# BUSINESS PLAN

## CEN/TC 442
## BUILDING INFORMATION MODELLING (BIM)

## EXECUTIVE SUMMARY

### Scope

Standardization in the field of structured semantic life-cycle information for the built environment.

The committee will develop a structured set of standards, specifications and reports which specify methodologies to define, describe, exchange, monitor, record and securely handle asset data, semantics and processes with links to geospatial and other external data.

### Business Environment

The construction industry is one of the largest European industries (10% of the GDP of the EU and 20 million jobs). It uses 50% of the materials taken from the earth's crust and generates about 40% of all greenhouse gas emissions in Europe.

The industry is seen as being relatively inefficient in both process and service delivery. Current practices lead to duplication of activities as well as increases in costs and timescales for delivery of construction projects.

Construction clients and users typically receive poor operating information at handover of the built assets and as such, management of the asset portfolio can be improved.

The introduction of Building Information Modelling (BIM) is seen as being the solution to the management of the information during the design, construction and operational phases of the asset lifecycle. The development of BIM is advancing rapidly and requires the application of common standards to ensure future compatibility of data exchange and use.

Initial results from a Danish study indicate potential improvements of 70% on productivity, bid price reductions of 30%, reduction in design faults of 90% and reduction of FM/operation costs of 20%. A recently published UK Cabinet Office report shows capital cost savings of 19.6% due to use of BIM, saving £840m on £3.5bn of construction spend in the 2013/2014 financial year.

### Benefits

The introduction of common standards and operating methods using BIM will:

- Reduce barriers to operation and trade across the European market area and beyond
- Reduce both the capital and operating cost of construction assets
- Improve certainty of the construction output including increases in quality and reductions in defects
- Improve resource efficiency of construction products and materials, improving both operating and embodied carbon performance.
- Support improvements in team working and collaboration

### Priorities

- Understand existing activities and standards in use within the European market
- Adopt suitable standards and technical specifications from ISO and then extend to cover new areas including infrastructure as well as records management

- Develop new standards to support process management and associated guidance, as well as standards to enable the representation of European sustainability standards in BIM.
- Develop relationships with key stakeholders including the European Commission

# 1 BUSINESS ENVIRONMENT OF THE CEN/TC

## 1.1 Description of the Business Environment

The construction industry is one of the largest European industries (10% of the GDP of the EU and 20 million jobs). It has to increase its competitiveness and must become more sustainable. Key drivers to make this happen are Information and Communications Technology (ICT) supported by standardization.

Current practices and studies show how traditional processes repeatedly experience dramatic information loss, especially in the steps between the main processes and life-cycle stages. Digital processes often are supported with manual processes to build and rebuild information. Therefore:

- Construction cost is increased by splitting up of processes and lack of communication;
- Without a common language there are often significant communication errors and loss of information;
- The same information is re-entered several times in different systems before the building is handed over to owner organisation;
- Same information is also re-created several times by different software packages.

The process Building Information Modelling (BIM) is a way of structuring building information. BIM refers to the use of a shared digital representation of a built object to facilitate the construction process (including buildings, bridges, roads, process plants etc.) to facilitate design, construction and operation processes to form a reliable basis for decisions. (ISO/DIS 29481-1 2014 – *Building Information Models – Information Delivery Manual- Part 1: Methodology and Format)*. The resulting Building Information Model (BIM) can be visualised as a virtual geometrical representation of the real asset and can report object properties and relations. BIM gives an intuitive understanding of complex building information and support many digital tools for effective information handling. BIM improves handling of information and is a condition for instance to tackle Lean Design and Construction, digital access to maintenance of project as well as product information during Facility Management or Operation.

With a BIM information-based construction process, loss of information between processes and/or stages can be eliminated or at least strongly reduced. This requires the development and implementation of an open and interoperable BIM supported by standards used across the European construction industry.

More information regarding BIM definitions is found in Annex A1.

## 1.2 Quantitative Indicators of the Business Environment

The Construction Industry consistently fails to measure results and effects of changes. The following mentioned studies try to overcome the lack of information. They indicate substantial positive effects of BIM. They do not deal with the effects of BIM standardization on regional or international level. It is implicit that standardization improving the uptake of BIM simultaneously causes the mentioned positive effects in an increasing number of projects.

A Danish BIM study reports substantial cost reductions on entire life-cycle: increase of construction productivity by 70%, reduction of bid price by 30%, reduction of design faults found on site by 90% and reduction of cost of FM/Operation by 20% [1].

A US study discloses that lack of access to information in Facility Management and Operation of buildings cost in general $ 0.23 per Sq. ft. each year. A 20.000 $m^2$ building generates an extra cost over 30 years of almost EUR 2 mill. Easy access to correct and update project and to product information with BIM will have a major positive effect on company and society level [2].

A British BIM report discloses that BIM increases competitiveness and the ability to export service in the Building Industry. As an example, the report shows that "There has been an 18% improvement in productivity on UK Government projects using BIM".

A National BIM online survey conducted by Masterspec in conjunction with NBS (UK) states on barriers to BIM adoption: "In seeking what next steps the industry needs to take, we first need to be aware of what the current barriers might be. Clearly the 'big three' issues are: lack of expertise, lack of standardised tools and protocol, and lack of collaboration [3, 4].

BIM can profoundly affect the European construction industry, not only within Europe, but also globally, as it is anticipated that BIM will be adopted internationally by many regions to eventually become the current information-based construction process.

According to European Construction Industry Federation - FIEC, the EU total construction output amounted to €1,172 billion in 2012. We know from many projects that BIM easily contributes to a five to ten percent cost reduction on project cost simply by better coordinated construction models/drawings and better construction processes. Five percent of €1,100 billion is €55 billion. This number does not take into account the benefits of use of BIM within the construction products procurement and FM/Operation parts of the value chain and without the effect of combining BIM with Lean principles.

References are found in Annex A2.

## 2 BENEFITS EXPECTED FROM THE WORK OF THE CEN/TC

The overall benefits of the work from CEN/TC 442 are through BIM to support the visions for sustainable growth based on better resource efficiency through data sharing in the construction industry in Europe.

Data sharing is a complex process where effective rules and controls need to be defined to ensure secure and reliable transactions. This process is generically termed interoperability.

"Interoperability" is an international programme in which Europe can take two roles:

- Better "resource efficiency" (including cost and carbon) is a key area of European contribution and expertise;
- European contribution should focus on language and translation issues towards an open market, for construction products and services.

The geometry part of the BIM has reached a high maturity level, and its potential is understood. However, the full potential of BIM is far from being utilized since the information (data) part and interoperability remain immature.

The benefits and opportunities of adopting the BIM are summarised as follows:

- Increase the competitiveness of the European Construction sector (e.g. engineering firms, contractors, designers and product manufacturers) in their world-wide activities;
- Deliver efficiencies for client organisations regarding requirements of legacy systems;
- Facilitate the information exchange between clients asset management systems and contractors/designers BIM systems thanks to interoperability;
- Deliver efficiencies for contractors and manufacturers through standardized product selection and ordering processes;
- Substantial reduction in cost and resources in the European Construction Industry;
- European ICT support of increased sustainability and greenhouse-gas emission goals for the Construction Industry;
- Increased certainty for construction clients to achieve their built asset objectives and improvements in briefing as a result of improvements in post occupation evaluations;

- Provide a common understanding regarding the design of built environment between owners, operators and users, designers, contractors and manufacturers of construction products;
- Facilitate the exchange of information about construction services between stakeholders;
- Facilitate the marketing and use of construction components and kits of parts for stakeholders;
- Provide a common basis for research and development in the construction sector;
- Allow the preparation of common design aids and software packages;
- Support the objectives of European Governments in achieving their targets for BIM adoption.

# 3 PARTICIPATION IN THE CEN/TC

All the CEN National Standards Bodies are entitled to nominate delegates to CEN Technical Committees and experts to Working Groups, ensuring a balance of all interested parties. Participation as observers of recognised European or international organisations is also possible under certain conditions. To participate in the activities of this CEN/TC, please contact the National Standards Body in your country.

# 4 OBJECTIVES OF THE CEN/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

## 4.1 Defined objectives of the CEN/TC

The aim is to help the construction sector to be more (cost) efficient and sustainable by enabling a smooth data exchange and sharing between partners in the value chain.

The objectives of CEN/TC 442 are:

- To deliver a structured set of standards, specifications and reports which specify methodologies to define, describe, exchange, monitor, record and securely handle asset data, semantics and processes with links to geospatial and other external data.
- To be the home for European BIM standardization. CEN/TC 442 will be the central place to go for coordinating European BIM harmonisation. CEN/TC 442 shall consider NWI proposals to be developed in accordance with the Vienna agreement.

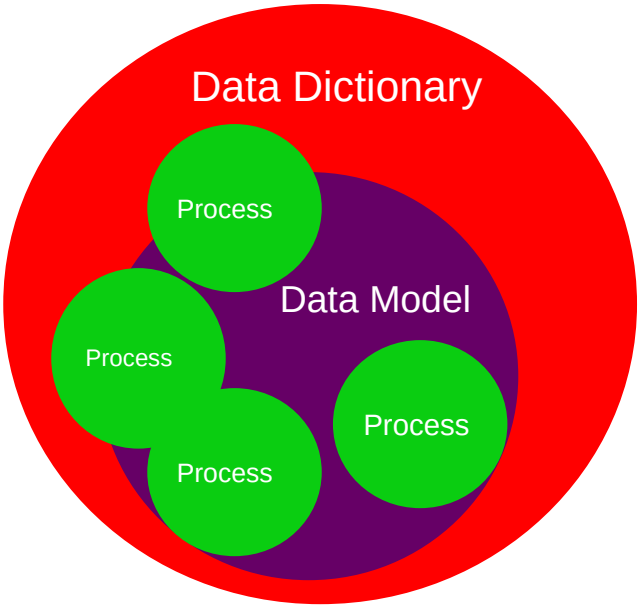
## 4.2 Identified strategies to achieve the CEN/TC's defined objectives.

### *4.2.1 Introduction*

Efficient interoperability requires a set of standards and implementation.
Interoperability can be achieved without standardization but it conditions the project to agree on its own rules and deliveries. A high level of expertise and resources is required, and utilization of information in the construction life-cycle is not ensured.

The three pillars of interoperability are:

- a standardized way to store and exchange data models and implement them in software packages;
- a common understanding of terminology and data-semantic structure;
- an agreed set of information delivery specifications for the information sender to support the processes of the information recipient.




An efficient object-based interoperability is conditioned by three sets of standards:

- ***Data Model standards*** to specify data structure for entities, geometry and related properties as well as classification for exchanging data models. The data model ensures exchange of object based information;
- ***Data Dictionary standards*** to specify data structure for defining data-semantic concepts (entity, property, classification...) and relations between them;
- ***Process standards*** to specify how to describe the required information supporting a given BIM process.

### *4.2.2 Understanding the current position*

There are several current national BIM standardization projects and more will probably be seen as implementation increases. Therefore it is necessary to understand what are the available standards including the implementation of existing ISO standards, from ISO/TC 59/SC 13 and ISO/TC 184/SC 4.

The results of this work, which will be a technical report, will contribute to the Work Program of this CEN/TC.

### *4.2.3 Adopt ISO standards as EN-ISO standards or technical specifications*

The work programme include, according to the Vienna agreement and where appropriate, to make current ISO standards for BIM valid as EN standards or technical specifications. EN standards will be implemented as national standards within EU Member States and thereby have a greater impact on national level than ISO standards not implemented as national standards.

At this time, candidates are:

- ISO 16739 *Industry Foundation Classes for data sharing in the construction and facility management industries*
- ISO 12006-2:2001 *Building construction – Organization of information about construction works – Framework for classification of information*
- ISO 12006-3:2007 *Building construction -- Organisation of information about construction works -- Part 3: Framework for object-oriented information*
- ISO 29481-1:2010 *Building information modelling -- Information delivery manual -- Part 1: Methodology and format*
- ISO 29481-2:2012 *Building information models -- Information delivery manual -- Part 2: Interaction framework*
- ISO/TS 12911:2012 *Framework for building information modelling (BIM) guidance.*

This list is not final.

### *4.2.4 Exchange Information – Enhance IFC standards*

IFC (Industry Foundation Classes) is an international standard, ISO16739 *Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries.*
It specifies a conceptual data schema and an exchange file format for Building Information Model data. It represents an open international standard for BIM data that is exchanged and shared among software applications used by the various participants in a built environment construction or facility management project.

**Actions:**

- ***Extend and develop standards for industrial facilities and infrastructure***

  BIM extensions are requested, in particular regarding industrial facilities, urban planning and infrastructure. The description of the industrial process being already defined by ISO 15926 *Industrial automation systems and integration -- Integration of life-cycle data for process plants including oil and gas production facilities*, ISO/TC 184/SC 4, a link between the two standards has to be clarified. An industrial facility or an infrastructure is always located in a geographical area. BIM should rely on the work already carried out and associated standards to tackle that purpose. This work will be carried out in close co-operation with ISO standards on BIM from ISO/TC184/SC4 on process plants and CEN/TC 287 on geographic information in order to avoid duplication of work or to embrace already existing work, and according to the INSPIRE Directive [*Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community*].

- ***Support Record management***

  Record management on BIM's data is necessary. In practice, to be efficient, the BIM's data produced for a building shall be readable and useful during all the stages of the whole life cycle (from design, construction, operation, maintenance to deconstruction).
  This work is broader than BIM and relates to Long Term Record Management. It will be carried out in close co-operation with ISO standards in order to avoid duplication of work or to embrace already existing work.

### *4.2.5 Develop Information Delivery Specifications*

ISO16739 is an open international standard for BIM data exchanged and shared among software applications used by the various participants in a built environment construction or facility management project. The content of the data exchange is highly driven by the lifecycle stage, the involved disciplines and the level of detail, or more generally speaking by the process.

Information Delivery Specifications should capture (and progressively integrate) construction processes whilst at the same time providing detailed specifications regarding the information that a user fulfilling a particular role would need to provide at a particular point within a project.

From the end-user point of view, this leads to the so-called Information Delivery Manual (IDM); from a BIM point of view, the associated description is called Model View Definition (MVD) defining a subset of the complete IFC model, with strict specifications regarding the attribute description

Direct use of ISO 16739 is hampered by the lack of implementation standards. There are so many IFC entities, each of them with so numerous optional attributes, that it becomes difficult to select the most adequate ones without shared guidelines.

**Actions:**

There is a need to define or revisit the business exchange processes according to the building life-cycle phases, the disciplines and stakeholders (roles, responsibilities) involved in the exchange, the expected deliverables, the current Level of Development. In particular, the coordination process including the aggregation of deliverables provided by different stakeholders as well as the data versioning is critical regarding the adoption of this new way of sharing information.

To achieve the BIM information highway, there are many IDM and MVD candidates for BIM standardization including (developing IDMs and MVDs for) the followings:

- Framework for BIM Guidelines, that can be seen as a collection of IDMs giving guidance and requirements;
- Energy Assessment, in order to support the practical implementation of EN 15603 *Energy performance of buildings - Overall energy use and definition of energy ratings*;
- Lifecycle Cost estimation and Assessment, in order to provide a practical implementation of CEN/TC 350 related standards;
- Facility Management and Operation, documentation of which is a common challenge in all projects;
- Building Application, in which digital rules and processing can substantially improve both efficiency and quality of the industry interaction with Planning and Regulatory Authorities.

### *4.2.6 Support Data Dictionaries*

IFD (International Framework for Data Dictionaries) is a standard for Data Dictionaries (ISO 12006-3 *Building construction - Organization of information about construction works -- Part 3: Framework for object-oriented information*). A Data Dictionary connects the entire world's domain terminology with internationally standardized and machine-readable concepts. A Data Dictionary can link together all existing and new databases and registries in the world. It enables to search information from around the world with a standardized interface. Data dictionary can be used both to secure unambiguous information flow with IFC files and can be used in direct communication with databases without the use of the IFC model.

The data dictionary should be used both for information unambiguously flow via IFC files and/or in direct communication with the database without using the IFC model.

There are at least three levels of standardization and implementation of a European Data Dictionary:

1. Establish European deliverables for the data structure of data dictionaries by adopting ISO 12006-3 and ISO 12006-2. Adoption of ISO 12006 does not include adoption any of the current implementations;
2. Produce an agreement for specific content of particular interest to the European market, expressed by the standard structure of ISO 12006-3 by developing high-value common European content and standard APIs;
3. (potentially multiple) commercial implementations of a data dictionary server, using the standardized data structure of ISO 12006-3 and delivering the agreed content for the European market combined with services is out of scope of the CEN/TC.

**Actions:**

- ***Establish a common Data Dictionary framework and Application Programming Interfaces***

The aim is to establish a common Data Dictionary framework including definitions of entities and properties with a particular interest in the European market and based on a common object classification.

A common Data Dictionary will act as the shared placeholder for national and regional context projects and make them general accessible.

An effective implementation of a link between a harmonised standard dictionary of concepts and IFC-based modelling will act as a unifying element for trade in national and regional projects.
Production of standardized Application Programming Interfaces (API) for the common Data Dictionary ensures that different context projects are related and accessible.

- ***Harmonisation of construction product properties***

Regarding Product Dictionaries, the ISO standards define the framework. The current challenge is related to the number of product dictionaries and the need to avoid misunderstanding of attribute naming convention: same name but different meaning or same concept but different names. A standard is necessary to address the topic.

- ***Harmonisation of European classification tables***

Candidates for further European standardization is both standardization of common European classification tables according to ISO 12006-2 where there is maturity for this, and to use Data Dictionary framework for mapping national tables for areas where there is no maturity for common tables.

- ***Dictionaries and Object Libraries***

Access to generic and product specific object libraries is a key for effective design and access to properties on available products. An Object Library is a structured set of digital objects (e.g. a door or a lighting fixture) which can both specify geometry, properties, classification and links to other documentation. An object library is established in a given data model.

The Work Item includes:
- A standardized European Dictionary framework based on either common classification tables or national tables cross referenced according to the Data Dictionary framework standard;
- Standardization of rules for BIM object libraries makes possible to use object libraries from all of the CEN countries regardless of local documentation requirements. Object Library rules will be standardised with the use of Data Dictionaries and common rules and guidelines for modelling and documenting naming and properties.

### *4.2.7 Collaboration with relevant technical committees and organisations*

CEN/TC 442 shall consider collaboration with relevant technical committees, such as:
- CEN/TC 287 Geographic Information;
- CEN/TC 348 Facility Management;
- CEN/TC 310 Advanced automation technologies and their applications;
- CEN/TC 350 Sustainability in Construction Works;
- CEN/TC 247 Building Automation, Controls and Building Management;
- CEN/TC 250 Structural Eurocodes;
- CEN/TC 371 Project Committee - Energy Performance of Building project group;
- CEN 440 Electronic Public Procurement
- ISO/TC 46/SC 11 Archives/records management;
- ISO/TC 59/SC 13 Organization of information about construction works, and other ISO/TC 59 SCs as relevant;

- ISO/TC 211 Geographic information/Geomatics.

Relevant organisations, such as the followings, will be asked to establish liaisons with this CEN/TC:

- Open Geospatial Consortium - OGC;
- buildingSMART International - bSI ;
- European Construction Industry Federation - FIEC;
- European Environmental Citizens Organisation for Standardisation - ECOS;
- Architects' Council of Europe.
- EU BIM Task Group

**Recommendation**:

TC 442 shall identify key stakeholders for future collaboration.

### 4.3 Environmental sustainability aspects

Construction Industry energy use represents about 40% of total energy consumption (Norwegian figures). A reduction of the Construction Industry's energy consumption and production waste is necessary to meet future emission goals. In addition, the UK ‘CarbonBuzz’ project had identified a 30% performance gap between the design carbon performance of a project and its ‘in use’ performance.
Key to the reduction of carbon emissions is the ability to perform complex performance analysis creates a potential to focus on environmentally low-impact design, construction, operation and demolition [5].

Standardised handling of information can predict environmental performance and thereby improve decision on impact from:

- construction (emissions, resource consumption and waste)
- operation (energy consumption, construction product life-cycle, maintenance)
- construction in local setting (transport, exchange of heat/cooling and electricity, shade, wind effect, water treatment)

**Benefits:**

- Better planning and design on energy and emissions;
- Coordination of domains during design and construction to reduce waste;
- Resource effective operation;
- Long-term BIM analysis of Cost and Resource;
- Documentation of Environmental Impact Values to elements of the Building Information Modelling;
- Performance measurement and feedback;
- Identification of reuse opportunities;
- Collaboration with environmental sector.

**Actions:**

- Representing European sustainability standards in BIM.

# 5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE CEN/TC WORK PROGRAMME

Due to the objectives, the work of CEN/TC 442 will mainly concentrate a lot of experts from the Construction Sector. The exchange format (IFC) will be derived from ISO standards. The key topic is to implement successfully this exchange process. Therefore guidelines and specifications supporting the exchange format have to be prepared in order to ensure consistency between the deliverables produced by CEN/TC 442 and the end-users needs.

Deliverables prepared by CEN/TC 442 have to include the use of open software solutions.

The work of CEN/TC 442 shall be oriented for the Building Owners, including Public Owners, as well as for the Construction Sector, including Small and Medium-sized Enterprises (SME) which constitute the majority of companies in that sector.

A relationship between European Commission and CEN/TC 442 has to be created to ensure consistency of the deliverables produced by CEN/TC 442 with EC orientations.

## INITIAL WORK PROGRAMME

| Sections | Items | Deliverable |
|---|---|---|
| Understand the current position | Terminology | TR |
| | Identification of stakeholder expectations (roles, phases...) | TR |
| | Common base of construction procurement methodology within Europe | TR |
| | BIM Implementation wedges | TR |
| | Available standards in the market (status and usage) | TR |
| | Definition of construction exchange processes | TR |
| Develop Exchange Information - IFC standards | ISO 16739 Industry Foundation Classes for data sharing in the construction and facility management industries | CEN ISO EN |
| | Extend and develop standards for industrial facilities and infrastructure | To define |
| | Record management | To define |
| Develop Information Delivery Specifications | ISO 29481-1 Building information modelling -- Information delivery manual -- Part 1: Methodology and format | CEN ISO EN |
| | ISO 29481-2 Building information models -- Information delivery manual -- Part 2: Interaction framework | CEN ISO EN |
| | ISO/TS 12911:2012 Framework for building information modelling (BIM) guidance | To define |
| | Framework for BIM Guidelines | To define |
| | Energy Assessment( EN 15603) | To define |
| | Lifecycle Cost estimation and Assessment, (CEN / TC 350 ) | To define |
| | Facility Management and Operation, | To define |
| | Building Applications ( Planning and Regulatory Authorities) | To define |
| Support Data Dictionaries | ISO 12006 Building construction -- Organisation of information about construction works -- Part 2: Classification | To define (CEN ISO/ EN or TS) |
| | ISO 12006 Building construction -- Organisation of information about construction works -- Part 3: Framework for object-oriented information | To define (CEN ISO/ EN or TS) |
| | Common Data Dictionary framework and Application Programming Interfaces | To define |
| | Harmonisation of construction product properties | To define |
| | Harmonisation of European classification tables | To define |
| | Dictionaries and Object Libraries | To define |
| Sustainability | Representing European sustainability standards in BIM | To define |

**Table 1- Work Programme**

***Explanation of Deliverables Colum in Table 1***
EN = European standard
TR = Technical report
TS = Technical specification

# 6 ANNEXES

## 6.1 Annex A1 Definitions

**BIM - Building Information Modelling** is an industry term that covers the sharing of structured information for Built Assets. “Sharing” requires consideration of processes and interoperability, “structured” requires the use of a common data schemas and “information” may depend on development of common terminology (CEN/BT/WG215, 2014).

**BIM - Building Information Model** can be visualised as a virtual geometrical representation of the real asset and can report object properties and relations. BIM gives an intuitive understanding of complex building information and support many digital tools for effective information handling (CEN/BT/WG215, 2014).

**built asset** is used as a more general word than “building” to include buildings, infrastructure and their context such as industrial facilities, bridges, tunnels, earthworks, the surrounding terrain etc. In this document, *building* always means *built asset*.

**construction works** everything that is constructed or results from construction operations. This term covers both building and civil engineering works.

**openBIM** means the deployment of BIM based on open standards, not dependent on proprietary formats, allowing the separation of the information from the applications that manage it. In this document, BIM means always openBIM.

**IFC** stands for Industry Foundation Classes. It is a neutral data format to describe, exchange and share information typically used within the building and facility management industry sector. IFC is the international standard for openBIM and registered with the International Standardization Organization ISO as ISO16739.

**buildingSMART International** the International, open and non-for-profit organization that has developed and maintains the IFC, IFD and IDM standard. buildingSMART International develops actual implementation based on their standard and work together with the Industry to ensure implementation of Open BIM.
buildingSMART International is formally recognized by ISO as organisation in cooperation.

**data model** A specified set of entities and their related properties and attributes representing a virtual model of one or more domains structured by a modelling language. The buildingSMART Data Model is the same as the IFC data model.

**data dictionary** A data-semantic dictionary specifying concepts (entities, properties, classification and other concepts) and their relations. A data dictionary defines entities and properties uniquely, understandable and machine readable. It is possible to connect different data dictionaries and to harmonize the understanding of the content we want to share. Such a harmonized dictionary of properties could be used for an unambiguous information exchange either in direct communication with Data dictionaries or other exchange flows based on IFC.

**buildingSMART Data Dictionary** An actual Data Dictionary based on the IFD standard, ISO 12006-3 developed and maintained by buildingSMART International

**IFD** stands for International Framework of Dictionaries. A standard specifying a data structure for Data Dictionaries. IFD is standardized as ISO 12006-3, developed and maintained by buildingSMART International.

**IDM** stands for Information Delivery Manual - A specification of the information requirements needed to support a given BIM process in a standardized structure. The structure of an IDM is standardized by ISO 29481 part 1 and 2.
According to clause 3.8 from ISO 29481-1, the content in a specific IDM will:

- describe the need for information exchange between processes,
- specify how to capture the information needing to be exchanged between these processes,
- identify the actors sending and receiving information,
- define, specify and describe the information being exchanged to satisfy the requirements at each point of the business process,
- ensure that definitions, specifications and descriptions are provided in a form that is useful and easily understood,
- create detailed specifications of the information captured within exchange requirements to facilitate the development of software building information systems,
- ensure that the information specifications can be made relevant to local working practices.

**Information Delivery Specification** The same as an IDM.

**MVD** stands for Model View Definition - A subset of the IFC model needed to support the data exchange for one or more given processes.

**object** Something that can be understood or interpreted, which may be physical or non-physical, which can exist, exists or has existed. Objects have their own identity and can have attributes and relationships to other objects

**object library** A set of virtual objects representing a physical construction object.
An Object Library can be generic and product specific.

**property** A single characteristic of an object or system.

**API** stands for Application Programming Interface. It is a standardized access point to information and relations in a data model.

**life-cycle** Covers both the process perspective and the actual life span of a given physical structure. The life-cycle perspective focuses to improve the sum of performances of a physical structure in its various relation to e.g. function, people, environment and economy.

**facility management** The profession and processes that includes multiple disciplines to ensure functionality during operation of the built environment by integrating people, place, process and technology. In a wider definition it covers both the operation of facilities and assets.

**building application** Covers both the process of and the actual application to local building authorities to get a permit to build and use a construction.

These definitions are provided as elements of understanding. They could be modified following the work of CEN/TC 442.

## 6.2 Annex A2 References

[1] www.bygst.dk/media/17484/projektteknisk-rapport.pdf, DTU Byg Rapport SR 12-06, in Danish, http://www.buildingsmartnordic.org/resources/openbim-for-a-nordic-sustainable-building-industry-1/openbim-is-profitable, in English
[2] http://buildingsmart.no/sites/buildingsmart.no/files/b04022.pdf, Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry - NIST GCR 04-867.
[3] http://www.buildingsmart.no/sites/buildingsmart.no/files/nbs-international-bim-report_2013.pdf, NBS International BIM Report 2013.
[4] http://www.thenbs.com/topics/bim/articles/nbs-national-bim-report-2014.asp, NBS International BIM Report 2014.
[5] http://ec.europa.eu/clima/policies/roadmap/.milestones/index_en.htm, European Commission, Climate Action, Roadmap 2050, Milestones