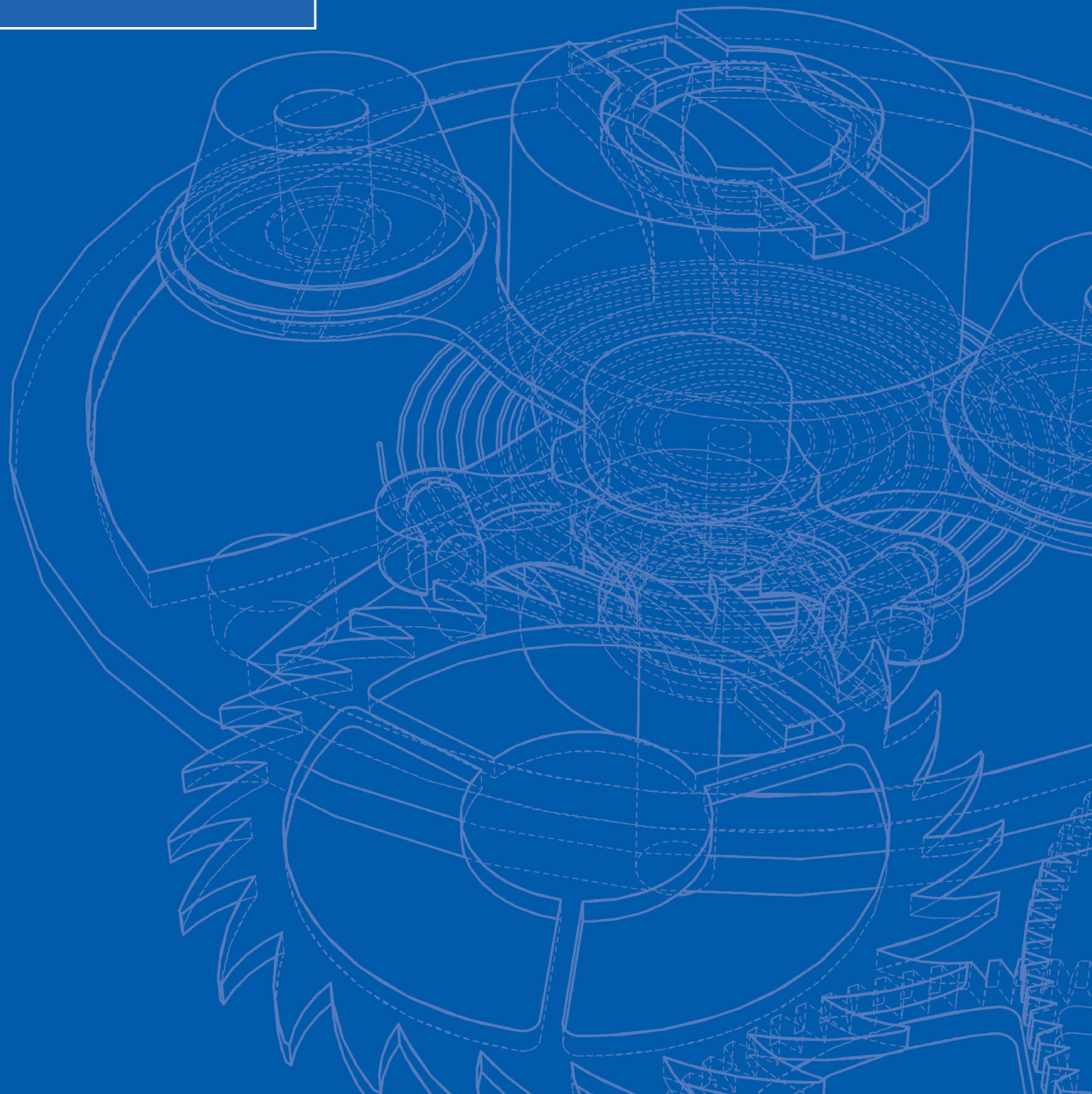


USER GUIDES

Learning Outcome and Question Development

CONFIDENTIAL: For Internal buildingSMART use only



Terms and abbreviations

The following definitions and abbreviations are used in this document:

Applicant

A training organisation wishing to be registered by buildingSMART International.

buildingSMART

Is the worldwide authority driving the transformation of the built asset industry through creation and adoption of open, international standards. buildingSMART is comprised of multiple national Chapters.

buildingSMART International (bSI)

Is the central legal body which leads the entire buildingSMART organisation.

Candidate

An individual wishing to sit the qualification exam.

Chapter

A national (or regional) membership body representing the interests of buildingSMART at a local level.

The Committee

The buildingSMART International group responsible for developing and coordinating the Program.

Individual Qualification

Refers to Phase 1 of buildingSMART Professional Certification.

Learning Outcome Framework (LOF)

The entire list of learning objectives upon which Individual Qualification is developed.

Learning Outcome (LO)

Individual learning objectives that form part of the Learning Outcome Framework.

Online platform

Refers to an online application to be used by Candidates to take the qualification exam.

Phase 1

Refers to Phase 1 of the buildingSMART Professional Certification Program, *Individual Qualification*.

Phase 2

Refers to Phase 2 of the buildingSMART Professional Certification Program, *Professional Certification*.

Professional Certification

Refers to the buildingSMART Professional Certification Program for individual learning and qualification.

Program

buildingSMART Professional Certification Program.

Provider

Refers to a training organisation, specifically one registered by buildingSMART to deliver approved training.

Qualified

Refers to an individual (prev. Candidates) who has passed a buildingSMART International Individual Qualification exam.

Qualified Provider

Refers to a training organisation, specifically one registered by buildingSMART to deliver approved training.

Question Database

A list of questions and answers that form the basis of the Professional Certification Program and correspond directly to the Learning Outcome Framework.

Question Rating Tool (QRT)

An online platform developed to support Chapters in creating and evaluating questions for the testing tool database.

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Professional Certification Program

Phase 1: Individual Qualification Learning Outcome and Question Development

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Draft: Version 1.0 - April 2018

Preface

This document forms part of a document series that details the buildingSMART Professional Certification Program, Phase 1: Individual Qualification. The series' aim is to provide guidance to Chapters for implementing and delivering the Program in their country or region.

The series is divided into four document sets, each branded with a distinct colour coding. Currently, there are eight documents in the entire series, however, it is expected that more documents will be added as the Program matures. All available documents should be read before implementation begins.

Document Set (Colour code)	Name	Reference
Policy & Process (Red)	Policy and Process Overview	bSI_IndiQual_Doc1.1
	Approval of Training Providers	bSI_IndiQual_Doc1.2
Communications (Green)	Branding and Logo Usage	bSI_IndiQual_Doc2.1
User Guides (Blue)	Learning Outcome and Question Development	bSI_IndiQual_Doc3.1
	Online Qualification	bSI_IndiQual_Doc3.2
	Body of Knowledge - Basic	bSI_IndiQual_Doc3.3
Development (Purple)	Overview and Sponsorship Plan	bSI_IndiQual_Doc4.1
	Business Plan Template	bSI_IndiQual_Doc4.2

If you have questions, comments or recommendations for the improvement of these documents please contact professional.certification@buildingsmart.org

We wish your Chapter the greatest success with the implementation and delivery of the buildingSMART Professional Certification Program.

Introduction

buildingSMART International (bSI) Individual Qualification has three areas of activity:

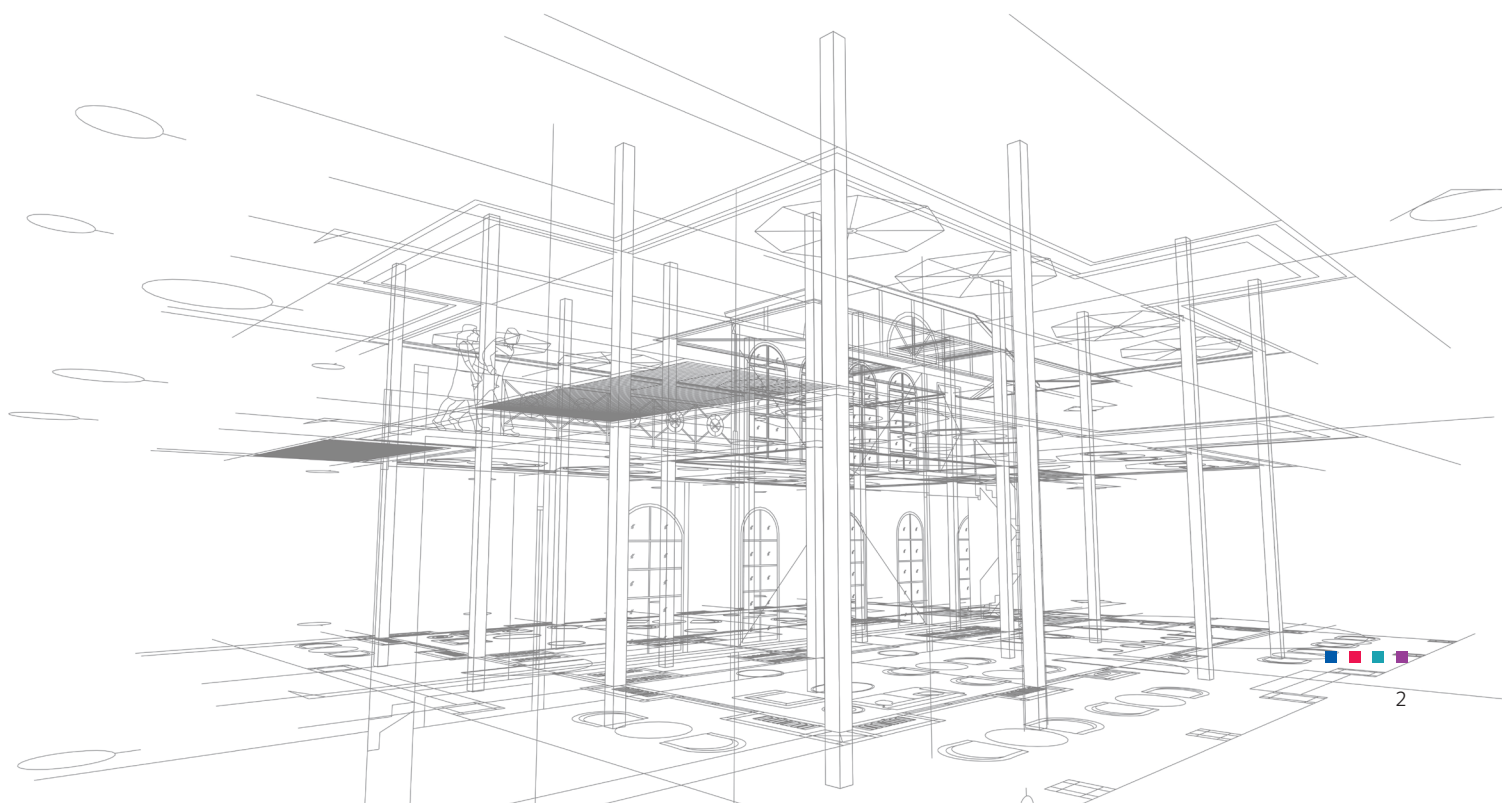
- Content Development – defining Learning Outcomes (LO's) and related resources.
- Course Approval – the procedure to review and approve candidate training.
- Individual Qualification – the testing and qualification of individuals who have undertaken an approved training.

This document assists Chapters in understanding the methodology and content structure of the bSI Individual Qualification Program. Specifically, it deals with the topic of content development.

Content development itself is divided into three further sub-tasks:

- Development of the so-called Learning Outcome Framework (LOF) (course learning objectives).
- Creation of reference (learning) material (Body of Knowledge).
- Development of the Question Database.

This document provides an introduction and overview to the LOF (Part 1), the core of the Individual Qualification Program. It also provides guidelines on how questions are to be constructed (Part 2) and how to use the online Question Rating Tool (QRT) (Part 3), which has been provided to help you evaluate your questions and question translations.



Part 1

Learning Outcome Framework

1.1 Overview

The LOF is the core component of the bSI Individual Qualification Program. Each module is to have a minimum of 25 and a maximum of 30 individual LO's. These are typically grouped in a series of five to six related items.

The LO's define the minimum learning that approved trainings must convey within their course curricula and is subsequently the framework against which applicant courses will be assessed and approved. The LO's are also the basis for the testing and qualification processes.

There are currently seven modules planned (see below). The Basic module, which is already complete, is the foundation of the Program and is mandatory for all Chapters to adopt. Chapters are free to expand their Program with further modules as they wish.

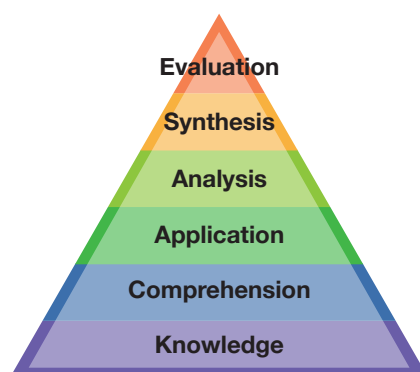
Basic	
➡	Manager
➡	Consultant
➡	Contractor
➡	Owner
➡	Facility Manager
➡	Manufacturer

1.2 Methodology and structure

Professional Certification utilises the Bloom's Taxonomy to classify the level of learning required.

As an entry level Program, Individual Qualification has been designed to satisfy only basic knowledge requirements around Building Information Modelling (BIM); specifically the knowledge and comprehension learning levels of the Bloom's Taxonomy.

In Phase 2, the more advanced learning levels (application, analysis, synthesis and evaluation) will be addressed.



1.3 Purpose and use

The LOF and Question Database will be made freely available to all Chapters participating in the Program. All material will be provided in English only and it is the responsibility of each participating Chapter to manage the translation of the LOF and related material for their country or region.

The core 25-30 LO's (and related questions) cannot be edited or deleted by any participating Chapter. The content is to be translated in the most direct form. However, each Chapter is able to add an additional six country-specific LO's to each module, to meet national or regional requirements. Chapters that wish to expand a module must define the necessary LO's and corresponding questions in accordance with the LOF & Question Development guidance document. The additional LO's and corresponding questions must be submitted to the International Committee in English for review and approval, before they can be included in the national module (in the local language).

Training Providers are encouraged to use this LOF as a basis for developing BIM training content. However, it is not intended that the LO's alone will comprise a full course curriculum. As the LOF represents the minimum learning, it is expected that approved courses will cover other content in addition to the LO's described within this framework to suit the intended audience. We suggest that the time required to sufficiently cover all content within the LOF is not less than 6 hours. This is designed to be implemented into training courses with a duration of 1-2 days.

1.4 Basic Learning Outcome (Overview)

1 Understand what BIM is, why it is needed, and recognise its specific terminology.

- 1.1 Define the drivers that have led to BIM;
- 1.2 Define BIM;
- 1.3 Identify & define key BIM terminology;
- 1.4 Define BIM maturity levels;
- 1.5 Define what constitutes an Information Model.

2 Recognise the advantages of BIM compared to traditional project delivery.

- 2.1 Know why collaborative and new ways of working are required;
- 2.2 Identify the effects of poor information management on projects;
- 2.3 Identify the standards developed to mitigate poor information;
- 2.4 Identify the benefits of BIM to construction professionals;
- 2.5 Identify the benefits of BIM adoption to clients and facility management.

3 Understand the project information development cycle (and its key terms); specifically how project information is specified, produced, exchanged, and maintained.

- 3.1 Know why employers need to clearly define their requirements (EIR);
- 3.2 Know why the supply chain needs to agree a plan to execute BIM on the project (BEP);
- 3.3 Know why consistent exchanges of information are required;
- 3.4 Identify the key elements and benefits of using a collaborative exchange platform (CDE);
- 3.5 Know why clearly defined information management responsibilities are required;
- 3.6 Know why assessing potential supply chain members before appointment is required.

4 Recognise the need for open and interoperable solutions.

- 4.1 Define who buildingSMART are;
- 4.2 Define openBIM and its benefits compared to using proprietary products and systems;
- 4.3 Know what IFC is and its benefits;
- 4.4 Know what MVDs are and their benefits;
- 4.5 Know what IDMs are and their benefits;
- 4.6 Know what the bSDD is and its benefits;
- 4.7 Know what BCF is and its benefits.

5 Identify an organisation's capability in working with BIM.

- 5.1 Understand the potential benefits for a company in adopting BIM;
- 5.2 Understand the factors that define an organisation's level of BIM Maturity;
- 5.3 Know why BIM adoption needs to align to organisational goals;
- 5.4 Identify the benefits and challenges to BIM adoption;
- 5.5 Know what the data security implications are for adopting BIM.

Part 2

Question Development

2.1 General information

A Question Database of a minimum 150 questions is to be created for each LO module. The Question Database is used in the Qualification Platform to randomly select questions for each candidate test (described further in Part 3).

There shall be a minimum of 4, and ideally, 10 questions developed per LO, to achieve the minimum 150 questions per module.

Every question has 4 answering options, where the candidates should choose the most correct option. The candidate only has the option to select one of the four options. Correct answers give points, wrong answers or questions not finished within the time limit of 30 minutes do not give points.

2.2 Question creation and evaluation

The quality assurance is an iterative process.

The first iteration involves an evaluation of around 200 questions, where you shall give feedback on:

- A general rating of the question with answering options (this is done with a rating of 1 (low) to 5 (high). If you rate a question with 3 or lower please give a comment).
- Is the "Correct answer" (marked green in the test) clearly the most correct option?
- If you answer 'No', please give a comment.

This first iteration can be completed in 3-5 hours if you assume around 1 minute per question.

You can stop testing whenever you want and continue later. Please manually keep track of which questions you have commented on.

2.3 Proposing new questions

The proposal of new questions is most welcome. Please use our online form at: <https://skjema.uio.no/bs-basic>

Creating new questions can also be activated as an option in the QRT.

There is limited need to see previous questions because:

- If the proposals are identical, this only confirms the quality of the question.
- If there is only a slight difference we select the best (less time consuming).
- It is somewhat different – we can have both – this increases variation.
- If it is entirely new it makes the database complete.

We will make a review of all proposals, and your contribution will be anonymous.

Approved questions will be transferred to the ordinary online exam solution.

We will monitor failure ratio and remove questions with unusual results.

We will continuously update the Question Database with new questions.

We do therefore hope that you will join in for a new test during 2018.

2.4 General guidance on developing questions

There are several guidelines for the design of multiple choice questions:

http://thelearningcoach.com/elearning_design/rules-for-multiple-choice-questions/

<https://cft.vanderbilt.edu/guides-sub-pages/writing-good-multiple-choice-test-questions/>

Good questions and answering options are important.

The proof is in the pudding, and the question is the pudding. This is what the candidates see!

The candidates do not see the LOF, so the design of questions is therefore very important.

Only course developers read the LOF. The candidates rely on the presentation from the course Provider, or other sources. The candidate should be able to answer the questions swiftly. All questions should have the same structure – written as positive assertion (say what something is) where the client chooses the most relevant/important answering option.

Important principles

Questions

- Keep the question as short as possible.
- Use simple language with common words in general text.
- Be precise when using professional terms.

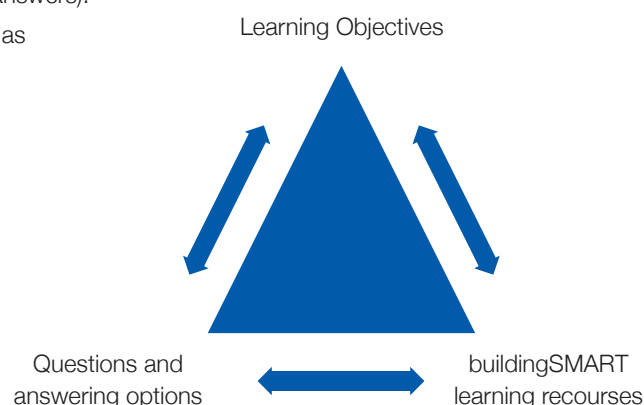
Each question is directly related to a defined Learning Objective (it is not directly related to learning material or other documentation). Each Learning Objective should have a minimum of four questions, but ideally between 6-10 questions.

Answering options

- Keep the four answering options as short as you can (this is more important than keeping the question short – answering options are read four times).
- All options should not be too far-fetched.
- We ask for most correct/relevant/important/useful etc. - not for the only correct answer.
- This makes it easier to find relevant distractors (not correct answers).
- Do not use misspellings as answering options.

Tips!

If it is very clear what the most relevant or important correct answer is, then the differences between the answering options can be limited. If it is an open question, use larger differences between the options so it is clear what the most relevant (important) answering option must be.

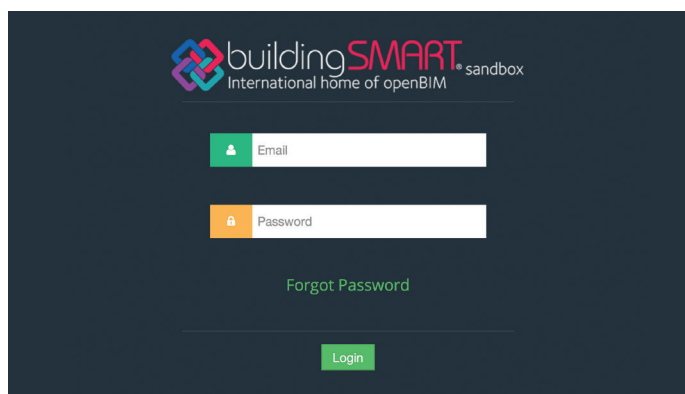


Part 3

Use of the online Question Rating Tool

You have been pre-registered and should have received your username and password to access the QRT. If you have not received these details please contact Sarah Evered: sarah.evered@buildingsmart.org

The URL for the QRT is: http://162.144.252.29/~smartbuildsand/rating_tool/

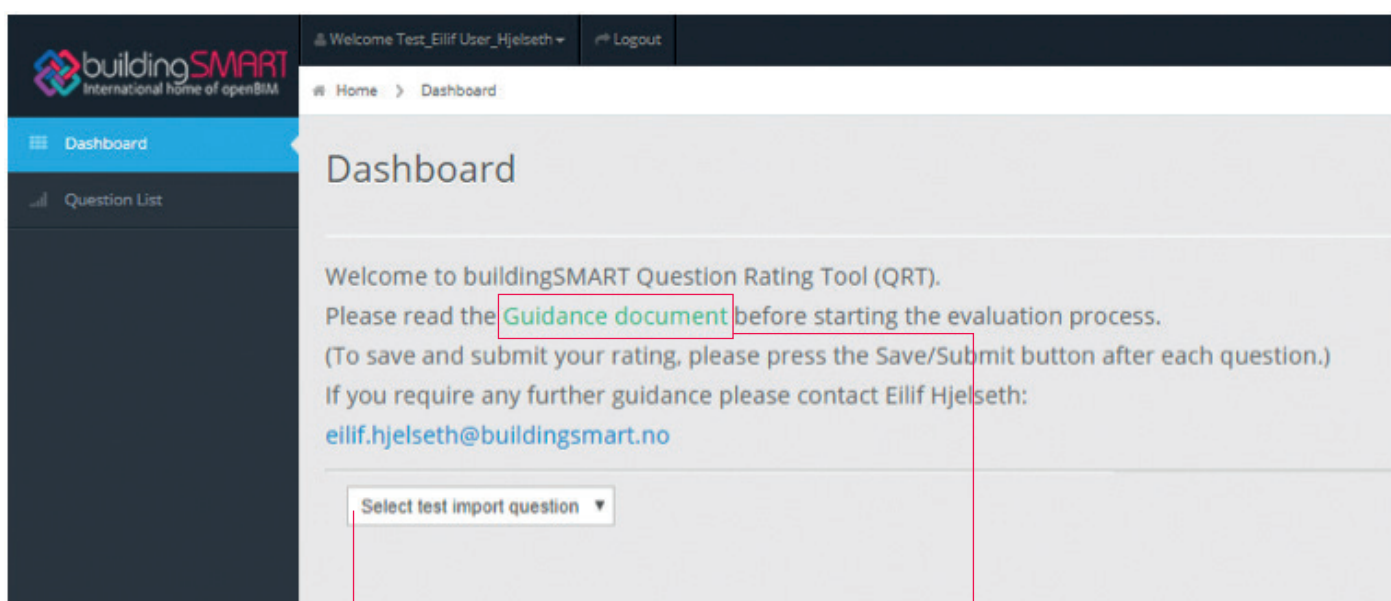


3.1 Logging in

Please enter your username and password.

3.2 Starting the evaluation process

Please click on the Question List to the left of the interface and select the question Basic Module Question Database.

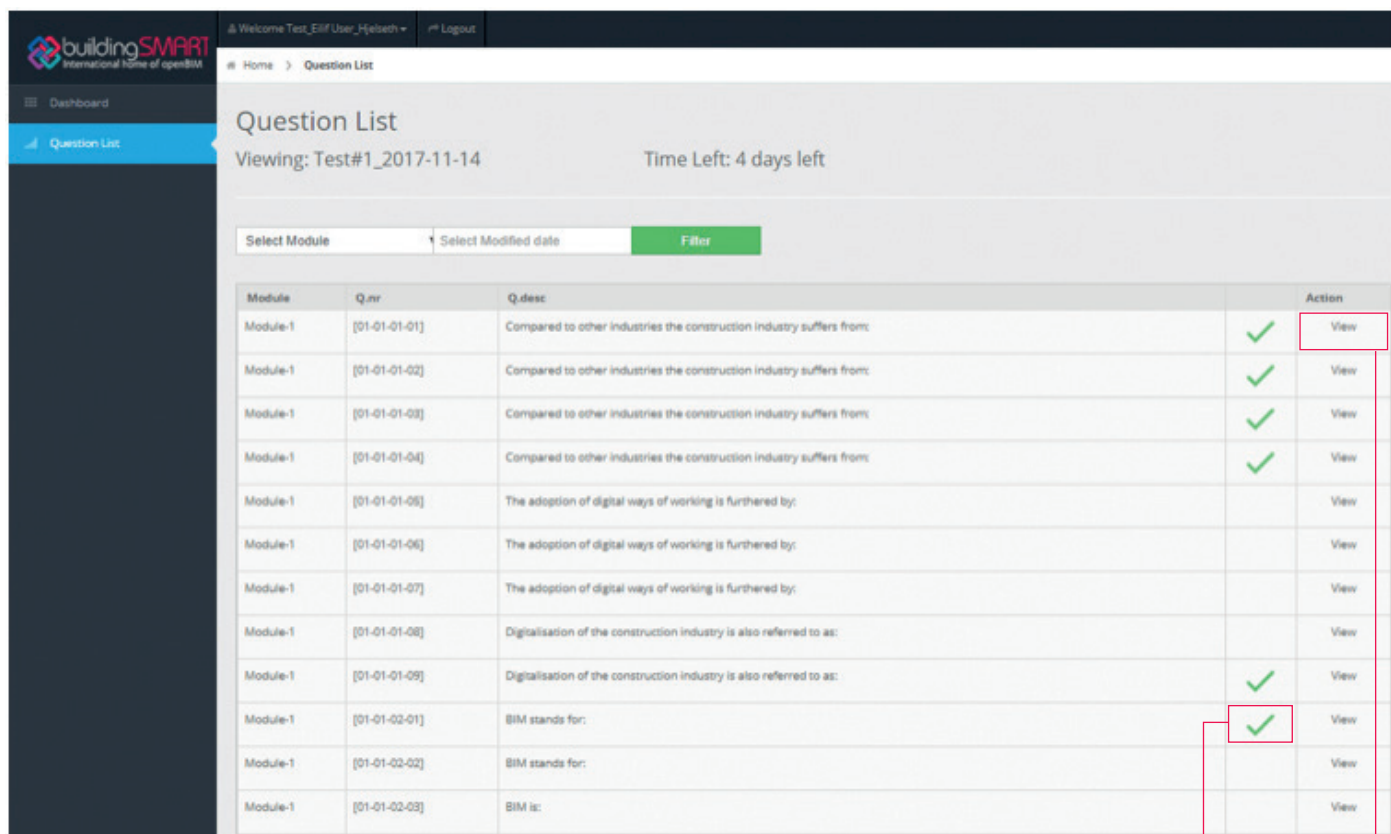


This tool can handle multiple question lists (databases), so you have to select one list before you get redirected to the Question List.

Click here if you want to know more about the tool (recommended), how to design questions and the LOF.

3.3 Selecting the questions

To start, please go to the first question on the list and click 'view' on the right-hand side.



Module	Q.nr	Q.desc		Action
Module-1	[01-01-01-01]	Compared to other industries the construction industry suffers from:	✓	View
Module-1	[01-01-01-02]	Compared to other industries the construction industry suffers from:	✓	View
Module-1	[01-01-01-03]	Compared to other industries the construction industry suffers from:	✓	View
Module-1	[01-01-01-04]	Compared to other industries the construction industry suffers from:	✓	View
Module-1	[01-01-01-05]	The adoption of digital ways of working is furthered by:		View
Module-1	[01-01-01-06]	The adoption of digital ways of working is furthered by:		View
Module-1	[01-01-01-07]	The adoption of digital ways of working is furthered by:		View
Module-1	[01-01-01-08]	Digitalisation of the construction industry is also referred to as:		View
Module-1	[01-01-01-09]	Digitalisation of the construction industry is also referred to as:	✓	View
Module-1	[01-01-02-01]	BIM stands for:	✓	View
Module-1	[01-01-02-02]	BIM stands for:		View
Module-1	[01-01-02-03]	BIM is:		View

You can go back and redo your rating if you want to.

The question can be rated in your own order. The Question List is ordered after the LOF; Module, and more detailed in Question number (Q.nr).

Rated question - after you have clicked on Save/submit it is marked with ✓

To show the question click on View

3.4 Rating the questions and answering options

When you have clicked on View, the screen below is shown.

Here you have an opportunity to rate both the question and answer.
There is a quick (1-5) rating which is mandatory, plus a more detailed evaluation option.

Home > Question View

Remaining of test period: 4 days left

Test: Test#1_2017-11-14

Learning objective: Define the drivers that have led to BIM

Previous

Next

Module-1 [01-01-01-02]

Compared to other industries the construction industry suffers from:

Answers

→ a high degree of specialisation and fragmentation

→ too much influence from software companies

→ too much industry standardisation

→ a low degree of specialisation and fragmentation

Rating : ☐ 1 (Poor) ☒ 2 ☐ 3 ☐ 4 ☐ 5 (Best)

I agree that the Green answer is correct? : ☒ Yes ☐ No

Propose new question


Show/hide detailed view

Save/Submit

These two elements are **mandatory**.
If you answer 'No', a comment field will appear.

Click here if you want to <Propose new question>
(see view on page 11, point 3.6)

More detailed feedback can be given if you click on <Show detailed view> 3.5

Finalise by clicking on <Save/Submit>
The question will be marked with a  in the Question List.

3.5 Content in <Show/hide detailed view>

This is OPTIONAL to comment on.

If you have clicked on <Show/hide detailed view>, the below view is presented.

You can close this view by another click on <Show/hide detailed view>

You give your comment by selecting the most appropriate field in the pull-down menu.

Show/hide detailed view

I rate the general quality as :

Select ▼

I rate the question as :

Select ▼

I rate the answering option as :

Select ▼

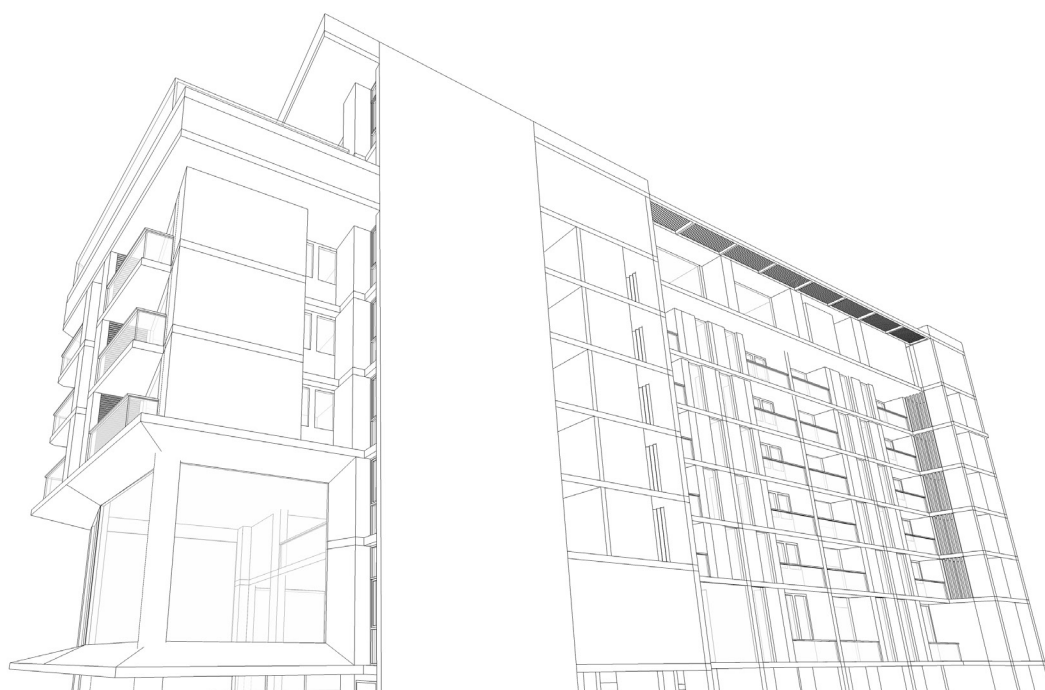
I rate the language as :

Select ▼

I rate the grammar as :

Select ▼

Save/Submit



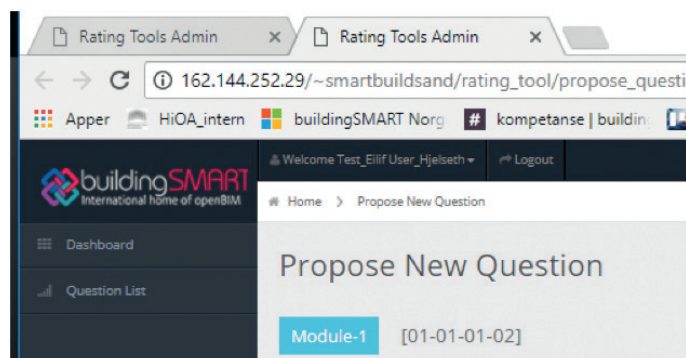
3.6 Proposing a new question

This is of course OPTIONAL.

See Part 2 in the guidance document for more information about how to design multiple choice questions.

If you choose to propose a new question, this form will be opened in a new tab.

You can propose more questions by going back to the original question and click once more on <Propose new question>



Proposals for questions are most welcome.

Your contribution is of course anonymous, and will be Quality Assured by the bSI team, and in the next test iteration. See Part 2 for more information about how to write questions, and answering options.

Home > Propose New Question

Propose New Question

Module-1 [01-01-01-02]

Compared to other industries the construction industry suffers from:

Answers

- a high degree of specialisation and fragmentation
- too much influence from software companies
- too much industry standardisation
- a low degree of specialisation and fragmentation

Proposed question

Question text

Answering Options

Most correct answer (1)

Right answer text

Distractor - not correct answer (2)

Wrong answer text

Distractor - not correct answer (3)

Wrong answer text

Distractor - not correct answer (4)

Wrong answer text

Other comments

Attachment

Please include attachment for additional information

Velg fil Ingen fil valgt

Save/Submit

Contact Information

For technical problems with the online software, please contact:

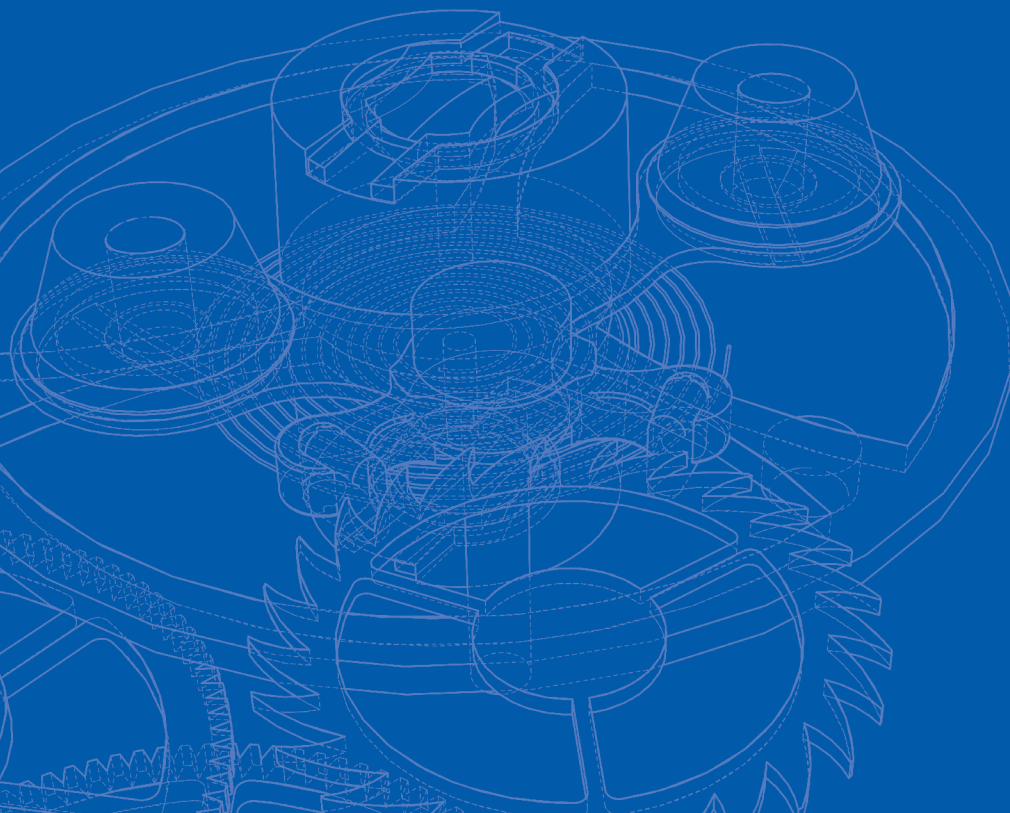
Minesh Amin: minesh@softarch.no

For questions concerning the process, please contact:

Eilif Hjelseth: eilif.hjelseth@buildingsmart.no

For general enquiries regarding the buildingSMART Professional Certification Program, please contact:

professional.certification@buildingsmart.org



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