identified for **Technical** positions in **Italy**. The skills present in SME4DD courses are highlighted in **green**:

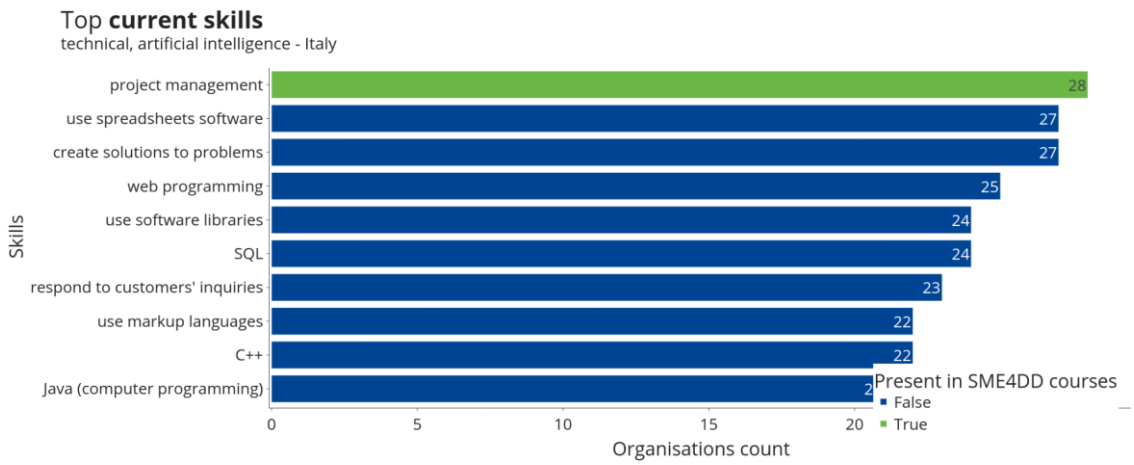

***Figure 50**: Key **Artificial Intelligence** skills identified for **Technical** positions in **Italy**.*

6.1.1.3. Non-Technical

The following chart displays the key **Artificial Intelligence** skills identified for **Non-Technical** positions in **Italy**:

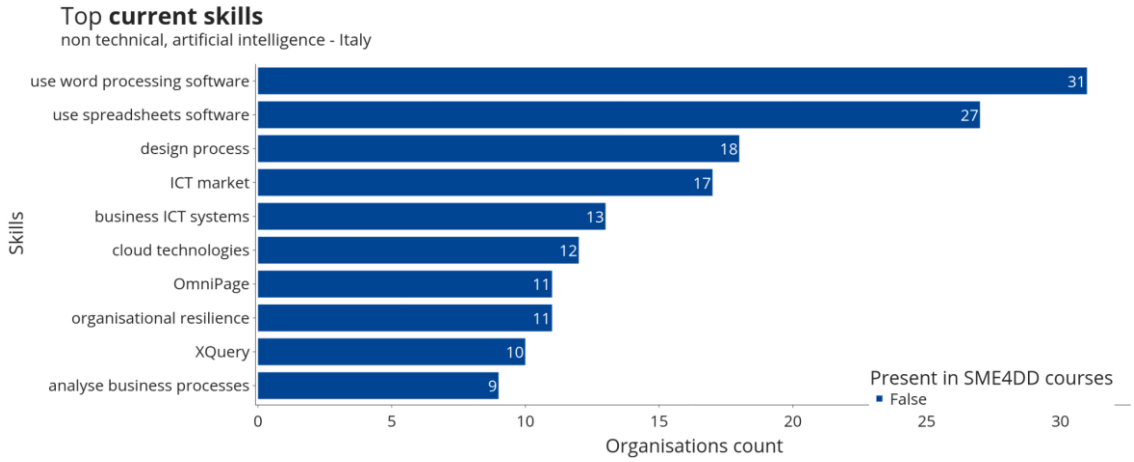

***Figure 51**: Key **Artificial Intelligence** skills identified for **Non-Technical** positions in **Italy**.*

6.1.2. Cybersecurity

6.1.2.1. Manager

The chart below showcases the essential **Cybersecurity** skills for **Manager** roles in **Italy**. Skills covered in the SME4DD courses are highlighted in **green**:

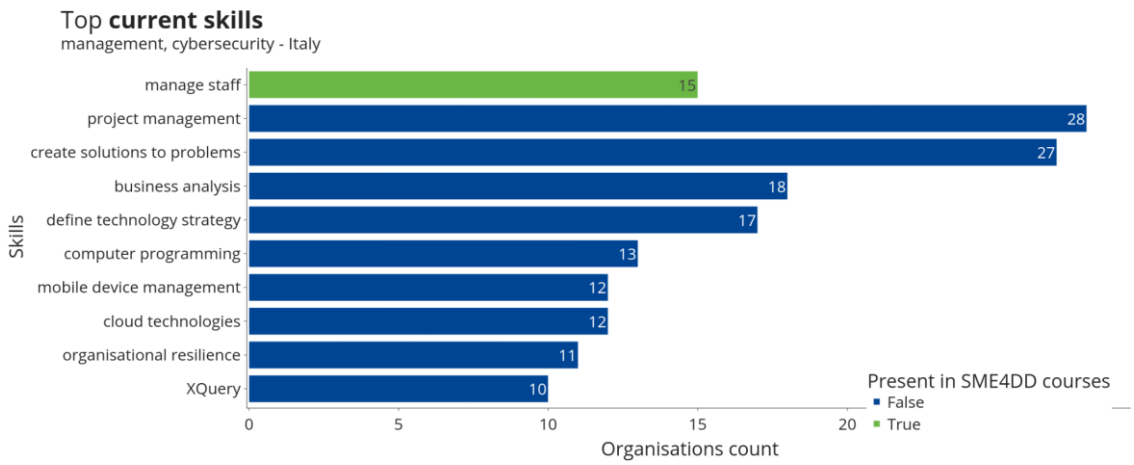

***Figure 52**: Key **Cybersecurity** skills identified for **Manager** positions in **Italy**.*

6.1.2.2. Technical

The chart below showcases the essential **Cybersecurity** skills for **Technical** roles in **Italy**. Skills covered in the SME4DD courses are highlighted in **green**:

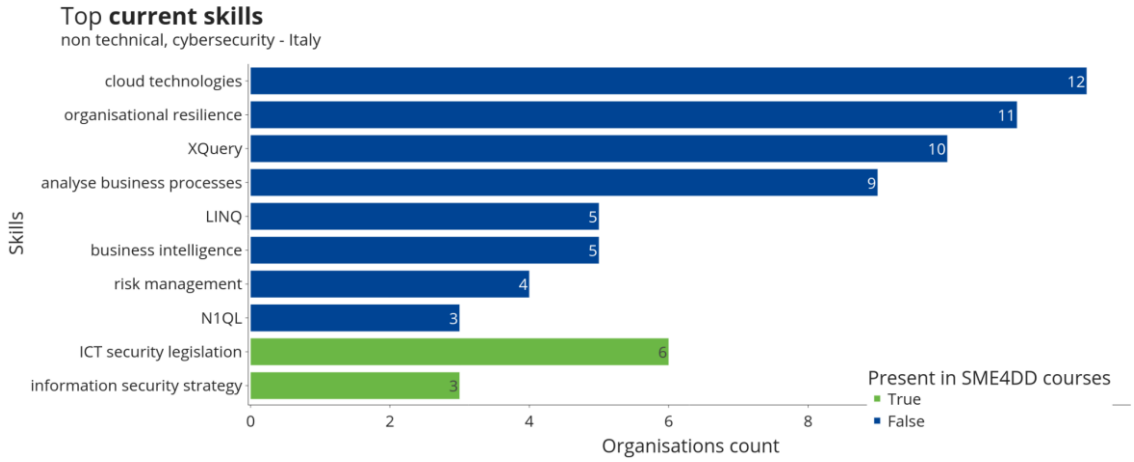

***Figure 53**: Key **Cybersecurity** skills identified for **Technical** positions in **Italy**.*

6.1.2.3. Non-Technical

The chart below showcases the essential **Cybersecurity** skills for **Non-Technical** roles in **Italy**. Skills covered in the SME4DD courses are highlighted in **green**:

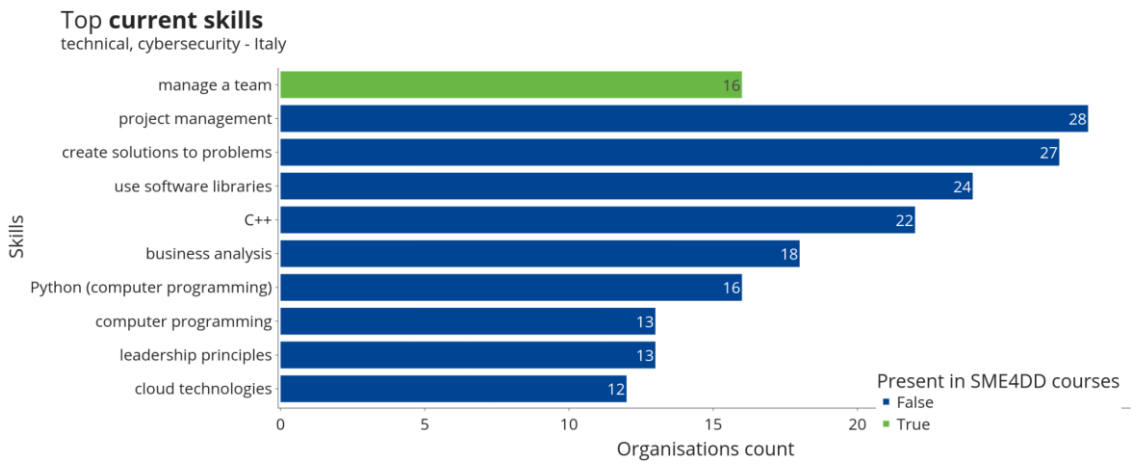

***Figure 54**: Key **Cybersecurity** skills identified for **Non-Technical** positions in **Italy**.*

6.1.3. Blockchain

6.1.3.1. Manager

The following chart displays the key **Blockchain** related skills identified for **Manager** positions in **Italy**:

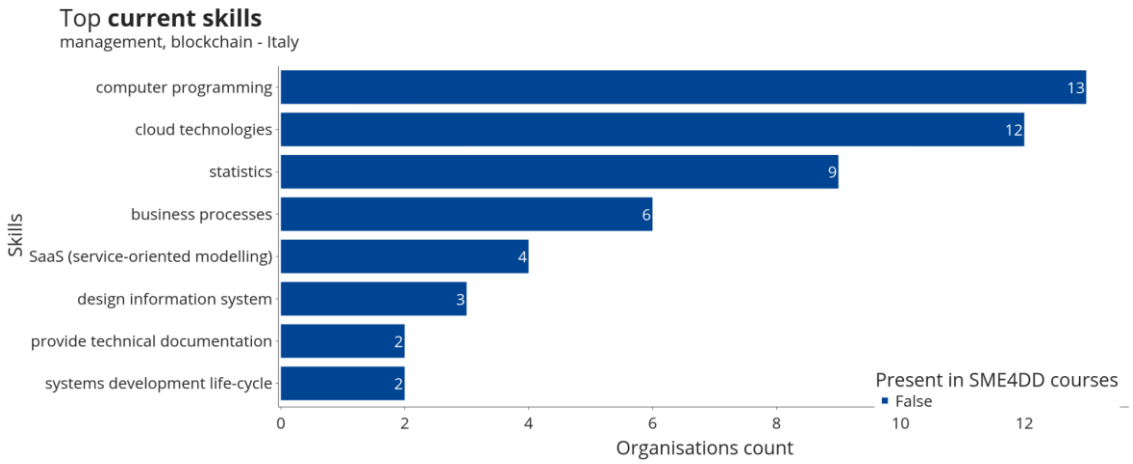

***Figure 55**: Key **Blockchain** skills identified for **Manager** positions in **Italy**.*

6.1.3.2. Technical

The chart below showcases the essential **Blockchain** skills for **Technical** roles in **Italy**:

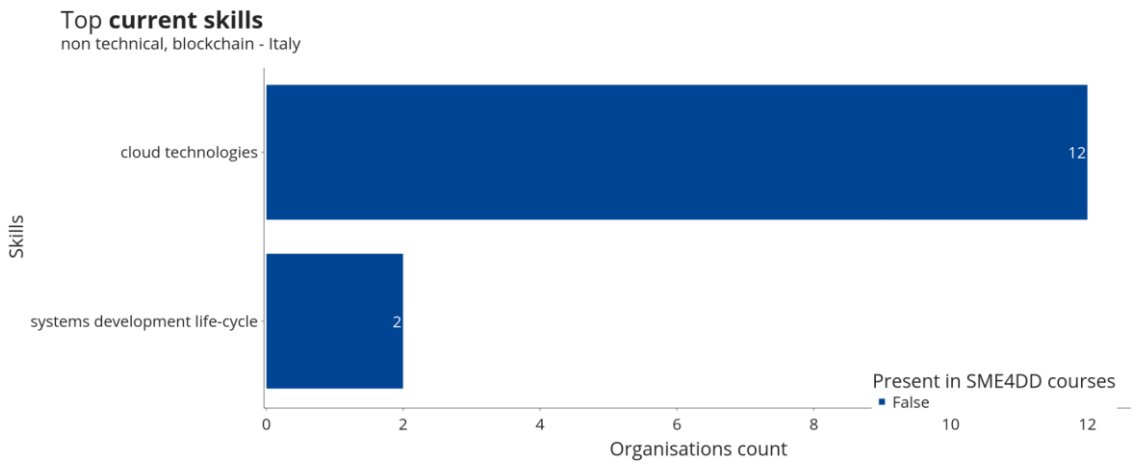

***Figure 56**: Key **Blockchain** skills identified for **Technical** positions in **Italy**.*

6.1.3.3. Non-Technical

The chart below showcases the essential **Blockchain** skills for **Non-Technical** roles in **Italy**:

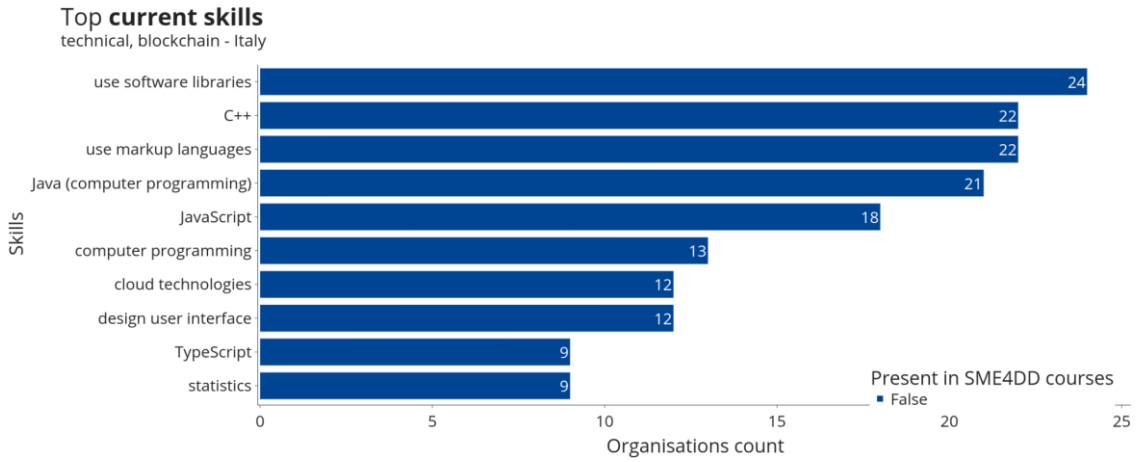

***Figure 57**: Key **Blockchain** skills identified for **Non-Technical** positions in **Italy**.*

6.2. Lacking Expertise

In the "Lacking Expertise" section, we shift our focus from current skills to areas where further development is needed to align each country's knowledge with the prevailing European standard.

This investigation zooms in on particular areas within Artificial Intelligence, Blockchain, and Cybersecurity that require attention. We not only identify skills gaps and recommend needed proficiencies but also highlight the skills offered by SME4DD courses matching the recommendation. Additionally, we provide a thorough analysis of the existing European competence courses in our database, offering valuable insights to assist in informed strategies for skill enhancement.

6.2.1. Artificial Intelligence

6.2.1.1. Manager

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Manager** roles in **Italy**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync Artificial Intelligence engine as covered in the SME4DD course offerings.

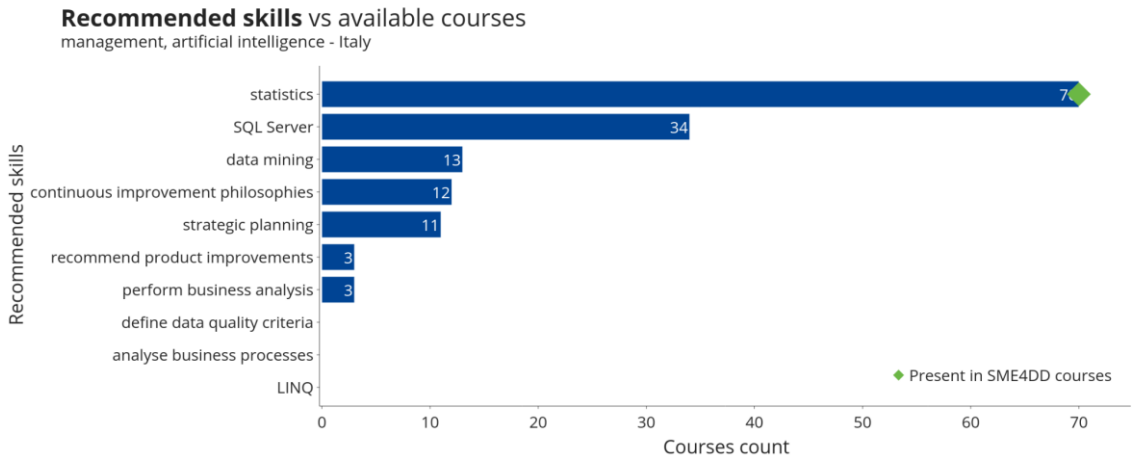

***Figure 58**: Number of courses teaching **AI** recommended skills for **Manager** positions in **Italy**.*

Delving deeper into the analysis of these courses, the subsequent set of visual representations showcases them according to various parameters: geographical location, language of instruction, teaching methodology, duration, and cost.

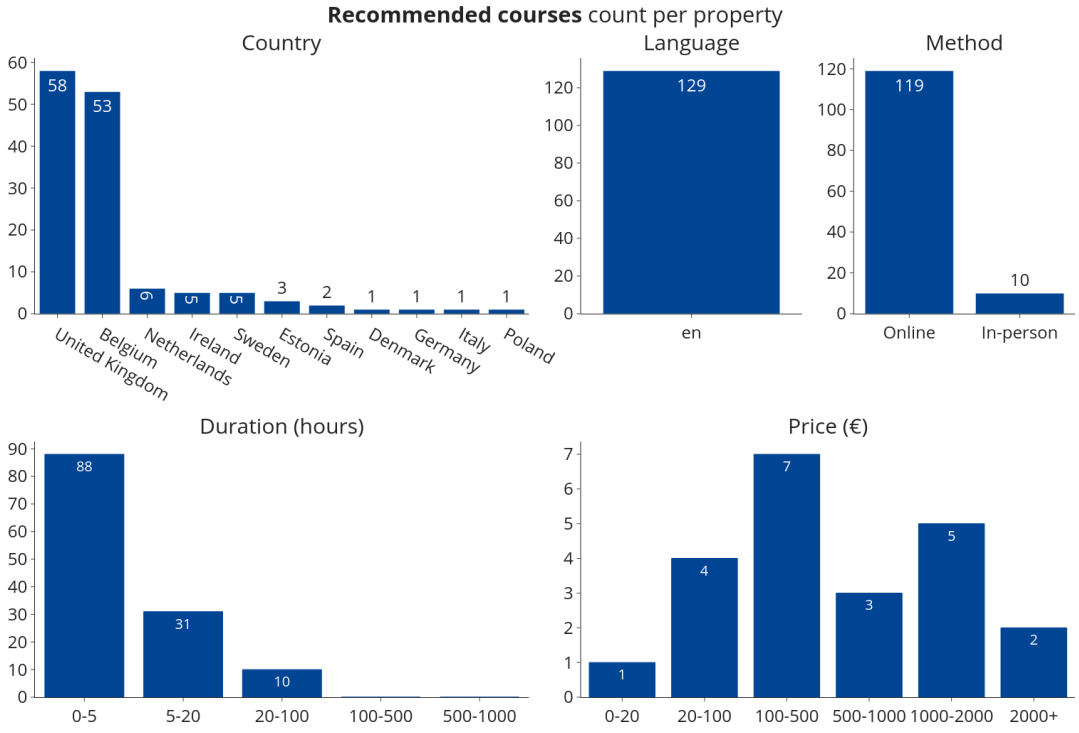

***Figure 59**: Features of courses teaching **AI** recommended skills for **Manager** positions in **Italy**.*

The table below presents a curated list of courses that impart the recommended **Artificial Intelligence** related skills for **Manager** roles in **Italy**. For each course, you'll find its name, a concise description, a direct link to the course's official webpage, and the skills identified by the Skill Sync Artificial Intelligence engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- statistics - data mining - strategic planning
url	Machine Learning and Applied Statistics	The Machine Learning and Applied Statistics course from Imperial College London will introduce you to a range of quantitative methods from mathematics, statistics and computing and will enable you to use these methods in applications in various fields including finance and bioimaging…	- statistics
url	CBAP - Certified Business Analysis Professional	The CBAP - Certified Business Analysis Professional course of The Learning People platform is for business analyst professionals with extensive experience to document their high level of knowledge within the industry. Essential skills for your career…	- perform business analysis - strategic planning
url	Declarative Problem Solving with Answer Set Programming	Answer Set Programming (ASP) is a declarative programming paradigm designed within the field of Artificial Intelligence (AI), and used to solve complex search-problems. The Declarative Problem Solving with Answer Set Programming course offered by Örebro University focuses on formalising and solving various search problems in planning, scheduling and system configuration in ASP. Review of First Order Logic…	- continuous improvement philosophies
url	Leading Successful Teams	Effective teamwork is crucial for organisational success, according to recent surveys by LinkedIn and Salesforce. Nearly 75% of employers across various industries agree. University of Glasgow offers the Leading Successful Teams programme. Getting to Know Your Team Managing Team Performance: Motivation, Engagement & Setting Clear Goats) Managing Team Performance…	- strategic planning

***Table 15**: Courses teaching **AI** recommended skills for **Manager** positions in **Italy**.*

6.2.1.2. Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Technical** roles in **Italy**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

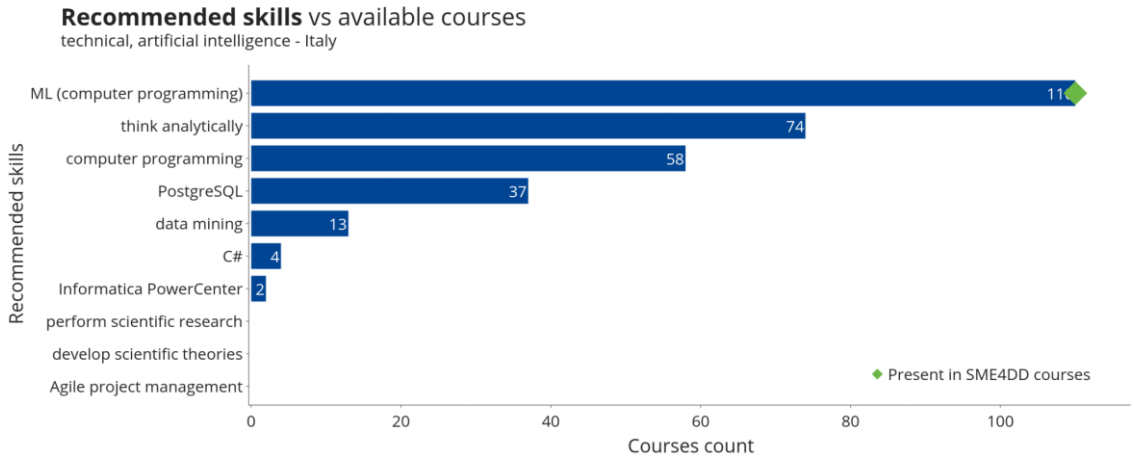

***Figure 60**: Features of courses teaching **AI** recommended skills for **Technical** positions in **Italy**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

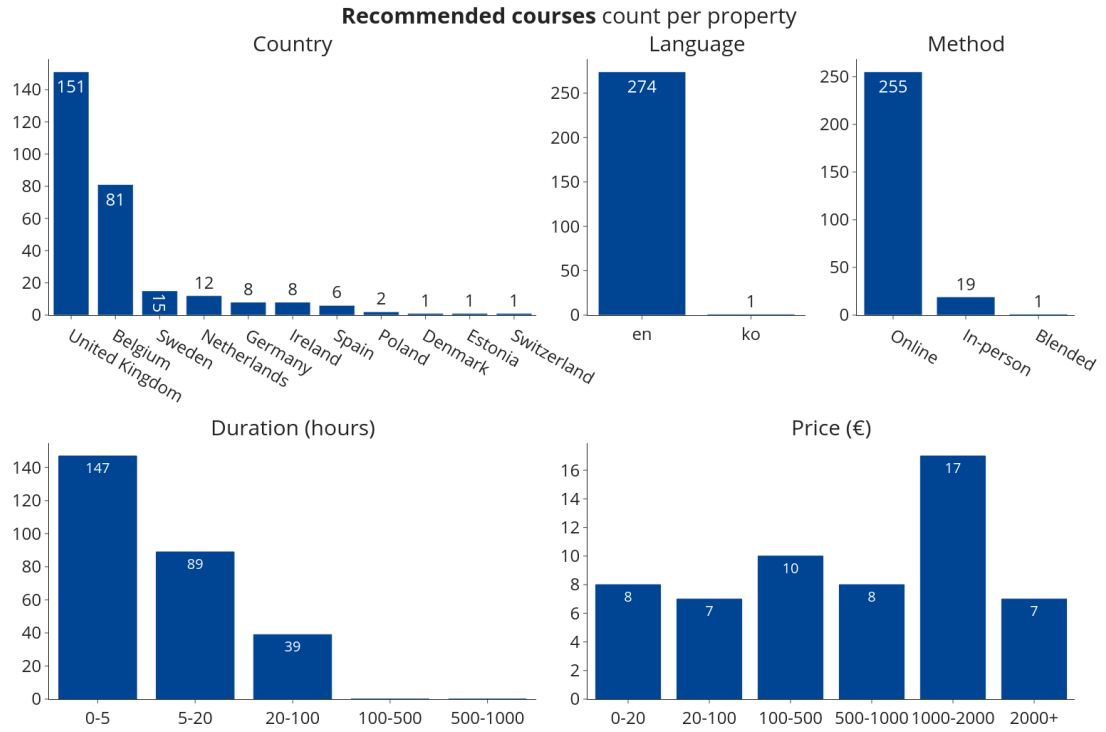

***Figure 61**: Features of courses teaching **AI** recommended skills for **Technical** positions in **Italy**.*

The table that follows offers a carefully selected compilation of courses tailored to equip individuals with the essential **Artificial Intelligence** related skills for **Technical** positions in **Italy**. For every listed course, we provide the course name, a succinct overview, a direct hyperlink to its official website, and the specific skills as pinpointed by the Skill Sync AI engine, drawn from the course's metadata.

Link	Name	Description	Skills
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- ML (computer programming) - data mining - think analytically
url	Data Mining	In the Data Mining course offered by Örebro University, we aim to cover the most applicable topics of understanding the data. exploratory data analysis (such as preprocessing, visualisation, and statistical techniques)...	- think analytically - data mining
url	Introduction to Programming	Students in the Introduction to Programming course from Vrije Universiteit Amsterdam will learn about an approach to research that engages artistic expression, scholarly investigation, curiosity, and experimentation. Background information on programming languagesAlgorithmsData typesOperators and built-in functionsVariablesKeyboard Input and OutputIf-statements and logicWhile- and for-loopsUser-defined function and variable scopeFile Input and Output…	- C# - computer programming - think analytically
url	Computer Programming for Everyone	Discover the art of computer programming and learn what code can do with the Institute of Coding and the University of Leeds…	- computer programming
url	Business Intelligence from Web Data Analytics and Data Mining	The aim of this Business Intelligence from Web Data Analytics and Data Mining course from Aarhus University is to introduce the business student to the rapidly evolving area of business intelligence. Write programs to run the R programming language…	- think analytically - data mining

***Table 16**: Courses teaching **AI** recommended skills for **Technical** positions in **Italy**.*

6.2.1.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Non-Technical** roles in **Italy**.

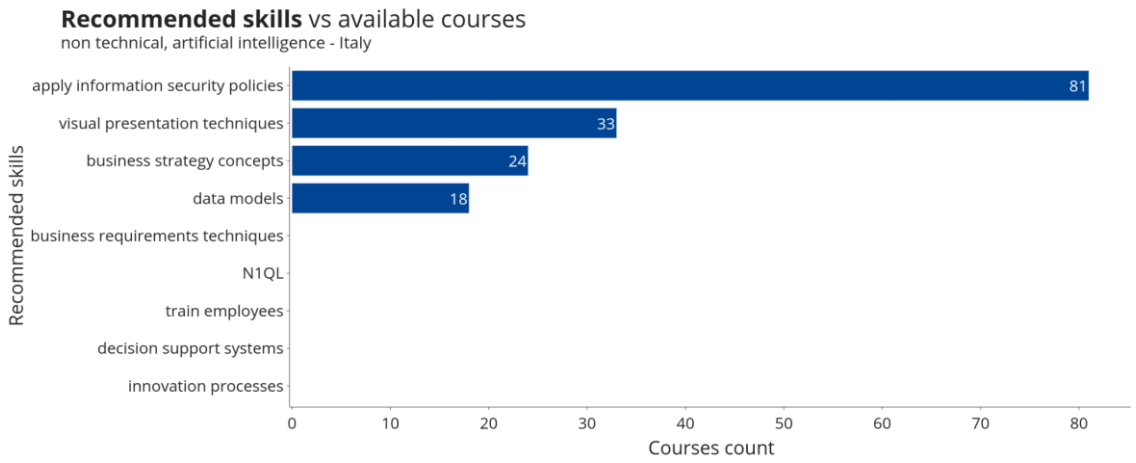

***Figure 62**: Number of courses teaching **AI** recommended skills for **Non-Technical** positions in **Italy**.*

Upon conducting a thorough analysis of these courses, the upcoming series of visual illustrations presents them based on multiple criteria. Specifically, these graphics categorise the courses in terms of their geographical location, the language employed for instruction, the approaches adopted, the length of the course, and the associated fees.

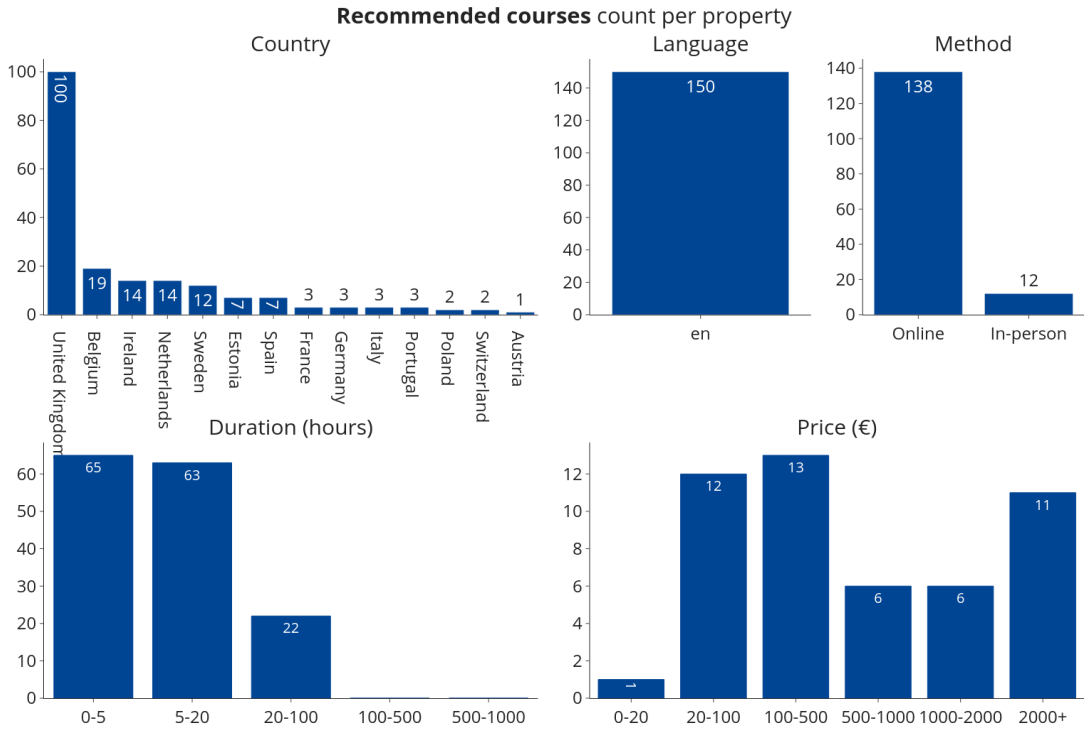

***Figure 63**: Features of courses teaching **AI** recommended skills for **Non-Technical** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Artificial Intelligence** related capabilities for **Non-Technical**

roles within **Italy**. For each course highlighted, we furnish not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's comprehensive metadata.

Link	Name	Description	Skills
url	Information Security	This online Information Security course from Warnborough College will teach you how to keep the information you hold on your computer secure; this may be for an individual or a large company/business. Since the birth of the internet in the early 1990's information has become increasingly accessible – by everyone. Information Security Ethics	- apply information security policies
url	Data Visualization - Graphics for Impact	The aim of the Datavisualization - Graphics for Impact course at the University of Glasgow is to teach participants the skills to plan, create, and distribute data visualisations that aid decision making, enable effective reporting and tell clear messages. Moreover, the course introduces and applies standards for impactful, trustworthy and accessible visualisations. The course is structured around topical themes in visualisation and the necessary skills to put these into practice. The skills progress from basic to intermediate through the course with a focus on enabling learners to easily build on skills for specific projects. Each session consists of a lecture and demonstration, followed by peer-learning, self-study materials, and programming support labs.	- visual presentation techniques
url	Scientific Computing with applications in Tribology	The Scientific Computing with applications in Tribology course offered by Luleå University of Technology is an open online course (OOC) with video lectures, quizzes and assignments where you get insight into modelling and simulation of tribological processes. Contact mechanics	- data models - visual presentation techniques
url	Design and Implementation of Digital Health Interventions	This course covers various themes around design, regulatory approaches, ethics, technology adoption, implementation and strategy as applied to digital health. These sessions cover areas to include data regulations, examples of data breaches in digital health, the challenges and opportunities of technology adoption and implementation with a focus on the non-adoption, abandonment, scale-up, spread and sustainability framework (NASSS Framework). The strategy part of this course focuses on understanding a simple strategy for digital health through PESTLE	- business strategy concepts

Link	Name	Description	Skills
		and SWOT analysis, and examples of their application in digital health…	

***Table 17**: Courses teaching **AI** recommended skills for **Non-Technical** positions in **Italy**.*

6.2.2. Cybersecurity

6.2.2.1. Manager

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Manager** roles in **Italy**.

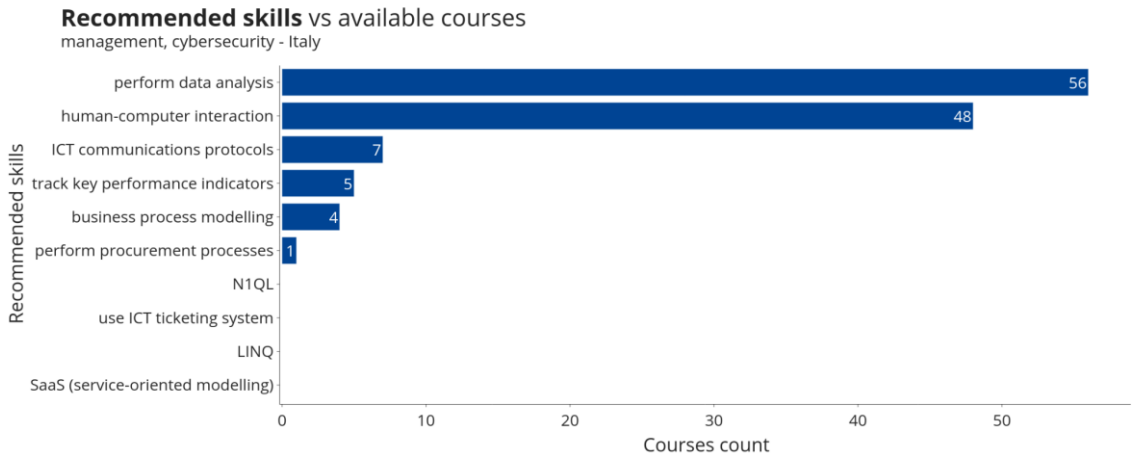

***Figure 64**: Number of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Italy**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

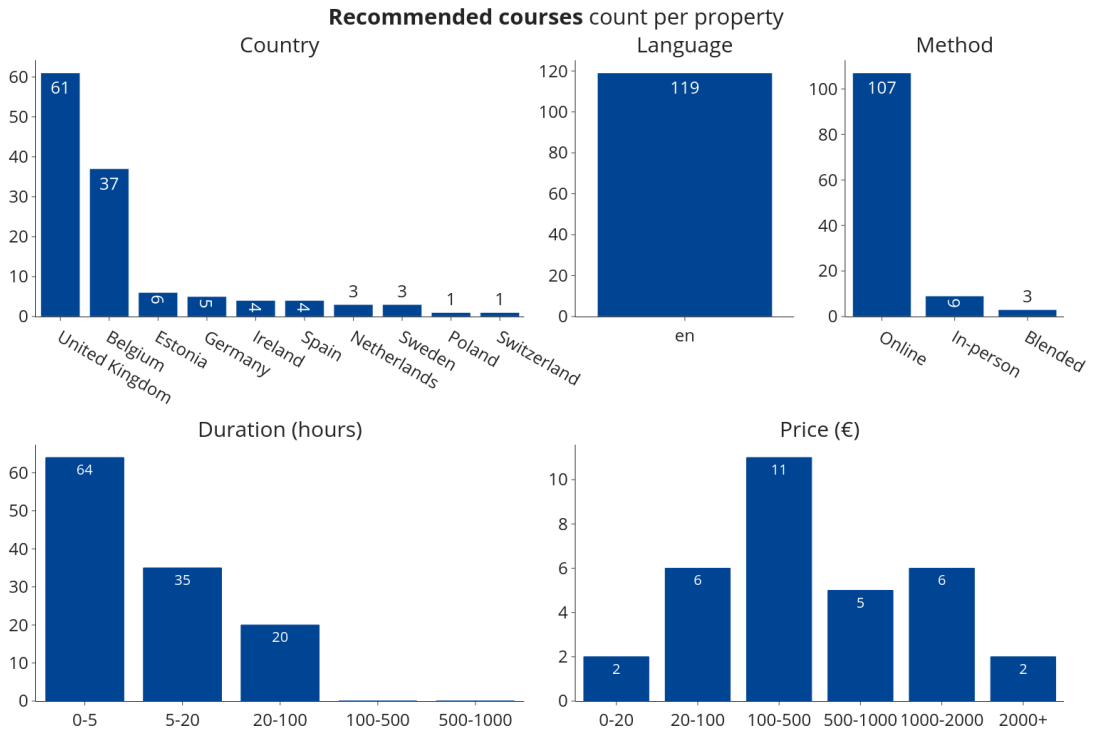

***Figure 65**: Features of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Manager** roles within **Italy**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Data Analysis: Visualization and Dashboard Design	Learn how to turn raw data into visual insights using Excel to help support business decisions…	- perform data analysis
url	Natural Language Processing	Natural Language Processing (NLP) is one of the most rapidly advancing fields in technology, using state-of-the-art methods to analyse and process both written and spoken language data. Enhance your programming skills and get a hands-on understanding of the theory and practice of NLP in this hybrid course provided by ZHAW Zurich University of Applied Sciences. Handling and pre-processing of textual and speech data…	- perform data analysis
url	Experimental Interaction Design	The Experimental Interaction Design programme of Tallinn University is a two-week extensive hands-on course in interaction design. The main goal of the course is to empower people to shape their	- human-computer interaction

Link	Name	Description	Skills
		digital environment thus providing a new level of digital literacy. Classes take place each week from Monday to Friday…	
url	Designing Tactile Wearables	This one-week hands-on experimental Designing Tactile Wearables course from Tallinn University will introduce core design principles related to novel wearable technology with a focus on vibrotactile feedback. The main goal is to explore how to design and build wearables that communicate rich information via tactile sense. The outcome of the course is to design and build a working wearable prototype that can be used for evaluation.During the course, the students will be supported by experts in Interaction Design and Haptics, Smart Textiles, and Arduino programming engineers.Classes take place each week from Monday to Friday. The lectures are planned for each day 10:00 – 14:00…	- human-computer interaction
url	Data Analysis: Take It to the MAX()	Enhance your data analysis skills using spreadsheets and data visualization. Increase your productivity and make better business decisions.	- perform data analysis

***Table 18**: Courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Italy**.*

6.2.2.2. Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Technical** roles in **Italy**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

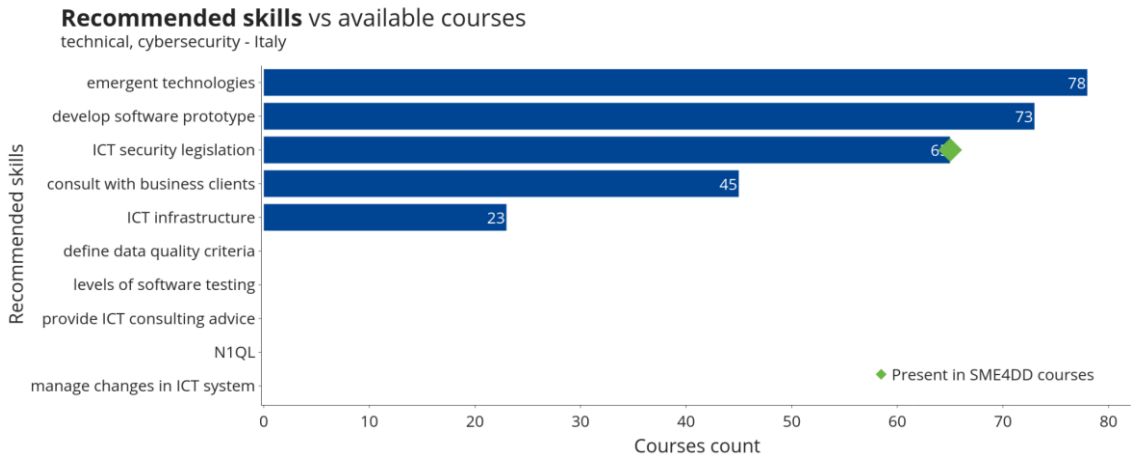

***Figure 66**: Number of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Italy**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass

geographical location, language of instruction, pedagogical approach, course duration, and associated fees:

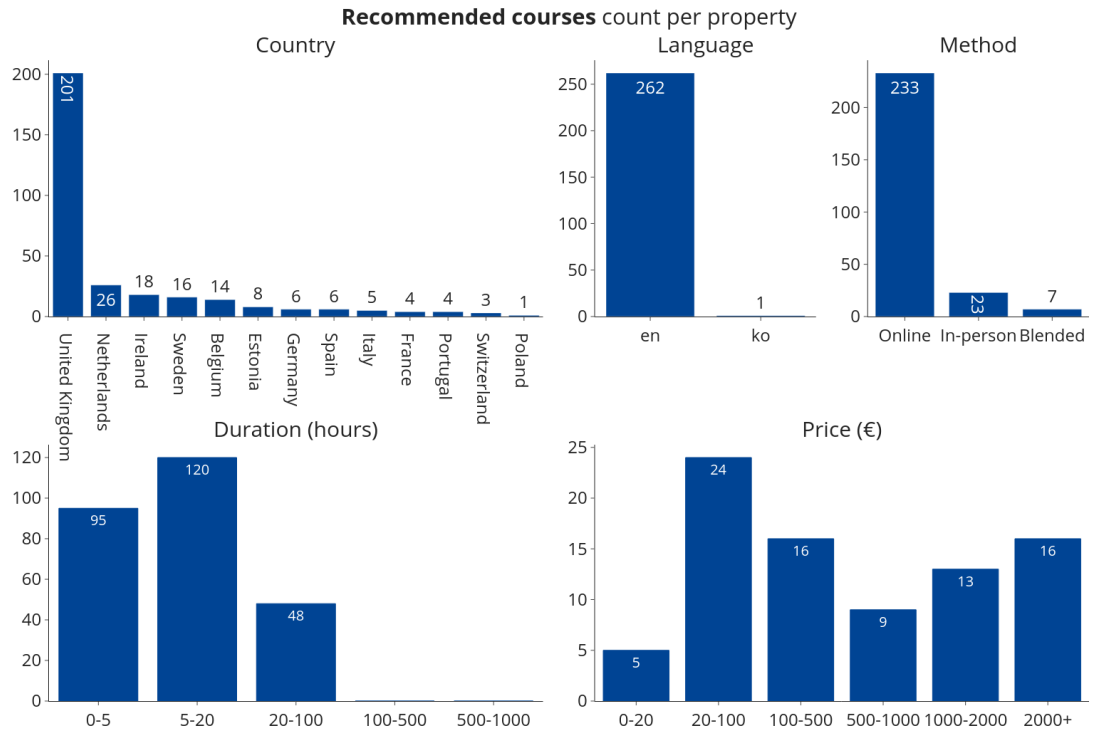

***Figure 67**: Features of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Cybersecurity** capabilities for **Technical** roles within **Italy**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Cyber Security	This Cyber Security PG Cert programme from University of Essex Online introduces you to a number of essential topics such as: key trends and developments within cyber security; fundamentals of network security and information security governance principles; an interdisciplinary perspective involving psychology that considers the human factor in cyber security challenges. Launching into Cyber Security…	- ICT security legislation
url	Network Defence Management Overview	Explore the basic requirements of network defence management with Network Defence Management Overview at Coventry University by FutureLearn. An overview of network defence management…	- ICT security legislation - ICT infrastructure
url	Digital health - understanding the application	The content of this Digital health - understanding the application of technology in modern healthcare - Micro-credential from	- emergent technologies

Link	Name	Description	Skills
	of technology in modern healthcare - Micro-credential	Trinity College Dublin is varied; therefore, the learner will receive knowledge that will help them develop a critical understanding of digital health for their organisation. Domain 1 – Digital ProfessionalismDomain 2 – Leadership and AdvocacyDomain 3 – Data and Information QualityDomain 4 – Information-enabled CareDomain 5 – Technology…	
url	Advances in Software Development	Malmö University offers the Advances in Software Development programme. The aim of this course is for students of computer science to establish a deep understanding for best practices and current research related to software development. This includes collaboratively working with fellow students in order to critically reflect upon core advances in software development.	- develop software prototype
url	eHealth - Combining Psychology, Technology, and Health	How can technology make you healthy? Learn about the design, application, implementation and evaluation of eHealth with eHealth - Combining Psychology, Technology, and Health at University of Twente by FutureLearn at University of Twente by FutureLearn. What is eHealth?...	- emergent technologies - consult with business clients

***Table 19**: Courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Italy**.*

6.2.2.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity** skills for **Non-Technical** roles in **Italy**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

***Figure 68**: Number of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Italy**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their

geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

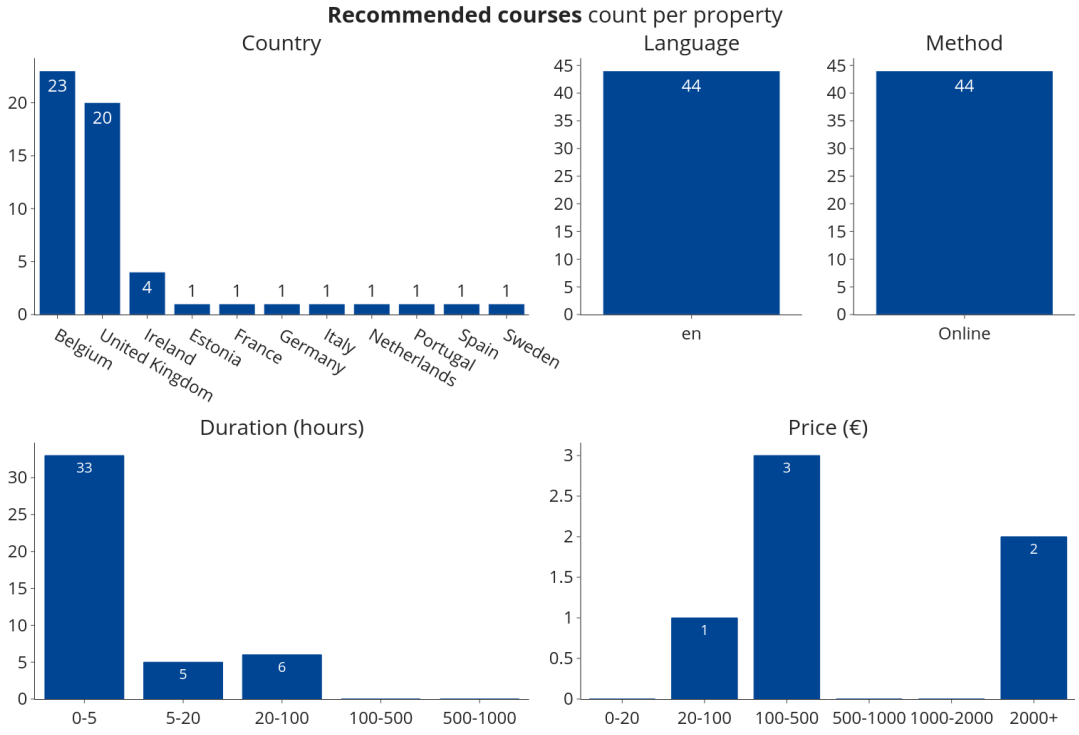

***Figure 69**: Features of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Non-Technical** roles within **Italy**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- legal requirements of ICT products
url	Introduction to Coding with HTML, CSS, and JavaScript	In this Introduction to Coding with HTML, CSS, and JavaScript course from International Open Academy you will: know how to speak and understand computer languages, see how computers	- use an application-specific interface

Link	Name	Description	Skills
		work and understand what exactly programming is, understand what we mean by the internet and web pages, Realise how the internet works, discover what JS Bin is and why you need it, What is a computer?...	
url	Rasch Courses	University of Leeds' Rasch Courses workshop to introduce Rasch analysis using RUMM2030 software. This course will suit those working in the measurement of outcomes in the health sciences, of attitudinal data in the social sciences, or in educational testing. Input of data into the RUMM2030 programmeTesting for local dependency and unidimensionality assumptions Assessing scaling characteristics and fit to the Rasch model Examining the category probability patterns for polytomous items Examining the targeting and reliability of the scale or test Assessing Differential Item Functioning Assessing Response Dependence…	- use an application-specific interface
url	Learn to Code for the Web	Ever wondered what's behind your favourite websites and apps? Get to grips with the basics of coding in HTML, CSS and Java Script…	- use an application-specific interface

***Table 20**: Courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Italy**.*

6.2.3. Blockchain

6.2.3.1. Manager

The chart below presents the number of courses that teach the recommended **Blockchain**-related skills for **Manager** roles in **Italy**.

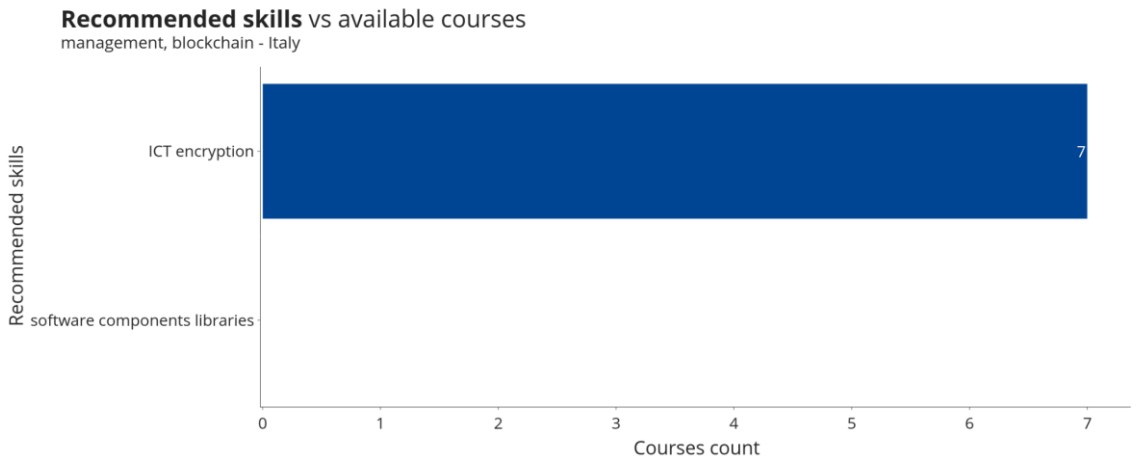

***Figure 70**: Number of courses teaching **Blockchain** recommended skills for **Manager** positions in **Italy**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

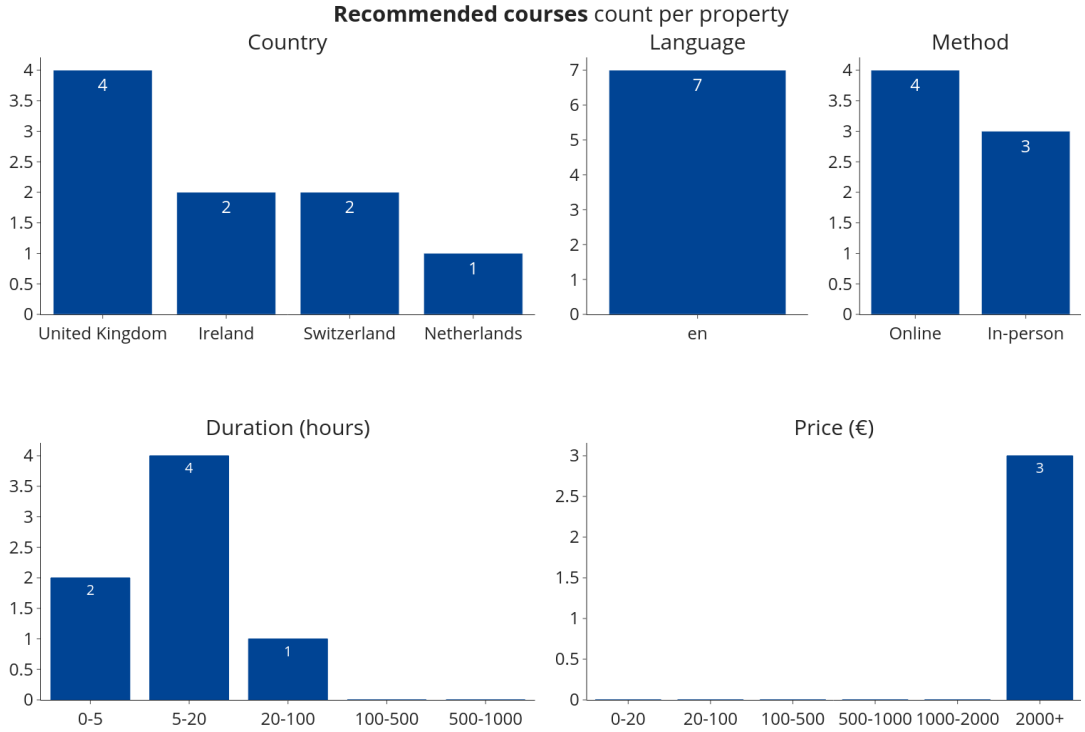

***Figure 71**: Features of courses teaching **Blockchain** recommended skills for **Manager** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Blockchain** expertise necessary for **Manager** roles within **Italy**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Cyber Security	The Cyber Security course offered by ETH Zurich - Swiss Federal Institute of Technology will be exploring the fundamentals of cyber security from a computer science and policy perspective. Information Security	- ICT encryption
url	Cybersecurity Fundamentals	In this 4-day Cybersecurity training you will be prepared for the international ISACA Cybersecurity Fundamentals Certificate. Increase your technical (cyber)security knowledge and skills and become certified! Cyber security objectivesCyber security rolesDifferences between information security and cyber securityConfidentiality, integrity, and availabilityAuthentication and non-repudiation…	- ICT encryption

Link	Name	Description	Skills
url	Certified Secure Software Lifecycle Professional (CSSLP)	Want to call yourself a guru of software security? If you're demonstrating a globally recognised level of competence, the next best step is getting certified with the Certified Secure Software Lifecycle Professional (CSSLP) course offered on The Learning People platform. Security Design Principles…	- ICT encryption
url	Computer Science	The Computer Science provided by ETH Zurich - Swiss Federal Institute of Technology offers a broad selection of courses taught by leading experts in computer science. These courses cover foundations as well as cutting-edge developments. Data Management Systems…	- ICT encryption

***Table 21**: Courses teaching **Blockchain** recommended skills for **Manager** positions in **Italy**.*

6.2.3.2. Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Technical** roles in **Italy**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

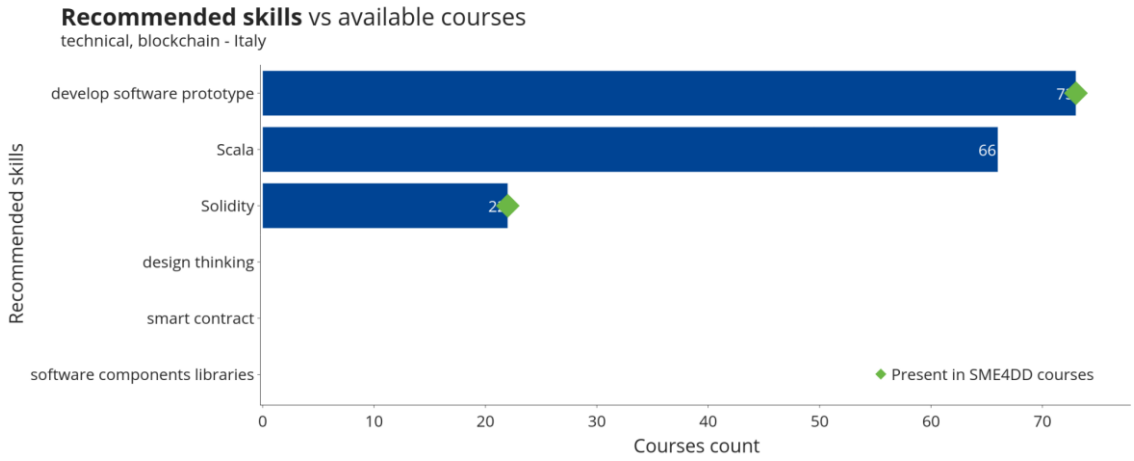

***Figure 72**: Number of courses teaching **Blockchain** recommended skills for **Technical** positions in **Italy**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

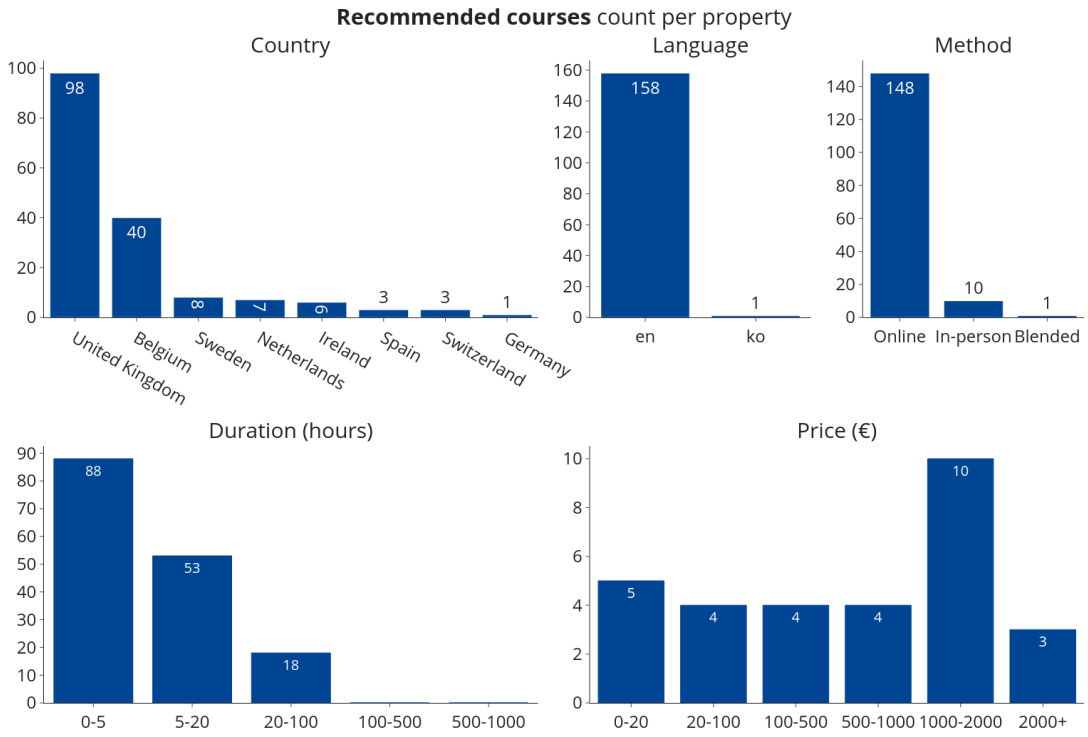

***Figure 73**: Features of courses teaching **Blockchain** recommended skills for **Technical** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Technical** roles within **Italy**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Creative Coding	In this Creative Coding course from Vrije Universiteit Amsterdam, we will explore the cutting edge of programming and visual arts by understanding the basics of programming for creative purposes. use programming as a medium for exploring their creativity via computer programs. read technical documentation (e.g., programming language and library references).	- Solidity
url	Programming in Python	Through the Programming in Python course offered by Luleå University of Technology you will learn the basics of programming with a focus on Python, but the knowledge is equally applicable to many other programming languages Software development and software development environments.	- develop software prototype

Link	Name	Description	Skills
url	CSCU - Certified Secure Computer User	Want the necessary knowledge to tackle various computer and network security threats? Then the CSCU - Certified Secure Computer User course offered on The Learning People platform is for you! Security…	- develop software prototype
url	Introduction to Programming	Through this Programming course by Luleå University of Technology, you will learn the basics of programming. You will have the necessary knowledge to build further on, no matter what language you immerse yourself in. Software development and software development environments…	- develop software prototype

***Table 22**: Courses teaching **Blockchain** recommended skills for **Technical** positions in **Italy**.*

6.2.3.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Non-Technical** roles in **Italy**.

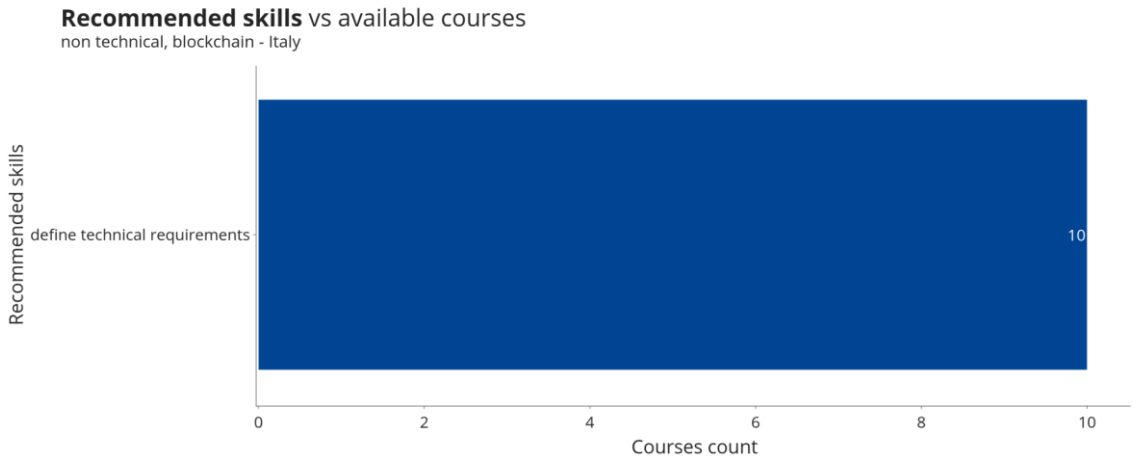

***Figure 74**: Number of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Italy**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

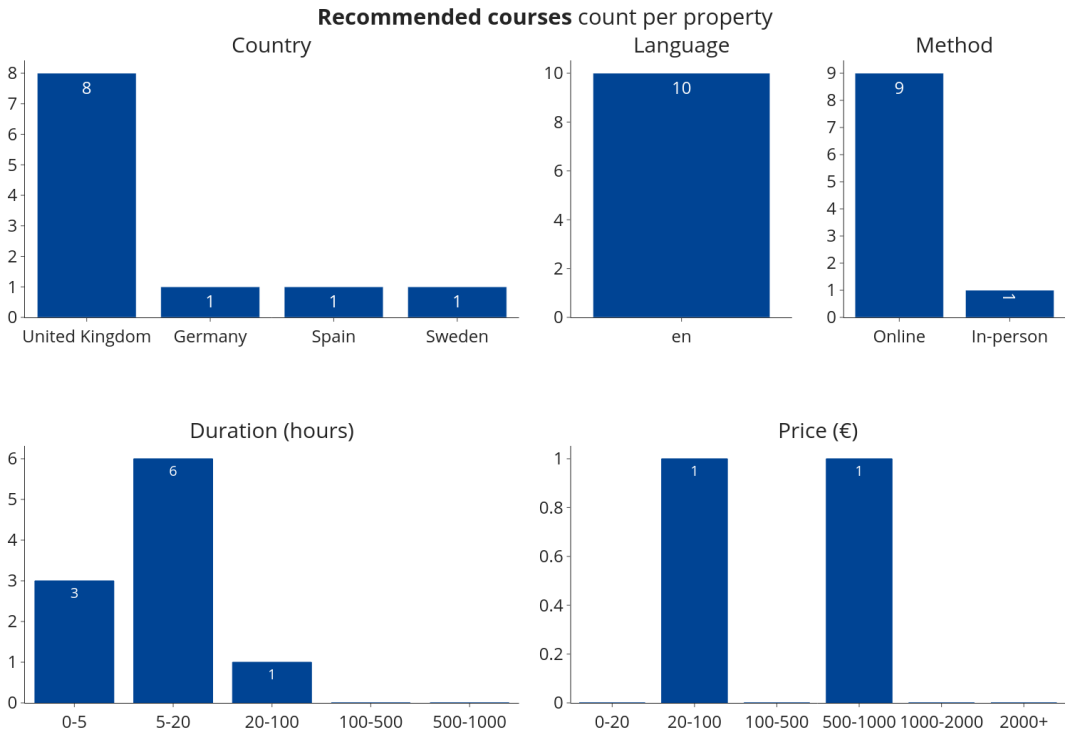

***Figure 75**: Features of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Italy**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Non-Technical** roles within **Italy**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Mining for Industry	The Data Mining for Industry course offered by Luleå University of Technology will introduce you to data mining and how it might enable businesses to drive better business results by analysing their different data using predictive and prescriptive tools. machine learning techniques for classification, regression, and clustering…	- define technical requirements
url	Modern Cloud-Project with Java	Each group in this Modern Cloud-Project with Java course at TU Berlin will develop an Web-Application that runs in the cloud. Requirements engineering Source code managementWorking in a teamJava-Framework Spring boot Running Containers with DockerManage DatabasesAutomatic testsFront-End development with HTML, JavaScript and CSSCould Environments…	- define technical requirements

***Table 23**: Courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Italy**.*

6.3. Conclusion

6.3.1. Missing skills per Categories on the targeted Verticals

In the Italian context, when we look at AI-related skills, we see some clear trends across different job roles in the sampled data used for the analysis. For managers, improving their statistical skills would be valuable, especially for business analysis needs. In technical roles, there's a strong demand for skills in machine learning and analytical thinking, which is in line with the broader AI sector. Non-technical roles in AI should focus on incorporating information security processes, similar to what's seen in the cybersecurity field. Additionally, fostering innovation is crucial, which is a common need across different sectors.

Now, shifting to the realm of cybersecurity, the sampled Italian SMEs face similar challenges to their French counterparts. Managers need to be adept in data analysis. Technical roles require expertise in emerging technologies and the ability to consult with clients. Non-technical roles emphasize the importance of data confidentiality and cost-benefit analysis, which are also important in AI and blockchain.

In the field of blockchain, Italian SMEs consistently need proficiency in software components for both managerial and technical roles, similar to AI and cybersecurity. Technical expertise in blockchain aligns with the analytical thinking demands of AI. Non-technical roles in blockchain focus on defining technical requirements, which is a common thread in the technical aspects of AI and cybersecurity.

6.3.2. Skills covered by the SME4DD courses with respect to the target audience

As seen in the preceding plots, the green diamond marks indicate the skills covered by the SME4DD courses. You can find the complete list of skills per course in the Annexes at the end of the document.

Some key points are the following: for technical roles, SME4DD courses cover a range of competencies, including machine learning (ML) for data analysis and decision-making. Participants also learn how to effectively communicate with business clients and create software prototypes, gaining practical experience in turning ideas into tangible products. These skills collectively prepare professionals to meet the diverse demands of startups.

For non-technical roles, the SME4DD courses include the skill of understanding and applying the "legal requirements of ICT products."

6.3.3. Skills needed on the market but not covered by the SME4DD courses

In the preceding bar plots illustrating deficient skills, the absence of a green mark signifies skills not addressed by the SME4DD courses.

Some key points are the following. For managers, there's a lack of skills related to strategic project planning and database manipulation. These skills are available in European courses but not in SME4DD courses. Additionally, the LINQ skill is not covered by either European or SME4DDD courses.

On the other hand, technicians need skills like analytical thinking and database knowledge, which are not included in SME4DD courses.

Regarding non-technical roles, the most desired skills not covered by SME4DD courses are those related to creating client-facing documentation or reports, such as skills like "provide user documentation," "visual presentation techniques," or "provide cost benefit analysis report."

6.3.4. European courses covering the missing skills identified

Regarding the European courses contained in our database, characteristics of recommended courses for Italian SMEs follow a similar pattern to those for French SMEs. Like before, most courses are concentrated in the United Kingdom and Belgium, and they are primarily delivered in English. Additionally, these courses are mostly available online. We also notice that as the duration of courses increases, the number of available courses decreases. In other words, there are more courses in the 0-5 hours range compared to longer durations, and very few exceed 100 hours.

7. Hungary

Moving on to the next part, we're going to take a close look at data from various companies across Hungary. This initial investigation aims to help us understand the information we have and set the stage for our upcoming analysis of skills.

Our main goal remains the same: to clearly explain what we've found about Hungarian companies in our data compared to other European ones. This effort is meant to give us a strong foundation for our study and reveal any potential biases or nuances that could affect our later evaluations of skills and abilities.

This initial exploration also covers things like how big our sample is, how employees are distributed, and what kinds of technology these companies are involved in. It's an important start to our in-depth investigation into the most important technical skills these companies have.

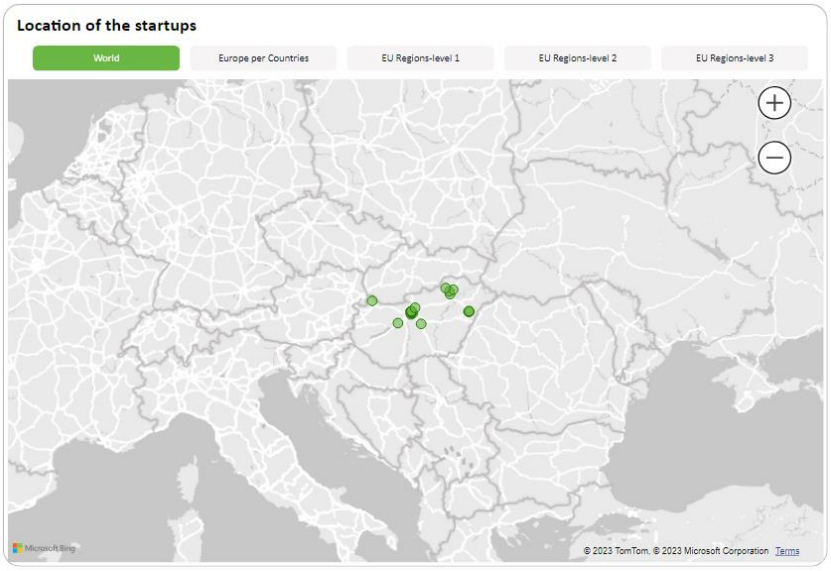

***Figure 76**: Screen capture from the geographical view of the Skill Sync displaying the organisations located in **Hungary**.*

The plot below illustrates the size distribution of the companies sampled in our database. The green bars represent organisations located in Hungary, used for the later analysis, while the blue bars represent the count of organisations in the rest of Europe.

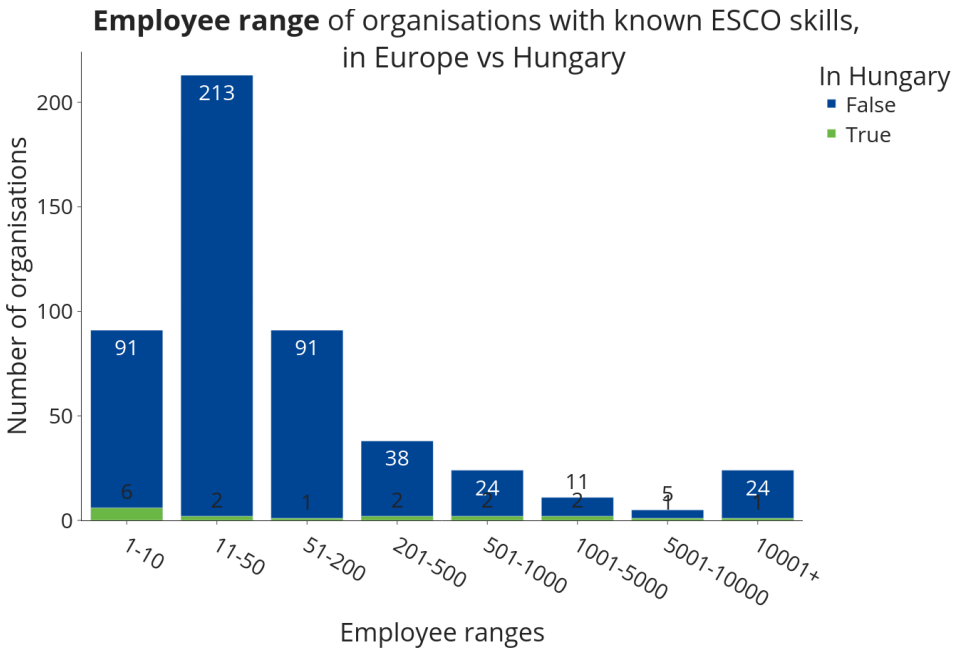

***Figure 77**: Comparison of Employee Counts. **Hungarian** Organisations vs. European Counterparts.*

In this plot, we present insights into the industry affiliations of the sampled **Hungarian** companies. This snapshot provides a quick glimpse into the primary sectors characterising Hungary's business environment, setting the stage for readers to interpret the country's strengths and focus areas in the realm of technology.

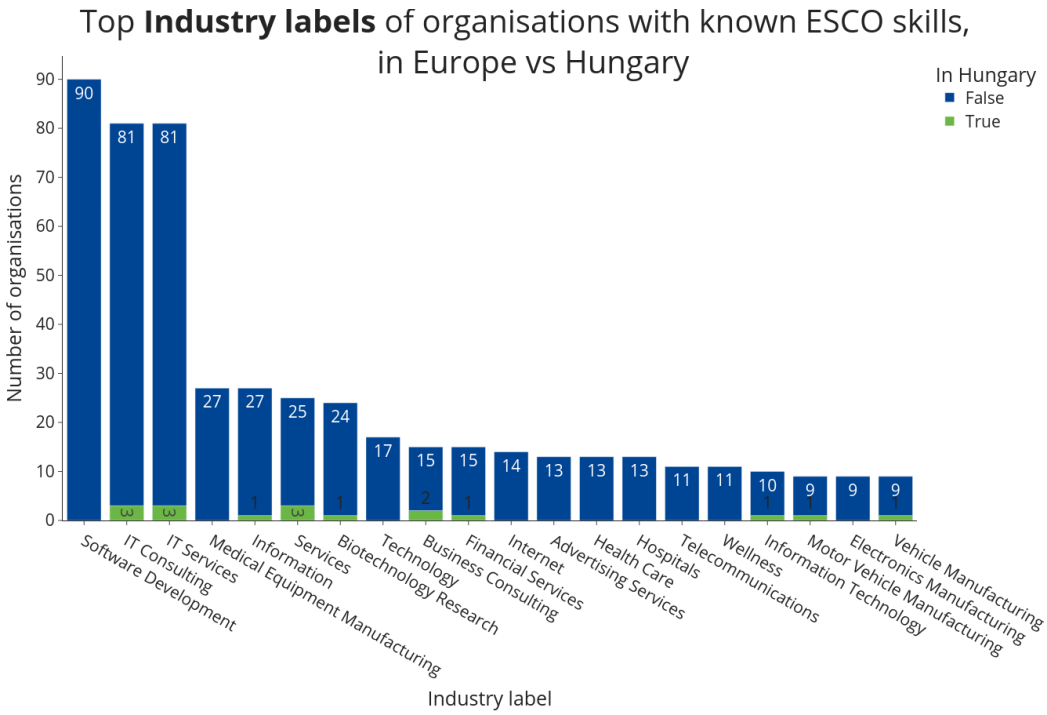

***Figure 78**: Comparison of Industry. **Hungarian** Organisations vs. European Counterparts.*

7.1. Current Expertise

Transitioning into the subsequent "Current Skills" section, we embark on a comprehensive deconstruction of the identified proficiencies within pivotal verticals crucial for contemporary technological advancement: **Artificial Intelligence**, **Blockchain**, and **Cybersecurity**. Each ensuing subchapter provides unique insights into the predominant skills observed among **Hungarian** companies, classified according to distinct role categories: **Managers**, **Technical Specialists**, and **Non-Technical** Personnel. This analytical exploration offers a focused examination of Hungary's expertise, derived from the sampled companies, within these essential domains. Through this intricate dissection, our aim is to outline the nuanced skills landscape of the country and spotlight the roles that significantly contribute to its technological prowess.

7.1.1. Artificial Intelligence

7.1.1.1. Manager

The following chart displays the key **Artificial Intelligence** related skills identified for **Manager** positions in **Hungary**. The skills present in SME4DD courses are highlighted in **green**:

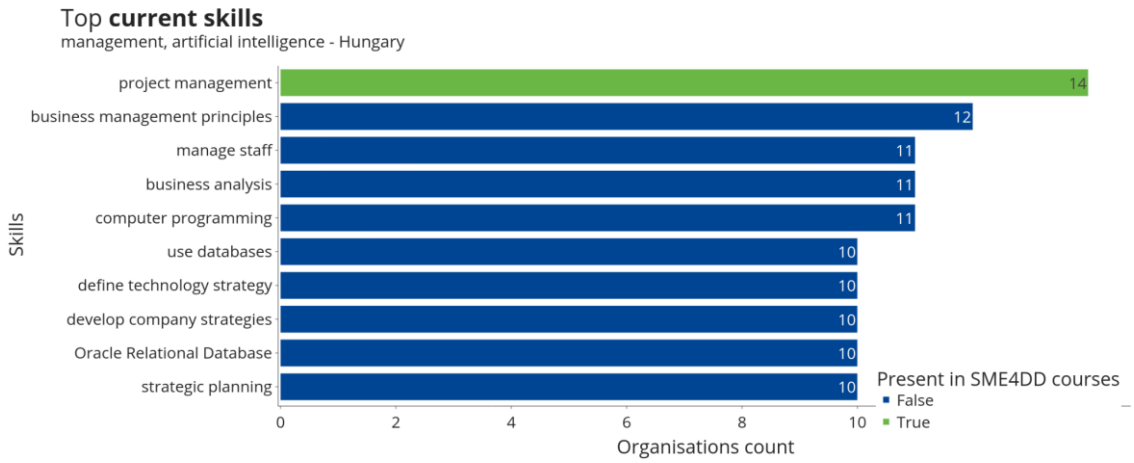

***Figure 79**: Key **AI** skills identified for **Manager** positions in **Hungary**.*

7.1.1.2. Technical

The following chart displays the key **AI** related skills identified for **Technical** positions in **Hungary**. The skills present in SME4DD courses are highlighted in **green**:

***Figure 80**: Key **AI** skills identified for **Technical** positions in **Hungary**.*

7.1.1.3. Non-Technical

The following chart displays the key **AI** skills identified for **Non-Technical** positions in **Hungary**:

***Figure 81**: Key **AI** skills identified for **Non-Technical** positions in **Hungary**.*

7.1.2. Cybersecurity

7.1.2.1. Manager

The chart below showcases the essential **Cybersecurity** skills for **Manager** roles in **Hungary**. Skills covered in the SME4DD courses are highlighted in **green**:

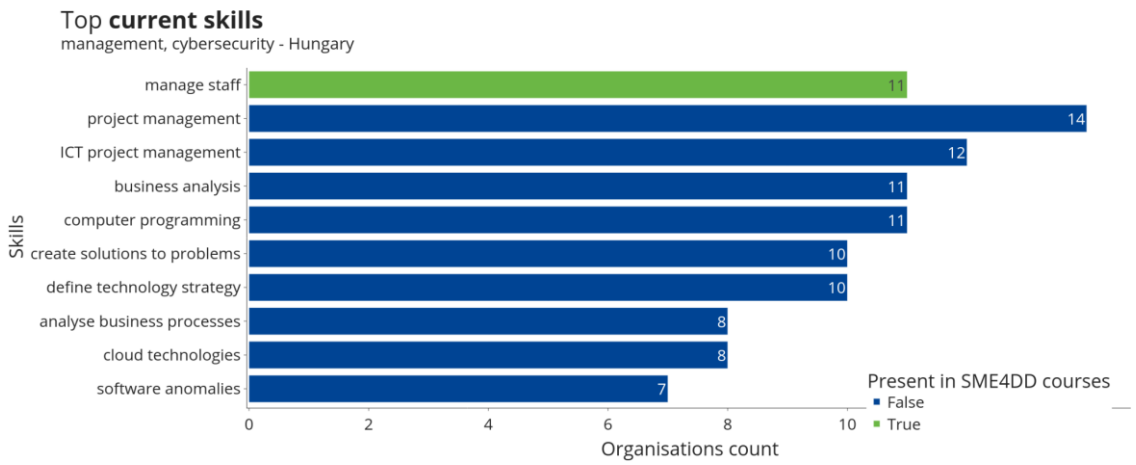

***Figure 82**: Key **Cybersecurity** skills identified for **Manager** positions in **Hungary**.*

7.1.2.2. Technical

The chart below showcases the essential **Cybersecurity** skills for **Technical** roles in **Hungary**:

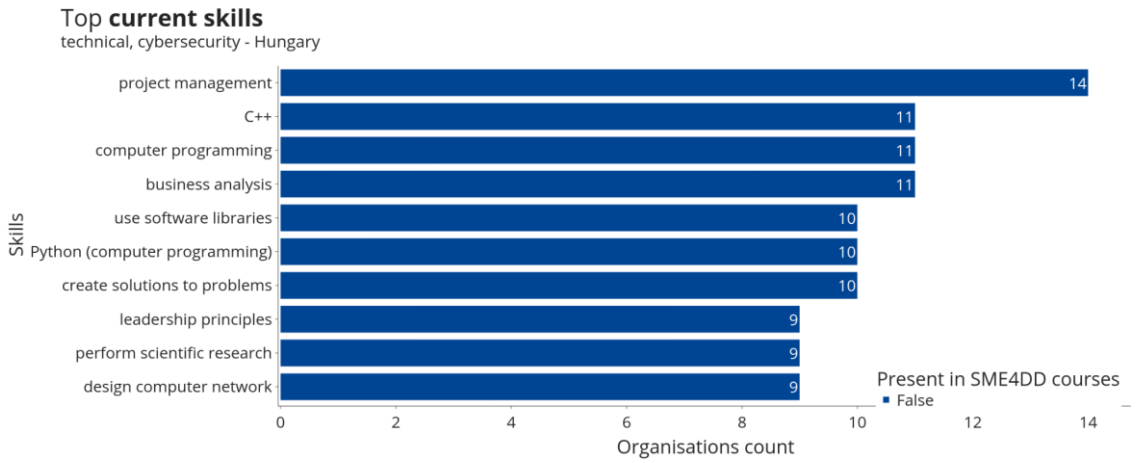

***Figure 83**: Key **Cybersecurity** skills identified for **Technical** positions in **Hungary**.*

7.1.2.3. Non-Technical

The chart below showcases the essential **Cybersecurity** skills for **Non-Technical** roles in **Hungary**. Skills covered in the SME4DD courses are highlighted in **green**:

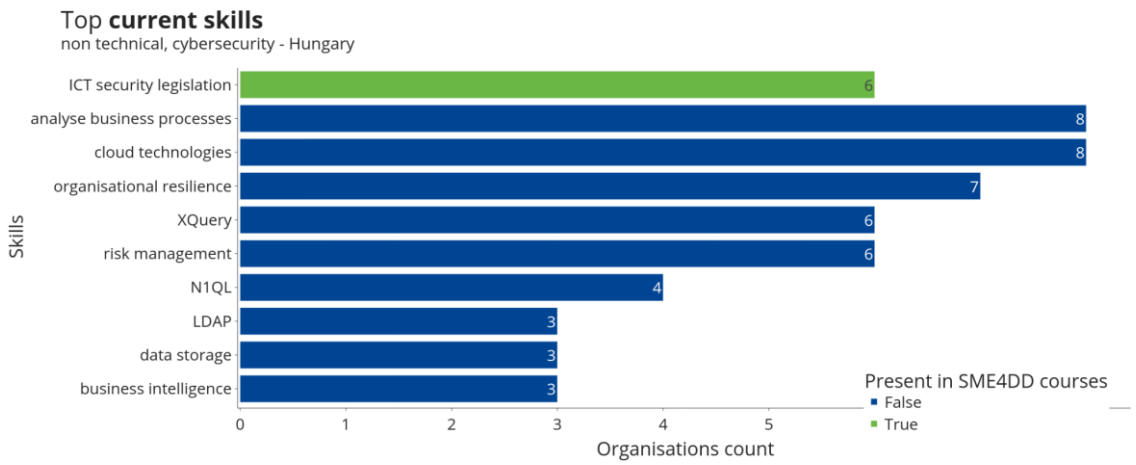

***Figure 84**: Key **Cybersecurity** skills identified for **Non-Technical** positions in **Hungary**.*

7.1.3. Blockchain

7.1.3.1. Manager

The following chart displays the key **Blockchain** related skills identified for **Manager** positions in **Hungary**:

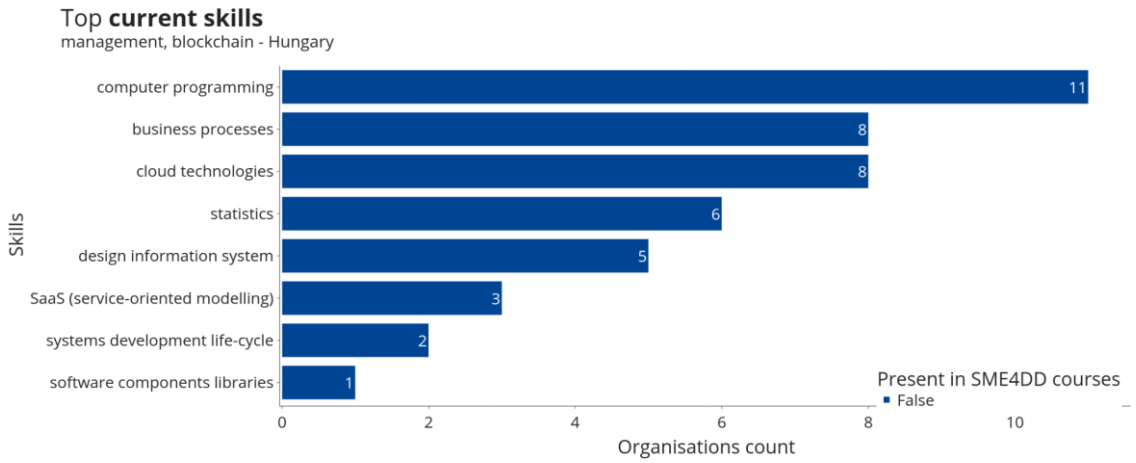

***Figure 85**: Key **Blockchain** skills identified for **Manager** positions in **Hungary**.*

7.1.3.2. Technical

The chart below showcases the essential **Blockchain** skills for **Technical** roles in **Hungary**:

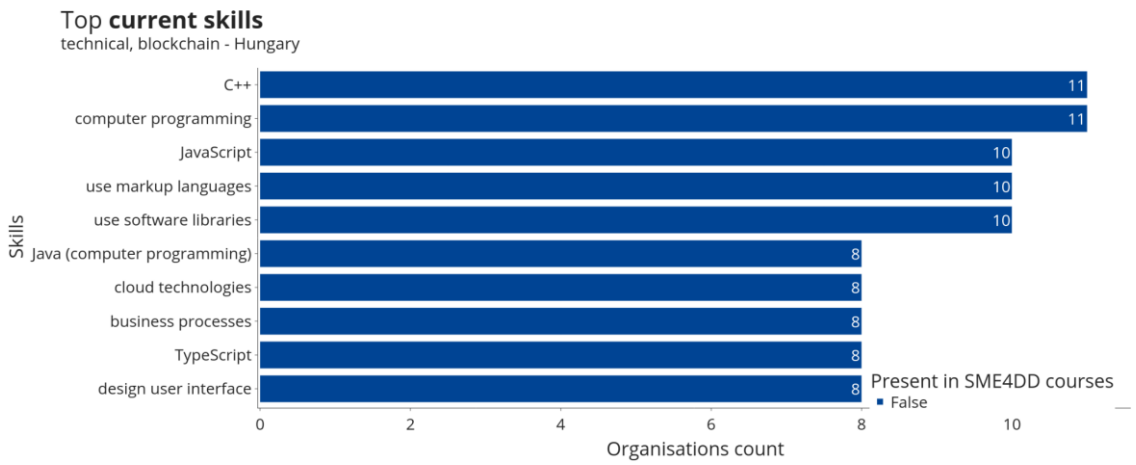

***Figure 86**: Key **Blockchain** skills identified for **Technical** positions in **Hungary**.*

7.1.3.3. Non-Technical

The chart below showcases the essential **Blockchain** skills for **Non-Technical** roles in **Hungary**:

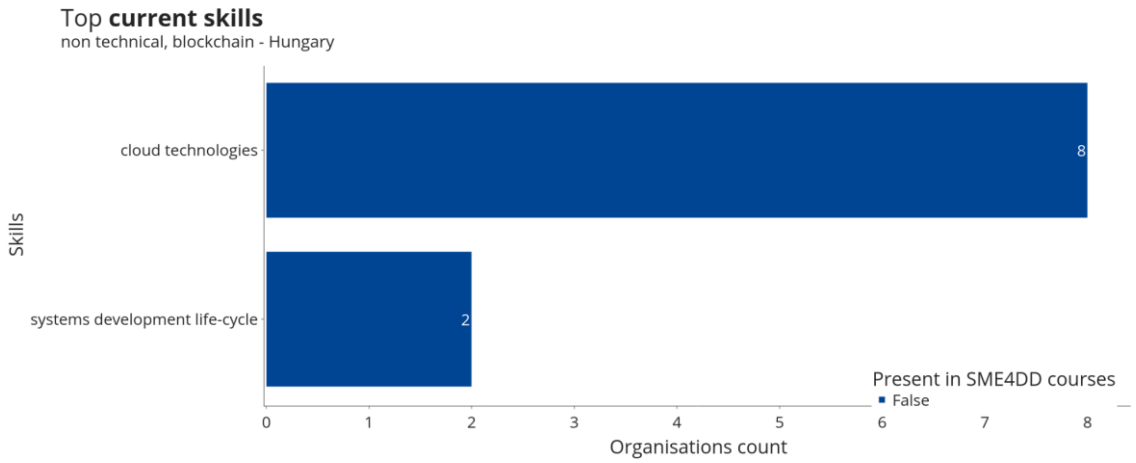

***Figure 87**: Key **Blockchain** skills identified for **Non-Technical** positions in **Hungary**.*

7.2. Lacking Expertise

Transitioning to the following "Lacking Expertise" section, we transition from analysing the existing skills to probing into the areas where each country's proficiency falls short of the contemporary European benchmark. This inquiry targets specific domains within Artificial Intelligence, Blockchain, and Cybersecurity that warrant enhancement.

Our analysis not only highlights the skills that need cultivation but also underscores those covered by the SME4DD courses. Additionally, we provide a comprehensive examination of the current European competence courses accessible in our database, offering a comprehensive picture that informs strategic actions for bridging the knowledge gap.

7.2.1. Artificial Intelligence

7.2.1.1. Manager

The chart below presents the number of courses that teach the recommended **Artificial Intelligence**-related skills for **Manager** roles in **Hungary**.

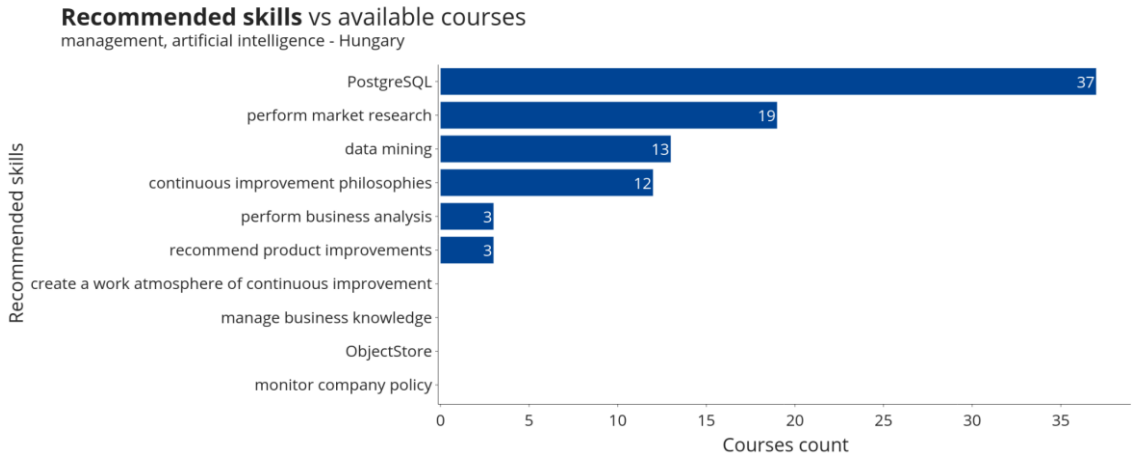

***Figure 88**: Number of courses teaching **AI** recommended skills for **Manager** positions in **Hungary**.*

Delving deeper into the analysis of these courses, the subsequent set of visual representations showcases them according to various parameters: geographical location, language of instruction, teaching methodology, duration, and cost.

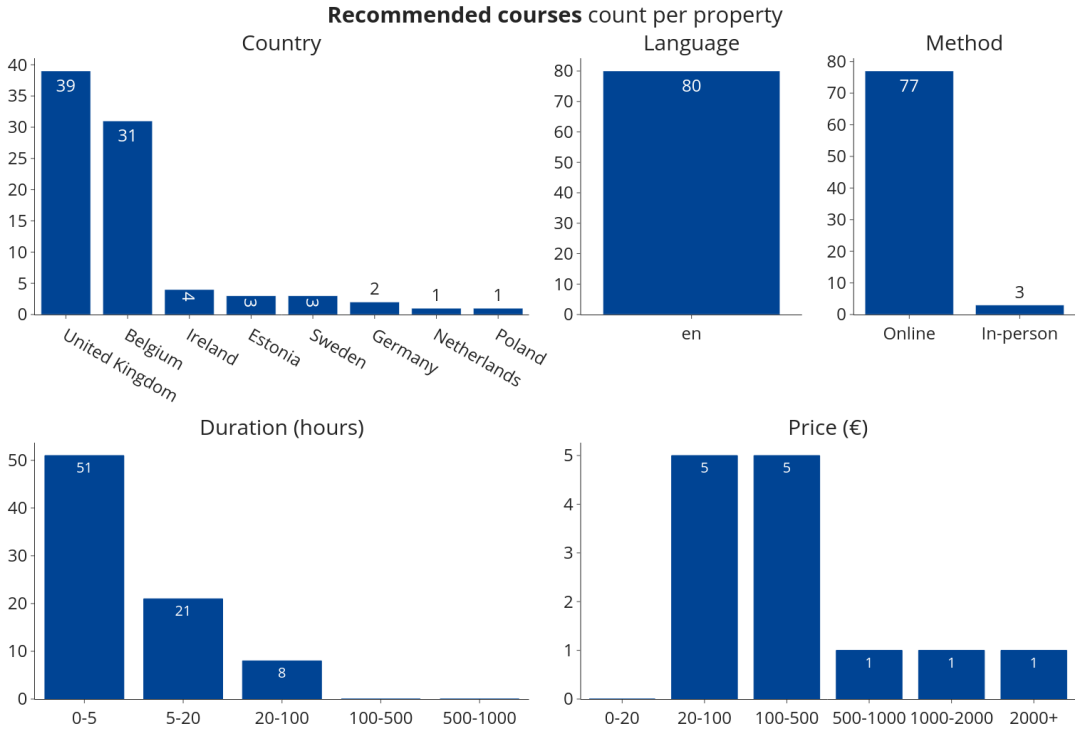

***Figure 89**: Features of courses teaching **AI** recommended skills for **Manager** positions in **Hungary**.*

The table below presents a curated list of courses that impart the recommended **Artificial Intelligence**-related skills for **Manager** roles in **Hungary**. For each course, you'll find its name, a concise description, a direct link to the course's official webpage, and the skills identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- perform market research - continuous improvement philosophies
url	Gamification Workshop	Gamification is a process that helps you create interesting, interactive and fun content from the mundane by adding game-inspired elements. The best part about gamification is that it can be applied to many aspects in life, the fields of business, marketing and education being just a few examples…	- perform market research
url	Scientific Computing with applications in Tribology	The Scientific Computing with applications in Tribology course offered by Luleå University of Technology is an open online course (OOC) with video lectures, quizzes and assignments where you get insight into modelling and simulation of tribological processes. Contact mechanics…	- data mining
url	Data Mining	In the Data Mining course offered by Örebro University, we aim to cover the most applicable topics of understanding the data. exploratory data analysis (such as preprocessing, visualisation, and statistical techniques)...	- data mining

***Table 24**: Courses teaching **AI** recommended skills for **Manager** positions in **Hungary**.*

7.2.1.2. Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence**-related skills for **Technical** roles in **Hungary**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

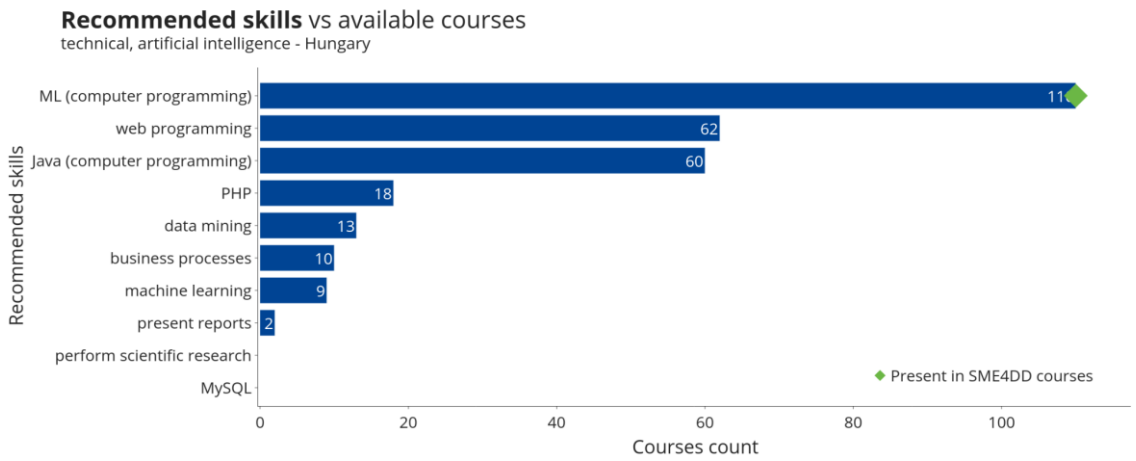

***Figure 90**: Number of courses teaching **AI** recommended skills for **Technical** positions in **Hungary**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

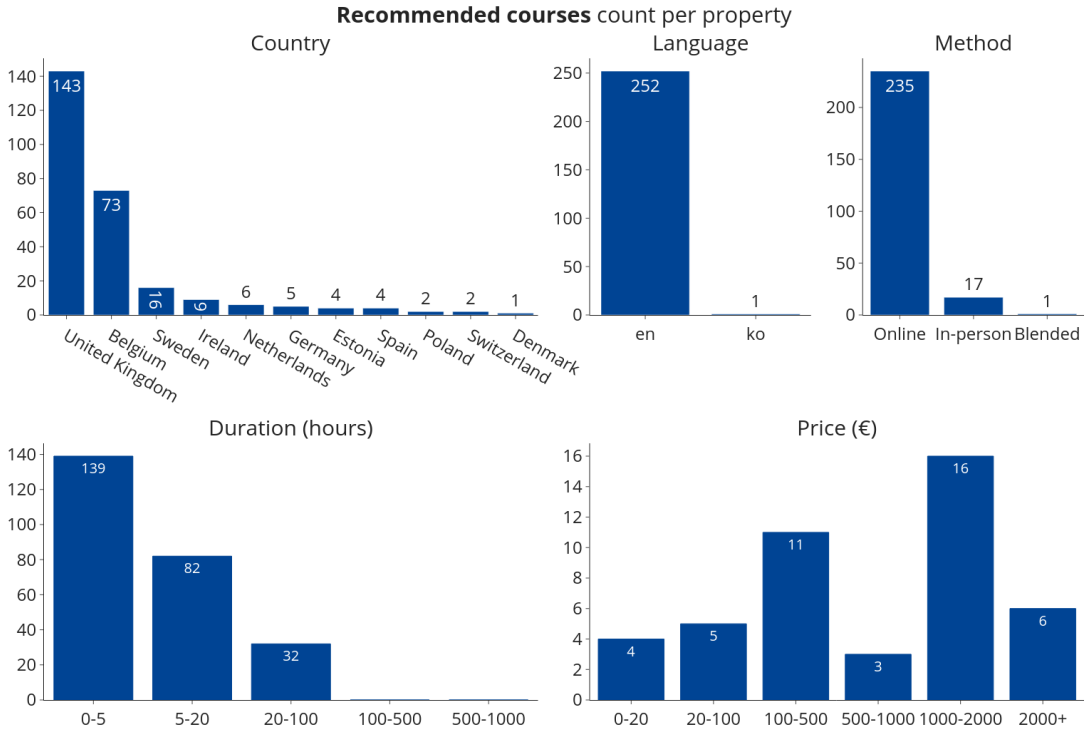

***Figure 91**: Features of courses teaching **AI** recommended skills for **Technical** positions in **Hungary**.*

The table that follows offers a carefully selected compilation of courses tailored to equip individuals with the essential **Artificial Intelligence** related skills for **Technical** positions in **Hungary**. For every listed course, we provide the course name, a succinct overview, a direct hyperlink to its official website, and the specific skills as pinpointed by the Skill Sync AI engine, drawn from the course's metadata.

Link	Name	Description	Skills

url	Application Development for Android	Malmö University offers the Application Development for Android programme. The purpose of the course is for the students to develop basic knowledge and skills in designing software for mobile phones and tablets. The purpose is also to develop an understanding of the differences between software development for PC in comparison to hand held devices. The course focuses on development on Android OS…	- Java (computer programming) - web programming
url	Designing Web Landing-Page for Entrepreneurship	In this Designing Web Landing-Page for Entrepreneurship course from Tallinn University, the students will learn how to design the web landing-page that can be used for entrepreneurship. In the beginning of the course, the students will select topics by their own interest and develop their idea into a working solution. Design and development methodology to the students who had no, or a very small amount of existing design experience.Get a working tool for your business idea, startup, or other entrepreneurship goals…	- PHP - web programming
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- ML (computer programming) - data mining
url	Advanced App Development in Android	This Specialisation is intended for learners with basic knowledge in Android app development seeking to develop knowledge in computer graphics and virtual reality in Android. Through the 4 courses, you will learn basic computer graphics theories and practical implementations of 3D graphics, OpenGL ES, and Virtual Reality on Android…	- Java (computer programming) - web programming
url	Object-oriented programming in Java	Java is one of the world's most widely used programming languages and the Object-oriented programming in Java course offered by Luleå University of Technology is a course for those who want to learn this object-oriented language from scratch. Classes and objects…	- Java (computer programming)

***Table 25**: Courses teaching **AI** recommended skills for **Technical** positions in **Hungary**.*

7.2.1.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence** related skills for **Non-Technical** roles in **Hungary**.

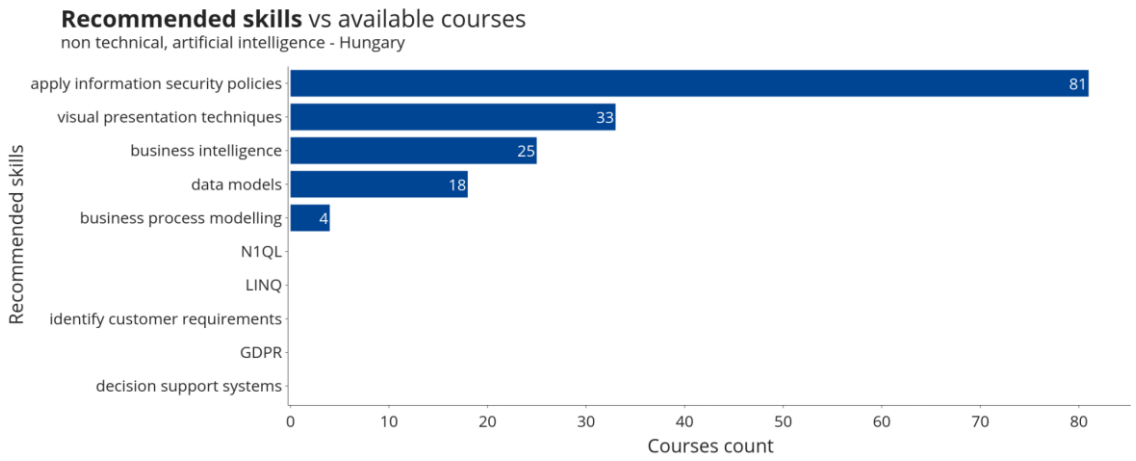

***Figure 92**: Number of courses teaching **AI** recommended skills for **Non-Technical** positions in **Hungary**.*

Upon conducting a thorough analysis of these courses, the upcoming series of visual illustrations presents them based on multiple criteria. Specifically, these graphics categorise the courses in terms of their geographical location, the language employed for instruction, the approaches adopted, the length of the course, and the associated fees.

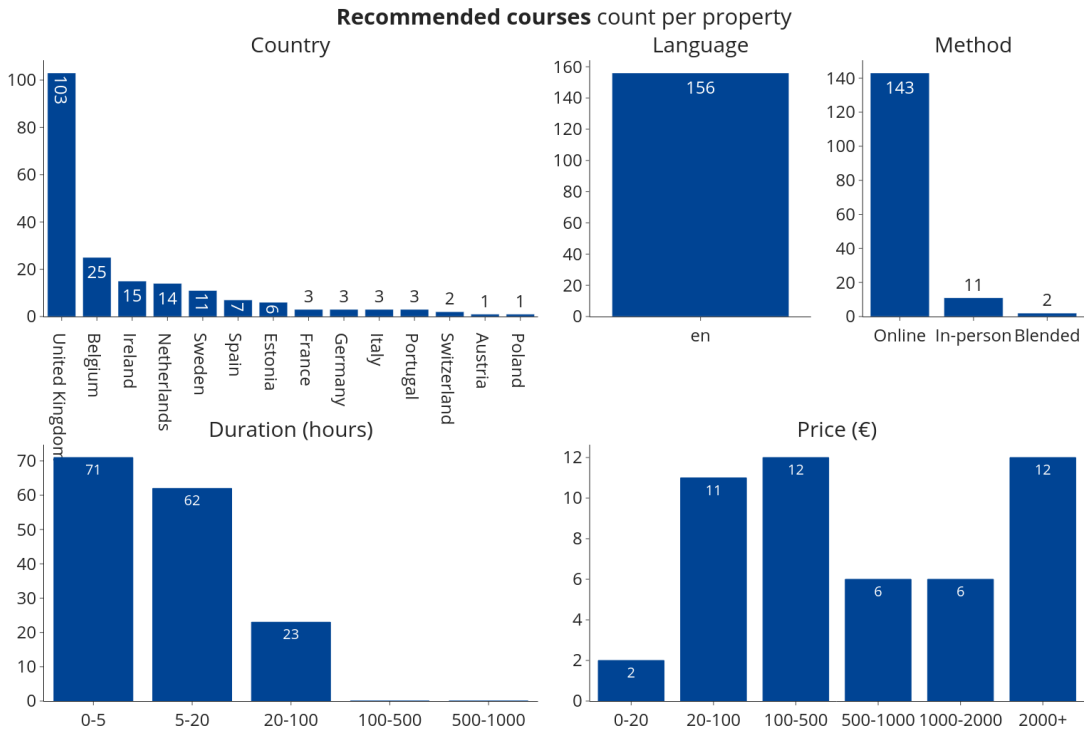

***Figure 93**: Features of courses teaching **AI** recommended skills for **Non-Technical** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Artificial Intelligence** related capabilities for **Non-Technical**

roles within **Hungary**. For each course highlighted, we furnish not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's comprehensive metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- apply information security policies
url	Data Governance	On Data Governance at WU (Vienna University of Economics and Business) you will focus on data governance and its importance in an organisation, both from a theoretical and a practical perspective. Drivers of Data Governance…	- apply information security policies
url	Business Operations	To ensure success in business, you need to begin with a strong foundation of skills and knowledge in various aspects of business operation and planning. This Business Operations course from Warnborough College covers vital topics such as finance, record keeping, financial management, business planning, mistakes to avoid, and more. Finance…	- business process modelling - business intelligence
url	Digital Innovation for Civic Engagement Projects	Digital Innovation for Civic Engagement Projects from Tallinn University is a programme for digital transformation in communities and civic initiatives in order to involve more people into the discussion and decision-making process by using technology. In this hands-on training participants will work with their own projects to learn to initiate digitally innovative engagement projects…	- apply information security policies

***Table 26**: Courses teaching **AI** recommended skills for **Non-Technical** positions in **Hungary**.*

7.2.2. Cybersecurity

7.2.2.1. Manager

The chart below presents the number of courses that teach the recommended **Cybersecurity** related skills for **Manager** roles in **Hungary**.

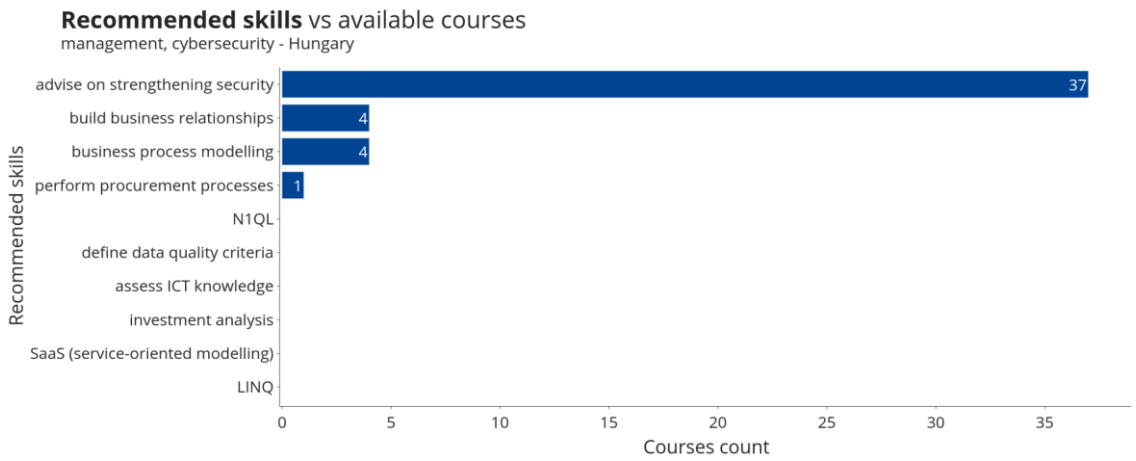

***Figure 94**: Number of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Hungary**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

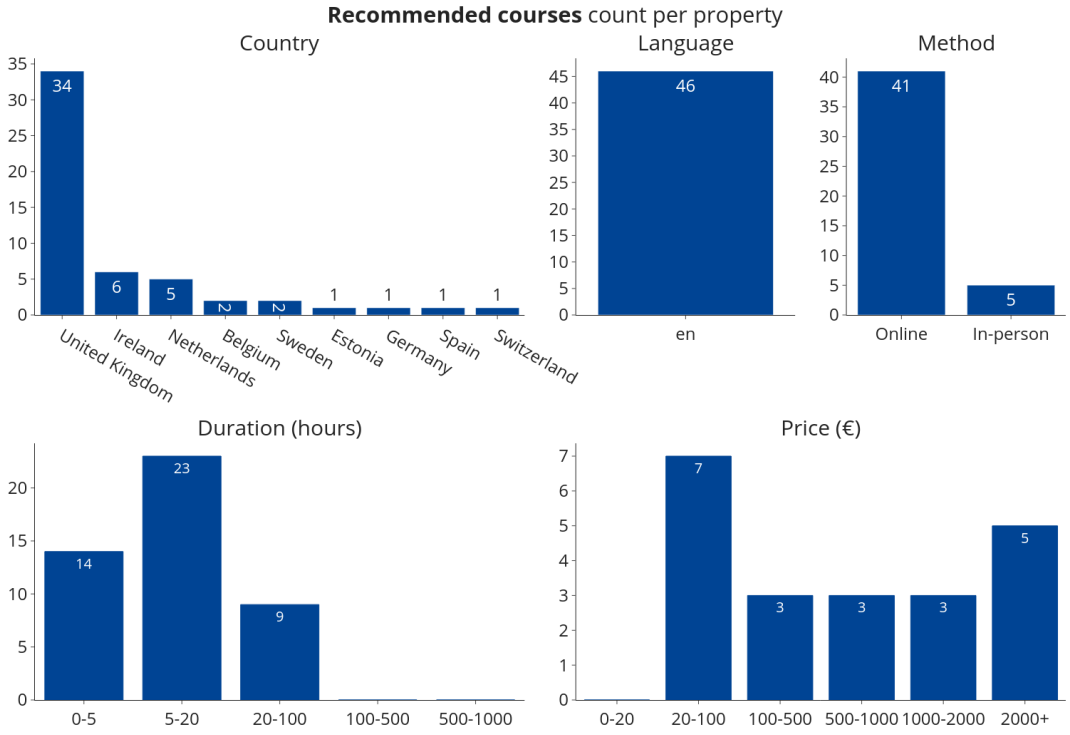

***Figure 95**: Features of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Manager** roles within **Hungary**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- advise on strengthening security
url	Cyber Security	This Cyber Security PG Dip programme from University of Essex Online explores the key trends within this high-demand field, developing your technical and practical skills to deal with the range of cyber security issues that can arise within an organisation. Launching into Cyber Security…	- advise on strengthening security
url	Gamification Workshop	Gamification is a process that helps you create interesting, interactive and fun content from the mundane by adding game-inspired elements. The best part about gamification is that it can be applied to many aspects in life, the fields of business, marketing and education being just a few examples...	- build business relationships
url	Cyber Security Economics	Learn how to make better decisions about security and IT by using state-of-the-art economic tools, security metrics and data analytics…	- advise on strengthening security
url	The Economics of Cybersecurity	This The Economics of Cybersecurity course at Delft University of Technology (TU Delft) provides an introduction to the field of cybersecurity through the lens of economic principles. Introduction to key concepts in security economics. Here, we provide an overview of how information security is shaped by economic mechanisms, such as misaligned incentives, information asymmetry, and externalities…	- advise on strengthening security

***Table 27**: Courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Hungary**.*

7.2.2.2. Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity** related skills for **Technical** roles in **Hungary**. Highlighted with a green diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

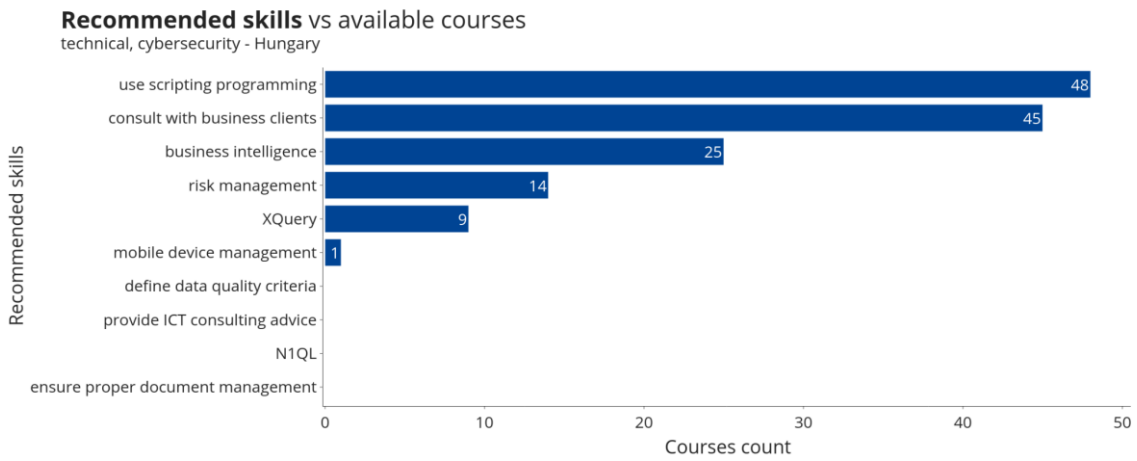

***Figure 96**: Number of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Hungary**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

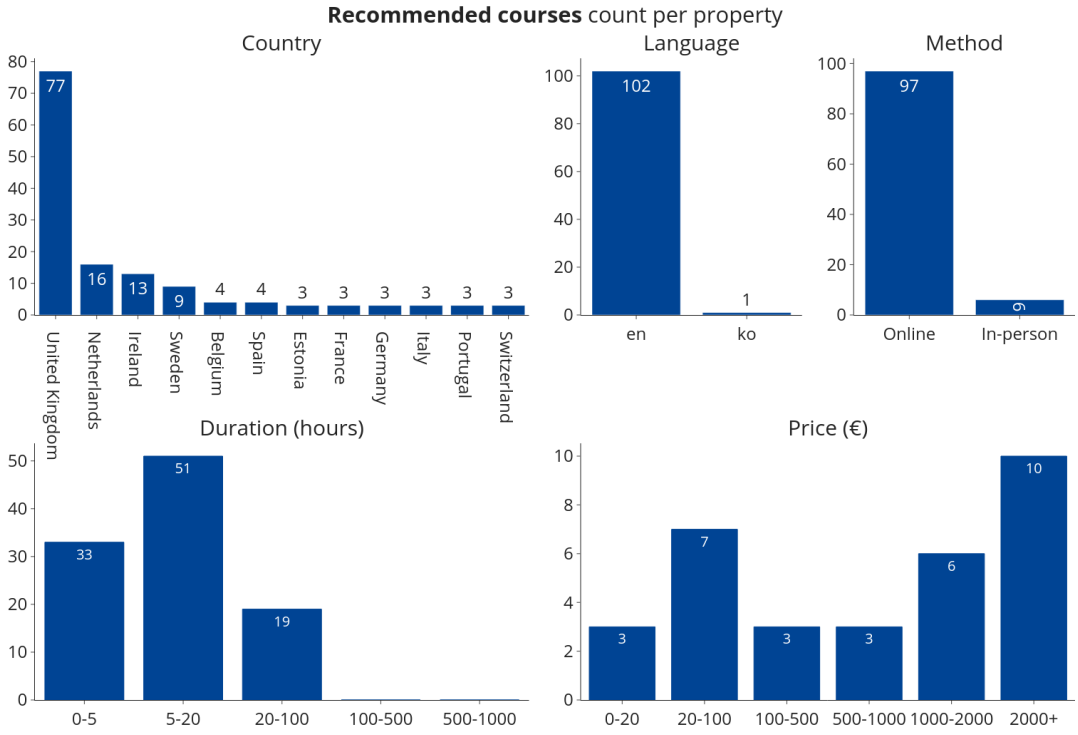

***Figure 97**: Features of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Cybersecurity** capabilities for **Technical** roles within **Hungary**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- risk management
url	Criminology - Violence Risk Assessment	Malmö University offers the Criminology - Violence Risk Assessment programme. The aim of this course is for the student to develop in depth theoretical and criminological relevant knowledge about the risk concept and risk assessment of violence in different criminal justice and mental health contexts, such as police and forensic psychiatric settings…	- risk management
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- business intelligence
url	Computational Physics - Introductory Course	Malmö University offers the Computational Physics - Introductory Course programme. Basic mathematical operations. Solution of differential equations. Solution of eigenvalue problems…	- Xquery

***Table 28**: Courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Hungary**.*

7.2.2.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity** skills for **Non-Technical** roles in **Hungary**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

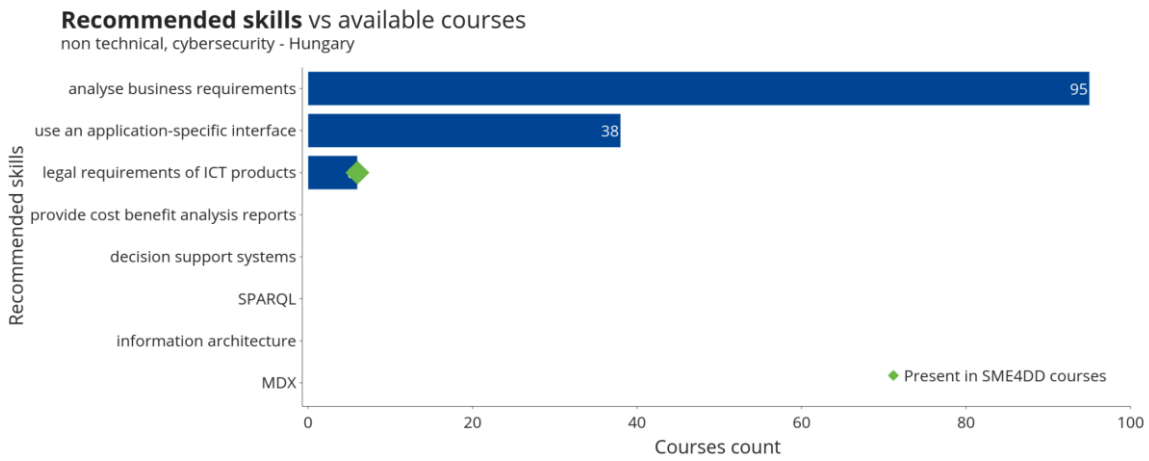

***Figure 98**: Number of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Hungary**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

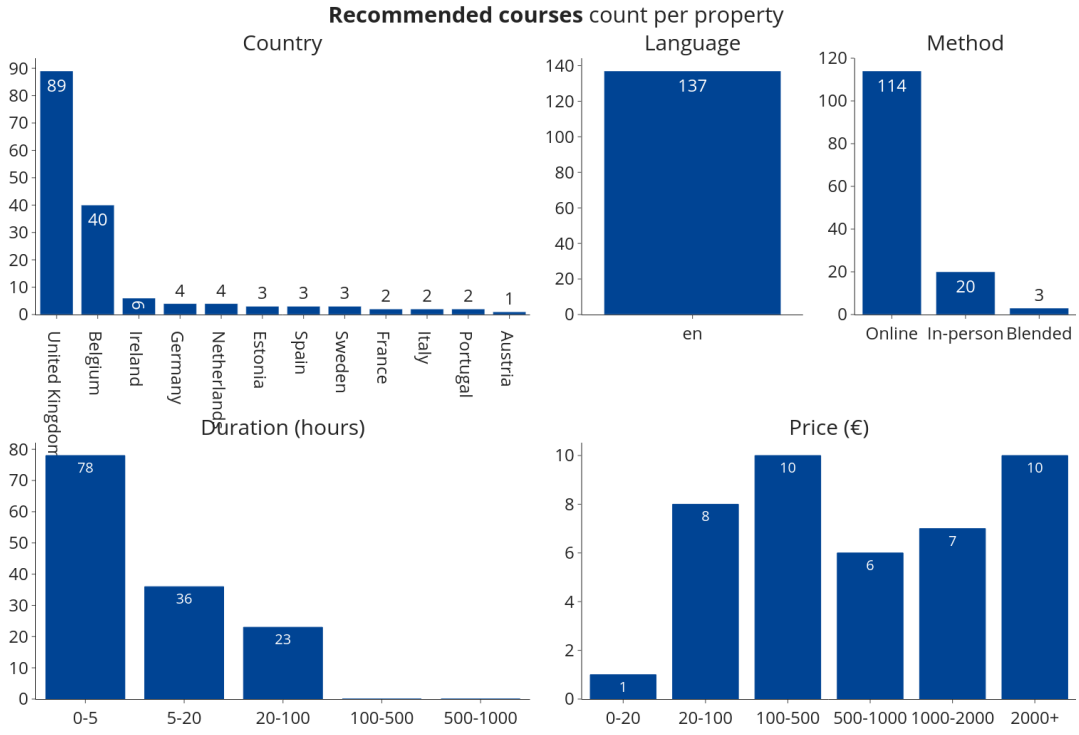

***Figure 99**: Features of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Non-Technical** roles within **Hungary**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular

skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
link	Advanced wireless networks	The Advanced wireless networks course offered by Luleå University of Technology will develop your knowledge in wireless networks. You will immerse yourself in the various technologies and gain practical knowledge in modern network technologies. Basic knowledge of wireless communication…	- analyse business requirements
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK.	-legal requirements of ICT products
url	Gamification Workshop	Gamification is a process that helps you create interesting, interactive and fun content from the mundane by adding game-inspired elements. The best part about gamification is that it can be applied to many aspects in life, the fields of business, marketing and education being just a few examples…	- analyse business requirements
url	Data Analytics	By undertaking the Data Analytics programme from CareerFoundry, you will learn all of the skills, tools, and processes you need to become a data analyst. Data Analytics in Practice…	- analyse business requirements

***Table 29**: Courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Hungary**.*

7.2.3. Blockchain

7.2.3.1. Manager

The chart below presents the number of courses that teach the recommended **Blockchain**-related skills for **Manager** roles in **Hungary**.

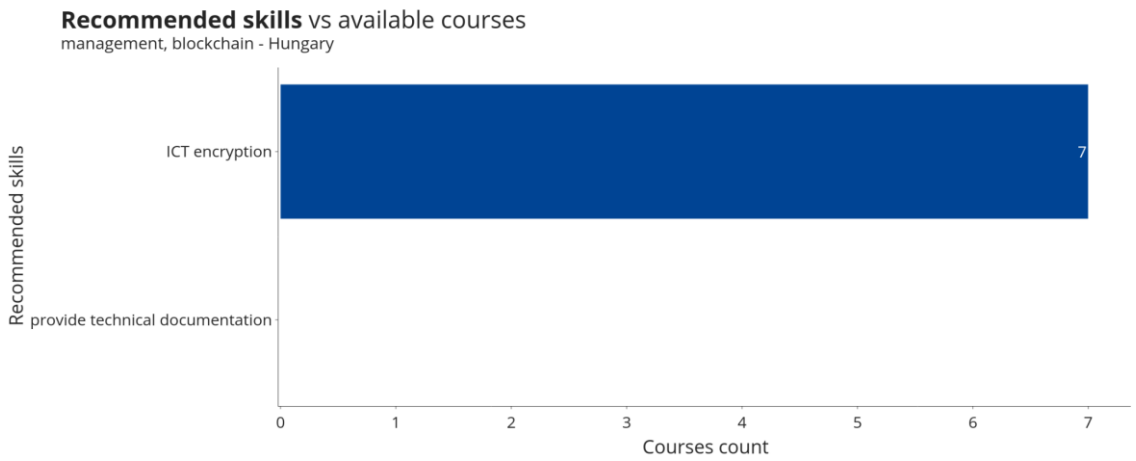

***Figure 100**: Number of courses teaching **Blockchain** recommended skills for **Manager** positions in **Hungary**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

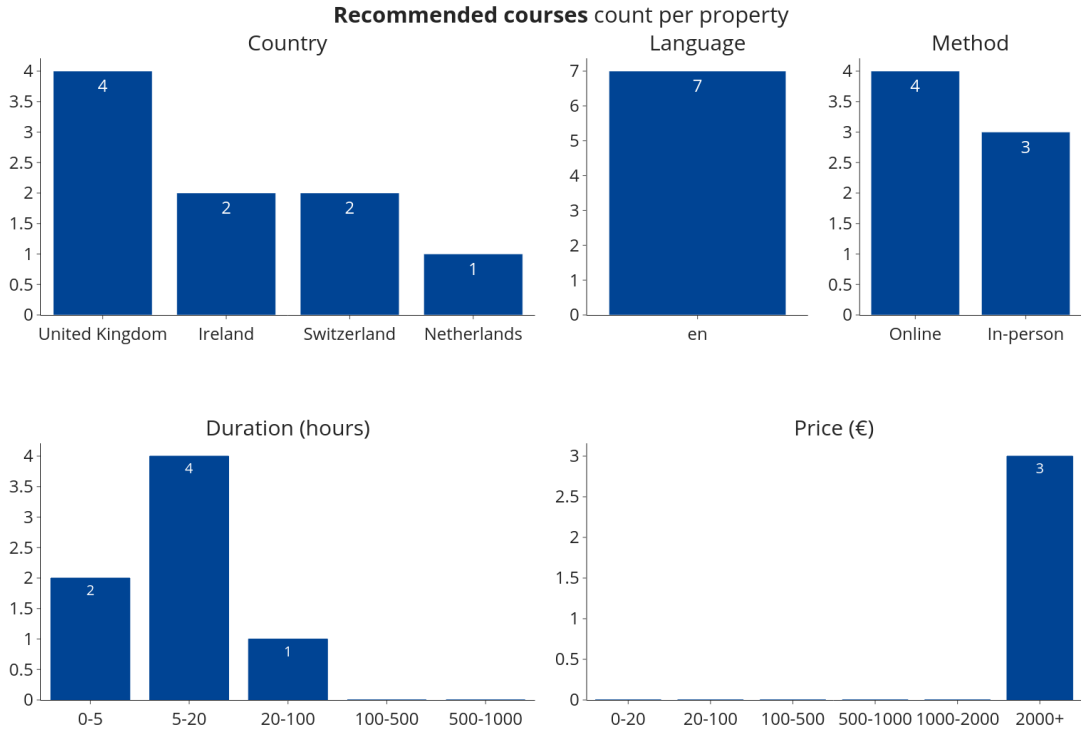

***Figure 101**: Features of courses teaching **Blockchain** recommended skills for **Manager** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Blockchain** expertise necessary for **Manager** roles within **Italy**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Computer Science	The Computer Science provided by ETH Zurich - Swiss Federal Institute of Technology offers a broad selection of courses taught by leading experts in computer science. These courses cover foundations as well as cutting-edge developments. Data Management Systems	- ICT encryption

***Table 30**: Courses teaching **Blockchain** recommended skills for **Manager** positions in **Hungary**.*

7.2.3.2. Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Technical** roles in **Hungary**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

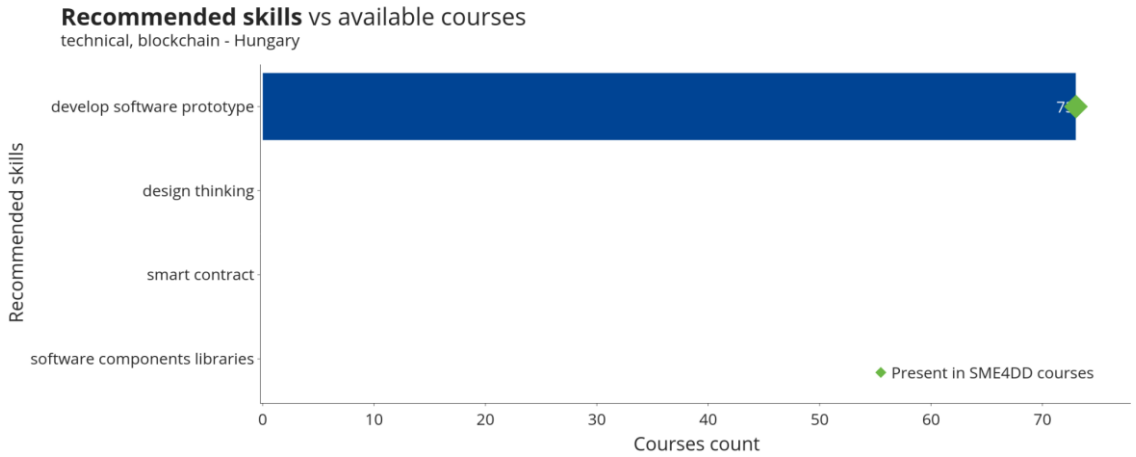

***Figure 102**: Number of courses teaching **Blockchain** recommended skills for **Technical** positions in **Hungary**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

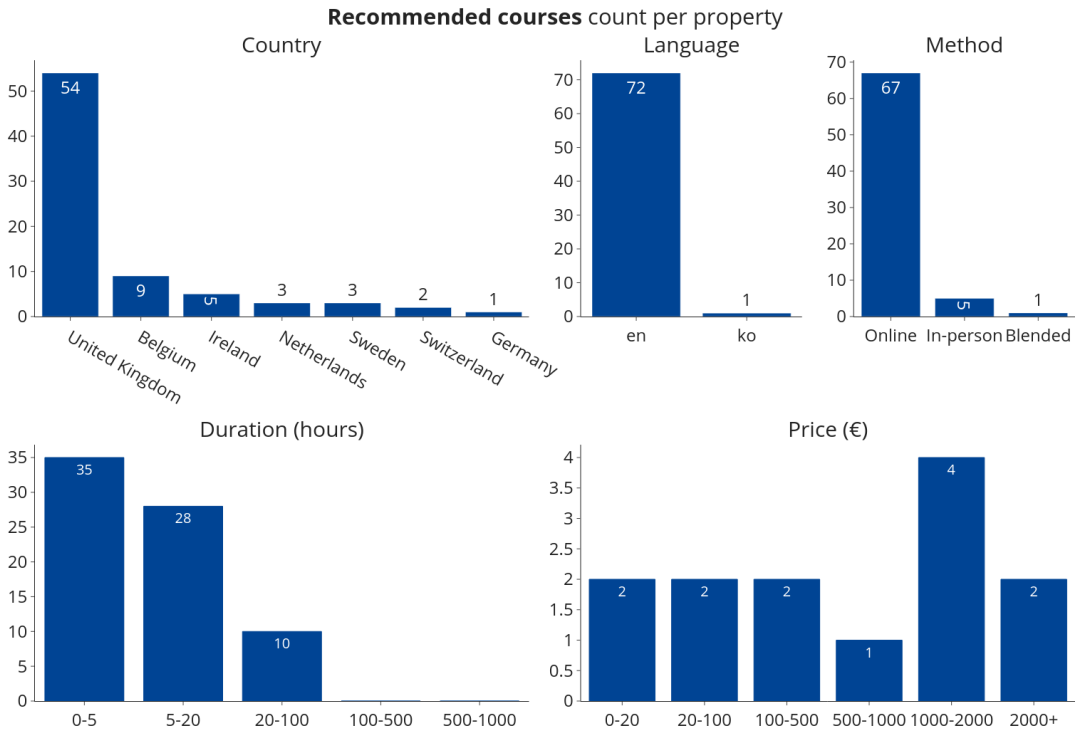

***Figure 103**: Features of courses teaching **Blockchain** recommended skills for **Technical** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Technical** roles within **Italy**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	App Development with Flutter and Dart	Be able to build any Android or iOS app you want based on Dart and Flutter. Save time, money and your sanity when you learn Dart and Flutter in International Open Academy's budget-friendly, jargon-free App Development with Flutter and Dart video course now. FlutterInstalling Android StudioInstalling Flutter SDKExploring Android StudioRunning your first Flutter appExploring your first Flutter app…	- develop software prototype
url	Advances in Software Development	Malmö University offers the Advances in Software Development programme. The aim of this course is for students of computer science to establish a deep understanding for best practices and current research related to software development. This includes collaboratively working with fellow students in order to critically reflect upon core advances in software development.	- develop software prototype
url	Global Software Development	Develop the technical and organisational skills you need to practise software	- develop software prototype

Link	Name	Description	Skills
		engineering in a globally distributed environment…	
url	Automated Software Testing	Software testing gets a bad rap for being difficult, time-consuming, redundant, and above all - boring. But in fact, it is a proven way to ensure that your software will work flawlessly and meet release schedules. In this two-course series, we will teach you automated software testing in an inspiring way…	- develop software prototype

***Table 31**: Courses teaching **Blockchain** recommended skills for **Technical** positions in **Hungary**.*

7.2.3.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Non-Technical** roles in **Hungary**.

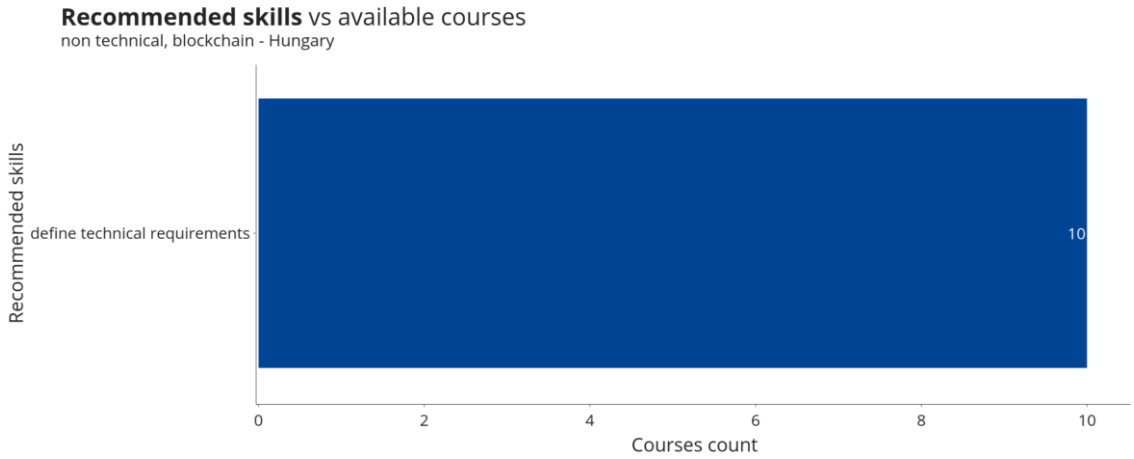

***Figure 104**: Number of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Hungary**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

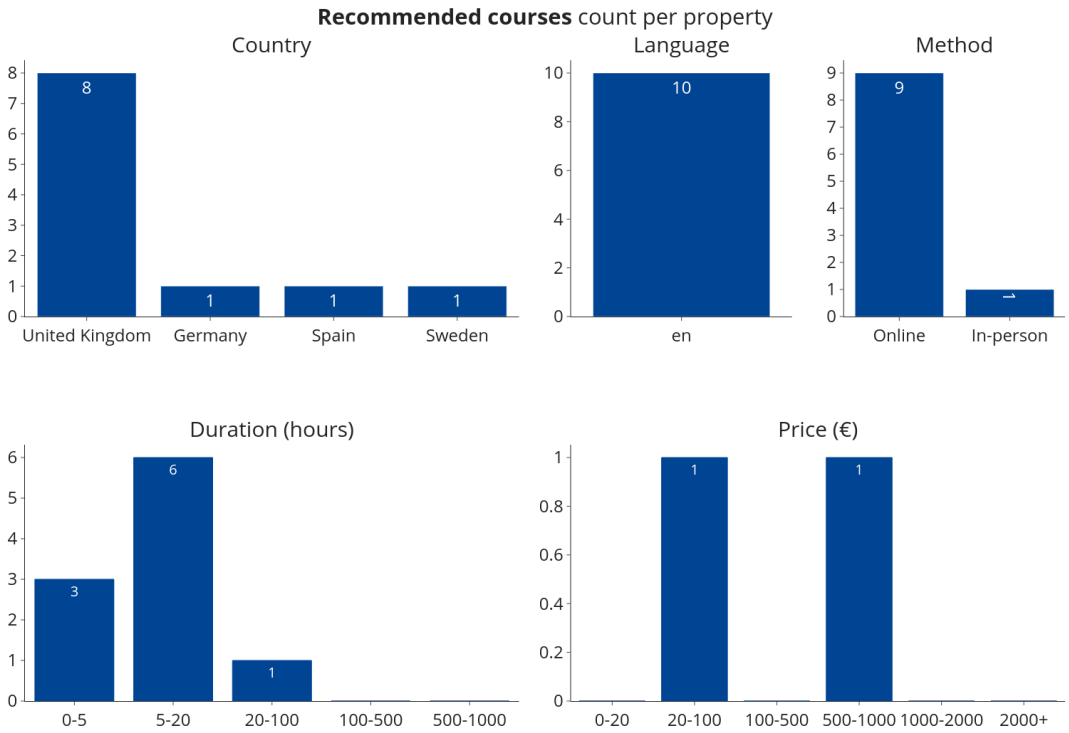

***Figure 105**: Features of courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Hungary**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Non-Technical** roles within **Hungary**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Mining for Industry	The Data Mining for Industry course offered by Luleå University of Technology will introduce you to data mining and how it might enable businesses to drive better business results by analysing their different data using predictive and prescriptive tools. machine learning techniques for classification, regression, and clustering…	- define technical requirements
url	Modern Cloud-Project with Java	Each group in this Modern Cloud-Project with Java course at TU Berlin will develop an Web-Application that runs in the cloud. Requirements engineering Source code managementWorking in a teamJava-Framework Spring boot Running Containers with Docker, Manage Databases, Automatic tests, Front-End development with HTML, JavaScript and CSS, Cloud Environments…	- define technical requirements

***Table 32**: Courses teaching **Blockchain** recommended skills for **Non-Technical** positions in **Hungary**.*

7.3. Conclusion

7.3.1. Missing skills per Categories on the targeted Verticals

In the Hungarian context, examining AI-related skills reveals intriguing trends across different roles. For managers, acquiring expertise in statistics would be of substantial value, aligning with the needs of business analysis. In the AI field, skills like PostgreSQL and conducting market research stand out as useful proficiencies. In the realm of blockchain, mastery of ICT encryption and technical documentation is required, while in cybersecurity, building business relationships, modelling business processes, and defining data quality criteria emerge as crucial skills.

For technical roles, as seen in the AI domain, competence in machine learning (ML), web programming, and PHP is essential. In cybersecurity, risk management, the utilisation of scripting programming, and business intelligence surface as fundamental competencies. In the blockchain sector, a design thinking mindset, an understanding of smart contracts, and other technical aptitudes are desired skills.

In the case of non-technical roles, as in AI, visual presentation techniques are of significant interest. In cybersecurity, data confidentiality and cost-benefit analysis are emphasised. In the blockchain realm, understanding technologies and defining technical requirements are notable skills that are not strictly technical but remain crucial for success. In all these scenarios, the skill landscape enriches and adapts to meet the changing demands of the contemporary business environment.

7.3.2. Skills covered by the SME4DD courses with respect to the target audience

We can see marked with a green diamond in the previous plots the skills covered by the SME4DD courses, and in the Annexes at the end of the document the actual list of skills per course is provided.

In the field of artificial intelligence, SME4DD courses recommend the skill of ML programming for the technical role. Alongside 17 other European courses, this skill is the most commonly offered among the courses used in the analysis. However, for manager and non-technical roles, SME4DD courses do not contribute to the skills needed for these positions in the realm of artificial intelligence.

In the realm of cybersecurity, SME4DD courses recommend the skill "legal requirement of ICT products" for the non-technical role. This skill is also present in the rest of the European courses but in lesser quantity compared to the other skills required for this role.

For the blockchain sector, the skill "develop software prototype" is the most frequent among European courses and is also included in the recommendations of SME4DD courses. This skill is the only one that is represented in both European and SME4DD courses and is needed for the technical role in the field of blockchain.

For the rest of the roles, SME4DD courses do not have representation in the skills recommended for these positions.

7.3.3. Skills needed on the market but not covered by the SME4DD courses

In the artificial intelligence sector, the skills not covered by SME4DD courses can be grouped into skills related to database knowledge, such as PostgreSQL for the manager and MySQL for the technical role. For the manager, there is also a lack of skills related to the business sector, such as the ability to "perform business analysis" or "manage business knowledge."

In the cybersecurity sector, a trend of missing business-related skills is also observed for managers. Skills not covered by SME4DD courses include "business process modelling" and "build business relationships." This is not only a gap for managers but also for technicians, encompassing skills like "risk management" that are not addressed by SME4DD courses.

In the blockchain sector, the skill covered by SME4DD courses is "develop software prototype." The rest of the skills not covered lack representation in other courses. Examples of these skills include "smart contract," "design thinking," and "software component libraries." Notably, for non-technical roles, there is a lack of the skill "define technical requirement," which is not covered by SME4DD courses.

7.3.4. European courses covering the missing skills identified

As with the courses we have been looking at in the report, the courses recommended for Hungarian SMEs have the same distribution of location, with the United Kingdom standing out as the country with the most courses in all areas. In addition, the predominant language is still English and the method by which the course can be taken is online.

The distribution of duration stands out, being previously predominant the short courses with a range of 0 to 5 hours. Now we see in some sectors, such as courses for cybersecurity roles, a longer duration for these courses.

We find a relationship between the role and the price of the courses for the technician compared to the other roles. The courses for the technician role have a slightly higher price distribution than the other roles. Courses are mostly between 1,000-2,000 euros, while in the rest of the roles we see courses mostly between 20-100 and 100-500 euros.

8. Sweden

Moving on to the next part, we're going to take a close look at data we've gathered from various companies in Europe, with a special focus on those in Sweden. Our goal with this initial investigation is to understand what's in our dataset and set the stage for analysing skills.

Our main aim remains the same: to give you a clear picture of Swedish companies in our dataset and compare them to other European ones. By doing this, we hope to get a solid grasp of what our study is based on and uncover any potential biases or nuances that could affect our assessment of skills.

This first step, which includes things like the number of samples, how employees are spread out, and the types of technology these companies are involved in, is an important introduction to our in-depth analysis of the prevalent technology skills in these businesses.

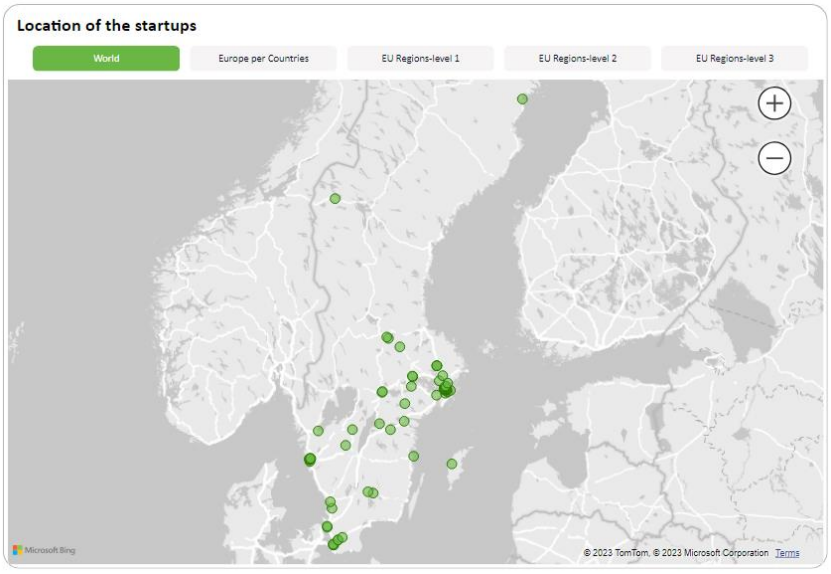

***Figure 106**: Screen capture from the geographical view of the Skill Sync displaying the organisations located in **Sweden**.*

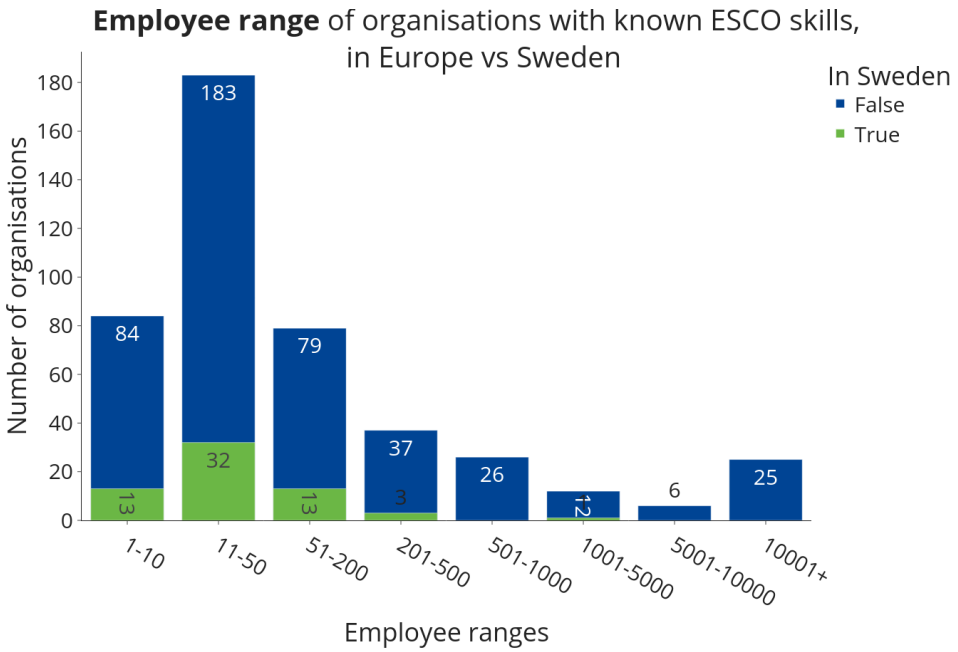

***Figure 107**: Comparison of Employee Counts. **Swedish** Organisations vs. European Counterparts.*

The following plot offers a brief glimpse into the industry affiliations of the sampled **Swedish** companies. It outlines the key sectors that define Sweden's corporate landscape, highlighting areas of specialisation and potential intersections with technology. Readers can draw their own conclusions regarding Sweden's technological strengths from this overview.

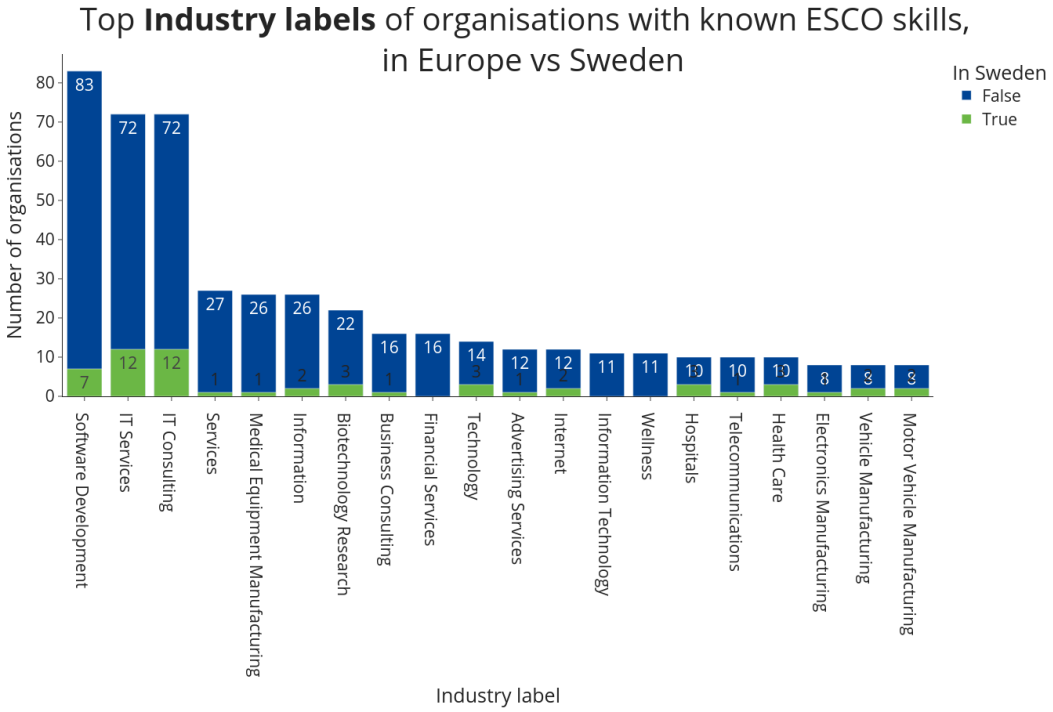

***Figure 108**: Comparison of Industry. **Swedish** Organisations vs. European Counterparts.*

8.1. Current Expertise

Shifting our focus to the "Current Skills" section, we delve into a comprehensive analysis of the prevalent competencies within crucial technological domains: Artificial Intelligence, Blockchain, and Cybersecurity. Each subsequent subchapter unveils insights into the primary skills demonstrated among Swedish companies, distinguished across distinct role categories: Managers, Technical Specialists, and Non-Technical Personnel. This analytical journey endeavours to spotlight Sweden's technological proficiency, extrapolated from the sampled companies, within these pivotal realms. By delving into this granular examination, our goal is to delineate the intricate skills terrain of the country and emphasise the roles that play a pivotal role in bolstering its technological expertise.

8.1.1. Artificial Intelligence

8.1.1.1. Manager

The following chart displays the key AI related skills identified for Manager positions in **Sweden**. The skills present in SME4DD courses are highlighted in **green**:

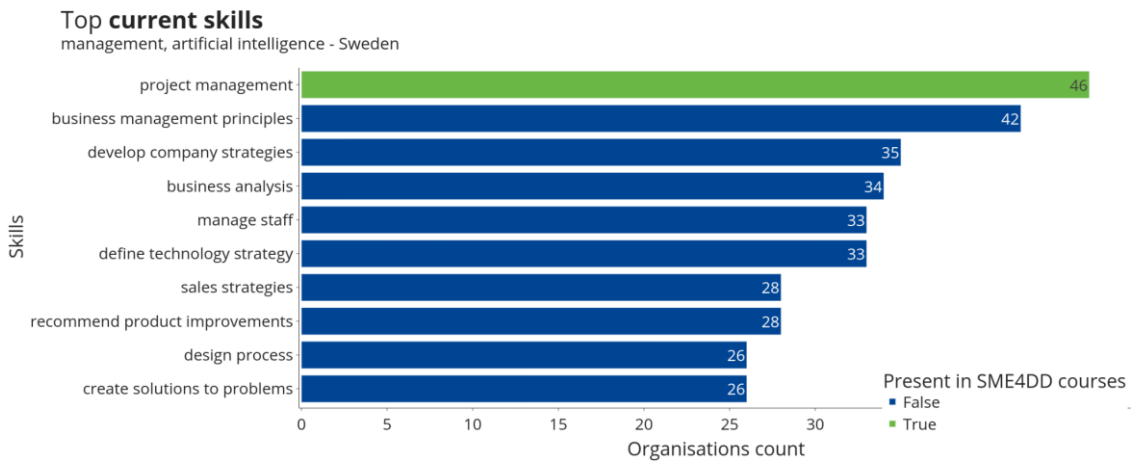

***Figure 109**: Key **AI** skills identified for **Manager** positions in **Sweden**.*

8.1.1.2. Technical

The following chart displays the key **AI** related skills identified for **Technical** positions in **Sweden**. The skills present in SME4DD courses are highlighted in **green**:

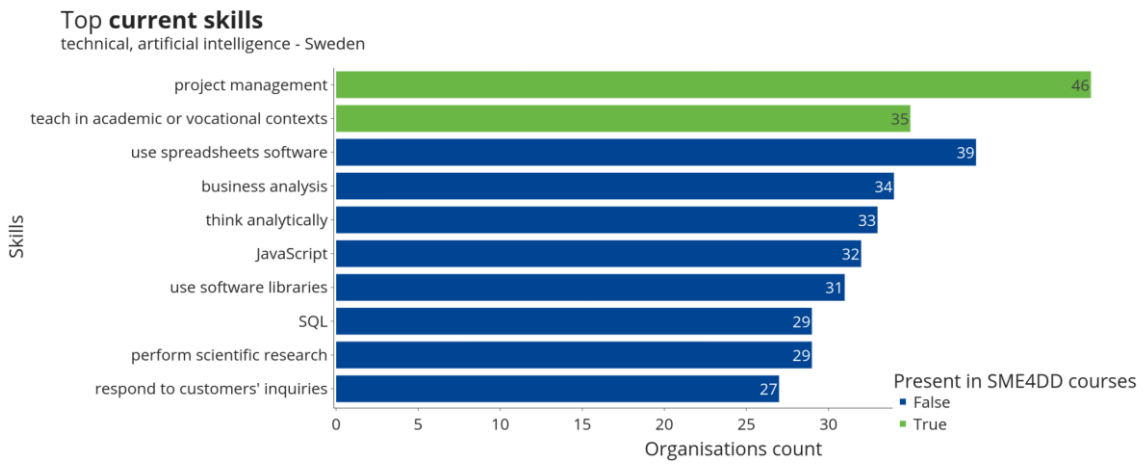

***Figure 110**: Key **AI** skills identified for **Technical** positions in **Sweden**.*

8.1.1.3. Non-Technical

The following chart displays the key **AI** skills identified for **Non-Technical** positions in **Sweden**:

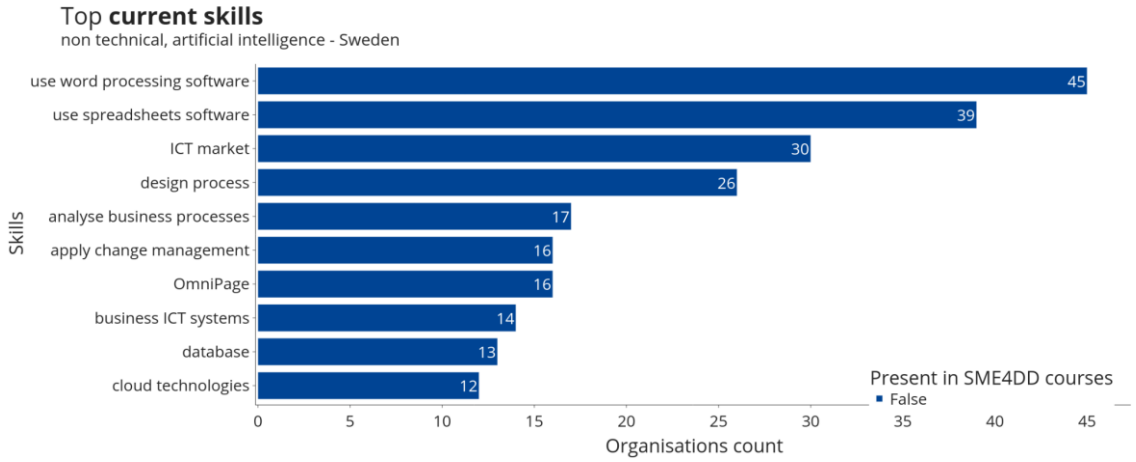

***Figure 111**: Key **AI** skills identified for **Non-Technical** positions in **Sweden**.*

8.1.2. Cybersecurity

8.1.2.1. Manager

The chart below showcases the essential **Cybersecurity** skills for **Manager** roles in **Sweden**. Skills covered in the SME4DD courses are highlighted in **green**:

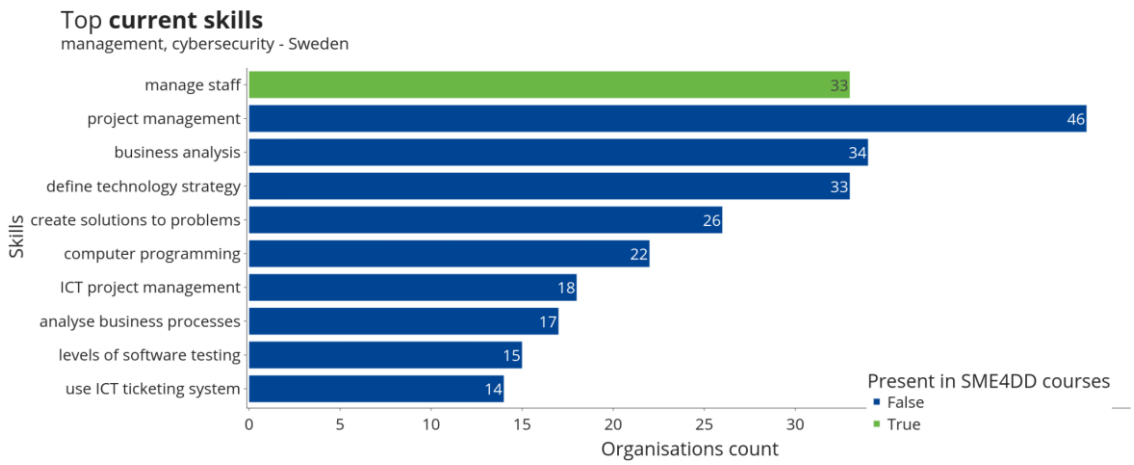

***Figure 112**: Key **Cybersecurity** skills identified for **Manager** positions in **Sweden**.*

8.1.2.2. Technical

The chart below showcases the essential **Cybersecurity** skills for **Technical** roles in **Sweden**:

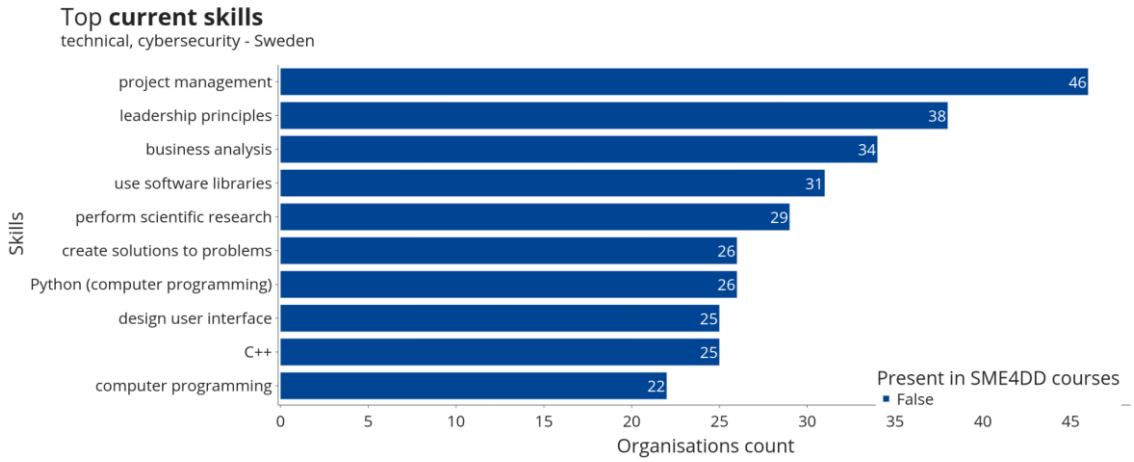

***Figure 113**: Key **Cybersecurity** skills identified for **Technical** positions in **Sweden**.*

8.1.2.3. Non-Technical

The chart below showcases the essential **Cybersecurity** skills for **Non-Technical** roles in **Sweden**. Skills covered in the SME4DD courses are highlighted in **green**:

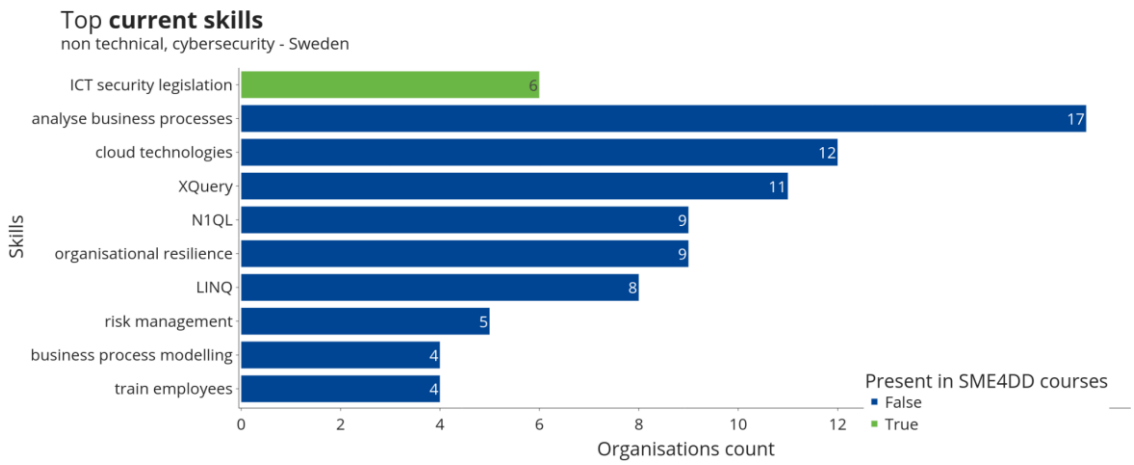

***Figure 114**: Key **Cybersecurity** skills identified for **Non-Technical** positions in **Sweden**.*

8.1.3. Blockchain

8.1.3.1. Manager

The following chart displays the key **Blockchain** related skills identified for **Manager** positions in **Sweden**:

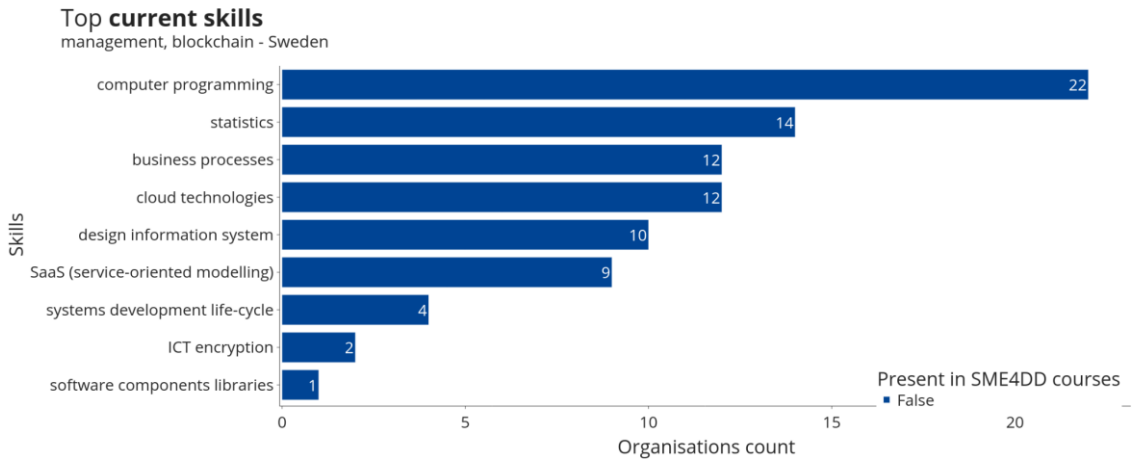

***Figure 115**: Key **Blockchain** skills identified for **Manager** positions in **Sweden**.*

8.1.3.2. Technical

The chart below showcases the essential **Blockchain** skills for **Technical** roles in **Sweden**:

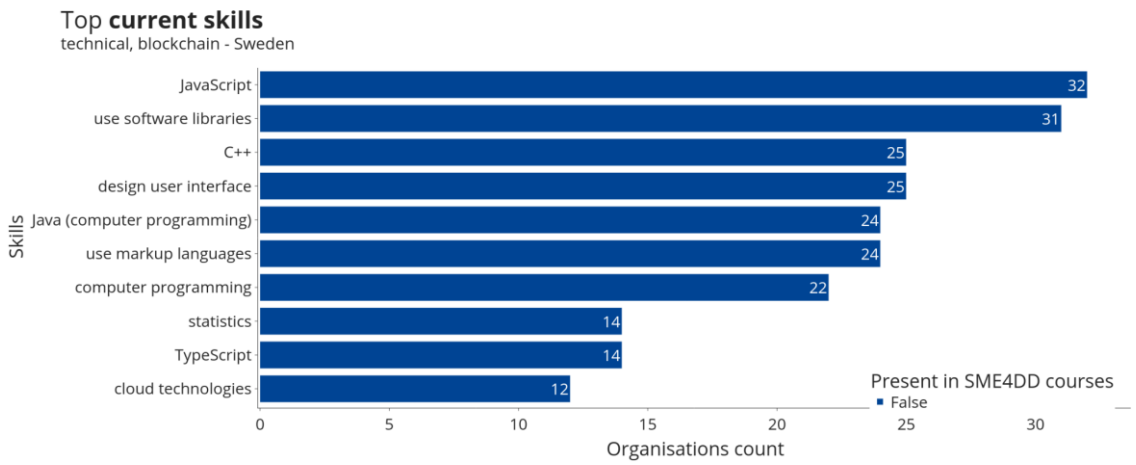

***Figure 116**: Key **Blockchain** skills identified for **Technical** positions in **Sweden**.*

8.1.3.3. Non-Technical

The chart below showcases the essential **Blockchain** skills for **Non-Technical** roles in **Sweden**:

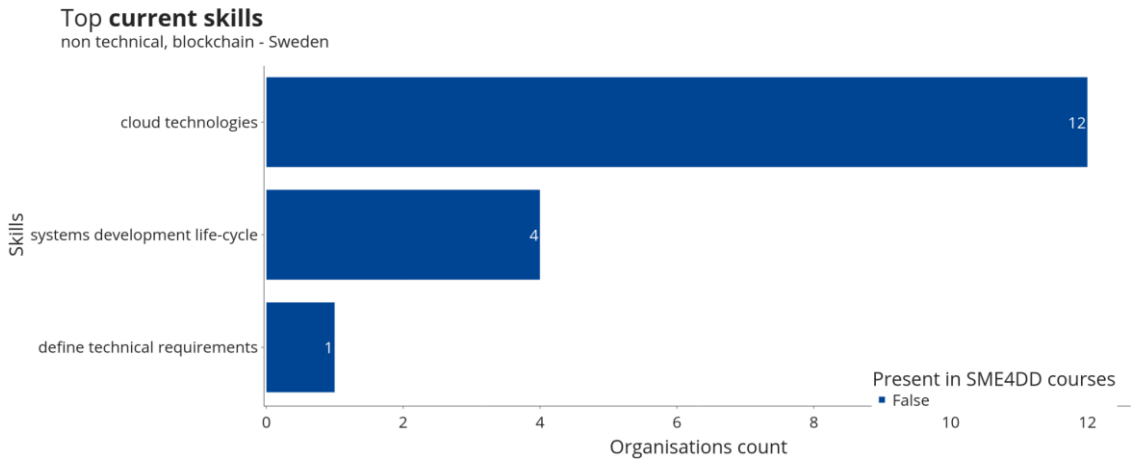

***Figure 117**: Key **Blockchain** skills identified for **Non-Technical** positions in **Sweden**.*

8.2. Lacking Expertise

Moving ahead to the "Lacking Expertise" portion, we move beyond evaluating the current skill sets to delve into the areas where each country's knowledge requires augmentation to match the prevailing European standards. This exploration zeroes in on distinct domains within Artificial Intelligence, Blockchain, and Cybersecurity that necessitate attention.

Our assessment encompasses not only the identification of missing skills but also emphasises the ones addressed by the SME4DD curriculum. Furthermore, we present a thorough sampling and analysis of the existing European competence courses available within our database, providing a solid foundation for informed decision-making in pursuit of knowledge enhancement.

8.2.1. Artificial Intelligence

8.2.1.1. Manager

The chart below presents the number of courses that teach the recommended **Artificial Intelligence**-related skills for **Manager** roles in **Sweden**.

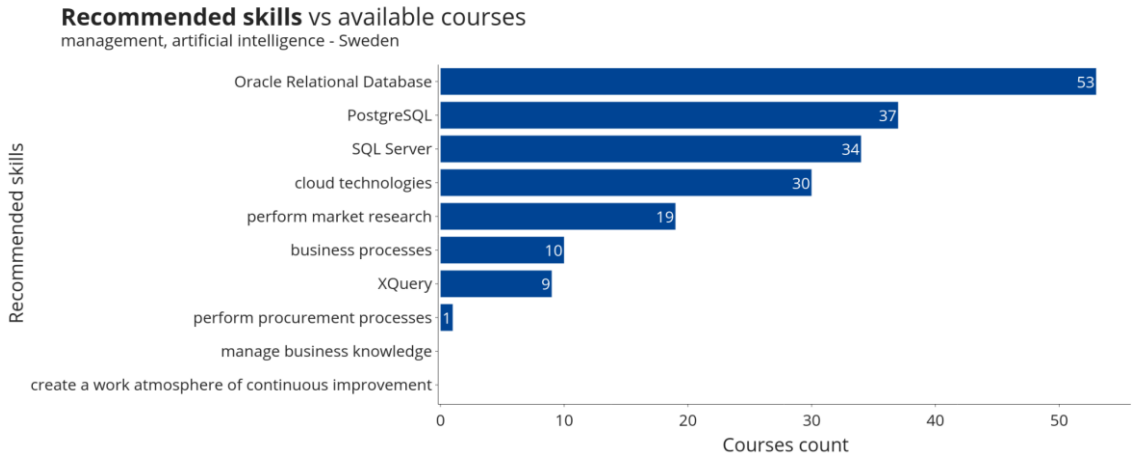

***Figure 118**: Number of courses teaching **AI** recommended skills for **Manager** positions in **Sweden**.*

Delving deeper into the analysis of these courses, the subsequent set of visual representations showcases them according to various parameters: geographical location, language of instruction, teaching methodology, duration, and cost.

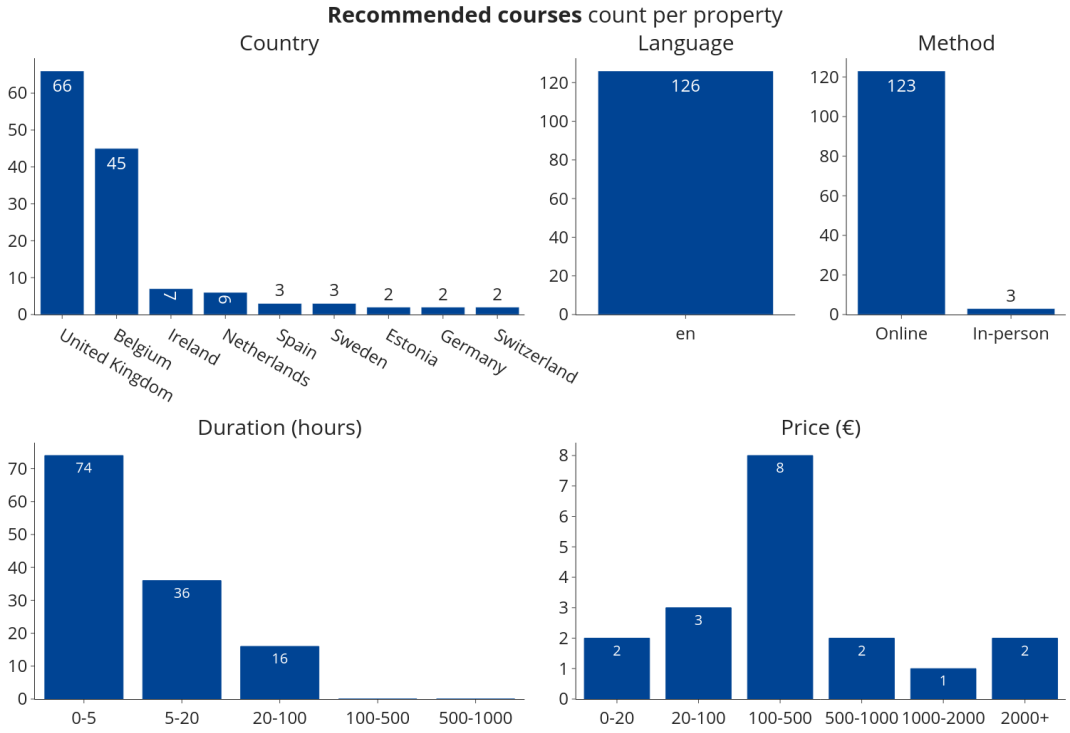

***Figure 119**: Features of courses teaching **AI** recommended skills for **Manager** positions in **Sweden**.*

The table below presents a curated list of courses that impart the recommended **Artificial Intelligence** related skills for **Manager** roles in **Sweden**. For each course, you'll find its name, a concise description, a direct link to the course's official webpage, and the skills identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	SQL for the Web	Using databases is a skill that, once learned, will last you far into the future. This SQL for the Web course from Warnborough College will provide you with an in-depth introduction to SQL – which is one of the most used database languages by professional IT businesses. Fundamentals of SQL…	- Oracle Relational Database - SQL Server
url	Data Mining	In the Data Mining course offered by Örebro University, we aim to cover the most applicable topics of understanding the data. exploratory data analysis (such as preprocessing, visualisation, and statistical techniques)...	- Oracle Relational Database
url	Essential Marketing Management	The broad aim of Queen Mary University of London's Essential Marketing Management two-day interactive course is intended to provide non-marketing professionals with the basic concepts and practices of modern marketing in a changing world. As a management function, marketing's role is to scan the customer and competitor environment, proactively seeking opportunities and ways to cost-effectively respond to those opportunities….	- Perform market research
url	Gamification Workshop	Gamification is a process that helps you create interesting, interactive and fun content from the mundane by adding game-inspired elements. The best part about gamification is that it can be applied to many aspects in life, the fields of business, marketing and education being just a few examples…	- Perform market research - Business processes

***Table 33**: Courses teaching **AI** recommended skills for **Manager** positions in **Sweden**.*

8.2.1.2. Technical

The chart below presents the number of courses that teach the recommended **Artificial Intelligence**-related skills for **Technical** roles in **Sweden**.

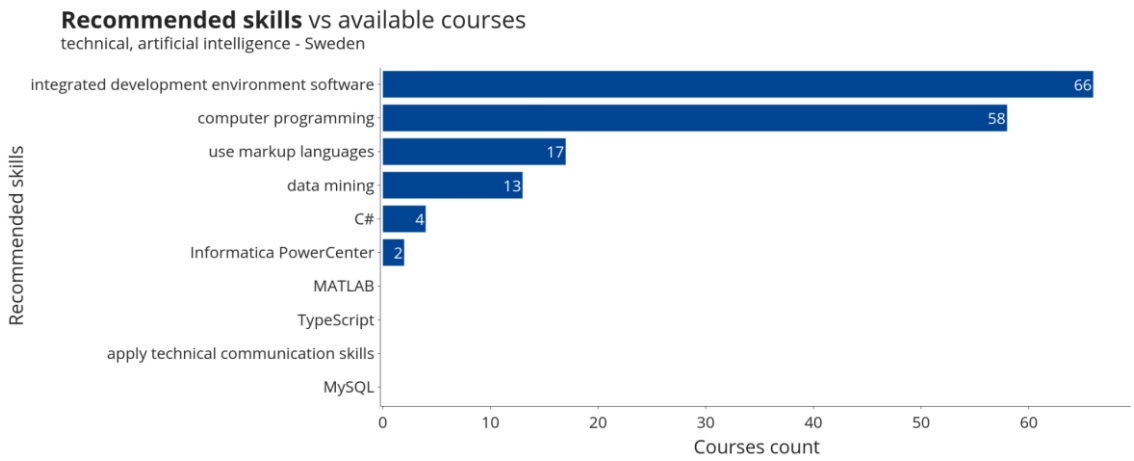

***Figure 120**: Number of courses teaching **AI** recommended skills for **Technical** positions in **Sweden**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

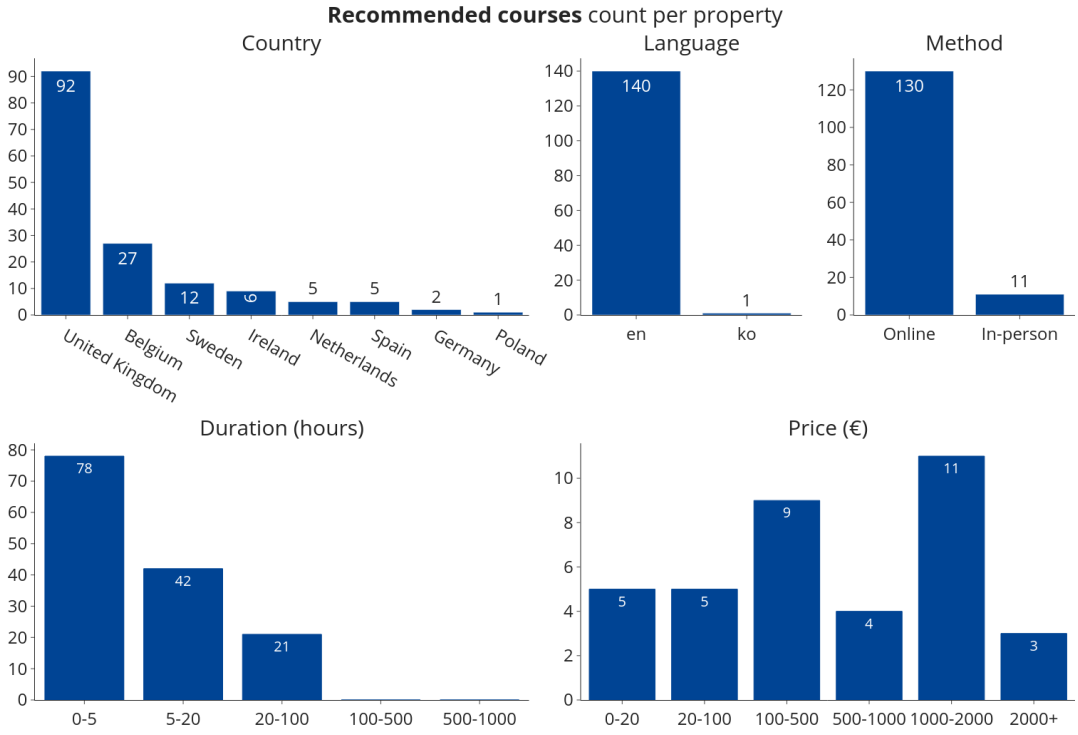

***Figure 121**: Features of courses teaching **AI** recommended skills for **Technical** positions in **Sweden**.*

The table that follows offers a carefully selected compilation of courses tailored to equip individuals with the essential **Artificial Intelligence**-related skills for **Technical** positions in **Sweden**. For every listed course, we provide the course name, a succinct overview, a direct hyperlink to its official website, and the specific skills as pinpointed by the Skill Sync AI engine, drawn from the course's metadata.

Link	Name	Description	Skills
url	Introduction to Programming in Python	In Introduction to Programming in Python at Vrije Universiteit Amsterdam you will learn how to solve problems using structured programming. Computer programming conceptsProgramming as a problem-solving toolThe Python languageThe use of Jupyter notebookBest coding practicesDebugging code…	- computer programming
url	Introduction to Functional Programming for Big Data Processing	This Introduction to Functional Programming for Big Data Processing course at Delft University of Technology (TU Delft) prepares you for big data processing in a unique way. You will be introduced to the principles of functional programming, learn the particular challenges of distributed systems, and how big data processing systems use functional programming to respond to these challenges…	- computer programming
url	Introduction to Functional Programming	The aim of this course is to teach the foundations of functional programming and how to apply them in the real world…	- computer programming
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data	- data mining

***Table 34**: Courses teaching **AI** recommended skills for **Technical** positions in **Sweden**.*

8.2.1.3. Non-Technical

The chart below presents the number of courses that teach the recommended **AI**-related skills for **Non-Technical** roles in **Sweden**.

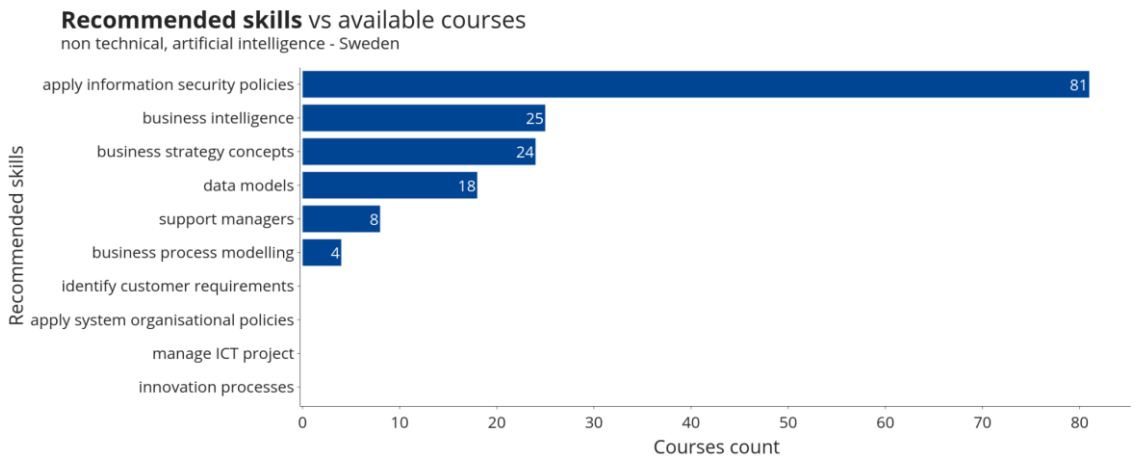

***Figure 122**: Number of courses teaching **AI** recommended skills for **Non-Technical** positions in **Hungary**.*

Upon conducting a thorough analysis of these courses, the upcoming series of visual illustrations presents them based on multiple criteria. Specifically, these graphics categorise the courses in terms of their geographical location, the language employed for instruction, the approaches adopted, the length of the course, and the associated fees.

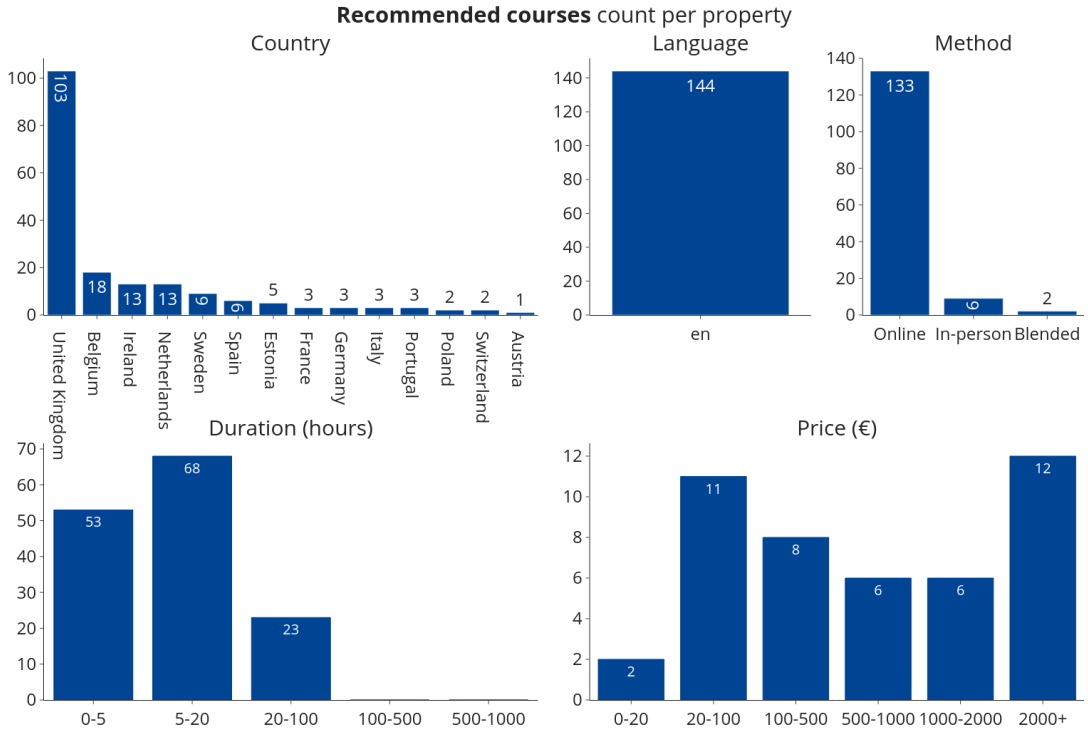

***Figure 123**: Features of courses teaching **AI** recommended skills for **Non-Technical** positions in **Sweden**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **AI**-related capabilities for **Non-Technical** roles within **Sweden**. For each course highlighted, we furnish not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's comprehensive metadata.

Link	Name	Description	Skills
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data…	- business intelligence
url	Data Mining	In the Data Mining course offered by Örebro University, we aim to cover the most applicable topics of understanding the data. exploratory data analysis (such as preprocessing, visualisation, and statistical techniques)...	- data models
url	Data Governance	On Data Governance at WU (Vienna University of Economics and Business) you will focus on data governance and its importance in an organisation, both from a theoretical and a practical perspective. Drivers of Data Governance…	- apply information security policies
url	Improve Your Business	This Improve Your Business course from Warnborough College is a quick guide to improving your business – learn the techniques and cover all your bases to make your business soar to greater heights. Recognising Problems – Where Things Go Wrong?...	- business intelligence

***Table 35**: Courses teaching **AI** recommended skills for **Non-Technical** positions in **Sweden**.*

8.2.2. Cybersecurity

8.2.2.1. Manager

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Manager** roles in **Sweden**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

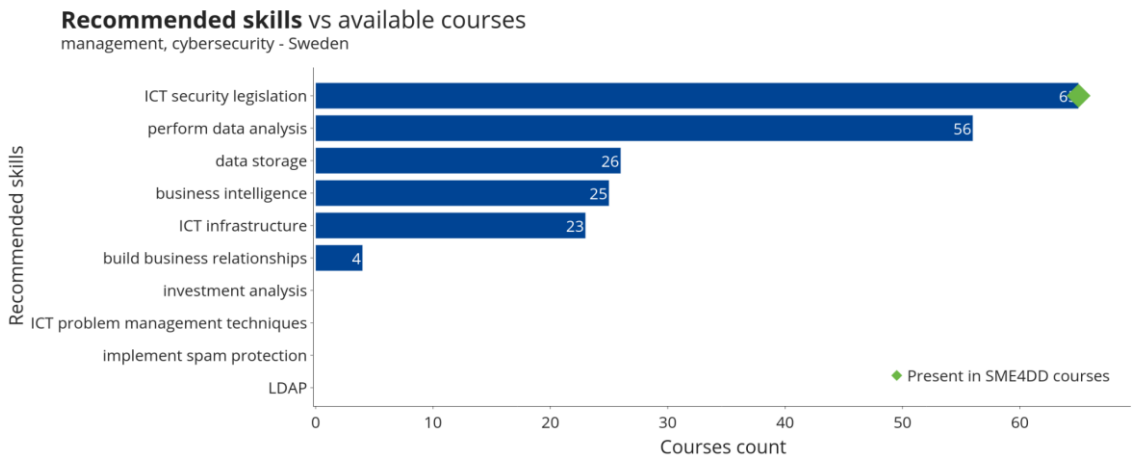

***Figure 124**: Number of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Sweden**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

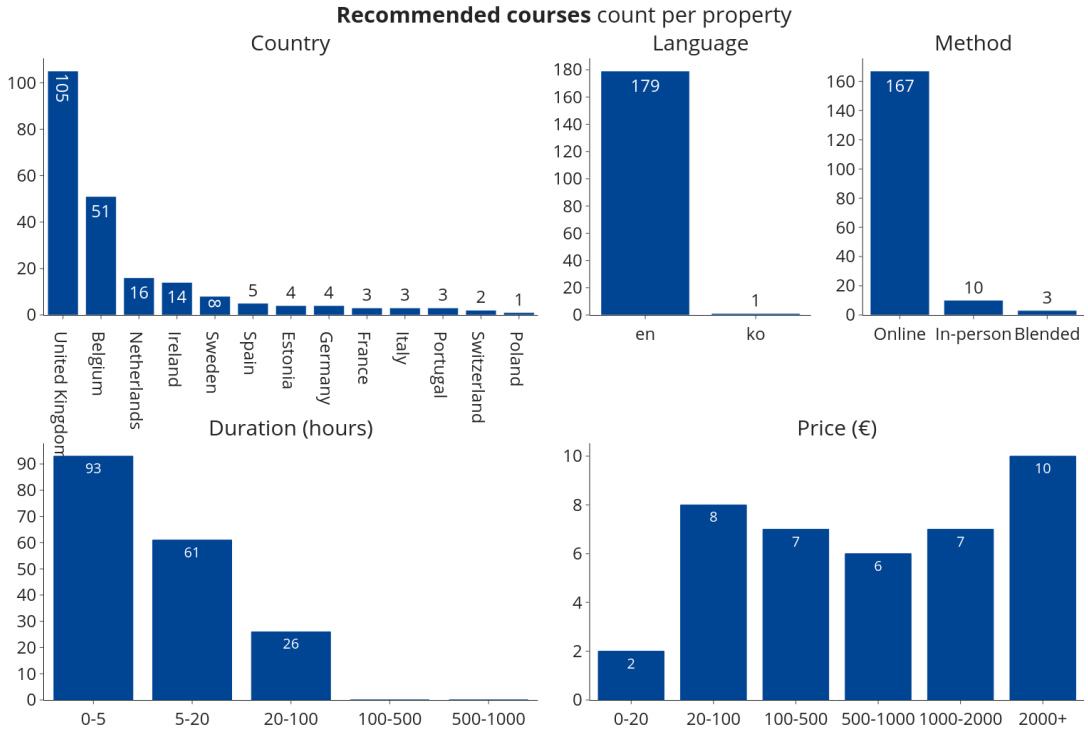

***Figure 125**: Features of courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Sweden**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Manager** roles within **Sweden**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Computer and network security	Through the Computer and network security course offered by Luleå University of Technology, you will learn the basics of IT security. You will learn to understand security threats and learn to design and implement security solutions. Cryptography…	- ICT security legislation
url	Cyber Security Economics	This The Economics of Cybersecurity course at Delft University of Technology (TU Delft) provides an introduction to the field of cybersecurity through the lens of economic principles. Introduction to key concepts in security economics. Here, we provide an overview of how information security is shaped by economic mechanisms, such as misaligned incentives, information asymmetry, and externalities.Measuring cybersecurity….	- ICT security legislation
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK.	- ICT security legislation
url	Data Science for Business	The Data Science for Business course offered by Kozminski University will help you learn how data-driven analytical thinking transforms business organisation and influences overall business performance, the amount of information offered in the course is a true compendium of these developments. Understanding Big Data	- business intelligence - perform data analysis - data storage

***Table 36**: Courses teaching **Cybersecurity** recommended skills for **Manager** positions in **Sweden**.*

8.2.2.2. Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity**-related skills for **Technical** roles in **Sweden**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

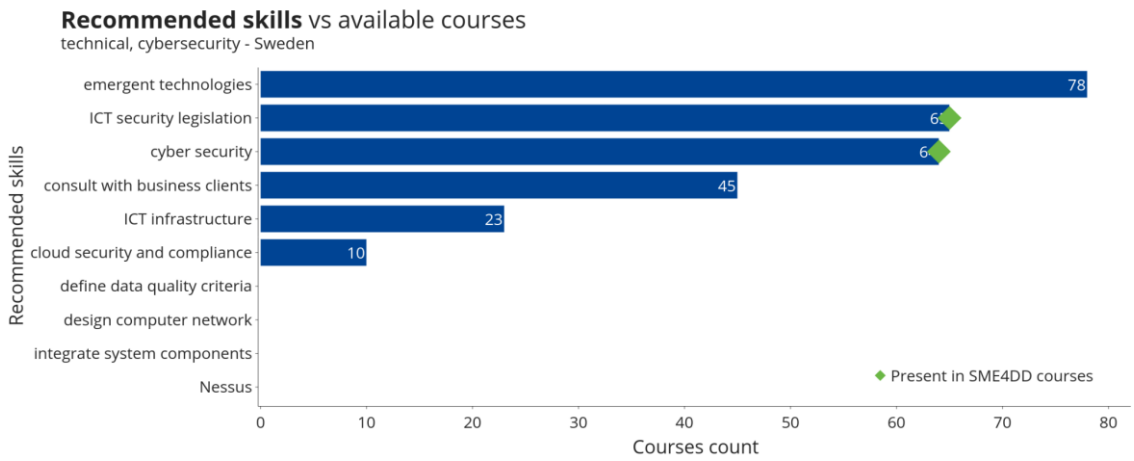

***Figure 126**: Number of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Sweden**.*

Diving further into the analysis of these courses, our comprehensive collection of visual data provides insights based on several crucial parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

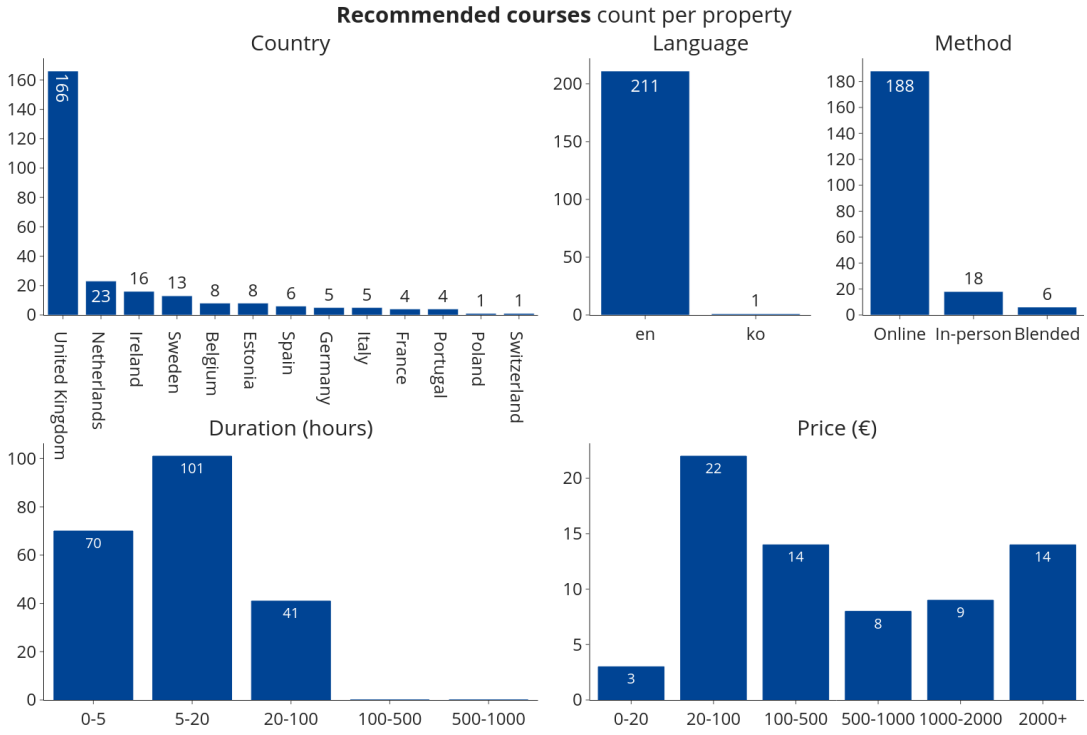

***Figure 127**: Features of courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Sweden**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Cybersecurity** capabilities for **Technical** roles within **Italy**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Machine Learning for Semiconductor Quantum Devices	Learn how to deploy artificial intelligence to control and calibrate semiconductor quantum computing chips…	- emergent technologies
url	Information Security	This online Information Security course from Warnborough College will teach you how to keep the information you hold on your computer secure…	- ICT infrastructure
url	Fundamentals of Quantum Information	Quantum information is at the heart of quantum computing: learn how it is mathematically represented via quantum circuits and how to manipulate quantum entanglement with these circuits…	- emergent technologies
url	The Economics of Cybersecurity	This The Economics of Cybersecurity course at Delft University of Technology (TU Delft) provides an introduction to the field of cybersecurity through the lens of economic principles. Introduction to key concepts in security economics. Here, we provide an overview of how information security is shaped by economic mechanisms, such as misaligned incentives, information asymmetry, and externalities.Measuring cybersecurity…	- ICT security legislation
url	Data Ethics, AI and Responsible Innovation	This Data Ethics, AI and Responsible Innovation course at The University of Edinburgh explores the social implications of our increased use of data-driven technologies. Medical robots, smart homes and cities, predictive policing, artificial intelligences – all are fuelled by data and all promise new benefits to society. help you understand and articulate the critical challenges we are all facing around data inspire you to design, criticise, and develop better intelligent systems to shape our future…	- emergent technologies

***Table 37**: Courses teaching **Cybersecurity** recommended skills for **Technical** positions in **Sweden**.*

8.2.2.3. Non-Technical

The chart below presents the number of courses that teach the recommended **Cybersecurity** skills for **Non-Technical** roles in **Sweden**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

***Figure 128**: Number of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Sweden**.*

After an analysis of these courses, the forthcoming set of visual representations offers a breakdown based on a variety of criteria. These infographics categorise courses by their geographical location, the language used for instruction, the teaching strategies employed, the duration of the course, and the related fees.

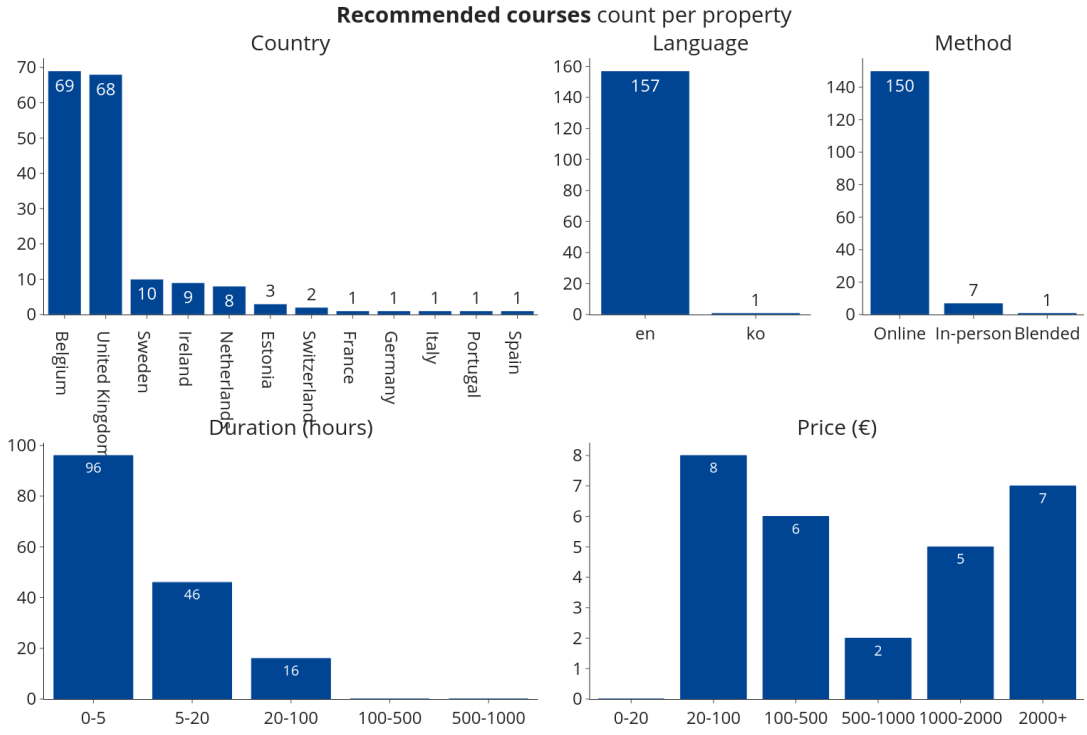

***Figure 129**: Features of courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Sweden**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with the pivotal **Cybersecurity** expertise necessary for **Non-Technical** roles within **Italy**. For each course enumerated, we not only furnish the course name but also deliver a description, a direct link to its authoritative website, and a detailed breakdown of particular

skills identified by the Skill Sync AI engine, sourced directly from the course's intrinsic metadata.

Link	Name	Description	Skills
url	Cyber Security for Public Leadership - Planning, Policy and Strategy	Make cyber security a keystone of your strategy. This eight-week Cyber Security for Public Leadership - Planning, Policy and Strategy online course from the University of Oxford's Blavatnik School of Government will teach you, as a non-technical leader, how to integrate robust cyber security policies into your organisational planning, strategy and operations. This course is certified by CPD UK. Module 0: Getting started…	- legal requirements of ICT products - information security strategy
url	Data Mining Without Coding: Using Rapid Miner in the Context of Education.	This Data Mining Without Coding: Using Rapid Miner in the Context of Education course from Tallinn University is designed to give an overview of applying data mining in an educational context to students without a computer science or programming background. The learners should not worry if they do not know any of these concepts beforehand – all methods and approaches will be introduced and explained in detail in video lectures and in-person practice seminars…	- unstructured data
url	Data Mining for Industry	The Data Mining for Industry course offered by Luleå University of Technology will introduce you to data mining and how it might enable businesses to drive better business results by analysing their different data using predictive and prescriptive tools. machine learning techniques for classification, regression, and clustering…	- unstructured data
url	Cyber Security Economics	Learn how to make better decisions about security and IT by using state-of-the-art economic tools, security metrics and data analytics…	- information security strategy

***Table 38**: Courses teaching **Cybersecurity** recommended skills for **Non-Technical** positions in **Sweden**.*

8.2.3. Blockchain

8.2.3.1. Manager

The chart below presents the number of courses that teach the recommended **Blockchain** related skills for **Manager** roles in **Sweden**.

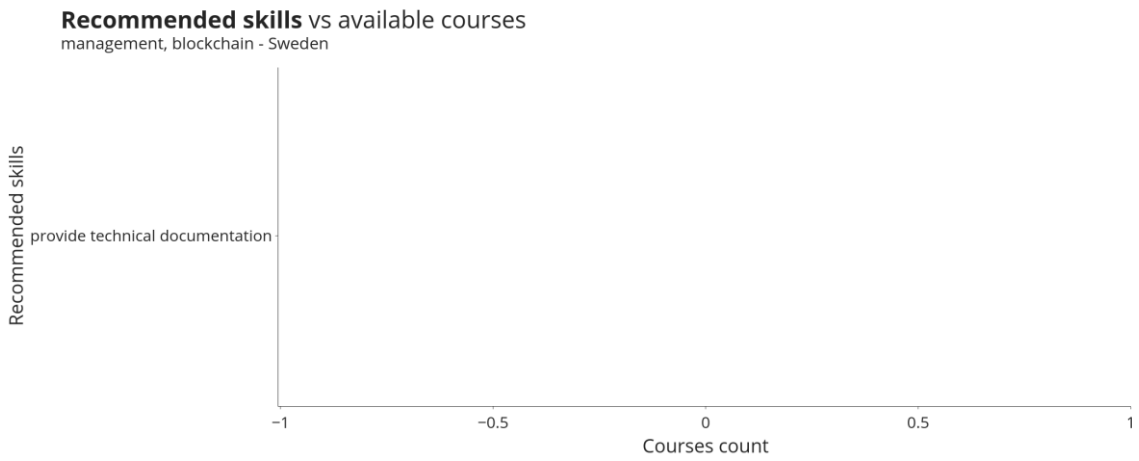

***Figure 130**: Number of courses teaching **Blockchain** recommended skills for **Manager** positions in **Sweden**.*

> ***Note**: Although there are **two skills recommended** by the system, there are no courses in the database specialised into teaching these skills.*

8.2.3.2. Technical

The chart below presents the number of courses that teach the recommended **Blockchain** skills for **Technical** roles in **Sweden**. Highlighted with a **green** diamond are the skills that are detected by the Skill Sync AI engine as covered in the SME4DD course offerings.

***Figure 131**: Number of courses teaching **Blockchain** recommended skills for **Technical** positions in **Sweden**.*

Diving further into the analysis of these courses, the following collection of visual data provides insights based on several parameters. These parameters encompass geographical location, language of instruction, pedagogical approach, course duration, and associated fees.

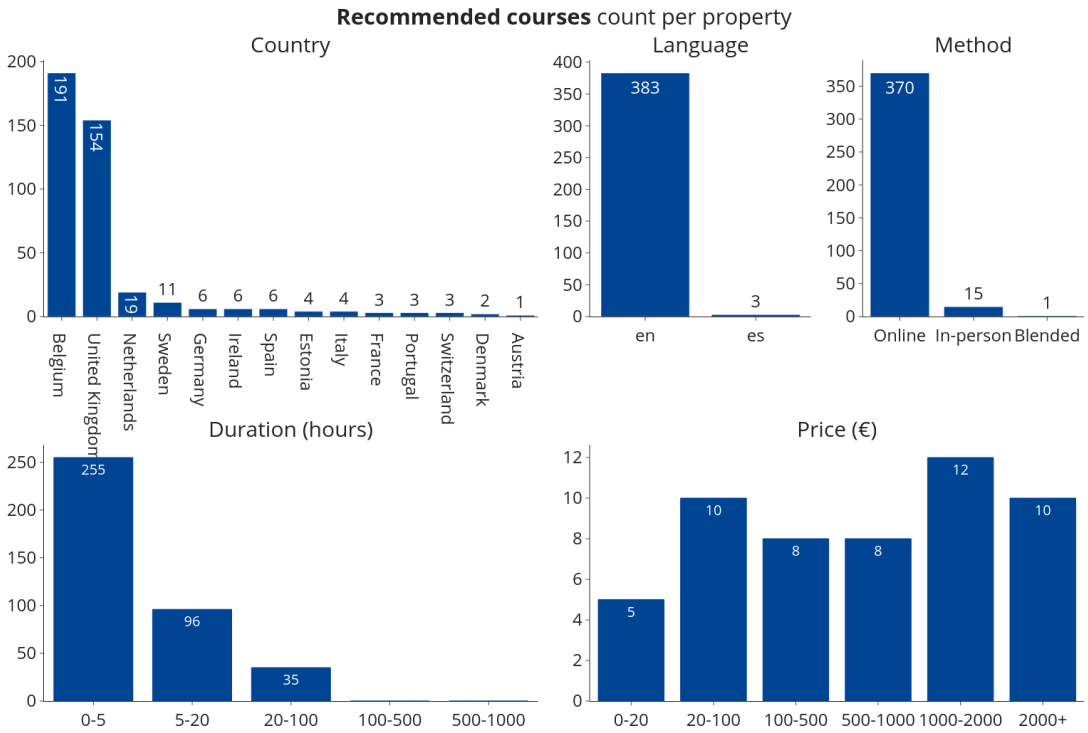

***Figure 132**: Features of courses teaching **Blockchain** recommended skills for **Technical** positions in **Sweden**.*

The subsequent table presents a collection of courses, specifically designed to empower individuals with fundamental **Blockchain** capabilities for **Technical** roles within **Sweden**. For each course, we show not only its name but also a concise description, a direct link to its official webpage, and the particular competencies identified by the Skill Sync AI engine, derived from the course's metadata.

Link	Name	Description	Skills
url	Data Creation and Collection for Artificial Intelligence via Crowdsourcing	A one-stop shop to get started on the key considerations about data for AI! Learn how crowdsourcing offers a viable means to leverage human intelligence at scale for data creation, enrichment and interpretation, demonstrating a great potential to improve both the performance of AI systems and their trustworthiness and increase the adoption of AI in general…	- data analytics
url	Data Analysis Essentials	Discover and acquire the quantitative data analysis skills that you will typically need to succeed in an MBA program. This course will cover the fundamentals of collecting, presenting, describing and making inferences from sets of data…	- data analytics
url	Statistical Predictive Modelling and Applications	Learn how to apply statistical modelling techniques to real-world business scenarios using Python…	- data analytics

Link	Name	Description	Skills
url	Data Science in Stratified Healthcare and Precision Medicine	In this Data Science in Stratified Healthcare and Precision Medicine course at The University of Edinburgh, you will learn about some of the different types of data and computational methods involved in stratified healthcare and precision medicine. You will have hands-on experience of working with such data. And you will learn from leaders in the field about successful case studies. Sequence ProcessingImage Analysis, Network Modelling, Probabilistic Modelling,Machine Learning, Natural Language Processing, Process Modelling Graph Data…	- data analytics

***Table 39**: Courses teaching **Blockchain** recommended skills for **Technical** positions in **Italy**.*

8.2.3.3. Non-Technical

> ***Note**: The Skill Sync Engine does not have enough data to make a prediction for Non-Technical profiles in Sweden for the Blockchain area.*

8.3. Conclusion

8.3.1. Missing skills per Categories on the targeted Verticals

In the area of artificial intelligence, the most recommended skills for the role of manager are those related to database processing, such as "Oracle Relational Database", "PostgreSQL", or "SQL server". The recommended technical skills are usually specific programming languages, such as C#, TypeScript or MATLAB, however, non-technical people need more reinforcement in the area of business strategy, with skills such as "business intelligence", "business intelligence" or "business intelligence".

In the area of cybersecurity, the manager is recommended to improve skills related to business, and "ICT security legislation", just like the technician. However, the non-technical person requires programming languages such as MDX or SPARQL along with the aforementioned skills.

In the blockchain area we do not have enough information to make an analysis of the skills needed by SMEs in Sweden for the manager and non-technical role, however, for the technical role, diverse skills such as data analytics, solidity or ICT debugging tools are recommended.

8.3.2. Skills covered by the SME4DD courses with respect to the target audience

We can see marked with a green diamond in the previous plots the skills covered by the SME4DD courses, and in the Annexes at the end of the document the actual list of skills per course is provided.

In artificial intelligence we did not find any skills in the SME4DD courses that can be recommended to SMEs in Sweden.

For the cybersecurity sector, SME4DDD courses cover the ICT security legislation skill for the manager. This skill is the one we found the most for the courses recommended to these SMEs, with a total of 65 courses. Regarding the technical role, the cybersecurity skills covered by SME4DDD courses are "cyber security" and "ICT security legislation". These two skills are also part of the set of courses taken into account for the analysis. For the non-technical, the SME4DDD courses cover the recommended skills of "legal requirements of ICT products" and "information security strategy". The first of these skills is not so often found in the other courses analysed, so it would be a good recommendation for Swedish SMEs to focus on this skill.

For the blockchain sector, the skill recommended by SME4DDD courses is the solidity skill, a high-level programming language used to write smart contracts on the Ethereum platform. Compared to most courses, which recommend the data analytics skill.

8.3.3. Skills needed on the market but not covered by the SME4DD courses

In the artificial intelligence sector, no recommended skill is covered by SME4D courses. These skills, for the role of manager, are related to database processing, such as "Oracle Relational Database", "PostgreSQL" or "Cloud technologies". In addition, there are skills on cloud technology, Xquery and performing market research. In the technician role, there is a gap between skills related to programming languages, with some skills such as "use markup languages" or TypeScript being recommended skills for this role. Regarding the non-technical role, the recommended skills are related to the business sector and skills related to support the manager.

In cybersecurity, for the role of manager, we find that the skills not covered by SME4DD courses are those aimed at business improvement, such as "business intelligence" or "build business relationships". Skills related to database processing are also recommended. These skills are "data storage" and "ICT infrastructure". The manager profile is also recommended to have the ability to "perform data analysis". The manager profile is the most complete of all, so the skills are more varied and do not only contemplate the cybersecurity role, with business-related skills being the most frequently recommended. The technician profile requires skills dedicated to infrastructure, cloud security and skills focused on improving knowledge in emerging technologies.

For the blockchain area, in the manager role we only find the "provide technical documentation" skill. This skill is not included in any course used in the analysis or in any SME4DD course. In the technician role we find that most courses recommend the data analytics skill, however,

there are many skills that are not covered by the courses such as "ICT debugging tools", or "smart contract".

8.3.4. European courses covering the missing skills identified

The recommended courses for the different areas for Swedish SMEs follow the same distribution as for the rest of the countries. As previously seen, most of the courses are located in the United Kingdom, with English being the predominant language and most of the courses are online.

Regarding duration, we see that the number of courses exceeding 100 hours is negligible compared to the rest, which tend to be between 0 and 5 hours in duration or 5 and 20 hours in duration.

In relation to the price of the courses, we find that for the technical sector, the number of courses increases for a high price range (more than 500€) in the case of artificial intelligence and blockchain areas, however, in cybersecurity the price is standard compared to the rest of the analysed courses. As a conclusion we comment that the courses recommended for the role of manager in the area of cybersecurity and blockchain have a higher price distribution than those of artificial intelligence, the price range of these courses being predominantly between 1000-2000 € per course.

9. Future work

Considering the current state of our data analysis and the data available in our database, there are several avenues for further research and development.

Firstly, our data collection efforts are ongoing, and we anticipate gathering a more extensive dataset in the future. Currently, we have identified approximately 2.7K courses in Europe, but our database contains over 30K total courses, with many yet to be located due to the slower process of scraping metadata from organisations offering these courses. Over time, we expect to expand our course dataset, particularly from platforms specialising in European courses and emphasizing in-person offerings. This expansion will enhance the pool of potentially European courses available for future analysis.

Furthermore, while we have cataloged a total of 14K organisations, including those providing courses and those used for European expertise analysis (primarily SMEs), we have only obtained metadata from 1.8K companies. This leaves significant room to gather additional European organisations. This expanded dataset will bolster the reliability and robustness of future analyses, allowing for broader conclusions at the country level, rather than specific sample assessments.

Additionally, there is potential for improving our current NLP models used for identifying skills within organisations and courses. Enhanced models would provide more accurate and dependable predictions. Similarly, refining the model used to normalise LinkedIn skills into our ESCO ontology will help capture additional skills that are currently overlooked due to their abstract descriptions.

These steps will contribute to a more comprehensive and precise analysis, enhancing the quality and depth of insights generated from our data. The following are some possible additional steps in the analysis that will be available to explore with additional data:

- **Enhanced Regional Insights**: With a more extensive dataset of European organisations and courses, we can conduct region-specific analyses to uncover variations in skills and expertise across different European countries or regions. This will provide more localized and detailed insights.
- **Industry-Specific Trends**: A richer dataset allows for in-depth exploration of industry-specific trends. In addition to the current verticals of analysis (AI, Blockchain, cybersecurity) we will be able to delve into how skills and competencies evolve within specific sectors, identifying emerging trends and areas of demand.
- **Incorporating Additional Data Sources**: Beyond the existing data, we can consider integrating other relevant data sources, such as labor market data or job offerings, to enrich the analyses and provide a more comprehensive view of the employment landscape.

10. Appendix: Details on the ESCO Roles and Categories

The following table displays the current professional roles and categories mapping.

ESCO Role	Category
ICT intelligent systems designer	Technical
bioinformatics scientist	Technical
data warehouse designer	Technical
big data archive librarian	Technical
data quality specialist	Technical
database designer	Technical
computer vision engineer	Technical
data analyst	Technical
data scientist	Technical
database integrator	Technical
database developer	Technical
ICT security administrator	Technical
ICT security engineer	Technical
blockchain architect	Technical
blockchain developer	Technical
digital forensics expert	Technical
embedded systems security engineer	Technical
ethical hacker	Technical
chief data officer	Management
business intelligence manager	Management
ICT information and knowledge manager	Management
ICT operations manager	Management
ICT resilience manager	Management
ICT security manager	Management
chief ICT security officer	Management
ICT business analyst	Non Technical
data protection officer	Non Technical
data entry clerk	Non Technical

***Table 40**: ESCO Roles and their corresponding Professional Categories.*

In the context of skills, it is noteworthy that a single skill can be applicable to multiple roles that belong to different categories. This implies that a skill may fall under more than one category.

For instance, the proficiency in ”using spreadsheet software” can be essential for both a managerial role and a nontechnical role.

11. Appendix: Details on the ESCO Roles and Areas

Apart from the category assigned to the role (manager, technical and non-technical) a categorisation has also been made by topic to which the role belongs (Cybersecurity, artificial intelligence and blockchain).

ESCO Role	Area
ICT intelligent systems designer	Artificial Intelligence
bioinformatics scientist	Artificial Intelligence
data warehouse designer	Artificial Intelligence
big data archive librarian	Artificial Intelligence
data quality specialist	Artificial Intelligence
database designer	Artificial Intelligence
computer vision engineer	Artificial Intelligence
data analyst	Artificial Intelligence
data scientist	Artificial Intelligence
database integrator	Artificial Intelligence
database developer	Artificial Intelligence
ICT security administrator	Cybersecurity
ICT security engineer	Cybersecurity
blockchain architect	Blockchain
blockchain developer	Blockchain
digital forensics expert	Cybersecurity
embedded systems security engineer	Cybersecurity
ethical hacker	Cybersecurity
chief data officer	Artificial Intelligence
business intelligence manager	Artificial Intelligence
ICT information and knowledge manager	Artificial Intelligence
ICT operations manager	Artificial Intelligence
ICT resilience manager	Cybersecurity
ICT security manager	Cybersecurity

***Table 41**: ESCO Roles and their corresponding Areas.*

12. Appendix: Details on the SME4DD Courses Skills

12.1. C1 - Blockchain - BME

Name	Blockchain for the SME decision makers
Description	The course presents the basic principles and usage of blockchain-based systems and services. Main topics: Recognition and high level definition of use cases for business development by blockchain solution: connect to supply chains, collaborate with novel partners, improve efficiency and save cost, involve funding, etc. Understanding and evaluation of the potential of blockchain solutions in a concrete business context.
ESCO skills and model probability	- blockchain consensus mechanisms: 99.99% - blockchain platforms: 99.21% - promote open innovation in research: 96.16% - blockchain openness: 93.08% - establish data processes: 50%

***Table 42**: SME4DD SillSync Predictions for course **Blockchain - C1 BME**.*

12.2. C2 - Blockchain - BME

Name	Blockchain for SME project managers and domain experts
Description	The course presents how novel solutions and products can be developed on blockchain. Main topics: Detailed elaboration on use cases, service and product transformation and expected functionalities of a blockchain solution. Definition of RFQs and tenders. Evaluation of project proposals. Create and follow project plans for blockchain applications.
ESCO skills and model probability	- blockchain consensus mechanisms: 100% - blockchain platforms: 99.99% - promote open innovation in research: 97.84% - blockchain openness: 97.49% - Solidity: 46.31%

***Table 43**: SME4DD SillSync Predictions for course **Blockchain- C2 BME**.*

12.3. C3 - Blockchain for the SME IT Technologist (Hyperledger Fabric / Ethereum)

Name	Blockchain for the SME decision makers
Description	The course will present a compact overview on blockchain service development for technologists, including aspects of operation as well. Main topics: Know and apply the steps of design, implementation, testing and deployment of a blockchain application. Execute blockchain projects. Analyse and mitigate the risk of a blockchain application. Integrate blockchain with existing systems and services. Know the basics of blockchain interoperability. The course will be offerd in two variants (Hyperledger Fabric / Ethereum).
ESCO skills and model probability	- blockchain consensus mechanisms: 100% - blockchain platforms: 99.99% - promote open innovation in research: 97.84% - blockchain openness: 97.49% - Solidity: 92.17%

***Table 44**: SME4DD SillSync Predictions for course **Blockchain for the SME IT Technologist (Hyperledger Fabric / Ethereum)**.*

12.4. C4 - Blockchain - BME

Name	Engineering blockchain-based systems
Description	The course will present main engineering aspects and methods to design trustworthy blockchain applications. Topics: Apply solution patterns to ensure efficient development and operation. Engineer the capacity/performance, dependability and privacy of blockchain applications.
ESCO skills and model probability	- blockchain consensus mechanisms: 99.69% - blockchain platforms: 97.68% - blockchain openness: 85.78% - promote open innovation in research: 71.55% - contract law: 51.06%

***Table 45**: SME4DD SillSync Predictions for course **Blockchain- C4 BME**.*

12.5. C5 - Cybersecurity - TAG

Name	Managing Cybersecurity
Description	Managing Cybersecurity is the blended-format cybersecurity training program that equips managers and entrepreneurs with all the necessary knowledge and skills to face nowadays challenges of Cybersecurity. This course is designed for those who want to deepen their understanding of Cybersecurity and learn how to effectively integrate it into their business strategies.

Name	Managing Cybersecurity
ESCO skills and model probability	- ICT security legislation: 97.38% - safeguard online privacy and identity: 88.23% - manage IT security compliances: 86.34% - information security strategy: 82.6% - manage system security: 80.78%

***Table 46**: SME4DD SillSync Predictions for course **Blockchain- C4 BME**.*

12.6. C6 - AI INRIA 1

Name	Artificial intelligence : everything you always wanted to know, advances and use cases
Description	Let's demystify artificial intelligence through a brief history of the field to better understand our perception of advances in AI and get a first-hand look at how artificial neural networks work: more specifically, deep artificial neural networks, which are at the heart of the impressive advances of the last decade. Let's take a closer look at what is known and mastered and what is still in the field of research, and at current performance and limitations: computing costs, bias, etc. Let's analyse how a few applications that are making the headlines work, and let's review a few existing or potential, but realistic, use cases for applications in industry!
ESCO skills and model probability	- emergent technologies: 49.10% - principles of artificial intelligence: 38.64% - deep learning: 37.66% - computer engineering: 31.30% - analyse scientific data: 31.30%

***Table 47**: SME4DD SillSync Predictions for course **Blockchain- C4 BME**.*

12.7. C7 - AI INRIA 2

Name	Machine Learning : scikit-learn Beginner
Description	This course will cover the basics of machine learning and how to do it with scikit-learn. It will focus on practical examples of applications with code run by the participants. Topics: dataset loading , types of statistical learning questions, supervised learning, including model selection and validation, assembly of data shaping pipelines, linear models and decision tree.
ESCO skills and model probability	- data analytics: 50.00% - deep learning: 50.00% - Statistics: 44.6% - principles of artificial intelligence: 44.43% - analyse scientific data: 39.12%

***Table 48**: SME4DD SillSync Predictions for course **C.7 AI INRIA2**.*

12.8. C8 - AI INRIA 3

Name	Machine Learning : scikit-learn Advanced
Description	This course will focus on the following models and their implementation with scikit-learn: linear models, tree models, ensemble models, including random forests and boosting-based models. It will help to understand the different aspects of model evaluation, including the choice of cross-validation strategies and evaluation metrics. Topics: linear models for regression and classification, regularisation of linear models, decision tree models for regression and classification, tree-based model : random forests and boosting models, model evaluation: cross-validation strategies and evaluation metrics.
ESCO skills and model probability	- Statistics: 47.78% - manage quantitative data: 46.27% - data analytics: 44.26% - deep learning: 43.59% - Mathematics: 43.52%

***Table 49**: SME4DD SillSync Predictions for course **C.8 AI INRIA 3**.*

12.9. C9 - AI HI

Name	Business implications of AI or How take advantage of AI - SME perspective
Description	on-line and face-to-face classes , with nano learning units be provided prior to each face-to-face session. See description below…
ESCO skills and model probability	- penetration testing tool: 94.84% - contract law: 89.74% - Pentaho Data Integration: 64.75% - principles of artificial intelligence: 57.33% - use access control software: 54.41%

***Table 50**: SME4DD SillSync Predictions for course **C.9 AI HI**.*

13. Appendix: List of Skills

13.1. Manager

A:
ABBYY FineReader,
address identified risks,
advise on government policy compliance,
analyse business processes,
analyse business requirements,
analyse legal enforceability,
analyse the context of an organisation,
apply change management,
apply information security policies,
apply information security policies,
apply organisational techniques,
apply statistical analysis techniques,
apply system organisational policies,
assist with litigation matters.
B:
business ICT systems,
business intelligence,
business process modelling,
business requirements techniques,
business strategy concepts.
C:
cloud technologies,
conduct impact evaluation of ICT processes on business,
create business process models.
D:
data models,
data protection,
data storage,
database,
decision support systems,
define organisational standards,
define technical requirements,
design process,
develop information security strategy,
develop organisational policies,
develop training programmes,
document project progress,
documentation types.
E:
ensure compliance with legal requirements,
ensure information privacy,
establish data processes,
estimate impact of risks,
execute analytical mathematical calculations.
G:
GDPR.
I:
ICT market,
ICT security legislation,
identify customer requirements,
identify legal requirements,
identify legal requirements,
implement data quality processes,
implement data warehousing techniques,
implement strategic planning,
information architecture,
information categorisation,
information confidentiality,
information confidentiality,
information extraction,
information governance compliance,
information security strategy,
innovation processes,
interact with users to gather requirements,
internal auditing,
internal risk management policy,
internal risk management policy.
L:
LDAP,
legal case management,
legal requirements of ICT products,
legal research,
legal terminology,
LINQ.
M:
maintain data entry requirement,s
maintain internal communication systems,
manage data,
manage data collection systems,
manage data for legal matters,
manage digital documents,
manage ICT data classification,
manage ICT project,
manage keys for data, protection,
MDX,
monitor legislation developments.
N:
N1QL,
normalise data.
O:
OmniPage,
optical character recognition software,
organisational resilience.
P:
perform data cleansing,
perform data cleansing,
perform project management,
process data,

product usage risks analysis,
propose ICT solutions to business problems,
protect personal data and privacy,
provide cost benefit analysis.
provide legal advice
provide user documentation
Q:
query languages
R:
resource description framework query language,
respect data protection principles,
respond to enquiries,
risk management.
S:
SPARQL,
support managers,
systems development life-cycle.
T:
train employees,
translate requirements into visual design.
U:
unstructured data,
use an application-specific interface,
use consulting techniques,
use databases,
use spreadsheets software,
use word processing software

Back to 3.1.

13.2. Technical

A:
ABAP,
adapt to changes in technological development plans,
address problems critically,
Agile project management,
AJAX,
algorithms,
analyse big data,
analyse business requirements,
analyse ICT system,
analyse network configuration and performance,
analyse scientific data,
analyse the context of an organisation,
Angular,
apply blended learning,
apply company policies,
apply for research funding,
apply ICT systems theory,
apply information security policies,
apply research ethics and scientific integrity principles in research activities,
apply reverse engineering,
apply scientific methods,
apply statistical analysis techniques,
apply systemic design thinking,
apply technical communication skills,
artificial neural networks,
ASP.NET,
Assembly (computer programming),
assess ICT knowledge,
assist scientific research,
attack vectors,
attend to ICT systems quality.
B:
balance database resources,
biology,
biometrics,
blockchain consensus mechanisms,
blockchain openness,
blockchain platforms,
build business relationships,
build predictive models,
build recommender systems,
business analysis,
business intelligence,
business process modelling,
business processes.
C:
C#,
C++,
CA Datacom/DB,
cloud monitoring and reporting,
cloud security and compliance,
cloud technologies,
COBOL,
CoffeeScript,
collect biological data,
collect customer feedback on applications,
collect cyber defence data,
collect ICT data,
Common Lisp,
communicate with a non-scientific audience,
comply with legal regulations,
computer engineering,
computer equipment,
computer forensics,
computer programming,
computer vision,
conduct literature research,
conduct qualitative research,

conduct quantitative research,
conduct research across disciplines,
conduct scholarly research,
consult with business clients,
contact scientists,
copyright legislation,
create business process models,
create data models,
create data sets,
create database diagrams,
create flowchart diagram,
create project specifications,
create software design,
create solutions to problems,
cyber attack counter-measures,
cyber security.

D:

data analytics,
data extraction,
data mining,
data models,
data storage,
data warehouse,
database,
database development tools,
DB2,
debug software,
decentralized application frameworks,
deep learning,
defence standard procedures,
define data quality criteria,
define database physical structure,
define integration strategy,
define security policies,
define software architecture,
define technical requirements,
deliver visual presentation of data,
demonstrate disciplinary expertise,
design application interfaces,
design cloud architecture,
design computer network,
design database backup specifications,
design database in the cloud,
design database scheme,
design information system,
design process,
design thinking,
design user interface,
develop automated migration methods,
develop code exploits,
develop creative ideas,
develop data processing applications,
develop ICT device driver,
develop ICT workflow,
develop information security strategy,
develop professional network with researchers and scientists,
develop reporting software,
develop scientific research protocols,
develop scientific theories,
develop software prototype,
develop statistical software,
digital image processing,
digitise documents,
disseminate results to the scientific community,
documentation types,
draft scientific or academic papers and technical documentation.

E:

educate on data confidentiality,
embedded systems,
emergent technologies,
ensure information security,
Erlang,
establish data processes,
estimate duration of work,
ethics,
evaluate genetic data,
evaluate research activities,
execute analytical mathematical calculations,
execute ICT audits,
execute integration testing,
execute software tests.

F:

Filemaker (database management systems).

G:

gather data,
gather data for forensic purposes,
gather experimental data,
genetic engineering,
genetics,
give live presentation,
Groovy.

H:

handle data samples,
hardware architectures,
hardware platforms,
Haskell,
hybrid model.

I:

IBM Informix,
IBM InfoSphere DataStage,
IBM InfoSphere Information Server,
ICT debugging tools,
ICT encryption,
ICT infrastructure,
ICT network security risks,
ICT power consumption,
ICT process quality models,
ICT project management methodologies,
ICT security legislation,
ICT security standards,
identify customer requirements,
identify ICT security risks,
identify ICT system weaknesses,
identify software for warehouse management,
image formation,
implement a firewall,
implement a virtual private network,
implement anti-virus software,

implement cloud security and compliance,
implement data quality processes,
implement data warehousing techniques,
implement front-end website design,
implement ICT network diagnostic tools,
implement ICT risk management,
implement ICT safety policies,
implement spam protection,
increase the impact of science on policy and society,
Informatica PowerCenter,
information architecture,
information categorisation,
information confidentiality,
information extraction,
information security strategy,
information structure,
integrate ICT data,
integrate system components,
integrated development environment software,
interact professionally in research and professional environments,
internet governance,
Internet of Things,
interpret current data,
interpret technical requirements,
interpret technical texts.

J:

Java (computer programming),
JavaScript,
JavaScript Framework.

K:

keep task records,
keep up with the latest information systems solutions.

L:

laboratory techniques,
LDAP,
lead disaster recovery exercises,
leadership principles,
Lean project management,
legal requirements of ICT products,
levels of software testing,
LINQ,
Lisp.

M:

machine learning,
maintain database,
maintain database performance,
maintain database security,
maintain ICT identity management,
maintain ICT server,
maintain laboratory equipment,
manage a team,
manage archive users guidelines,
manage business knowledge,
manage changes in ICT system,
manage cloud data and storage,
manage content metadata,
manage data,
manage data collection systems,
manage data for legal matters,
manage database,
manage digital archives,
manage digital documents,
manage disaster recovery plans,
manage findable accessible interoperable and reusable data,
manage ICT change request process,
manage ICT data architecture,
manage ICT data classification,
manage ICT legacy implication,
manage ICT semantic integration,
manage ICT virtualisation environments,
manage intellectual property rights,
manage IT security compliances,
manage keys for data protection,
manage open publications,
manage personal professional development,
manage quantitative data,
manage research data,
manage schedule of tasks,
manage standards for data exchange,
mathematics,
MATLAB,
MDX,
mentor individuals,
Microsoft Access,
Microsoft Visual C++,
migrate existing data,
ML (computer programming),
mobile device management,
molecular biology,
monitor system performance,
monitor technology trends,
MySQL.

N:

N1QL,
Nessus,
Nexpose,
normalise data.

O:

Objective-C,
ObjectStore,
online analytical processing,
Open source model,
OpenEdge Advanced Business Language,
OpenEdge Database,
operate open source software,
operate relational database management system,
operating systems,

optimise choice of ICT solution,
Oracle Data Integrator,
Oracle Relational Database,
Oracle Warehouse Builder,
organisational resilience,
Outsourcing model.

P:

Pascal (computer programming),
penetration testing tool,
Pentaho Data Integration,
perform backups,
perform data analysis,
perform data cleansing,
perform data mining,
perform dimensionality reduction,
perform forensic preservations of digital devices,
perform ICT security testing,
perform ICT troubleshooting,
perform laboratory tests,
perform project management,
perform resource planning,
perform risk analysis,
perform scientific research,
Perl,
PHP,
PostgreSQL,
present reports,
principles of artificial intelligence,
principles of distributed ledger technology,
process data,
Process-based management,
product data management,
project management,
Prolog (computer programming),
promote inclusion in research,
promote open innovation in research,
promote the participation of citizens in scientific and research activities,
promote the transfer of knowledge,
provide ICT consulting advice,
provide information,
provide technical documentation,
provide user documentation,
proxy servers,
publish academic research,
Python (computer programming).

Q:

QlikView Expressor,
quality assurance methodologies,
query languages.

R:

remove computer virus or malware from a computer,
report analysis results,
report test findings,
resource description framework query language,
respond to customers' inquiries,
respond to incidents in cloud,
risk management,
Ruby (computer programming).

S:

SaaS (service-oriented modelling),
safeguard online privacy and identity,
SAP Data Services,
SAP R3,
SAS language,
Scala,
scientific modelling,
scientific research methodology,
Scratch (computer programming),
secure sensitive customer's information,
service-oriented modelling,
signal processing,
Smalltalk (computer programming),
smart contract,
software anomalies,
software components libraries,
Solidity,
solve ICT system problems,
SPARQL,
speak different languages,
SQL,
SQL Server,
SQL Server Integration Services,
statistics,
store digital data and systems,
Swift (computer programming),
synthesise information,
system backup best practice,
systems theory.

T:

task algorithmisation,
teach in academic or vocational contexts,
Teradata Database,
test ICT queries,
think abstractly,
think analytically,
tools for ICT test automation,
track key performance indicators,
train employees,
transformation and loading tools,
troubleshoot,
TypeScript.

U:

unstructured data,
use access control software,
use an application-specific interface,
use back-up and recovery tools,
use data processing techniques,
use databases,
use different communication channels,
use interface description language,
use markup languages,

use personal organization software,
use query languages,
use scripting programming,
use software design patterns,
use software for data preservation,
use software libraries,
use spreadsheets software,
utilise computer-aided software engineering tools,
utilise machine learning,
utilise regular expressions,
utilise machine learning,
utilise regular expressions.

V:

VBScript,
verify formal ICT specifications,
visual presentation techniques,
Visual Studio .NET,
Vyper.

W:

web analytics,
web application security threats,
web programming,
WhiteHat Sentinel,
write database documentation,
write research proposals,
write scientific publications,
write work-related reports.

X:

XQuery.

Back to 3.2.

13.3. Non-Technical

A:

ABBYY FineReader,
address identified risks,
advise on government policy compliance,
analyse business processes,
analyse business requirements,
analyse legal enforceability,
analyse the context of an organisation,
apply change management,
apply information security policies,
apply information security policies,
apply organisational techniques,
apply statistical analysis techniques,
apply system organisational policies,
assist with litigation matters.

B:

business ICT systems,
business intelligence,
business process modelling,
business requirements techniques,
business strategy concepts.

C:

cloud technologies,
conduct impact evaluation of ICT processes on business,
create business process models.

D:

data models,
data protection,
data storage,
database,
decision support systems,
define organisational standards,
define technical requirements,

design process,
develop information security strategy,
develop organisational policies,
develop training programmes,
document project progress,
documentation types.

E:

ensure compliance with legal requirements,
ensure information privacy,
establish data processes,
estimate impact of risks,
execute analytical mathematical calculations.

G:

GDPR.

I:

ICT market,
ICT security legislation,
identify customer requirements,
identify legal requirements,
identify legal requirements,
implement data quality processes,
implement data warehousing techniques,
implement strategic planning,
information architecture,
information categorisation,
information confidentiality,
information confidentiality,
information extraction,
information governance compliance,
information security strategy,
innovation processes,
interact with users to gather requirements,
internal auditing,
internal risk management policy,
internal risk management policy.

L:

LDAP,
legal case management,
legal requirements of ICT products,
legal research,
legal terminology,
LINQ.

M:

maintain data entry requirement,s
maintain internal communication systems,
manage data,
manage data collection systems,
manage data for legal matters,
manage digital documents,
manage ICT data classification,
manage ICT project,
manage keys for data, protection,
MDX,
monitor legislation developments.

N:

N1QL,
normalise data.

O:

OmniPage,
optical character recognition software,
organisational resilience.

P:

perform data cleansing,
perform data cleansing,
perform project management,
process data,
product usage risks analysis,
propose ICT solutions to business problems,
protect personal data and privacy,
provide cost benefit analysis.
provide legal advice
provide user documentation

Q:

query languages

R:

resource description framework query language,
respect data protection principles,
respond to enquiries,
risk management.

S:

SPARQL,
support managers,
systems development life-cycle.

T:

train employees,
translate requirements into visual design.

U:

unstructured data,
use an application-specific interface,
use consulting techniques,
use databases,
use spreadsheets software,
use word processing software.

V:

visual presentation techniques.

W:

write work-related reports.

X:

XQuery.

Back to 3.3.