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ARISE (*cert*COIN)- inspiring demand for sustainable energy skills

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The European AEC Sector now faces impending challenges over the next decade concerning escalating climate targets. To reach these targets, it vital that the green economy deliver a better-skilled workforce and develops new competencies and methods of working. Training in the domain of digital construction technologies and processes, such as Building Information Modelling (BIM), are now seen as essential upskilling vehicles that must be embraced if the sector is to transition towards a greener agenda. To assist in meeting these training needs a selection of partners from the BIM EPA will partake in the Horizon 2020 ARISE project, aiming to contribute to this agenda by stimulating and inspiring the demand for sustainable energy skills. This will be achieved by monetising skills development and learning exchanges within a digital system based on skills recognition. The project will develop a suite of modules underpinned by micro-credentials that will enable the learner to acquire the skills and accreditation/recognition needed to meet the job requirements while also providing vocational mobility. This material will be hosted on an on-demand mobile-friendly training portal and will have procedures inbuilt in its architecture to measure progress and validate the achievement. This achievement will come in the form of a cryptocurrency titled CERTcoin. It is hoped that this innovative approach will support the transition of the construction sector by providing its workforce with digital and sustainable energy skills that will secure a greener future.

keywords– Building Information Modelling, Sustainability, Education, Horizon 2020, ARISE, CPD

I INTRODUCTION

There is a recognised need to build a more comprehensive understanding concerning the numerous factors that impact participation in training. Some of these perceived barriers that an individual must overcome include the value of training, insecurity and fear of failure, motivational or lack of desire to participate in training; and the extent to which previous learning experiences affect the likelihood of pursuing future training activities [1]. The understanding of training barriers is required more than ever within the construction sector. A sector that is one of the most significant contributors to the global warming crisis and responsible for: one-third of global carbon emissions, one-third of global resource consumption, 40% of the world's energy consumption, 40% of global waste generated, and 25% of the world's total water consumption [2]. Climate change and its associated impacts have been identified as the greatest challenge facing human society; its adverse effects include increased average

temperatures, sea-level rise, increased heavy precipitation, and more frequent extreme weather events [3]. To help address this impact, the AEC sector has championed digitisation, as it acts as a catalyst for improvement of processes that, for example, enables us to model building assets and sequentially perform a multitude of analyses, including energy performance predictions that compare design alternatives, thus allowing for an improved data-driven built environment[4].

Digitalisation is now becoming pervasive in our daily lives. It is driving a level of connectivity never seen before in society, with digital methods and technologies, such as Building Information Modelling (BIM), now disrupting how we are traditionally doing business within the construction industry [5]. With BIM, buildings can be inspected from various angles, including sub-structures, intersections, and building performance characteristics, and allows for visual language tailored to different actors [6].

From an Irish context, the call for these digital skills is highlighted by the Expert Group on Future Skills Needs. The Group outline that changing technological and environmental factors, such as the increasing importance of BIM techniques and recent regulations around Nearly Zero-Energy Buildings (NZEB), create a need for additional upskilling and retraining to allow the sector to respond to these trends [7]. The Future Jobs Ireland 2019 Report also highlights BIM as a tool that will cultivate productivity improvements in the construction sector [8]. The difficulty in procuring trained individuals within the industry is discussed in a further report from the Expert Group on Future Skills Needs, highlighting that 16% of organisational responses report a specific difficulty in hiring BIM Operators / Experts [9]. To assist in overcoming these barriers, the Horizon 2020 ARISE project will help advance the upskilling and retraining process in the sector, as well as the recognition of these activities and the skills obtained. This will be achieved through the monetising of skills development and learning exchanges within a digital system based on skills recognition rather than solely the more traditional accreditation pathway.

II EUROPEAN NEED

Europe faces many impending challenges over the next decade, such as the climate crisis. To adequately address this crisis, we must develop a skilled and equipped workforce. The green economy is an instrumental part of sustainable development and COVID economic recovery plans across the globe. The organisation for Economic Co-operation and Development reports that countries and key partner economies have so far allocated USD 336 billion to environmentally positive measures within their COVID-19 recovery package [10]. The green economy must now deliver a better-skilled workforce and reduce labour market shortages by increasing participation in training. This can result in increased productivity and guarantee better compliance with deadlines and energy targets, thus reducing cost and waste. The key ideology is to facilitate BIM upskilling within the broader agenda of digital skills to enable the imminent transition, which is essential to the industry's decarbonisation and positive climate action [11].

The European Construction Sector Observatory report that Automation and the increasingly widespread utilisation of BIM are still not widely used in the construction sector. The report states the industry needs to develop new competencies and methods of working. This report outlines that by setting ambitious goals for Europe, the Energy

Efficiency and Energy Performance of Building Directives has driven the need for additional green energy and energy-efficient construction skills. To achieve this, a total of 3 to 4 million construction workers in Europe will need to develop their energy efficiency-related skills in the building sector [12].

ARISE will aim to contribute to this agenda by stimulating and inspiring the demand for sustainable energy skills from industry and individuals by redesigning the skills exchange, providing transparent upskilling transactions, and recognising upskilling performed. This will be achieved by delivering a 'portable' skills mechanism that provides the learner with access and vocational mobile flexibility. The ARISE digital Individual Learning Passport (ILA) will assist with the transition from paper-based to digital credentials in the European skills area and deliver digital credentialing solutions using Blockchain technology for verifiable transactions.

III ARISE BACKGROUND

In 2018, an initiative involving former Horizon 2020 and Erasmus+ projects including BIMCert, BIMEET, BIMplement, BIMzeED, and NET-UBIEP, as well as additional vital players in the upskilling of the AEC sector in digitalisation and sustainability, came together to form the *BIM Energy Performance Alliance* (BIM-EPA) [10,13,14,15,16,17&18]. In previous work, BIM-EPA partners had confirmed, with measurable results, the advantages of BIM as an improved enabler for higher levels of sustainable energy in buildings compared to traditional methods. They have also developed and showcased training programmes to upskill the construction sector workforce in digital construction with a focus on energy reduction.

A selection of partners from the BIM EPA have responded to another direct call from the Horizon 2020 initiative. This is the most extensive EU research and innovation programme ever, with nearly €80 billion of funding available over seven years (2014 to 2020). A part of this initial funding call was made available to focus on building a low-carbon, climate resilient future, which underpins the goals of the Paris Agreement and the Clean Energy for all European packages. A consortium of Northern Ireland (project lead- Belfast Metropolitan College), Republic of Ireland (Technological University Dublin), Portugal (CERIS/Instituto Superior Técnico), North Macedonia (Institute for Research in Environment, Civil Engineering, and Energy), Netherlands (Stitching ISSO and Building Changes Support BV), Italy (IBIMI), Denmark (Copenhagen

School of Design & Technology) and Belgium (Architects' Council of Europe) has proposed to respond to the call, by building on the outputs of several BIM-EPA members and other projects to provide a cohesive training response. This will deliver a set of interconnected, self-enhancing training modules to be realised in 4 key steps:

- [1] The harmonisation of activities performed with partners of past EU-funded projects, in regards to foreseeing different actions, such as the definition of sustainable energy and digitalisation competencies to facilitate mutual recognition. This step will also involve associating the training content, previously developed by the BIM-EPA partners, and new ARISE material to a commonly agreed recognised set of Learning Outcomes (LO).
- [2] The development of a digital delivery system for Continuous Professional Development (CPD) recognition pathways and training schemes and its deployment into the market. This recognition pathway will be a didactical structure used to assemble all existing and new learning materials into bite-size microlearning units. A suite of modules providing discreet micro-credentials will enable the learner to acquire the skills and accreditation/recognition needed to meet the job requirements while also providing vocational mobility.
- [3] To assist in the market by increasing demand and delivery of upskilling, ARISE will develop an on-demand mobile-friendly training portal for digitisation and sustainable energy in the construction sector. This e-platform and tools will assist individuals, industry, SMEs, large companies, and public authorities to engage and achieve digital energy skills maturity. The platform will have procedures inbuilt in its architecture to measure progress and validate the user's achievement, as well as issue a reward and recognition (accreditation) system titled CERTcoin.
- [4] The creation of a cryptocurrency (CERTcoin) of skills and learning in the digitally built environment enabled by blockchain technology to ensure the trust of the CPD type digital awarding. The purpose of this is to provide a model for providing professionals with a mutually recognised, comparable, and accepted leverage for their skills, to enhance their vocation employment while raising the standards and demand across the construction sector.

IV ARISE TARGETS

ARISE's approach and proposal is to improve and increase the collaborative skills of practitioners at all levels regarding the use of BIM and other technologies. These skills will enable and enhance the sector's ability to deliver energy-efficient buildings, leading to the scaling up of implementation of new construction processes, potentially with more significant impact when applied to retrofitting existing building stock. Facilitating BIM upskilling is recognised as an instrument to contribute to the European Green Deal by helping to ensure that the project life-cycle and costing analysis have a sustainable growth agenda for the future by using digital technologies [11&12]. This collaboration will be undertaken with Industry stakeholders (Public authorities, professional associations, building owners, tenants, and Facility managers) to support and directly stimulate the demand for such skills. An initial skills maturity level analysis will be used as a method to diagnose and reward skills development. This will enable the development of several levels of maturity of applied digitalisation.

A Learning Record Store will be implemented to enable digital delivery of both training, assessment, and recognition. For independent verification, these recognitions can be registered with blockchain technology resulting in an Interactive Learning Business Account (ILBA) This will enable a control track that can never be modified, with a consensus on the truth of the content, through multiple versions of the control track, created between many nodes, thus providing quality assurance of the skills recognition.

Completing modules allows a CERTcoin to be claimed/given, which underpins maturity and builds up a portal for users to promote their successes. Data traceability with unique digital IDs for each user, integrated into Blockchain, will protect individual digital experiences. This will also permit independent validation of an individual's learning data history over time, through the ledger if necessary to demonstrate data integrity to third parties, such as auditors or regulatory compliance agencies, or during legal disputes.

The developed qualification will encompass the workforce and professionals included in construction processes and the essential stakeholders such as public administration and public/private owners. The qualifications that will be designed for public administration will enable these institutions to initiate, run, and implement processes to digitally support energy skills and to require such skills from the industry. Digitalisation tools, such as BIM, generative design, digital simulation, and blockchain processes, will be demonstrated to upskill the public

administration workforce in digital ways of evaluating and validating public procurements and other legislative actions to regulate the market towards energy efficiency.

V ARISE CHALLENGES

One of the challenges expected throughout the project's life-cycle includes a potential low number of participants in program trials. It is hoped this can be avoided through extensive communication and dissemination activities. Continuous monitoring of participants' progress and understanding of the trial's materials will assist with learner engagement and interaction as they test the innovative learning tools under development.

Additionally, as part of ARISE's technical groups, there will be direct input from Industry leads. They will help review and inform the training programme, make it suitable and impactful to the Industry, and facilitate the likelihood of its uptake by construction professionals.

There are also other concerns, such as the range of applicability and recognition achieved. Through continuous measurements and surveys of the level of inclusion of stakeholders, timely detection of weak spots, alignment with CPD schemes to make the program widely applicable and accepted across Europe, will help to circumvent such barriers. Another barrier that must be considered is the lack of government mandates across Europe for a common standard in certified skills. Partners from neighbouring countries will support the consortium efforts to overcome this barrier by engaging stakeholders from their countries in the project activities.

VI ARISE METHODOLOGY

The project will commence in September 2021 and will conclude within a 30-month timeframe. The ARISE methodology is designed to focus on the following six deliverables

1. Facilitate mutual recognition of energy skills and qualifications in the construction sector.
2. Develop maturity level-based digitalisation, including classifications for energy skills.
3. Underpin national, regional, and local initiatives to raise awareness of the benefits of sustainable energy skills.
4. Provide support and training to public authorities to potentially develop new legislative frameworks and digital processes.

5. Establish cross-sectoral partnerships and collaborations to raise awareness and demand for good energy practice in construction/renovation.
6. Start initiatives to reinforce the links between skills/education and energy performance

To achieve this, the project will measure the current level of energy and digitisation skills maturity, knowledge, and understanding within the built environment sector. This will be an updated review of state of the art, based on the most up-to-date literature, survey data, and previous reports and EU projects, as well as an internal research analysis. This will result in three benchmarks: 1. EU Skills Benchmark; 2. Internal consortium Benchmark within the BIM-EPA; 3. Industry Benchmark.

These benchmarks will enable the development of a task-based qualification framework to enable a digitalisation transformation pathway. The framework will be an extensible foundation for the ARISE CPD system, and it will permit the generation of micro-learning, as well as the record store compatible learning statements, and the bite-sized units of learning outcomes that will form the upskilling modules. Ultimately, it will provide the skills framework enabling the transition from traditional to the digital method of application of skills.

This framework will be hosted on a gamification-type platform. Gamification has been found to be a productive tool to increase intrinsic motivation, introduce new technologies and products, and promote innovation and flexibility [19].

A work package will be dedicated to establishing and implementing the learning content and tools for the ARISE pilots. This learning content will be reflective of the skills established within the maturity qualification-based framework and aligned to support public administration, clients and users, as well as professionals (architects, engineers, technicians) and blue-collar workers. It will develop the micro bite-size modules encompassing a "just in time/beyond blended" approach. The beyond blended approach will include a combination of IT application and gamification rewards to facilitate its delivery. The micro size modules will be assessed using an AGILE methodology, which will enable adaptive planning, evolutionary development, prompt deployment, and continual improvement of the learning content and delivery.

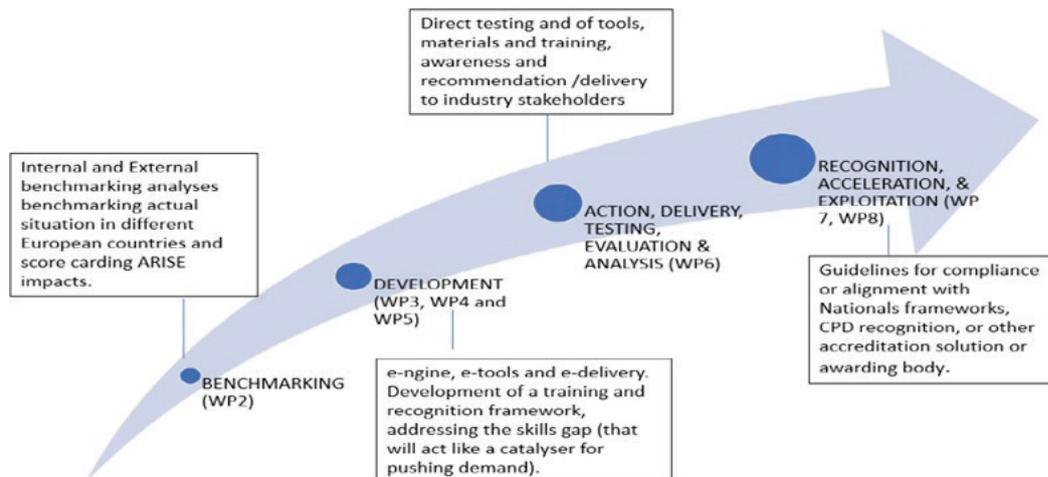


Figure 1 ARISE Methodology

A demonstration of the developed upskilling materials and pilot testing will be undertaken in both Consortium and associated partner countries. This will demonstrate the multi-criteria benefits of applying new digitalisation skills towards energy efficiency and ARISE's tailored upskilling scheme format for recognised competencies. These pilots will also be used to develop the matrix of competencies and skills to increase market competence. The matrix includes both the aspects of the digital tools of delivery and certification attribution (CERTcoin). The ARISE project will also develop a framework to align training modules with potential CPD certification systems and prepare guidelines for key market drivers. This will establish appreciation and acceptance of sustainable energy skills in construction, which will help to stimulate market demand for the skills. Figure 1 provides an overview of the ARISE Methodology

VII CONCLUSIONS

The uptake of the developed scheme will increase company and workforce willingness for upskilling and professional development. It is expected that the project will make a significant contribution to increasing the number of upskilled construction professionals. The overarching aim is to support the transition of the construction sector by providing its workforce with digital and sustainable energy skills of the future, along with demand-side guidelines for marketable appreciation of skills and exploitation of benefits thereof.

REFERENCES

- [1] Brown, T.C. and McCracken, M. (2009) Building a bridge of understanding How barriers to training participation become barriers to training transfer, *Journal of European Industrial Training*, Vol. 33, No. 6, pp. 492-512
- [2] Balasubramanian, S., & Shukla, V. (2017). Green supply chain management: an empirical investigation on the construction sector. *Supply chain management: An International Journal*, 22(1), 58-81.
- [3] Kim, K.P. and Park, K.S (2016) Primary BIM dataset for refurbishing flood risk vulnerable housing in the UK, *Built Environment Project and Asset Management*, Vol. 6 No. 4, pp. 365-378
- [4] Sanhudoa, L., Ramosb, N., Martinsa, J.P., Almeida, R., Barreirab, M., Simõesb, L. and Cardosob, V. (2018) Building information modelling for energy retrofitting – A review *Renewable and Sustainable Energy Reviews*, Iss 89, pp 249–260
- [5] World Economic Forum, (2018), An Action Plan to Accelerate Building Information Modeling (BIM) Adoption, *Shaping the Future of Construction*, World Economic Forum
- [6] Alashmori, T., Othman, I., Rahmawati, Y., Amran, M., Sabah, S.A, Rafindadi, A.D, and Mikic, M. (2020) BIM benefits and its influence on the BIM implementation in Malaysia, *Ain Shams Engineering Journal*
- [7] Expert Group on Future Skills Needs (2020) *Building Future Skills: The Demand for Skills within Ireland's Built Environment Sector to 2030*, National Skills Council
- [8] Government of Ireland (2020) *Future Jobs Ireland 2019: Preparing now for Tomorrows Economy*, Government of Ireland
- [9] Expert Group on Future Skills Needs (2018) *Digital Transformation: Assessing the Impact of*

Digitalisation on Ireland's Workforce, National Skills Council

- [10] [Organisation for Economic Co-operation and Development (2021) Focus on Green recovery, available from <https://www.oecd.org/coronavirus/en/themes/green-recovery>]
- [11] McAuley, B., Behan, A., McCormack, P., Hamilton, A., Rebelo, E., and Lynch, S. (2020) Improving the Sustainability of the Built Environment by Upskilling SMEs in Building Information Modelling Through the Horizon 2020 BIMcert Project, SDAR, Journal of Sustainable Design & Applied Research: Vol. 8: Iss. 1, Article 6
- [12] European Construction Sector Observatory (2020) Improving the human capital basis: Analytical Report, European Construction Sector Observatory
- [13] [BIMEET (2021) BIM-based EU-wide standardized qualification framework for achieving energy efficiency training, available at <https://projectsites.vtt.fi/sites/bimeet/>]
- [14] BIMplement (2021) objectives, available at <https://www.bimplement-project.eu/about-bimplement/objectives/>
- [15] BIMzeED (2021) Education for Near Zero Energy Buildings Using Building Information Modelling, available at <https://bimzeed.eu/>
- [16] NET-UBIEP (2021) Network for Using BIM to Increase the Energy Buildings Performance, available at <http://www.net-ubiep.eu/home/>
- [17] BIMCert (2021) About the Project, available at <https://energybimcert.eu/>
- [18] McAuley, B., Behan, A., McCormack, P., Hamilton, A., Rebelo, E., Neilson, B., Beckett, G., Costa, A.A., Carreira, P., Likar, D., Taneva-Veshoska, A., Lynch, S., Hynes, W. and Borkovic, T. (2019) Improving the sustainability of the built environment by training its workforce in more efficient and greener ways of designing and constructing through the Horizon2020 Energy BIMcert project, Proceedings of the CitA BIM Gathering, Galway 26th September, pp 63-70.
- [19] Reis, A.C.B., Junior, E.S., Gewehr, B.B and Torres M.H. (2020) Prospects for using gamification in Industry 4.0, Production Journal, Vol 30, pp 1-13