awakening | relevant | innovative | scalable | equitable

D 6.6 - Guidelines for long term evaluation, benchmarking, long term follow-up, and measuring of impacts

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Revision and history chart

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Publishable executive summary

This deliverable presents guidelines and recommendation for the ARISE project regarding long-term:

- Evaluation,
- Benchmarking,
- As well as follow-up and measurement of impacts.

It is a summary guide that compliments and informs WP7 and WP8 final outputs and deliverables. The recommendations in this report are based on outputs of tasks 6.1 to 6.5 and include:

- The results of market surveys, deployed during trial period.
- The experience and lessons learnt during upskilling engagement and direct actions on the market including AEC stakeholders at conferences and workshops, speaking at events and published articles and social media.
- Direct and specific feedback from upskilling actions derived from the QF sample materials tested via Platform in WP6 Trails.

These recommendations aim to build upon and maintain the positive results, achievements, successful elements, and tools from Trials. At the same time, they provide and support recommendations for improvements based on comments from the surveys, as documented in D6.5 report. This is intended to improve the ARISE format and delivery methods, to enhance further reach and impacts, supporting future exploitation and wider market implementation.

List of acronyms and abbreviations

BEM – Building Energy Modelling

BIM – Building Information Modelling

BMC- Belfast Metropolitan College

CEIM- Civil Engineering Institute Macedonia

CIAT- Chartered Institute of Architectural Technologists

CPD – Continuous Professional Development

D – Deliverable

EE – Energy Efficiency

EIHP- Energy Institute Hrvoje Pozar

EV- External Verification

GSL – Guided Self Learning

ICT – Information and Communication Technologies

IST-Instituto Superior Técnico

IV- Internal Verification

LCA- Life Cycle Assessment

MS- Milestone

NZEB – Nearly Zero Energy Building

LO- Learning Outcomes

OA- Ordem dos Arquitectos

OE- Ordem dos Engenheiros

PBL -Project-Based Learning

PRR - Plano de Recuperação e Resiliência (Recovery and Resilience Plan)

QA- Quality Assurance

QF-Qualification Framework

RIAI-Royal institute of Architects of Ireland

St-Sub-task

T-Task

UI-user interface

ULO- Unit of Learning Outcome

WIP-work in Progress

WP-Work Package

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1. Introduction

The ARISE project aims to assist the construction industry to ARISE and move towards an energy-efficient built environment, by stimulating increase in demand for sustainable energy skills in the Architecture, Engineering, and Construction (AEC) sector. ARISE's five enabling pillars are Alignment, Access, Assignment, Accreditation, and Assistance. ARISE's approach is based on a push-pull effect, with awareness and training of skills considered to increase the demand on both the supply and demand sides. To support this, and interconnected to WP6 tasks, ARISE sought to:

- develop of a Qualification Framework (QF),
- conduct a survey of ACE stakeholders to validate the QF and to assess skills gaps and needs,
- develop a sample of digital tools/ training materials based on the QF,
- develop an e-learning platform to deliver training and to promoting the use of micro-badging, with the ability to integrate blockchain features to certify skills and competencies,
- participate and promoted upskilling actions to raise awareness of skills and the importance of both training on and demand for such skills to the EC Industry,
- deploy Trials for testing the validity of the developed QF, the sample training materials and the form of recognition of skills achievement via digital badging,
- collect feedback on the Trials, to support the further development and updating of a package of QF sample materials for release on the Platform.

This report addresses WP6 Task 6.8 and relates to the preparation of recommendations for future follow-up. It is based on the work conducted during ARISE, specifically during the Trials moderated by WP6, that built upon the work and outcomes of other WPs, most notably WP3, WP4, WP5, and related more specifically to this deliverable, WP7.

2. Objectives and Scope

Working towards the project aims and objectives, ARISE targeted improving skills in digital tools and sustainable energy practices for professionals in the AEC industry, focusing and working in practical terms to achieve:

- **Validation of Competency Framework**: Testing the ARISE Qualification Framework (QF) and its associated Unit Learning Outcomes (ULOs).
- **Upskilling of Professionals**: Enhancing knowledge and skills in enabling digital tools for energy efficiency (EE). This including BIM methods and tools.
- **Promotion of Digital Certification**: Use of micro-badging to certify skills and competencies.
- **Market Readiness**: By preparing training materials for adoption across Europe and facilitating stakeholder engagement.

The specific objectives and scope of WP6 directly connected to these included:

- **Testing and Validating:** Trialling a sample of Qualification Schemes, digital tools, and teaching materials.
- **Capacity Building:** Increasing the market's competence in digitalisation for energy efficiency through tailored tools and certifications.
- **Market Implementation:** Preparing materials and methods for broad uptake across European regions.

WP6's work integrated with the project's overall activities and outputs, contributing to the key ARISE Objectives including:

- **Upskilling the AEC Workforce:** by increasing the number of skilled professionals in sustainable energy and digital technologies- targeting at least 1,000 upskilled individuals during the project lifetime and further growth post-project.
- **Digital and Sustainable Integration:** fostering the adoption of Building Information Modelling (BIM) and related digital tools to enhance energy efficiency across the building lifecycle.

- **Market Stimulation and Recognition**: developing systems such as micro-badging to certify skills, enables mutual recognition of qualifications across Europe in turn stimulating demand for skilled professionals.
- **Energy Goals:** contributing to measurable energy savings (in GWh/year) and stimulate the increase renewable energy adoption, enabled by the application of digital and sustainable energy skills.

Within the overall project scope of work WP6's contribution included:

- Engaging with stakeholders across the supply and demand sides of the AEC industry, including SMEs, public administrations, and individual professionals.
- Aligned training with EU directives like the Energy Performance of Buildings Directive (EPBD) to support NZEB compliance and energy transformation.
- Allow integration of blockchain technologies with digital learning records to assure transparency and verification.

In relation to project scope and reach WP6 Trials achieved the following:

- **Participants:** Over 3,300 professionals engaged, with more than 400 that were directly involved int the Platform trials successfully completing training modules.
- **Reach:** Diverse engagement across Portugal, the UK, Ireland, Italy, and Macedonia, with language adaptations to meet regional needs when practicable or viable.
- **Focus Areas:** Emphasis was on digital tools and BIM integration, fostering digital transformation within the AEC industry towards EE and on NZEB

This report focuses on the third aspect of the WP6 specific scope and provides recommendations for market implementation. It follows on from previous deliverables, achieved in the lead up to and throughout the Trial testing and its results. It builds upon the successful achievements and reach of the WP6 Trials.

The recommendations presented intended to:

- indicate guidance towards large-scale market adaptation and actions to stimulate and support that,
- suggest further improvements and integration of feedback received during the Trials,
- ensure the continued measurement of the following impacts during a large-scale adoption; Upskill of the AEC Workforce; The Digital and Sustainable Integration; Stimulation of the Market and Skills Recognition; achievement of Energy Goals.

3. Packages- Key Finding & Recommendations

3.1 Qualification Framework -Course Guide, Curriculum Outline and Delivery

WP3 developed the proposed Qualification Framework (QF), structured around task-based competency areas and its associated ULOs, knowledge base and competencies, with progressive pathways. The ARISE QF organised skills into four principal areas of competencies, with specialisations defined such as BIM Basics, BIM Modelling, and BIM Coordination. The overall QF is based on a task-based approach, which facilitates identification of ULOs and competencies, with associated knowledge content. The curriculum structured around the ARISE Qualification Framework, emphases:

- **Task-Based Learning**: Modules aligned with specific Unit Learning Outcomes (ULOs).
- **Progressive Skill Development**: From basic digital literacy to advanced BIM applications for energy performance.
- **Tailored Pathways**: Customizable learning pathways for different professional profiles, including architects, engineers, and construction workers.

The task-based structure aligned with identified professional needs, whilst promoting flexibility and scalability. The QF Tasks break down competencies and ULOs into manageable modules, making training accessible and relevant.

WP6 tested a sample of the QF in trial delivery. The Micro-module format was adopted to facilitate delivery of test samples deployed via the WP4 developed ARISE Platform. The key focus areas of evaluation were boosting awareness of benefit of digital tools and sustainable energy skills, and fostering the adoption of digital tools (e.g., BIM), that can then help to advance even to further specific tools and skills, towards an easier uptake of NZEB practices, while aligning with market needs, through iterative feedback and improvements.

The Curriculum and modules are linked to the overall QF groups, Specialisms and Tasks, and more specifically with its associated ULOs and required knowledge. Modules are designed to be stackable and transferable, across QF groups, and specialism, and to facilitate mapping/integration. In parallel WP7 had researched an indicative approach and equivalence method to map the ARISE QF, tasks, competences and ULOS with other Qualification Frameworks across European regions, including maturity skills levels with EQF levels. As reported in D6.4 and D6.5, the bite-size micro modules allow for flexibility and adaptability for the Trial wide scale deployment, and to stimulate progression and uptake. It also facilitates mapping to various (QFs) and Continuous Professional Development (CPD) schemes via the WP7 indicated methodologies (refer to D7.1 and D7.2)

The grouping and association of modules, allowed to cover a set of ULOs, and the knowledge, leading towards the ability of performing certain QF subtasks and task, and advance through to the associated QF Specialisms. These associated set of modules formed the ARISE training plans.

3.1.1- Recommendation for future market implementation:

3.1.1.1 QF Continuous validation via surveying & monitoring.

The QF concept was evaluated via multiple surveys and direct market actions. Most respondents indicated positive support and agreement with the proposed concept. Surveys conducted confirmed AEC professionals' approval of the QF and delivery approach and WP6 concluded that QF suitability was validated. This has been reported in detail in D6.4.

WP6 recommends that QF validity continues via surveying and continuous monitoring. We recommend a regular review, to ensure it will remain in line with trends, market skills gap and needs, as well as suitable for mapping with other NQF schemes or CPD adaptation. The prepared surveys remain available and live, accessible via the "Welcome Trainees" module with new users directed to complete them.

"New" updated results should be collated and reviewed regularly. WP6 proposes to six monthly review period, and/or when a suitable number of responses is achieved to ensure validity of findings. We would recommend minimum of 100 participants dependant on future user engagement. If significant changes occur, then QF and associated modules and training plans should be reviewed and updated accordingly.

3.1.1.2 QF delivery expansion for Market Deployment

Micro-modules delivery was developed to bridge theory and practice, addressing identified skills gaps. Micro-modules also facilitate flexibility in design, delivery, and content, enabling adaptation to various regions and industries. A micro-module format is more widely recognised as a valuable approach, as it enables and facilitates an easier aligning with CPD schemes and professional qualifications. They enabled a bite-sized Learning strategy with desktop studies confirming that is an approach that helps to improve accessibility and retention for participants.

More modules should continue to be developed, based on the structure associated with the task based QF. Modules should identify the ULOs being taught/assessed, along with the possible pathways, task, and subtask to which they be associated. This is alignment with recommendations in D.7.1 and D7.2.

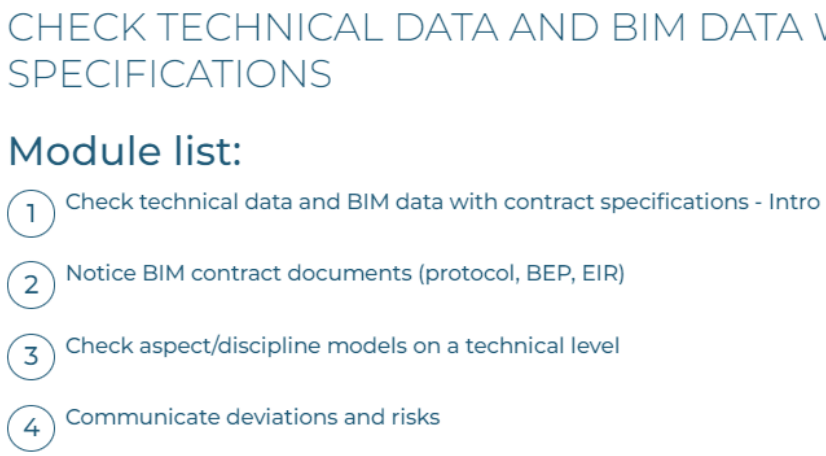

Fig.01 Example of training sub elements placeholder for future market implementation (sub-task)

Once a full set of modules is available to fully cover a sub-task or task, then an associated training plan can be released. Alternatively, a Framework of Training Plans, associated with the task (Fig.01) has already been created as placeholders by WP5 and WP6 in the platform, these and/or their associated sub-task modules/ lower category training plans (Fig.02) can be made available. In terms of skills recognition, these will equate to the “milestone badges.”

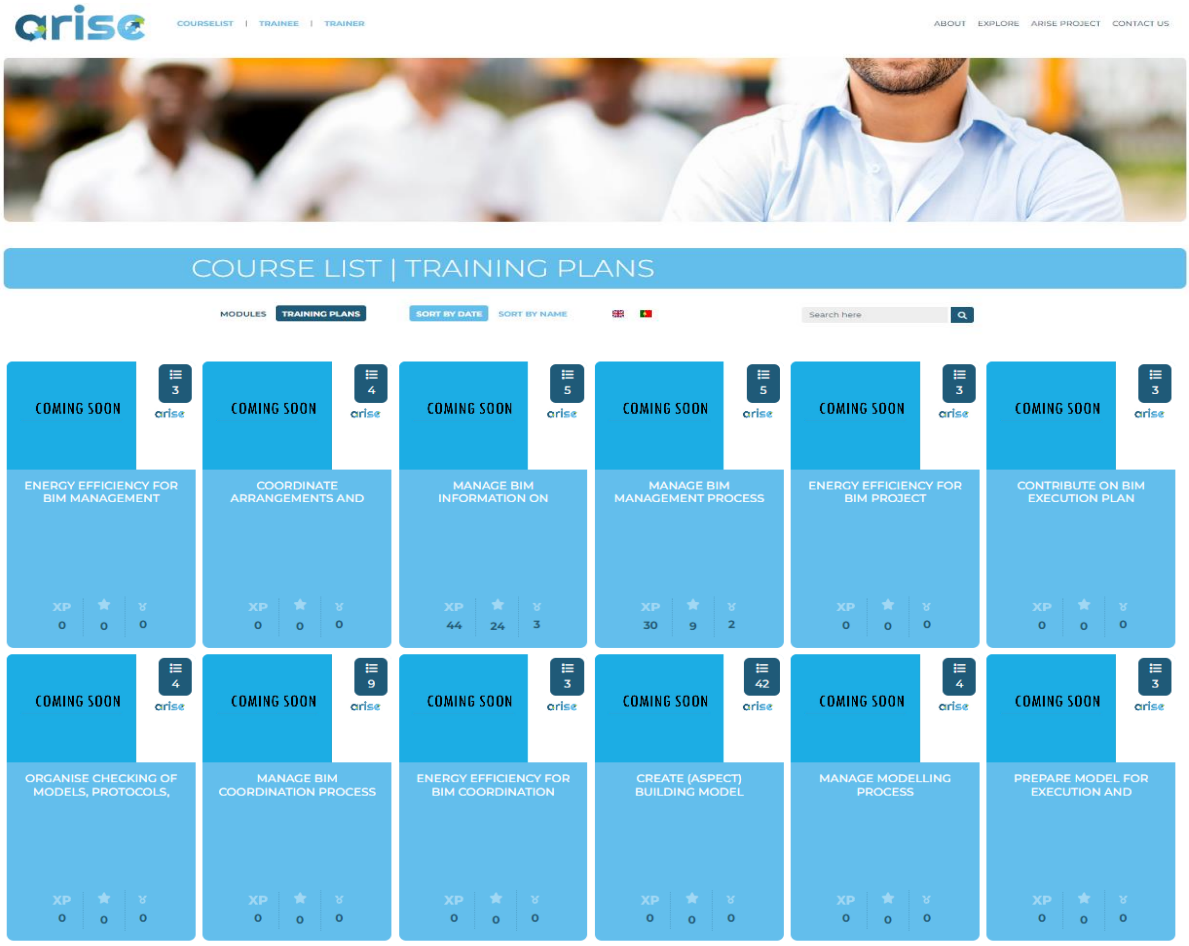

Fig.02 Example of training Plans placeholder for future market implementation (task level)

3.2 The Micro Modules Further Expansion

The Micro Modules developed integrate a set of learning activities that could provide the knowledge base linked to specific ULOs, required to perform the tasks defined in the QF. Each module links to ULOs to ensure alignment with the professional QF and learner outcomes. They have been developed to enable:

- **Modular and cumulative Design**: modules covering content and building up to increased skills in, for example BIM Fundamentals, Energy Efficiency Tools, and Digital Collaboration.
- **Bite-Sized Format**: to allow flexibility for professionals balancing training with work commitments.

- **Localised Content**: Multilingual materials, consideration on tailoring for regional compliance and accessibility in the future

The recommendations to expand the QF in wide scale market implementation, is linked to expanding delivery of further specialism and groups, covering even more tasks and subtasks. Continuous development and deployment of new micro modules should lead the way towards this purpose, and "*fill in*" the Training plans.

3..2.1 For future market implementation:

3.2.1.1 In general

With the sample testing Trials concluded, ARISE built the capacity of AEC stakeholders regarding the awareness of benefits of Digitisation tools towards EE. This enabled participants in the fundamental steps towards the EE benefits of digital construction. The next step of future market implementation is to build upon this digital foundation and introduce more complex digital tools for sustainable energy/energy efficiency. This will be facilitated via the Trials upskilling actions and the platform, with new module releases and content. ULOS will also be identified and development which link directly with sustainable skills enabled by BIM and upgrading EE and RES qualifications prescribed by EU Directives, as identified in Appendixes 8.1 and 8.2 of D 7.1 Report.

Furthermore, modules that WP6 had initially considered including in trials (refer to D6.3) and have commenced development during the project's lifetime can be completed and deployed.

3.2.1.2 Catering for "regional" contexts

Where suitable and viable, there should be an attempt to customise materials for local contexts and varying skill levels. For example, there were discussions with OA of Portugal, to pilot a sample of their own CPDs courses. These courses have parallels and similarities with elements of ARISE QF but with more focus on local legislation and Portuguese standards.

Similar considerations and pilots could guide the production of the new materials for large scale exploitation, to entice and grow audience in other regions (for example South European and Eastern European countries), including increasing reach in Consortium regions. There is already a Multilingual support for accessibility (e.g., Portuguese, English, Italian) that was assessed during Trials. This could be expanded further, if deemed required and/or effective to bring further users, whilst supporting retention and achievement rates. This could be of importance specially for blue collars uptake who may face exclusion due to the language barrier.

Different local modules, or exclusive access to specific content via platform's access restriction tools, could be one option to support this deployment. Both options of controlled deployment were assessed during trials. For example, the platform included "Italian" modules, or restrictions set in activities to control multilingual displays.

Further emphasis should be given to modules covering the practical aspects, and higher Skills maturity levels of digital tools in terms of energy efficiency.

3.3 Module Lesson plans

Examples of module lesson plans developed and used during Trials included "*BIM Basics*" and "*BIM Modelling*" specialism pathways, with further samples of BIM coordination and BIM supports amongst others. They provided an awareness and stimulated an increase in the demand for overall digital and sustainable energy skills in the market. They also provide a stepping stone to further advanced (higher maturity skill knowledge), while helping to create the fundamental basis to assist AEC professional in uptake and implementation of digital tools towards EE, utilising BIM.

Micro modules were created, deployed in the platform, and tested for suitability to deliver such skills. During deployment, modules followed a set of organisational principles to which "lesson plans" adhered to and should consider doing so in

future implementation. The contents were planned and deployed into the platform within micro- modules. Within the platform, micro modules were divided into a section structure, where sections could contain a set of learning and assessment activities. Together these activities and other elements within the micromodules, divided into these sections, constituted in effect a developed “lesson plans”- taking shape and deployed in the platform. Examples of such lesson plans, following the micro-module approach during trials, covered topics such as:

- BIM Fundamentals: Understanding BIM concepts, terminology, and benefits.
- Energy Efficiency Integration: Tools and strategies for enhancing energy performance using BIM.
- Advanced Applications: Practical exercises on BIM modelling and coordination.

A generic module template was created and implemented, forming the basis of an effective “lesson plan” template, in platform format. The plan, was divided into several sequential and progressive sections, including:

- An introduction to the module specific context, objectives and ULOs
- Explanation of the overall assessment criteria and features such as gamification.
- Set of scaffolded learning materials and activities (varied depending on module). This included formative practice assessment for supported learning (and should be implemented in all modules in future developments).
- Summary and revision of lessons learnt in the module.
- Summative assessment to address ULOs.
- Additionally, a bibliography should be provided with relevant and/or additional sources of information and learning.

3.3.1 For future market implementation:

The developed template “lesson plan” format should be used for development of future modules and platform implementation. New modules, content and assessment should be present in this form of “digital lesson plan.”

To support Quality Assurance (QA) prior to deployment the module content and assessment should be presented to members of ARISE responsible for QA for moderation. This could be a specific designated person, or suitable experienced and qualified team members, who are subject knowledge and quality assured. Second viewing and testing should be completed once the module is fully setup on the platform, using the lesson plan format for final internal testing, moderation, and validation by ARISE QA.

3.4 Learner’s materials: Methodology & digital tools

As previously indicated the developed Trails materials deployed a bite-sized format, with task-oriented content in terms of covering ULOs associated with the QF tasks. Micro modules included different formats of learning materials, such as tutorials videos, narrative videos, presentations, lessons, books, links to other third-party sources, etc. During the Trials, several formats were evaluated including giving emphasis to:

- Interactive Content: connection to gamified elements such as XPs and badges and “drag and drop” quizzes.
- Video Tutorials and other medium: Step-by-step walkthroughs for complex tools like BIM authoring tools and energy digital tools and software, lessons, and books for more generic skills.
- Guided Exercises: Practical, scenario-based tasks to apply learned skills.

Most activities (learning) were also developed to take around 15 minutes maximum each. This was to allow and stimulate completion and progression “on the go” at the limit free time of AEC professionals. Although, additional practice and self-guided learning activities could potentially take more time, without compressing

the initial timeframe objective. During Trials, the need and desire for training materials in regional language, instead of the overall English version was made evident. ARISE tried to respond to this and a sizeable portion of sample materials was translated.

3.4.1 Relevance

The modules and its contents/ materials were aligned with market needs, as identified, and confirmed in feedback surveys. Materials were designed based on skill gap analyses, ensuring alignment with industry needs as well as with ARISE QF. Complexity of materials was in-line with modules skills maturity levels (EQF equivalent). Key focus areas included digital transformation, energy efficiency concepts, tools, and practices, as per the modules tested.

Materials received positive feedback from participants both in terms of covering practical and theoretical aspects.

3.4.2 Promoting Ease of Use

Modular and bite sized format of materials and activities simplifies navigation and allows self-paced learning. Bite-sized modules with “smaller sized” activities cater to professionals with limited time availability. A 15-minute average duration per activity guidelines was followed. It should be maintained in future implementation when possible.

Materials are accessible across devices, supporting on-the-go learning. Recorded sessions and video tutorials improved accessibility.

The Platforms simplified, intuitive, and clear navigation features, as well as module design (sections/ lesson plan) improved usability. This is supported by user feedback, with a user-friendly interface and clear structure reduced learning barriers. Induction materials were made available to support first-time users (Welcome Trainees module content)

3.4.3 For future market implementation:

The tested formats, along with the deployed solutions regarding tools, and methodology, should be the format for delivery. This has been shown to supports ease of access and relevance for learners and should support exploitation for long term wider market implementation. Furthermore, consideration should be given to the following:

3.4.3.1 User's preferences

For future implementation, and as per survey results, preference should be given to video tutorials and where possible/subject appropriate, project-based learning.

- High quality graphics should be included in the materials.
- Accompany written materials to videos should be provided.

Further inclusion and monitoring of cases studies, to update any further value of findings, should be part of new and/or updated learning materials.

In terms of methodology, where applicable consideration should be given to project-based materials and assessments, as well as blended delivery mode (virtual real time classes). This will be dependent on the module subject/topic and resources, namely tutors associated with ARISE, with both requiring future development and planning. These can be of a benefit to ARISE and its users as the feedback responses from users (please refer to D6.4 report) indicated these as preferable options. Note that, despite many users indicated blended teaching as one of the favourites, a simple online delivery with narrative and tutorial videos was also among preferred choices, receiving positive feedback and effective during trials.

3.4.3.2 Continuous review & revalidation - technology, links, and standards

Continuous review, revalidation and update of contents should be conducted to ensure:

Alignment with emerging technologies and practices.

As digital tools experience rapid development and technological advances, a review of content will need to be performed to ensure ARISE material remains currently. This is particularly relevant in relation to software related modules, but equally important to ensure horizon scanning to identify and assess emerging technology solutions.

External links validation

A regular verification of links in bibliography should be conducted to avoid any broken links.

Standard, Requirements Guidelines and Legislation

Standards and legislation relating to both digital technologies (BIM) and energy efficiency tend to evolve and be reviewed regularly by statutory agencies. This is particularly evident in relation to Net Zero targets, carbon budgets and associated targets and legislation. ARISE should review modules contents, to ensure it is aligned to the most up to date changes in Standards and legislation for the market.

An overall desktop study, and cross reference of findings with ARISE modules to apply updates if required, should be done be done on a yearly basis, or if any significant changes to market are announced or identified (whichever the shortest).

3.5 Assessment tools

3.5.1 As tested on Trails.

Evaluation

Each modules had an assessment method, adequate to the assessment criteria of the Module ULOs, aligned with the QF, its skills maturity and indicative EQF level. The assessment was produced by WP5 in conjunction with and moderated by WP6. Some module's formative assessment was of a more practical nature. However summative assessment of both practical and theoretical nature, depending on ULOs, was incorporated into the micro modules on the platform. Assessments were widely evaluated with AEC public.

During feedback there were a few minor issues, which had been detected and addressed, despite previous moderation. This includes a few of the multiple-choice questions having repeated answers, and some typos.

One of the main objectives of WP6 was to ensure that achievement of users was assessed in a way that could be admissible in other QFs and courses. This included, but not limited to, plagiarism being avoided and detected. The aim was to ensure the credibility of any recognition and accreditation issued by ARISE and the digital badges being accepted by the wider AEC market. As such a rigorous assessment format and approval was essential, with many questions entered to form question banks and generate random questions to ensure a rigorous and validity assessment. Due to that substantial number, while inputting them to the platform, some minor errors still passed undetected. Feedback and learner support contact form allow for the detection of these, and consequent amendment during trial period. However, it proved the potential of human error during input of such large amount of data into the platform, while setting up the module's contents.

Feedback mechanisms

Feedback was set automatically in Online multiple choices, with qualitative feedback provide for learners in practical assessment.

3.5.2 For future market implementation:

Assessment

Again, while setting assessment for new modules, a process of moderation and validation with members of the ARISE teams related with QA should be undertaken. ARISE should aim to ensure full compliance with all quality assurance guidelines as developed. We would recommend moderation of assessment in pre-production and postproduction, after entry on the platform and before module goes "live." This will also help to provide competency-based evaluations designed to align with QFs.

Marking & Feedback

Feedback should be enhanced and increased as per feedback from learners in the Trials. They indicated a desire of further, more detailed, and positive feedback to be supplied. For large scale marking implementation, and adoption of the ARISE QF, training and platform by tutors across Europe, and to guarantee equity in evaluation and validation of achievement, an assessment rubric should be produced for all assessment material. This will support evaluation and assessment of ULOs and associated criteria across all regions. Rubrics would be based on the Skills maturity/ indicated EQF level, and indicate minimum pass criteria, as well as score banding. Template examples of rubrics would be made accessible via the Welcome Trainers Module. Rubrics would also be sampled and moderated before implementation.

In case of relevant modules if delivered by trainers in a blended mode, samples of assessment submissions and marking should be subject to ARISE QA for moderation and verification. If there is a grading band, samples for lower, medium,

and higher grades to be sampled. If modules have only a pass or fail criteria, representative sample of passed assessment, but all fails should be sampled.

If assessment graded automatically via quizzes or other automated way, it should still be moderated and verified by ARISE QA team prior to release of final grade/outcome. If ARISE modules and qualification are being endorsed or recognised by an NQF awarding body, in any of the regions, then trainers need to comply with such Awarding body rules and guidelines, including assessment criteria, moderation and verification sampling, etc. These requirements will need to be complied to, even if exceeding ARISE procedures when applicable.

3.6 Instructor guidelines, Quality Assurance, vetting & approval.

A trainer's module has been produced based on deliverables from WP5 and moderation by WP6, providing a Trainer's user manual (*D.5.5 - Development of Handbook for use after project duration*). Instructors will have access to this guide and must follow it in relation to development of future modules and materials. It includes:

- Step-by-Step Guides: Detailed instructions for delivering micro-modules and adapting to learner needs.
- Templates modules in platform to use to create new modules with "lesson plan" format.
- Access to examples as tested during Trials, on how to combine virtual and face-to-face training sessions (workshops/ virtual classes)
- An array of Assessment Tools enabled by the platform: Methods to evaluate learners' progress effectively, including real-time feedback mechanisms suck as forums or polls. (D6.5).

During Trials, upskilling actions were delivered by Consortium members, mainly WP6 and WP5 leads. In the future a wider network of trainers delivering ARISE QF training would help to expand into wider scale implementation. ARISE platform

can already facilitate this with two distinct enrolment sections- trainer and trainees.

During the project lifetime, a specific buildup international online workshop was delivered specifically for Trainers. ARISE also suggested in discussions with professional bodies the possibility of their trainers using the ARISE platform to deliver their own training programmes and CPDs. This would be based on the subjects that align with the ARISE QF.

3.6.1 For future market implementation:

For future Market implementation, Trainers seeking association and approval to deliver ARISE qualification via the Platform, should follow the instructions and guidelines. This includes for creating modules, setting up content and materials, as well as assessment, on the platform.

Trainers interested in becoming an ARISE certified trainer can apply via the platform, enrolling as trainees on the relevant module/training plan. If they outside of the ARISE consortium institutions, they should then await contact from ARISE team for instructions about the vetting process. A CV and proof of qualifications may be requested by ARISE QA for assessment and vetting. If trainers are from one of the ARISE consortium members, they can be directly appointed, under the responsibility of the member and complete internal vetting process.

If a trainer external to the original consortium wishes to propose or develop new modules, they must be aligned to the ARISE QF, and presented for moderation and verification by ARISE QA team. This QA team should be formed from ARISE members with responsibility for directly moderating and expanding platform delivered.

When setting materials trainers should follow D7.3 Report Guidelines.

3.7 User's feedback and technical support:

Feedback was received from surveys that identified skills gaps, requirements, and desired content. Links to the surveys were provided in the learner's welcome module, and further communicated via user messaging on the platform. Additionally, the platform support contact form and internal messaging system, allowed users to directly contact ARISE consortium with any queries and/or direct feedback more directly connected with the deployment in the platform and individual modules. This enabled almost "real-time" identification of issues and timely resolution.

3.7.1 Future Implementation

Once partner resources and staff arrangements are confirmed current lines of communication and support for users should be retained. This should include a regular review of users in terms of contact details, course engagement and progression. A user help/support desk should be established to verify and direct queries to appropriate channels/ resolutions, with an automatic reply message should be in place to give users estimated response time.

Whilst most of the technical issues have been resolved during the Trial period, currently we do not anticipate a considerable number of support queries for the materials available and deployed. A FAQ section should be included on the Welcome Trainers to avoid increased number of queries.

3.8 Gamification

Gamified elements (e.g., digital badges) helped increased motivation and completion rates. Positive feedback highlighted the value of gamification elements such as digital badges. The gamification and interactive elements help to maintain engagement, whilst digital badging provided tangible incentives for completing modules.

3.8.1 Future Implementation

In future implementation. gamified features should continue to be deployed and set for each module. Future new materials or platform features with additional gamification should be implemented when possible.

4 Further Engagement & increasing reach.

Dissemination, and direct contact with professional bodies and their endorsement helped increase participant numbers in Trials. It was a fundamental factor to Trials success.

Government mandates and local legislation proved to have a very direct impact in terms of demand for skills, both in the supply and demand side. This was demonstrated within the Portuguese region pilot training delivery. Over 2,000 of the platforms 3,300 users enrolled from Portugal, at a time when Portuguese legislators are implanting a BIM mandate and NZEB Regulations. The elevated level of interest is due to the Trials meeting an immediate need, supported by the Professional Body (OA), and 415 completing full training components. ARISE partners in the UK observed similar spike in demand for training in the lead up to the UK BIM Mandate implementation in 2016.

Participants via survey feedback indicate gamified elements contribute to maintaining their engagement in online delivery.

4.1 Future implementation

To increase reach, lessons learned should be applied in terms of induction materials, ease of navigation and tracking. Regions with initiated or upcoming mandates for BIM or EE policies, as well as active professional bodies, are key targets for potential to increase reach. The Trials results and output numbers can now be exploited to attract and validate new regional collaboration as they present a successful proven case that others may want to apply for and avail of.

4.1.1 Engagement and ease of use

Introduction videos, recorded induction and guides produced during ARISE should be deployed via online sources (platform, website, social media) and made available to reduced barriers for entry. These recordings and virtual support sessions were widely utilised and considered effective during the Trails. Improved user onboarding instructions to address initial registration challenges, as well as interactive elements should increase engagement. Feedback from Trials indicates:

- 1,000 views, reflecting strong interest.
- Interactive features fostered active participation among users.
- High utilisation of platform features such as recorded sessions and quizzes.
- Positive feedback on mobile accessibility and micro modular design

Therefore, when possible, virtual sessions should be deployed by the partners exploiting platform and materials. Additionally enhanced tools for organising and changing order of modules on user front end interface can help ensure a better user navigation and maintain engagement. The less friction and barriers of navigation by users, the better opportunity to retain and engage learners.

4.1.2 Engagement and ease of use

Enhanced platform automation for progress tracking and reporting would help in long term implementation with a wider market update. This would support tracking of learner progress and issuing of badges.

5 Overall Follow -up

5.1 General recommendations for long term continuation and improvement

WP6 recommends when feasible and in accordance with Exploitation plans developed and proposed by WP8, the following general action points are considered and implemented to improve and expand deployment of the platform:

- **Surveys and Analytics**: to monitor participant engagement and outcomes.
- **QF deployment increase with new modules:** New modules to be devised and deployed using lessons learnt regarding use of graphics, enhanced feedback, video tutorials, preferred methodologies, and materials (including blended and project-based learning), further visual aids and graphics.
- **Iterative Improvements:** Materials to be revised within the exploitation period, based on Trails feedback, and supported by further surveys and/or feedback, to enhance platform usability.

Related to the above, specific actions as follow:

5.1.1. Qualification Framework

Keep under review to, when applicable or required in long term future to

- Refine learning objectives to include advanced and emerging technologies.
- Enhance mapping with national and international standards.
- Incorporate more granular learning objectives for advanced users.
- Ensure alignment with emerging digital and sustainability standards.
- Introduce advanced learning pathways for specialised skills.

5.1.2 Materials

- Expand multilingual options.
- Review and update content with emerging technologies and practices.
- Develop materials for new modules.

5.1.3 Platform

- Possible Implementation of AI-driven personalisation for content recommendations.
- Continue to use and promote app connection for skills assessment and post signing to ARISE.
- Improve analytics to help track learner progression and engagement more efficiently.

- Regular updates to address technological advancements and market trends.
- Expand gamification features to sustain engagement.

5.1.4 Expansion and increase regional reach

- Scale up the pilot success to other European regions and industries.
- Foster further collaborations with additional professional bodies and SMEs using the current trial pilot and examples as springboard to assure further engagements.

5.1.5 Usage and recognition on NQF schemes and CPDs

WP7's analysis of national frameworks, in general their format, content and referencing to EQF, along with the specifics of sustainable energy correlated competences, resulted in a compilation of ARISE ULOs. This has been prepared within the D3.3 Qualification framework of sustainable energy skills leveraged by digitalisation including BIM, in a format that will enable recognition and correlation with national frameworks. This produced a methodology for mapping national qualifications and ARISE competences, as well as conversion of the ARISE framework and Maturity Skills levels towards EQF levels.

National Qualifications	ARISE qualifications
Title	Specialism
Learning outcomes (active verbs acc. to Bloom's Taxonomy)	Tasks (nouns – gerund acc.to Train4sustain proposed standard)
Assessment criteria	Subtasks
Knowledge	Knowledge
Skills	Skills

Competences	Competences
Duration (workload)	n/a
Level of proficiency (EQF hierarchy)	Maturity level (acc. to Train4Sustain Competence Quality Standard)

Table 1: Comparable elements of NQs and ARISE (excerpt)

D7.2 developed a method for conversion and transfer of ARISE modules to CPD points. The WP6 Trials used this guideline to streamline delivery, based on micro modules and bite-size content and progression. Within market implementation, ARISE will seek to use the develop framework and mutual recognition methodology to increase ARISE uptake. For example, in the UK, the ARISE training of BIM Application can be mapped using the methodology developed by WP7 to NQF course and awards. BMC should seek opportunities within those Frameworks for ARISE inclusion and usage.

6. Benchmarking & Measuring Impacts

6.1 The road so far

During platform trials, feedback was continuously gathered through:

- **Surveys and Workshops:** providing insights into participant engagement, learning experiences, and skill application.
- **Usage Analytics:** monitoring platform activity via platform internal tracking and reporting tools to identify trends in learner behaviour.
- **Quantitative and Qualitative question in surveys:** surveys captured deeper insights from key stakeholders and participants, as well as providing data to cross match with other responses and gauge reasoning and validity.

The surveys aimed to obtain qualitative and quantitative data to quantify the impact of the ARISE Trial upskilling.

The Platform enrolment form and survey collected information regarding the nature, number, and size of projects that participants currently or will be involved with. It queried users on the projects, the use of digital tools to assist energy efficient strategies, and an assessment of the usage of ARISE training and gained awareness. It also sought information on potential projects using NZEB guidelines that users considered they would be involved with in the future. Overall responses were positive in relation to future use of ARISE gained skills, as well as gained awareness.

Questions also addressed what benefit BIM and ARISE skills gained could provide in relation to energy efficiencies applicable to new build construction, maintenance, and retrofit/renovation projects. Again, positive responses highlighted increased awareness of digital tools and energy efficiency. Users responded that they would use the gained skills, including participation in NZEB project builds and retro fits. Estimation of those projects was u for to calculate equitable energy savings and economic impacts based on the average number of projects, size, and potential energy savings.

6.2 Benchmarking & continuous Impact measuring

During ARISE lifetime evaluation and benchmarking of impacts included:

- Surveys on skills improvement, applicability, and future project impact.
- Survey on QF validation and applicability.
- Comparative analysis of trial outcomes to benchmark engagement and learning success.

Indicators assessed included training completion rates, digital badges issued, and EE projects initiated or potential involvement from participants. The following aspects have been assessed via surveys, professionals' participation, and engagement with ARISE:

- **Validation of QF and recognition schemes by Participant Feedback:** Overall positive

- **Uptake, reach and Engagement towards skills capacity building Metrics:** Over 3000 participants with 415 completing training modules.
- **Skill Application and potential triggered investment:** participants involved in NZEB and/or energy-efficient projects of diverse types and sizes and recognising QF skills and ARISE training to be beneficial and applicable as help to those projects.
- **Energy Impacts & Saving**: derived from the upskilling participation numbers.

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6.2.1 Measuring Quantitative Impacts

6.2.1.1 Training/engagement and increased market capacity:

ARISE achieved contribution to proposed impacts with for example the following achievements:

- **ARISE direct Platform trials engagement:** Over 3,300 participants; 415 participants completed modules.
- **Increase of capacity and Skill Certifications:** 3,246 individual digital badges issued, displaying widespread skill enhancement.
- **Energy impacts and investment NZEB Projects**: Extrapolation of impact measure by findings on surveys and participant profiling. 75% of respondents confirmed that they are currently or will be involved in energy-efficient projects. Recognition of applicability and help of ARISE QF skills for those projects was supported by users.

6.2.2 Qualitative Impacts

Responses to surveys by participants in Trial period indicated:

- **Increased of Awareness and demand for Skills:** Increased awareness of the role of digital tools in achieving energy efficiency goals. ARISE detected a positive shift in professional practices toward integrating digital tools

towards sustainable EE solutions, with majority of participant indicating to find useful and intended to use ARISE skills going forward.

6.3 For future implementation

Post project during exploitation phase, continuation of monitoring including surveys and analytics should be implemented to track participant engagement, outcomes, and impacts. Surveys should continue to be available in conjunction with enrolment forms, and the Platform's internal tracking and reporting tools to collect quantitative and qualitative data. Minimum data to be tracked and recorded should include:

- Number for new participants,
- Badges issued (will indicated completion and achievement rates),
- Type and size for projects that participant is involved, initial use of digital tools and EE strategies,
- Current and estimated future project using NZEB, or other EE certifications/ standards (Passivhaus, BREEAM, etc.),

Other proposed actions related to overall impact contribution and measuring of ARISE, to be continued post project in long term implementation, are presented in a table in the next report article.

6.4 Overall continued long-term contribution and measuring of Impacts proposal.

The following table summarise the guidelines proposal for long term contributions and continuous impact measure for ARISE, in wide scale implementation. Following proposal to be subject to future review and adaptation, and to explored in conjunction and in accordance with guidelines provide in WP8 exploitation plan proposal.

Impacts	Continued long-term contribution for wide market implementation by ARISE	Indicators and Targets (where possible) and proposed measuring methods
1.Primary energy savings triggered by the project (GWh/ year)	Disseminate and include in ARISE training materials case studies to raise awareness and demand for skills. Upskill in digitisation and sustainable energy skills. Platform and materials available, to be exploited as suggested by exploitation plan. Communication, dissemination, and as per exploitation plan.	Monitor users, accomplishments and record projects type, number as size of such projects those participants are involved with. Use methodology for measuring savings. Measure tools for participant and achievement. Use ARISE platform tracking and reporting, surveys, or other means of record engagement and numbers.
2.Measurable energy savings and/or improved energy savings for at least 10% and increased share of renewable energy sources and recovered energy use for at least 5% in total energy consumption of the building.	Stimulate improvement of energy savings for via uptake of renewable energy sources and recovered energy	Seek to update ARISE materials with further case studies when data becomes available. Measuring tools: Use and inclusion of surveys (present or updated) to indicate participant intention of usage of renewable energies in their projects, and/ or indication of NZEB project participation will imply usage of renewables.
3. Investments in sustainable energy	Partners that may be exploring platform and materials, to update materials and/or when required	Use ARISE Platform reach, to continue to incentivise participants in sustainable

triggered by the project	and/or include more up to date data of benefits of investments in sustainable energy, to further trigger investments. Continue research and inclusion of case study examples case studies	energy initiatives and projects. Update materials when possible/ applicable. Suggested measuring tools: Use and inclusion of surveys (present or updated) to indicate participant intention of usage of renewable energies in their projects, and/ or indication of NZEB project participation will imply usage of renewables. New or updated materials
	Contact engaged and possible new participant and investor to incentivise use of ARISE skills to assist in NZEB projects. Engage with SMEs and public authorities. Resume / continued to engage and track progress of new participant that indicated to be working or estimate to be working in NZEB projects. assist when possible. Partners in regions to engage in these activities when possible and suitable contacts are available. A regular open call for action, participation of intent to be sent regularly (possible every 6 months)	Based on initiated or intended projects as the result of participant in the ARISE project, during and post project. Suggested measuring tools: Use and inclusion of surveys (present or updated) to indicate participant intention of usage of renewable energies in their projects, and/ or indication of NZEB project participation will imply usage of renewables. Register of contact and engagements, via survey or/or other sources and methods (emails, letter of intent, meeting minutes, etc..)
4. Increased number of	Developed a unique, modular scheme for digitally delivered	Developed transaction model to transfer ARISE

certification schemes for energy efficiency skill	sustainable energy skills and recognition of those skills, tailored for the complete chain of participants in the construction sector.	learning outcomes framework to CPD points, for alignment with national qualification schemes in at least 8 (partner) countries (WP2, WP3, WP4, WP7)
	Impact achieved with availability of platform and potential future exploitation of both platform, materials and QF. Increase number of new participants, and rate of achievement of current users. Proposal is for this to be monitored regularly if possible (indicative: every 6 months to a year)	Continued online upskilling action of construction sector professionals reached via platform or legacy project communication and dissemination format (articles, website, past social media post, etc) An increase participant receiving and/or further completing upskilling via ARISE. Suggested measuring tools: Use and inclusion of surveys (present or updated) to indicate participant intention of usage of renewable energies in their projects, and/ or indication of NZEB project participation will imply usage of renewables. Update on online viewings data tracking
5. Improved mutual recognition of sustainable energy skills between the Member States and	Partners to continue to promote the developed a training scheme model as suggested in exploitation plan. When possible, to apply the methodology of transferability to NQF and CPD schemes. Partners in position and exploiting platform and materials to seek opportunities for such	Partners in educational position to seek and explore inclusion of ARISE QF into NFQ course in tehri regions and/or CPD schemes. Suggested measuring tools:

neighbouring countries	recognitions. And/or propose for ARISE recognition participant in regional training whose pre acquired skills map with ARISE training/ QF, to increase usage and recognition of ARISE digital badging	Number of NFQ scheme of CPDs using ARISE derived training. Number of participants achieving ARISE skills previously obtained in regional NFQ and/or CPD schemes that map with ARISE training, as per method developed in WP7.
6. Improved collaboration and understanding across different trades and professional groups	Make ARISE training that has promoted collaboration between AEC stakeholder available	Suggested measuring tools: Use ARISE platform tracking and reporting, surveys and or other means of record engagement and numbers (including professional profiles)
7. Increased market acceptance of sustainable construction skills	Availability of the ARISE training and surveys	Suggested measuring tools: Use ARISE platform tracking and reporting, surveys and or other means of record engagement and numbers (including professional profiles)
8. Legislative changes stimulating the demand for energy skilled building professionals	Availability of the ARISE training and an additional module with the results of WP7 suggested recommendation. Designate the ARISE Portugal pilot test training Trial case study, as well and previous detected effect in the UK, of government adoption of BIM mandates, and NZEB standards adoption as drivers for market uptake.	Suggested measuring tools: Use ARISE platform tracking and reporting, surveys and or other means of record engagement and numbers.

9. Reduction in the gap between designed and actual energy performance through improved quality of construction	Availability of ARISE training.	Suggested measuring tools: Use ARISE platform tracking and reporting, surveys and or other means of record engagement and numbers
Additional impacts		
10. Collaboration with EU wide BIM/Energy projects	Make ARISE available for collaboration with other Eu projects. Explore further development and opportunities use of ARISE towards further Eu calls and projects	Continue to promote and enhance the use of digital skills in the construction sector Share knowledge, best practice, inspire collaboration, and showcase new opportunities in digitalisation of construction. ARISE representatives available to respond to solicitation and/or collaboration request from other EU projects. Seek new call and opportunities.

Table 1. Continued long-term contribution and measuring of Impacts guideline proposal.

7- Summary

The report is based on work developed during the ARISE project by several WPs, which contributed and informed WP6 during the project term. Specifically, it addresses the output, findings and impacts achieved by WP6 Trials, including participants survey feedback. These formed the basis for analysis and *Guidelines proposals for long term evaluation, benchmarking, long term follow-up, and measuring of impacts.*

The guidelines are framed by the remit of the WP8 exploitation plan and previous deliverables developed in WP7 related to market implementation. This includes but exclusively: *D7.1 Guidelines to align ARISE learning outcomes with national qualification frameworks; D7.2 Guidelines for use of ARISE trainings to gain CPD points; D7.3 Accreditation Report – QA&QC procedure to provide high quality of upskilling; D7.7 Policy recommendation. for a pan-EU common approach for sustainable energy skills recognition*.

In summary, proposal covered the following:

- Continued potential improvements of materials and platform were indicated, as compliment of previous recommendation presented in D6.5 report.
- Indicative preferred expansion and improvement of ARISE materials (including methodology tools, and assessment) for continued upskilling for wide market implementation.
- Indicative preferred expansion regarding new modules and areas for upskilling for market implantation, based on the work of WP3 and WP7, and according to user's survey indicative finding.
- Continuous uptake of Micromodule and bite size approach.
- Further complimentary (to D7.3) guidelines for quality assurance
- Suggestions of expansion of ARISE, incusing the use of reach in certain region during project, and a springboard and incentive to increase reach on other region on port project Implementation.
- Guidelines to continue contribution to ARISE impacts and measuring tools.