CHAISE: A Blueprint for Sectoral Cooperation on Blockchain Skill Development

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Abstract

CHAISE has responded to the European Commission's call (under the Erasmus+ Programme) for a strategic approach to Blockchain Skills Development to complement and reinforce the Union's BC Growth Strategy to acquire global leadership. CHAISE is a Sector Skill Alliance which aims to build an effective industry-led governance system and skills strategy to respond to the current and future skill needs of the European Blockchain workforce and deliver appropriate and future-focused and future-proof training solutions and qualifications geared to the realities and needs of the sector. CHAISE aspires to have a systemic and sector impact, going beyond the project's lifetime and its partners, addressing the needs of learners/workers, E&T providers, businesses, social partners, and educational authorities.

Keywords

Blockchain Skills, Blockchain Strategy, Blockchain Education, Blockchain Alliance, Blockchain Certification

Project Information Project's full name: CHAISE - A Blueprint for Sectoral Cooperation on Blockchain Skill Development, Project's acronym: CHAISE, Project duration: 48 months (November 2020-October 2024) – *Ongoing project,* Participating organizations: 23 partners and 5 associates from 15 EU countries. The alliance consists of leading companies (FUJITSU, IOTA, INTRASOFT, C4A, INDUSTRIA, EXELIA), sector representatives (INATBA, DIGITALEUROPE, DIGITAL SME, BERCHAIN, ITALIA4BLOCKCHAIN), thematically focused E&T providers (UCBL, UT, UL, DHBW, UPC, ESRI), public authorities in education & training (ECQA, YPEPTH, CPI,

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CIMEA, ACQUIN) and associated partners (ALASTRIA, DIEK-ALGALEO, VISC, ECORYS, KANEP-GSEE), Funding agency: Education, Audiovisual and Culture Executive Agency, URL: https://chaise-blockchainskills.eu/

1. Introduction

CHAISE, a sector skills alliance financed by the ERASMUS + Programme, aims to develop a strategic approach to blockchain skills development for Europe and deliver future professional training solutions, addressing blockchain skill shortages and current/future workforce needs. Blockchain is central to the EU's digital transformation strategy, positioning the European blockchain sector for global leadership, contingent upon a competent/versatile workforce. Challenges include talent shortages, global competition, and limited education-market connections. CHAISE aims to establish inclusive governance for blockchain skills, offering tailored training and mobility solutions. The project objectives include:

- Implementing an *institutionally validated European Blockchain Skills Strategy*, updated annually, to guide sectoral cooperation and address skill gaps.
- *Developing a forecasting mechanism to anticipate future blockchain skill needs*, aiding in workforce planning.
- Creating the *first EU-wide "Blockchain specialist" occupational profile* to address fragmentation in the labour market and set common educational requirements.
- Introducing an *innovative 5-semester Blockchain VET Programme in 11 EU languages* with accessible Massive Open Online Course (MOOC) materials.
- Facilitating *transnational Mobility Schemes for Blockchain students & professionals* through partnerships and career guidance platforms.
- Establishing a *European Blockchain ecosystem* for strategic collaboration and national implementation of skills strategies.

During the first 3 years of project implementation, the following outputs were obtained:

Study on the labour market and skills needs in the blockchain sector

- Definition of blockchain workforce characteristics
- Identification of the emerging blockchain occupational profiles in the EU labour market (BC manager, architect and developer)
- Definition of skills requirements and training priorities per occupational profile

An industry-validated strategy for Blockchain skills development in the EU

- 5 strategic objectives
- 19 action areas
- 10-year implementation period
- 79 initiatives documented and analysed
- Endorsed by 53 stakeholders

Blockchain skills forecasting mechanism

- Collaborative method for the anticipation of future skill demand and supply

- Consistent, reliable predictions of blockchain demand & supply
- Early warning information system to mitigate possible labour market imbalances.
- Supporting E&T and labour market actors in making evidence-based decisions

CHAISE Massive Open Online Course & online certification

- EQF 5 | 120 ECVET credits
- 5-semester duration
- 12 modules | 48 lectures
- 1200 hours of theoretical learning | 900 hours of practical learning
- 3 learning pathways
- 746 individuals enrolled so far.
- Establishment of the CHAISE certification scheme: CHAISE examination portal fully deployed (3 types of certificates for each occupational profile and certificates stamped by INATBA)

Blueprint of a VET qualification on Blockchain and Distributed Ledger Technologies

- It provides a roadmap for qualification and accreditation bodies, qualifications experts, VET providers, VET trainers, and curricula designers in ICT to implement CHAISE-identified occupational profiles (Blockchain Developer, Blockchain Architect, and Blockchain Manager).
- The report aims to contribute to the harmonization of occupational requirements and recognition of skills for Blockchain specialists at the European Union level.
- Deployment of an EU-wide virtual 'blockchain' career guidance and alumni platform

In the following chapters, the tasks realized in Work Packages 2–9 are described.

2. WP 2: Skills Need Intelligence

Work Package 2 identifies the blockchain labour market characteristics as well as skills needs, supply and mismatches. The work includes:

- A study on blockchain labour market characteristics: ecosystem, size, number and features of blockchain companies, job vacancies, and others.
- A study on blockchain skills demand, identifying (non-)technical and transversal skills needed for deploying and commercialising blockchain applications.
- A study on blockchain skill supply, analysing the profiles of individuals aspiring to work in blockchain.
- A registry of educational and training offerings/courses on blockchain skills.
- A registry of blockchain online job vacancies, reporting a snapshot of blockchain job vacancies in the EU.

The work investigates blockchain skills demand in the EU, highlighting key sectors like ICT, finance, and education as highly blockchain-intensive, with a majority recruiters being blockchain service providers. In terms of the firms that recruit blockchain talent, evidence from online job adverts indicated that almost three-quarters of recruiters were blockchain service providers. Recruitment predominantly targets developer and engineering roles, concentrated in Belgium, Germany, France, and Italy. There's a gender gap, with less than two-thirds of firms reporting female representation in blockchain under 20%. Professionals

are typically young (under 35) with post-graduate qualifications, and employers prioritise skills and experience over formal degrees, offering significant opportunities for newcomers. Technical competencies (coding, engineering, design) and business skills (management, marketing) are in high demand, underscoring the importance of transversal skills like cooperation and communication. Despite challenges like legal complexities and technological hesitance, stakeholders predict industry growth and specialisation, with consensus on the field's continuous evolution and high-growth potential.

3. WP 3: Forecasting Blockchain Skills Demand and Supply in Europe

Work Package 3 focuses on forecasting blockchain skills demand and supply in Europe. It aims to assist European labour market actors in predicting and addressing imbalances in blockchain skills ahead of time. The Work Package consists of a forecasting model (McGuinness *et al*, 2022b) and three annual reports (McGuiness *et al*, 2022a; McGuinness *et al*, 2023; McGuinness *et al*, forthcoming) with updated estimates and insights. Current statistics indicate the size of the blockchain job market based on online job vacancies. In 2021, blockchain vacancies accounted for 0.34% of all vacancies, decreasing to 0.23% in 2023. Online job vacancy data, CEDEFOP occupational forecasts and European Labour Force Survey (EU-LFS) data are used to estimate blockchain skills demand (2021-2026) for all workers and graduates. Blockchain skills supply is forecasted using graduate data and Eurostat trends. The three annual forecasting estimates for blockchain skills demand (total demand and graduate demand) and blockchain skills supply (blockchain graduate supply) across the EU-27 are displayed in Figure 1.

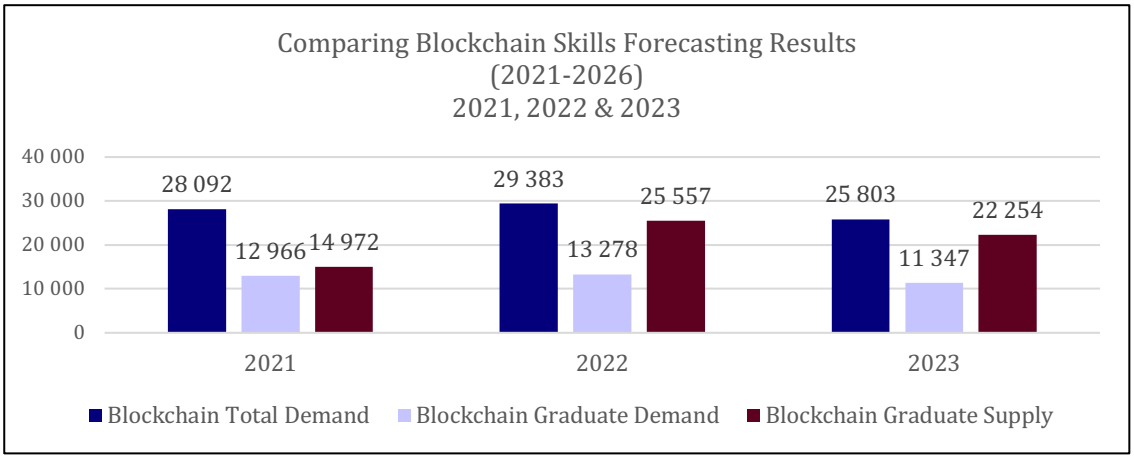

Figure 1*:* Comparing blockchain skills forecasting results via McGuinness et al. (forthcoming)

Reports include qualitative insights from industry partners on sectoral trends, education changes outlined by education partners, and policy-making input from CEDEFOP experts. Detailed analysis of blockchain labour market dynamics is conducted annually, thus accounting for the potential for rapid changes in the labour market for blockchain skills.

4. WP 4: Blockchain Skills Strategy

The European Blockchain Skills Strategy aims to provide stakeholders with essential knowledge and skills in blockchain technology, catering to those impacted by blockchain in their roles or industries, policy-makers needing to understand implications for regulation, and those seeking a general understanding of decision-making. It focuses on addressing the shortage of blockchain talent while maintaining a broad scope beyond the labour market. The Strategy, published in March 2022 after extensive research by the CHAISE partnership, outlines five key Strategic Objectives to achieve and measure its goals effectively:

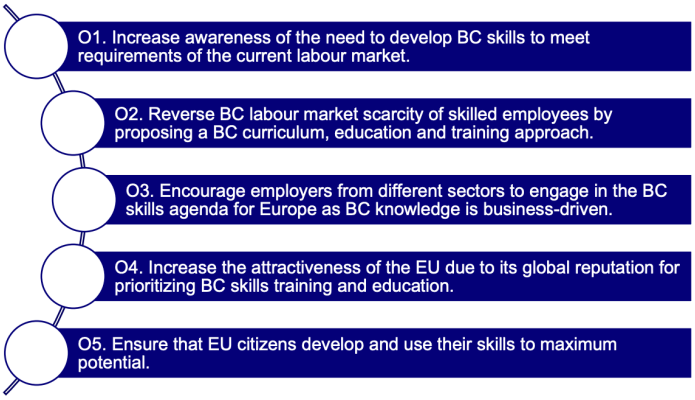

Figure 2*:* Strategic objectives

5. WP 5 – Joint Curriculum Design and Delivery

Work Package 5 creates an evidence-driven, learning outcome-oriented, modular VET programme on Blockchain. The main target of this task is to define the CHAISE CV Structure from the modules, hours and lectures perspective. Objectives of this work package include (i) a definition of a sector-specific VET curriculum structure. 5 Semester duration CV structure with 1,200 teaching hours and 900 hours of work-based learning (equivalent to 150 ECVET), (ii) creation of learning units with the following specifications: duration, weighting of outcomes, learning methods and assessment criteria according to ECVET principles, (iii) definition of curriculum corresponds to the 5th or 6th EQF level, and (iv) introduction of the QA scheme and procedures. The curriculum structure is presented in Figure 3. In the CHAISE VET program, educational modules are described in terms of technical and blockchain-specific business and transversal skills. The alignment of learning outcomes concerning the three occupational profiles, Blockchain Architect (A), Blockchain Developer (D) and Blockchain Manager (M), is described in Figure 3.

The curriculum was evaluated in five online and one online piloting session. The CHAISE MOOC platform is available at (https://erasmusmoocs.thinkific.com/courses/chaise).

<table>
<tr><td colspan="4">Transversal Skills (M, A, D)</td></tr>
<tr><td colspan="4">1. Introduction to Blockchain Technology
2. Regulation, Legal Aspects and Governance of Blockchain Systems</td></tr>
<tr><td colspan="2">Technical Basics (D, A, M)</td><td colspan="2">Business Basics (M, A, D)</td></tr>
<tr><td colspan="2">3. Fundamentals of Blockchain and Distributed Ledger Technologies</td><td colspan="2">4. Blockchain Business Management and Planning</td></tr>
<tr><td colspan="2">Technical Blockchain Specialisation (D, A)</td><td colspan="2">Business Blockchain Specialisation (M)</td></tr>
<tr><td colspan="2">5. Blockchain Security and Digital Identity
6. Blockchain System Architecture & Consensus Protocols</td><td colspan="2">7. Blockchain Platforms
8. Marketing and Customer Support</td></tr>
<tr><td>BC Conception & Use Case Development (A)</td><td>BC Engineering & Development (D)</td><td>Strategic Business Management (A, M)</td><td>Operational Business Management (D, M)</td></tr>
<tr><td>9. Applied Cryptography</td><td>10. Smart Contracts and Digital Currency Programming</td><td>11. Developing use cases: From ideas to services</td><td>12. Game Theory in Blockchain</td></tr>
</table>

Figure 3: Curriculum structure

6. WP 6 – Occupational Requirements, Recognition and Certification

Work Package 6 contributes by specifying occupational requirements for blockchain-related job roles and skill sets identified in WP 2 and 5, resulting in:

1. The definition of the Blockchain Specialist occupation and development of the Blockchain Specialist Occupation Card, integrated into the ESCO database.
2. The development and endorsement of a Statement of Support for the EU-wide recognition of blockchain occupational requirements, signed by more than 300 parties across Europe.
3. The development of a blueprint for establishing a new qualification for the "blockchain specialist" occupation, published on the CHAISE website, presented at the 30th EuroSPI conference, and published in the related Springer proceedings (Maratsi et al. 2023).
4. Creation of a Blockchain Skills Certificate Supplement to accompany ECQA CHAISE certificate.

These results support successful and sustainable exploitation of the CHAISE Skill Requirements Specification, focusing on key profiles like Blockchain Developer, Blockchain Architect, and an upgrade for IT Project Manager.

7. WP 7 – Blockchain Students and Professional Mobility Support

Work Package 7 aims to support transnational students and professional mobility by strengthening partnerships between education and training institutions and companies. The operational objectives aim to develop a network of VET institutions across the EU to

jointly deliver the “Blockchain Specialist” qualification, to deploy an EU-wide virtual “blockchain” career guidance platform and to set the ground for the creation of an EU-wide Blockchain scholarship and traineeship program. The aim is 5 VET institutions committed to participate in a future call by endorsing a relevant MoC., with 50 blockchain companies and education and training providers signed up to the Blockchain Career Guidance and Alumni Platform. Also 5 blockchain companies and 5 education and training providers from each partnership country is committed to participate in Blockchain Scholarship and Traineeship Program by endorsing the relevant MoC.

8. WP 8 – Dissemination and Communication Activities

Work Package 8 communicates and disseminates CHAISE activities, ensuring the project’s visibility and expansion of CHAISE sectoral collaboration. As an umbrella work package, WP8 operates for the whole duration of the project receiving inputs for its activities from other work packages. Initially, a communication strategy was drafted and implemented, followed by the development of dissemination infrastructures: the project website and social media channels. Since the beginning, those structures have been regularly updated with the project news and results. The content has been created to promote CHAISE results and disseminate them to the project’s target groups and possible adopters.

9. WP 9 – Sustaining and Extending the Sectoral Cooperation on Blockchain Skills

WP9 aims to exploit the CHAISE results and make them available to a broader audience. In this sense, WP9 aims to extend the sectorial cooperation on blockchain and develop a strong network of stakeholders by creating the CHAISE Associated Partner network. Organization from the educational or business fields can apply to become associated partners to CHAISE, contribute to the project results and exploit them. Moreover, WP9 will create National Blockchain Skills Partnerships to roll out project results at the national level. In the coming six months, WP9 will develop project exhibitions at the national level to expand the outreach of the project and promote its results at the national level. Finally, the CHAISE project will also organize a one-day workshop in Brussels to gather sectoral stakeholders that have expressed their interest in sustaining the cooperation on blockchain skills initiated by the SSA through the Memorandum of Understanding, to define the strategic focus and functions of the network, and discuss the steps required to form the “European Blockchain Skills Cooperation Network”.

10. Summary of Current Status and Intermediate Results

As we approach the final year of the CHAISE project, our focus is on expanding our community and disseminating our guidelines and learning materials via various events, including 13 national info days across Europe. Recent highlights include an *interactive online session* for CHAISE MOOC learners to engage directly with curriculum instructors. We’ve also released the *course validation methodology*, outlining guidelines for learners to

obtain certification aligned with specialised job profiles recognised by CHAISE, along with a *trainer's guide* to support ICT trainers. Additionally, we're advancing the Blockchain Skills Strategy Update for 2024, planning an *EU-wide career guidance platform*, and developing *National Action Plans* for project rollout in partner countries. The *Associated Partners' (APs) recruitment and onboarding scheme* continues, with the first wave of applicants reaching 55. Our goal is to ensure a lasting impact, paving the way for the establishment of a permanent Blockchain Skills Cooperation Network.

11. Conclusion

CHAISE Project can significantly benefit research in information systems by providing researchers with foundational knowledge, practical skills, and a deeper understanding of the implications of blockchain technology on information systems. The following reasons show how CHAISE can help:

1. **Understanding Blockchain Fundamentals**: Courses on blockchain cover fundamental concepts such as distributed ledger technology, consensus mechanisms, cryptographic principles, and smart contracts. This understanding equips researchers with the knowledge necessary to comprehend how blockchain works and its potential applications in information systems.
2. **Exploring Use Cases and Applications**: Blockchain courses often delve into real-world use cases across various industries, including finance, supply chain, healthcare, and governance. Researchers can gain insights into how blockchain is being implemented to address challenges and optimize processes within information systems. This exploration can inspire research ideas and guide scholars in identifying areas where blockchain can have a significant impact.
3. **Research Methodologies and Tools**: Many blockchain courses include practical components where students learn to develop blockchain applications, analyze blockchain data, and conduct experiments. Researchers can leverage these skills and methodologies to design and implement empirical studies, simulations, and experiments to investigate the implications of blockchain on information systems rigorously.
4. **Interdisciplinary Perspectives**: Blockchain technology intersects with various disciplines, including computer science, economics, law, and business. Courses on blockchain often incorporate interdisciplinary perspectives, providing researchers with a holistic understanding of the technology's implications. This interdisciplinary approach can enrich research in information systems by fostering collaboration and integrating diverse perspectives.
5. **Ethical and Regulatory Considerations**: Research in information systems must consider ethical, legal, and regulatory aspects. Blockchain courses address these considerations, discussing topics such as data privacy, security, governance, and compliance. Researchers can gain insights into the ethical and regulatory challenges associated with blockchain implementation within information systems and develop frameworks for addressing them in their research.
6. **Emerging Trends and Future Directions**: Blockchain technology is rapidly evolving, with new trends, protocols, and applications continually emerging. Courses on blockchain often explore these emerging trends and discuss potential future directions of the technology. Researchers can stay informed about the latest

developments in blockchain and identify research opportunities to contribute to the advancement of information systems.

Other benefit for the researchers is the possibility to join the CHAISE European Alliance community (https://chaise-blockchainskills.eu/join-the-chaise-alliance/). They can participate in the development of European Blockchain Skills Strategy, be informed about the new project proposals and make collaborations related to blockchain field.

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References

[1] McGuinness, S; Whelan, A; Ciprikis, K; Garcia-Rodriguez, A; Staffa, E (2023). *Annual Blockchain Skills Forecasts*. [online] chaise-blockchainskills.eu. Available at: https://chaise-blockchainskills.eu/wp-content/uploads/2023/07/CHAISE__WP3_Annual-Blockchain-Skills-Forecasts-2023.pdf [Accessed 03/04/2024]

[2] McGuinness, S; Whelan, A; Redmond, P; Ciprikis, K (2022a). *Annual Blockchain Skills Forecasts*. [online] chaise-blockchainskills.eu. Available at: https://chaise-blockchainskills.eu/wp-content/uploads/2022/06/CHAISE_WP3_D3.2.1-Annual-Blockchain-Skills-Forecasts_2022.pdf [Accessed 03/04/2024]

[3] McGuinness, S; Whelan, A; Redmond, P; Ciprikis, K (2022b). *Blockchain Skills Forecasting Model*. [online] chaise-blockchainskills.eu. Available at: https://chaise-blockchainskills.eu/wp-content/uploads/2022/06/CHAISE_WP3_D3.1.1-Blockchain-Skills-Forecasting-Model.pdf [Accessed 03/04/2024]

[4] McGuinness, S; Whelan, A; Redmond, P; Ciprikis, K; Staffa, E; Kelly, L (forthcoming). *Annual Blockchain Skills Forecasts.*

[5] Maratsi, G., Schösler, H., Riel, A., Solomos, D., Ghodous, P., & Matulevičius, R. (2023, August). Developing a Blueprint for Vocational Qualification of Blockchain Specialists Under the European CHAISE Initiative. In European Conference on Software Process Improvement (pp. 138-155). Cham: Springer Nature Switzerland.