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Koordinationskonferenz der Bau- und Liegenschaftsorgane der öffentlichen Bauherren
Conférence de coordination des services de la construction et des immeubles des maîtres d'ouvrage publics
Conferenza di coordinamento degli organi della costruzione e degli immobili dei committenti pubblici
Coordination Conference for Public Sector Construction and Property Services

Recommendations on working with BIM

Status as at January 2018

Members of the KBOB
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Contents

1. Introduction: aim of the publication

This publication contributes to the common understanding of Building Information Modelling BIM for public project owners. The aim is for public project owners to approach BIM with a uniform understanding; in our view, the BIM method must contribute to considering the entire life cycle of property and support the public sector in creating a continuous data management system for its buildings across all phases and organisational units.

Digital information on buildings should be available to involved parties at all times in a suitable form and defined quality. This should be seamless or at least subject to minimum disruption. Strategic and operational objectives should be pursued consistently and feedback with experiences should allow these to be improved.

These recommendations on working with BIM are therefore less concerned with the specific handling of BIM projects, rather they relate to the meaningful classification of BIM in the overall context of the public project owners' performance mandate.

As further reading to this publication, the KBOB recommends SIA factsheet 2051 *Building Information Modelling (BIM) – Principles of using the BIM method* (available in French and German). Factsheet 2051 explains the planning-related and technical processes and terms which are not presented here.

2. Digital building and BIM

For the purpose of common understanding, it would be useful first to differentiate between the terms digital building and BIM.

Digital building

We understand digital building to be the general and overarching name for digital applications along the value chain in the construction sector. For instance, it can concern the use of BIM, digitally controlled manufacture of components or other applications.

Building Information Modelling BIM

"Building Information Modelling (BIM) is a method of optimised planning, implementation and operating of buildings and other structures with the help of software. All relevant building data is hereby modelled, combined and collected." (Wikipedia (German version)), 07.01.2018, *https://de.wikipedia.org/wiki/Building_Information_Modeling*)

The KBOB sees the BIM method as merely a reflection of the developments expected from the digitalisation of the planning and construction industry. Beginning with the simple consistency of planning documents during the planning processing, digitalisation offers the construction industry prospects in planning, implementation and management through to the internet of things, where intelligent elements can be controlled and managed via a virtual building.

Currently, BIM can be seen as a good starting point for addressing the digitalisation of the sector and developing skills. If necessary, this analysis can also be deferred depending on the circumstances in the institutions and bodies. However, it is expected that acquiring the necessary skills and making infrastructure and resources available will become indispensable in the long term.

3. Assessment of BIM potential from the purchaser's point of view

In the KBOB's view, BIM's potential lies in the following characteristics:

Consistency of planning documents

Instead of isolated, mutually independent plan files (floor plans, sections, elevations, concepts, etc.), a coherent virtual building is created. Errors resulting from plan documents which do not match are recognised quickly and can be resolved.

Building a three-dimensional building model means that each element which is drawn is clearly and uniquely identifiable and can be linked to data.

Let us demonstrate: on which floor on a 2D plan should the information about a lift be inserted? Ground floor, basement, top floor or section? As soon as a building is drawn coherently in 3D, this question is made redundant: the potential source of errors or redundant information, in the best case, and contradictory information, in the worst case, is eliminated. Nevertheless, the potential for erroneous information remains.

Linking: drawn elements and systems with information and data

As the drawn elements are clearly identifiable, they can be linked to information in a structured manner. On the one hand, characteristics can be allocated to elements (e.g. material, use, cost parameters), on the other hand, characteristics can be exported from drawn elements (e.g. volume, dimensions, quantity, costs). Furthermore, elements can be linked with other information (e.g. specifications, picture documents, protocols, maintenance information).

Communication and coordination methods and processes

Data from all players involved in planning, construction/implementation and management is combined and coordinated in the virtual building model. Ideally, planning should be conducted jointly with the major decision-makers and responsible parties in the building's entire life cycle.

This common approach is the impulse for further development of the communication and coordination methods and processes. It will only be possible to describe the effects of this working method comprehensively once experiences have been gathered. It is therefore expected that decisions, services, processes and even phases will be postponed.

Entire life cycle of a building

Currently, the processes during the planning phase are at the forefront of the BIM discussion. The data management processes during the upstream and downstream life cycle phases of the building will be at least as equally important.

3.1. BIM in planning as the driving force behind digital building

As its level of market maturity (distribution, software, experience) is sufficient for the planning sector, BIM is currently the driving force behind digitalisation in planning and construction.

It is difficult to ascertain the general position of digital building in Switzerland due to the lack of comparability of scientific studies. Reliable and comprehensive surveys and analyses are still being developed (e.g. the digitalisation barometer of the Lucerne University of Applied Sciences and Arts).

In this context, public authorities can view the discussion on digitalisation in construction as a chance for both themselves and for the location, and use their expertise as professional project owners to embark on pilot and entry projects. In light of the experience gained from the specific projects, it will be possible to make reliable and proven assertions on costs and benefits as well as further recommendations on the continued use of digital planning methods.

3.2. View of the entire value chain

In its current state of development, BIM is mostly used in the planning phase but is increasingly found in the construction phase, notably in construction preparation and the manufacture of components (some of which are already available, particularly in timber and metal construction). The aim is to use BIM in a suitable manner across the entire value chain in construction.

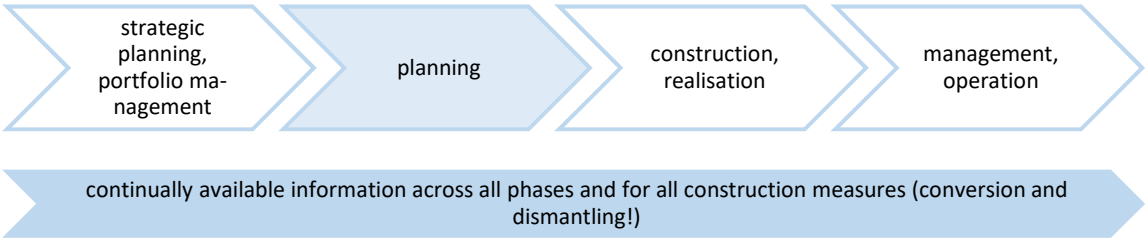

Figure 1: Overview of value chain and life cycle phases for buildings

4. Preparing to address BIM

In preparation for addressing digital building and BIM, the owner should consider the building in an overview and in the overall context of roles, phases and organisational units in its environment. In addition to project-related BIM objectives, organisation-related BIM objectives should also be set at the strategic level in order to answer the issue concerning the sustainable and long-term added value of the use of BIM.

The following questions can serve as examples:

Focus: Meeting objectives

Can objectives be better met by using BIM?
Objectives such as surface ratios, operating costs, cost per workspace, flexibility of use, energy use, …

Focus: Implementation during the planning and construction phase

Can implementation be improved by using BIM during project management?
For example, specific conflicts in planning/realisation, planning and construction facility management, deadlines, misunderstandings, technical coordination, ...

Focus: Individual organisation's performance

Can an individual organisation's performance be improved by using BIM?
For example, administration: planning for meetings, protocols, standardised reporting, comparing options, availability of information, ...

4.1. View on property: life cycle and roles

The life cycle phases for government property are generally grouped together in organisational units (Figure 2, blue borders):

- Property/portfolio management
- Project management (planning and construction/realisation)
- Building management

These three subject areas are usually organised as sections with combined phase and level-appropriate expertise and safeguard the owners' interests according to the relevant phase or coordinate them.

Organisation / Phases / Roles	Property/portfolio management	Project management		Building management
	Strategic planning	Planning	Construction/realisation	Management, operation
Property owner, project owner				
Planner				
Construction sector				
Operator				
User, tenant				

Figure 2: Standard division of government roles, phases, and organisations

4.2. Realistically evaluating individual possibilities

In order to integrate BIM meaningfully into the overarching property management process, discussions should first be held with all the organisational units involved in providing property. Should BIM be widely tested and introduced across multiple units or this be limited to one unit?

The tasks, objectives and opportunities of individual organisational units must be realistically evaluated: resources, expertise, education and training opportunities all have roles to play, as do the motivation and the interest of the bodies and individuals involved.

There will be little change in the definition of objectives for public project owners who already work with data-based objectives. However, it is expected that BIM will help simplify and standardise the pursuit of objectives.

In order to ensure that BIM is used in as useful and future-orientated manner as possible, it is pivotal that the BIM objectives and corresponding information needs and interfaces are defined and agreed across the organisation. Figure 3 below can be viewed as a concept model for this purpose:

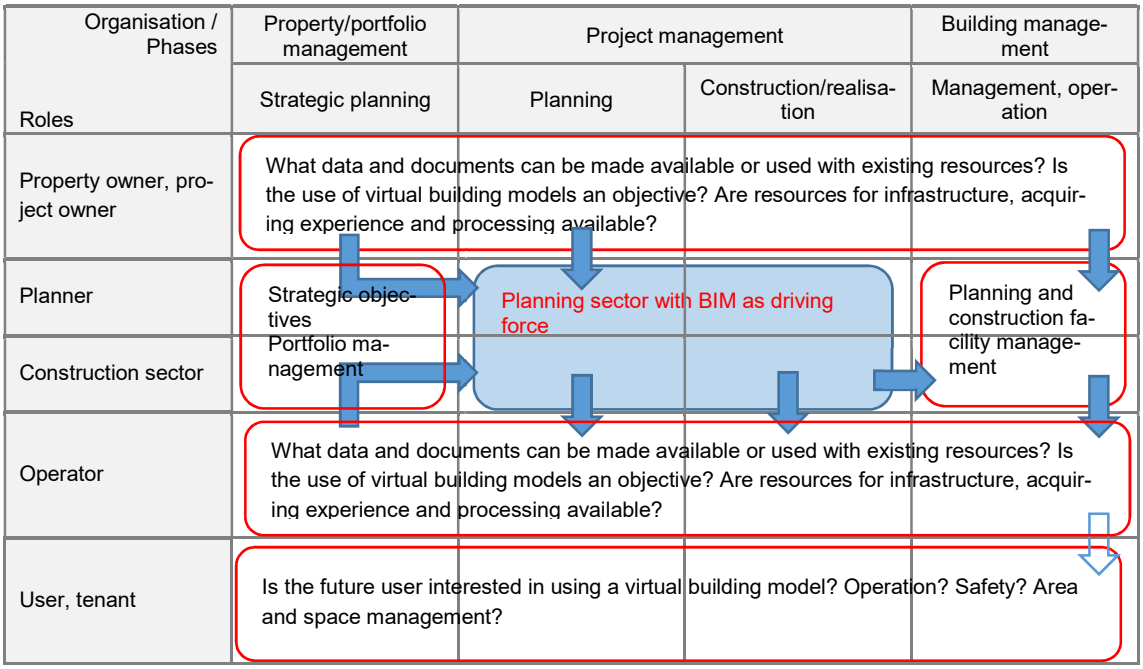

Figure 3: Realistic evaluation of resources and expertise leads to appropriate delimitation of the objectives which can be realised with BIM and digital products.

The keywords and questions listed are intended to provide inspiration and should be supplemented by the purchasing body with reflections on its individual, project-based situation.

A selection of criteria and questions follow:

Data input: client

- What data and documents can be made available at the start of the tender procedure?
- What objectives can be formulated, applied and meaningfully pursued and reproduced in the planning, construction and management/operation process?

Resource situation

- What resources are earmarked for a BIM pilot or entry project?
- What infrastructure needs to be procured?
- On which data platform is the project to take place?
- How much storage space is required for project documentation and archiving?

Project-related BIM objectives

- Should "only" existing objectives be pursued in a consistent and transparent manner or should new data be collected with BIM?
- Is the use of the virtual building model an aim for the building management?
- Should the virtual building also support future users in their core business (e.g. school planning)? How and when will these be included?

Strategic BIM objectives of individual organisations

- What parameters should be used to manage portfolios, projects and buildings and in which phase(s)? How and where are these represented and monitored? Does BIM lead to adaptions or changes?
- What is the situation with data management in the usual divisions/units (portfolio management, planning and construction management, building management)? What processes are envisaged and/or must be initiated?
- Does BIM lead to other applications?
- What interfaces are to be defined?

Data output

- At what time and in what format are data outputs requested?
- How, in what form and where is data stored?
- Logically, what data, will be requested for project documentation (archive) and in what form?
- Logically, what data will be requested for building documentation (management and operation) and in what form?

Great attention should be paid to the specification of the required data output: the more precisely the interface to the following applications can be defined and described, the less effort and frictional loss will be caused by the corresponding implementation. It is advisable to prepare examples and templates for suppliers already during the tender procedure as well as initial (test) data deliveries in an early project phase (pre- or construction project). In this way, misunderstandings can be recognised and resolved and preparations made for planning the future operation.

Requesting digital products which will not be maintained or used by the individual organisations in the foreseeable future should be avoided. For divisions which are not yet familiar with BIM, an internal example can be much more meaningful and helpful than some consultations.

The topic of building documentation and data management is covered extensively in the KBOB/IPB project committee's recommendation and is available for free download on the KBOB website.

5. Principles of tendering for project objectives and services associated with the BIM method

5.1. Ordering BIM as a method or ordering BIM objectives?

Currently two main approaches to ordering BIM services can be seen:

All-inclusive BIM method order

At first glance, the all-inclusive BIM method order appears appealing to clients who are inexperienced with BIM. Nevertheless, the description and specification

of the services and interfaces to be provided are hard to overcome: ordering the method is similar to ordering a textbook.

Even with the support of a BIM consulting service for the project owners, the risk of getting lost in inconsistencies and inadequate specifications is high.

Describing and ordering objectives and services

Project objectives which are to be attained with the support of the BIM method are based on the individual organisations' targets. The services and applications necessary in order to meet the objectives will be deduced throughout the planning and construction phase. The separation of basic and additional services as well as the definition of interfaces are based on the previous standard regulations.

Ultimately, the type of tender is dependent on the client's powers and the overarching objectives of the individual procurement office.

5.2. Choice of BIM pilot and/or BIM entry projects

Suitable BIM pilot and entry projects are projects which can be classed as average for the procurement office in question. Therefore, they should be medium-sized, of medium complexity and easily comparable. In addition, the project management should demonstrate solid experience in comparable, conventionally planned and executed projects.

5.3. Clarity in the individual organisations

In the individual organisations, the handling, expectations and tasks related to the use of BIM, as described in paragraph 4.2. Realistically evaluating individual possibilities and presented in Figure 3, should be clarified. Needs, interests and possibilities should, at least initially, be coordinated and agreed across projects. Depending on its application, BIM will have a sustainable influence on the data management process within a procurement office.

5.4. Spoken and written descriptions of project objectives and services: considering your own skills.

Project objectives which are to be attained with the support of BIM are described clearly and unambiguously in writing and orally. Formats and interfaces are described according to the planned application, if known. A comprehensive technical specification should only be prepared and accompanied with the necessary technical expertise.

If differences or ambiguities arise during the project planning, an unambiguous description of the intentions and objectives will prove helpful and useful when interpreting them.

5.5. Project organisation: minimising interfaces

Efficient use of BIM requires a common approach and influences the planning process. On the one hand, authorship and origin of information and data becomes more transparent, on the other hand, new interfaces and delimitation issues arise.

Expertise and flexibility in dealing with these expected shifts and delimitations are found within the planning team. From the purchaser's point of view, it is therefore useful to choose a project organisation model with as few interfaces as possible. The overall planner, general and total service contractor models appear to be appropriate here.

Depending on how objectives are defined, it may be in the interest of the client to support the planners in clarifying interfaces and delimitations, so that they can put individual planning services out for tender in future projects. In this case, the clarification of interfaces should be formulated as a BIM project objective and accompanied throughout the entire planning and construction process.

6. BIM project tenders, procedure

The KBOB believes that from the purchaser's point of view, the advantage of BIM primarily lies in the appropriate and targeted-oriented support given to project owners in fulfilling their tasks. Evaluation and formulation of BIM project objectives must therefore be derived from the procurement office's overarching targets.

The KBOB therefore recommends the following procedure when producing tender documents for BIM projects:

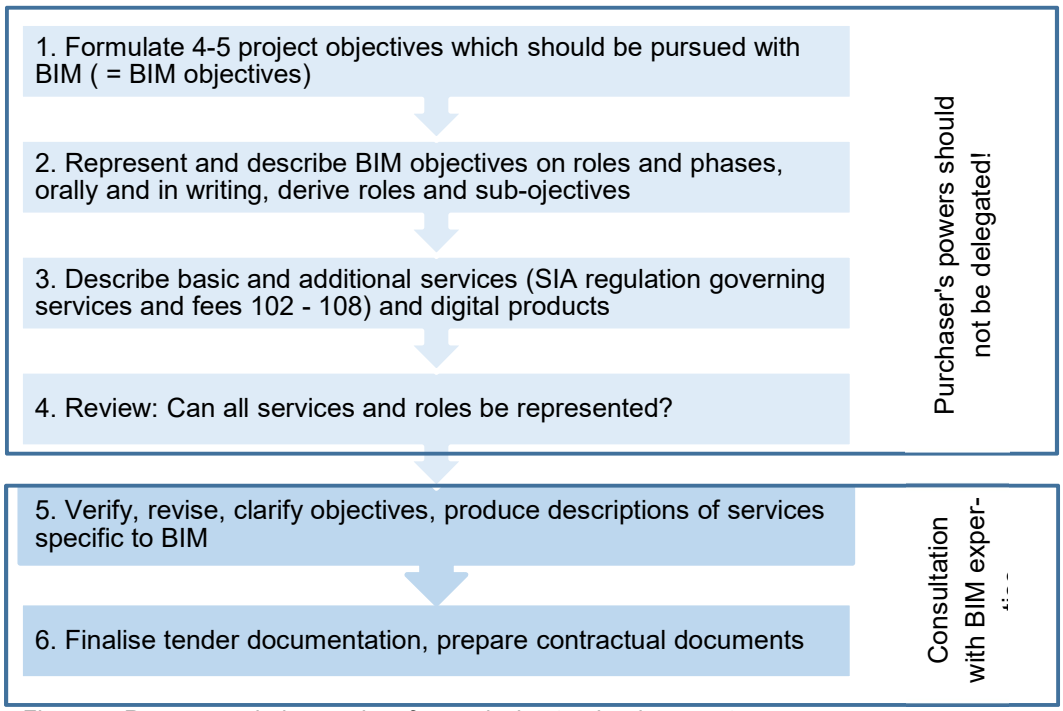

Figure 4: Recommended procedure for producing tender documents

1. Formulate 4-5 project objectives which should be pursued with BIM

   Based on the procurement office's targets, a maximum of 4 to 5 specific BIM project objectives will be described orally and in writing. This task is within the purchaser's power and should be completed without a specific BIM consultation.

   BIM objectives which are derived from the possibilities offered by the method and not from the project owner's strategic and operative regulations, should be checked for appropriateness.

   The project owners should always be able to understand and justify the aim and purpose of using BIM and the associated services and expenditure.

   Note: when reproducing the project objectives over the project phases, a project objective will rapidly entail ten or more sub-objectives or applications.

2. Reproduce and describe BIM objectives on roles and phases, orally and in writing, derive roles and sub-objectives

   A lane diagram with phases and roles will be created. The project objectives will be allocated to the phases and roles in sub-objectives and supplemented with the descriptions of the services needed to meet the objectives.

3. Describe basic and additional services (SIA regulation governing services and fees 102 to 108) and digital products

   Throughout the services and fees regulations, the services described in the lane diagram are either included in the basic services or are described separately as services to be agreed upon. Document 03 "Planner: description of tasks" (available in French and German) from the KBOB cockpit can be used as a template (https://www.kbob.admin.ch/kbob/de/home/publikationen/dokumente-entlang-des-beschaffungsablaufs.html).

Teilphase Leistungsbereiche	Erwartete Ergebnisse, Dokumente gemäss SIA 112/2014	Leistungen und Entscheide des Auftraggebers
11 **Bedürfnisformulierung, Lösungsstrategien** Grundlagen: Formulierung der Problemstellung und Bedürfnisse Ziele: Bedürfnisse, Ziele und Rahmenbedingungen definiert, Lösungsstrategie festgelegt		
111 Organisation		
112 Beschrieb und Visualisierung		
113 Kosten / Finanzierung		
114 Termine		
115 Administration		
116 Phasenabschluss		
21 **Definition des Bauvorhabens, Machbarkeitsstudie** Grundlagen: Bedürfnisse, Ziele, Rahmenbedingungen, Lösungsstrategie Ziele: Vorgehen und Organisation festgelegt, Projektierungsgrundlagen definiert, Machbarkeit nachgewiesen, Projektdefinition und Projektpflichtenheft erstellt		
211 Organisation		
212 Beschrieb und Visualisierung		
213 Kosten / Finanzierung		
214 Termine		

Figure 5: Document 03, Planner: description of tasks from the KBOB cockpit. Planner and client services are described in the second and third columns.

4. Review: Can all services and roles be represented?

   Finally, a review will be made to verify whether it was possible to represent all roles and services appropriately or whether the BIM objectives mean further roles and services are needed.

5. Verify, revise, clarify objectives, produce descriptions of services specific to BIM

   For project owners, a consultation with BIM expertise is recommended for pilot and entry projects. The described objectives will be verified and revised with the support of the project owners' BIM consultation. If required, descriptions of services specific to BIM will be produced and the digital interfaces clarified, as recommended in 4.2. In doing so, the principle of "as much as necessary, as little as possible" should be followed.

   Implementation models and general BIM documents are described in SIA factsheet 2051 and Bauen Digital Schweiz documentation. The two implementation models are not identical: the SIA factsheet 2051 takes into account conditions in Switzerland, the Bauen Digital Schweiz implementation model is based on the ISO standard. In order to prevent misunderstandings, the KBOB recommends choosing one of the models and clearly communicating this decision.

6. Finalise tender documentation, prepare contractual documents

   The documentation will be finalised together with the project owners' BIM consultation. A difference is usually made between the information requirements of the client (request for tender) and those of the supplier (offer). Both company and project-related information needs are defined in these information requirements in the form of data drops and models. The first mutual document to be produced by the client and supplier after the tender has been awarded is the project management plan, also known as the BAP project management plan or "plan of the plan".

7. Methodical skills as suppliers' competitive advantage

The KBOB recommends not exceeding the client's requirements. This allows the supplier to exploit their methodical skills and experience with BIM as a competitive advantage and provide an economically optimised offer which is appropriate and targeted in terms of technology and content.

8. Tender procedure and contracts

Generally speaking, public project owners may put commissions with BIM out for tender. The use of BIM as a suitability and award criterion must be described in a clear and understandable manner, as was previously the case. It may not be changed during the tender and award procedure.

In accordance with the SIA, the KBOB assumes a planner's freedom to choose the methods they use to provide their services. As a logical consequence, the KBOB believes that the use of the BIM method can figure in the existing KBOB planner contract.

As electronic data gains its own central importance when using the BIM method, the KBOB sees here a need for clarification which should be recorded in the contractual document.

However, BIM will have considerable further-reaching effects on roles, organisation, processes, phases and services. However, in the KBOB contractual document, these will not be described in the contract itself but rather in the addendum. Therefore the following contract components and associated BIM contents can be differentiated:

- Effects of the BMI method on the contractual document:
  → Need for clarification in managing data: our current view is that the topics which need to be governed by the contractual document are property, use, liability, data platform (CDE).
- Effects of the BMI method on the addenda:
  → Description of the BIM-related changes concerning roles, organisation, processes, phases and services according to the logic previously used: these will figure in the contract addenda in a project-related, unambiguous, clear and comprehensive manner.

In order to do so, the KBOB recommends the following:

- Precise oral and written description of the objectives and services
- Avoid inconsistencies caused by overspecification
- Agreement on remuneration models for services which cannot (yet) be conclusively defined

The KBOB will proceed with the necessary clarification in dealing with electronic data as determined.

9. KBOB networking in the area of digital building/BIM

In relation to digital building/BIM, the KBOB is organised as followed:

9.1. KBOB digital building/BIM ad hoc working group

The digital building/BIM ad hoc working group is the KBOB's channel for recording, coordinating and representing its members' interests and needs.

9.2. netzwerk_digital (nwd)

netzwerk_digital coordinates digitalisation in planning, construction and property at national level throughout the entire value chain. It represents the following core groups:

- SIA standardising
- CRB regulating
- Bauen Digital CH best practice
- KBOB/IPB ordering

9.3. KBOB/IPB project committee

The project is an amalgamation of the IPB (interest group of private professional builders) and the KBOB. In the KBOB/IPB project committee, the interests of professional builders are agreed upon in a relaxed manner and, if necessary, coordinated and pursued further.

9.4. Representation of interests in other cross-sector groups

If necessary, the KBOB also joins other groups or bodies and represents the interests of the public construction services.

10. Further action by the KBOB

10.1. Training and continuing professional development

Day courses which are adapted to meet the needs of KBOB members are to be offered as soon as possible in the following three topic areas:

- Purchaser's powers: tenders and awards
  Defining BIM objectives, putting out projects with BIM for tender, dealing with competitions and competitive tender procedures, procurement law issues, considering the particularities of the role of public project owners.
- BIM to FM
  Ordering appropriate and targeted digital products for the exploitation phase of property, building documentation, BIM as an information model, interfaces to CAFM, SAP and other data processing systems, data management during the exploitation phase.
- BIM during the planning and construction phase
  Using BIM from the purchaser's point of view for the planning and construction/realisation phases, pursuing BIM objectives, preparing the operation phase.

10.2. Help documents: examples, guidelines, checklists, text modules

The focus is on providing pragmatic, practice-oriented aids such as guidelines, templates and checklists, as well as requirements on procurement law compliant tenders, carrying out and managing projects and buildings with BIM.

10.3. Analysing and evaluating projects with BIM

Analysing and evaluating projects with BIM allows assertions based on specific experiences and projects to be made on BIM's added value as well as its costs and benefits. Both the project owners, as the client, and the planners, as the supplier, will benefit from the findings. The KBOB with develop the recommendations further bit by bit and complete them over the entire life cycle.

10.4. BIM know-how group

The know-how group is intended to offer public project owners who use BIM a platform in which to share experiences and information. It is also planned to open the group to investors and property owners with close ties to the public project owners.

11. Further publications

The KBOB is a core group member of the netzwerk_digital association to which SIA, CRB and Bauen digital Schweiz also belong in addition to the KBOB and the

IPB. Across the sector, netzwerk_digital has set itself the goal of supporting and coordinating digital building in Switzerland.

In the interest of clear communication, the KBOB recommends referring to the publications of netzwerk_digital's core group members.

The KBOB also recommends studying the following publications:

- SIA factsheet 2051 Building Information Modelling (BIM) – Principles of using the BIM method (in French and German). http://www.sia.ch/de/der-sia/kommissionen-fachraete/zn/2051/
- netzwerk_digital, https://netzwerk-digital.ch/de/
- Bauen Digital Schweiz (BIM implementation models – Understanding, BIM usage plan – Understanding, BIM contract, roles, services – Factsheet, Multistage plan for Switzerland | Digital planning, building and operating), https://bauen-digital.ch/de/medien/bauen-digital-schweiz/ (in German)
- KBOB/IPB building documentation recommendation, https://www.kbob.admin.ch/kbob/de/home/publikationen/bauweksdokumentation-im-hochbau/downloadbereich.html (in German)
- Building Information Modelling, Principles of an open BIM methodology for Switzerland, version 1.0 - 15 February, http://www.ebp.ch/de/publikationen/building-information-modeling-bim-grundzuege-einer-open-bim-methodik-fuer-die-schweiz 2015, Ernst Basler + Partner (in German)
- EU BIM Task Force, Handbook for the introduction of Building Information Modeling by the European Public Sector, 2016, http://www.eubim.eu/handbook/