



Do you own, operate, construct or
maintain physical built assets?

BUILDING WITHOUT BARRIERS

The business case for interoperability

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1 Executive summary

Technology is disrupting traditional business models.

Globalisation, digital transformation (and the resulting digital disruption) and cyber-security are creating new risks, challenges and opportunities for every modern business. Digitally agile organisations are gathering business intelligence about their existing operations, forecasting future needs, and developing new revenue streams.

The building and infrastructure industry is ripe for disruptive change.

Digitisation and related technology advances have only nominally improved productivity, partly because the industry currently known as construction is also a massive and highly fragmented sector. It needs an international body committed to creating and disseminating common, open data standards. buildingSMART meets that need.

Lead, follow or be crushed.

Change is necessary and inevitable. To implement faster, better and less costly ways of working, digital transformation is vital.

Is your organisation highly dependent on built assets? Do you want to be among the digital leaders in the world's built asset industry?

buildingSMART provides the perfect opportunity to help industry visionaries transform the design, delivery and operation of tomorrow's built assets. International open digital data-sharing standards are critical to this transformation, helping businesses – owners, architects, engineers, contractors and operators – become global industry leaders, while also:

- **mitigating risks**
- **saving time, and**
- **reducing costs**

2 Is your organisation digitally agile?

Organisations around the world are facing major challenges due to globalisation, digital transformation and data security.

Globalisation is speeding economic, financial, trade, and communications integration. Businesses increasingly operate in an interconnected and interdependent world with free transfer of capital, goods and services across national frontiers.

Similarly, continued **digital transformation** is challenging businesses and industry organisations around the world to rethink how they work and compete in the 21st century. Failure to adapt to digital disruption means businesses fall behind their more digitally adept competitors, or even close altogether (remember Kodak? Blockbuster?).

Data only has business value when used in business processes with confidence and reliability. Its meaning must be understood. Data therefore must be **well defined** and managed in accordance with global standards of good information quality and practice. The rapid flow of information across international boundaries also needs to be managed with **security** in mind. Key data must not be intercepted, lost or damaged.

Today's leading businesses are **digitally agile**. These organisations are securely integrating their people, processes and data to enable easier sharing of information and greater efficiency across all of their business operations. Their executives increasingly expect to have key data about value-adding aspects of their company's performance at their fingertips in seconds.

As we move into what the World Economic Forum has called the Fourth Industrial Revolution, data is being created at an unprecedented rate. IBM estimates that 90% of the world's data has been created in the past two years. Digitally agile organisations are increasingly using 'Big Data' analytics to gain business intelligence about their operations, to forecast their future needs, and to develop new revenue streams. Surprisingly, when it comes to data about the physical built

THE FOURTH INDUSTRIAL REVOLUTION (CYBER-PHYSICAL SYSTEMS)

“...the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance.”

KLAUS SCHWAB - Founder and Executive Chairman, World Economic Forum

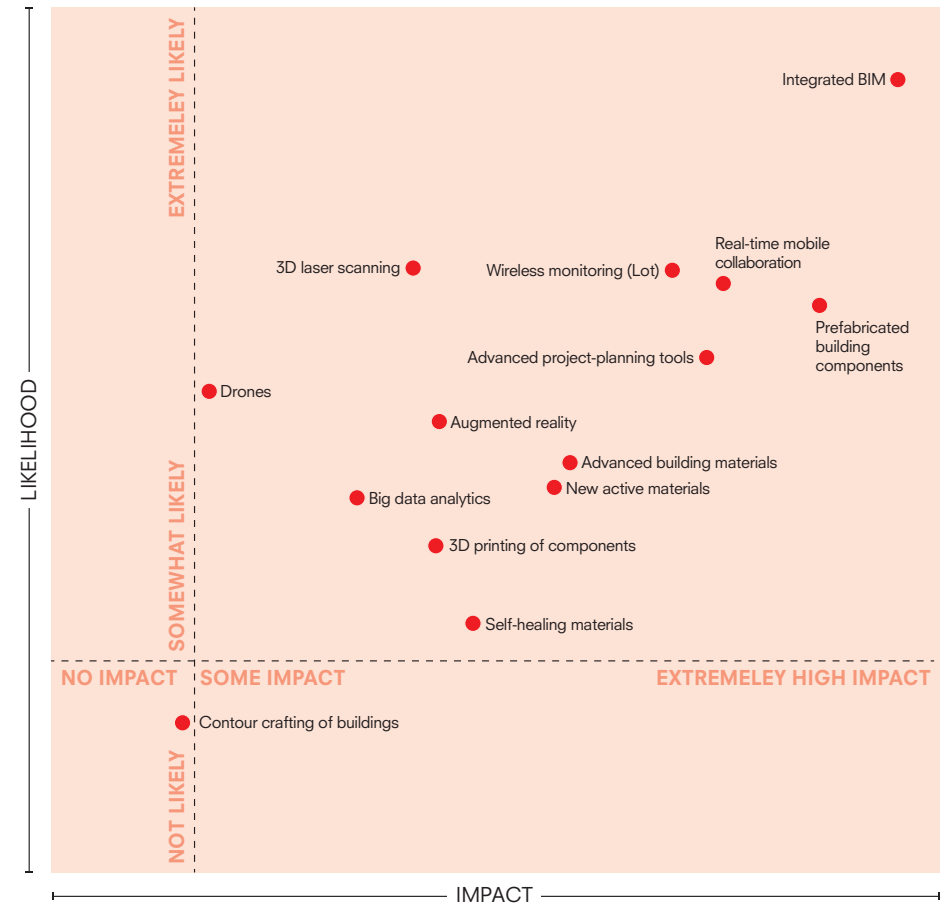
assets upon which most organisations depend, there is often a gap in the executive data dashboard. Construction has historically lagged behind other industries in creating and using the **open data standards needed to underpin the free flow of information** about our buildings and infrastructure (see chart opposite). And, partly as a result, it has lagged behind other industries in improving its productivity.

MCKINSEY GLOBAL INSTITUTE INDUSTRY DIGITISATION INDEX FOR EUROPE

Rating	Sector
1	ICT
2	Media
3	Finance and insurance
4	Professional services
5	Wholesale trade
6	Advanced manufacturing
7	Chemicals and pharmaceuticals
8	Utilities
9	Oil and gas
10	Basic goods manufacturing
11	Mining
12	Real estate
13	Transportation and warehousing
14	Retail trade
15	Personal and local services
16	Government
17	Education
18	Healthcare
19	Entertainment
20	Hospitality
21	Agriculture
22	Construction

SOURCE: EU Klems; Eurostat; OECD; McKinsey Global Institute analysis

WORLD ECONOMIC FORUM
IMPACT-LIKELIHOOD MATRIX OF NEW TECHNOLOGIES

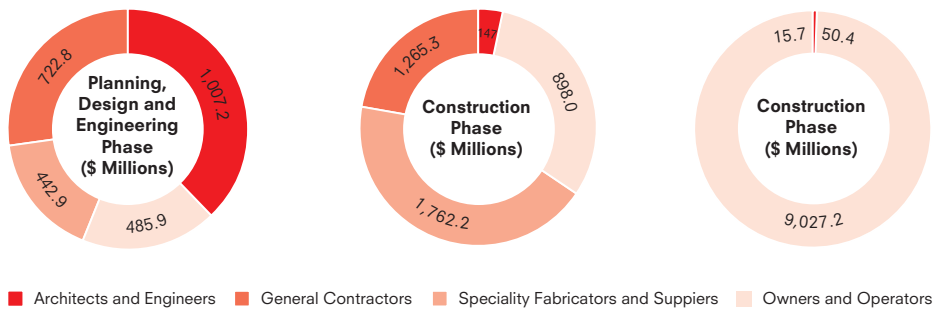


SOURCE: Shaping the Future of Construction, World Economic Forum/The Boston Consulting Group

3 Why have open data standards?

Common open data standards save time and money while significantly increasing innovation.

Without standards helping us share information using common languages and formats, the planning, delivery and operation of built assets remains inefficient and wasteful. The legacy of this poor interoperability is that owners and operators incur additional costs in converting or recreating the data they need to manage their built assets and asset-based services.



In 2004, the US National Institute for Standards and Technology conservatively estimated the total annual cost of poor interoperability to US asset operators at US\$15.8 billion.

Open, shareable information unlocks more efficient, transparent and collaborative ways of working throughout the entire life-cycle of buildings and infrastructure. The growing adoption of new asset delivery processes such as building information modelling (BIM) also allows owners and operators of built assets, working with their service partners, to plan their capital investments and understand the likely whole-life costs of maintaining and using those assets for their intended purposes.

The benefits of open data standards are substantial, and include:

- **more transparent, collaborative and open workflows**
- **greater information certainty due to a shared vocabulary of industry terms**
- **more open procurement processes**
- **processes that are inclusive for companies large and small**
- **greater re-use of data; less re-keying of the same data**
- **easier integration with linked data created and shared in related industries**

For data to flow easily, and for the resulting benefits to be shared across the built asset industry, the standards need to be developed collectively by the key stakeholders within it – from designers and constructors to owners and operators – and buildingSMART provides the vehicle to do this.

4 Building the open standards you need

Every industry uses standards to support business processes.

The immense impact of the WorldWide Web, for example, was only possible due to the development of global standards by the W3C consortium. While the building and infrastructure sector assume its own industry standards for physical objects (electrical power ratings, for instance) digital and data **standards are needed to keep pace with technological changes**, such as the adoption of building information modelling.

THE SEMANTIC WEB

“The Semantic Web is not a separate Web but an extension of the current one, in which information is given well-defined meaning, better enabling computers and people to work in cooperation.”

TIM BERNERS-LEE - Inventor of the world wide web

Digitisation is enabling designers and constructors to create and disseminate information more quickly and accurately than ever before. However, sharing this information digitally in the huge and highly fragmented global built asset industry is increasingly difficult.

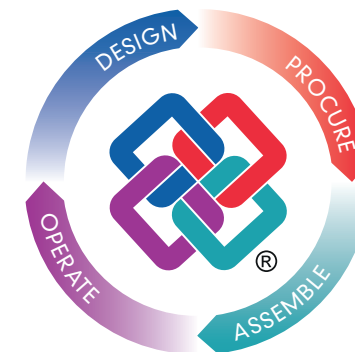
An international body committed to creating and disseminating common, open data standards relating to the built asset industry is needed. buildingSMART meets that need.

Since it was incorporated in 1995, buildingSMART has focused on solving common industry problems by collaboratively developing open, neutral, international digital data sharing standards for the built environment.

Where will buildingSMART standards help?



WITH OPEN DATA EXCHANGE



FOR THE WHOLE LIFE CYCLE



FOR ALL BUILT ASSETS

5 Four reasons why you should be part of buildingSMART

1 buildingSMART is creating the core technical functionality – the operating system – for open digital information flows across the built asset industry, and throughout the life-cycle of your built assets.

Whatever their background, users have the opportunity to capture their existing business processes and make them digital. As a result, the delivery of future built assets will be accompanied by the handover of detailed digital information that can be re-used and augmented by owners and operators, giving them a clearer view of **how their built assets support their business operations**.

2 buildingSMART provides the worldwide chapter network, plus the necessary technical and process support, to develop open standards that support both your information workflows and those of other businesses you deal with.

Individual companies may try to create their own standards, but this is expensive and the outputs are often highly localised and not shareable. But waiting to follow what others do makes businesses vulnerable.

The buildingSMART mission is to proactively support industry participants who want to develop open standards for planning, design, procurement, assembly and operation of buildings and infrastructure worldwide. Direct involvement in creating global standards **puts your business in an industry-leading position** when it comes to providing its services and products.

3 buildingSMART helps industry organisations share an unrivalled breadth of international experience in setting standards relating to built asset delivery and operation.

An open, neutral, not-for-profit international body, buildingSMART led development of geometric data exchange standards. Its core Industry Foundation Class standards achieved ISO approval in 2012 (buildingSMART also leads the ISO working group responsible for these standards). It is engaged with other international standards bodies such as the European Committee for Standardization (CEN) and the Open Geospatial Consortium, and **influencing national and client programmes across the globe**. And its endeavours are supported by leading software vendors including Autodesk, Nemetschek and Trimble.

“Arup believes that full implementation and adoption of open BIM is vitally important to the built environment sector and we are excited to play a strategic role in driving forward its implementation.”

TRISTRAM CARFRAE - Arup Deputy Chairman

4 buildingSMART provides a unique forum in which you can work with other industry organisations to innovate, create competitive advantages, and deliver real business benefits.

Poor interoperability hampers business efficiency, making the planning, delivery and operation of built assets inefficient and wasteful. buildingSMART starts from a foundation of international best practice, helping businesses formulate the standards and processes that will make them global industry leaders, while also:

- mitigating risks
- shortening delivery cycles, and
- reducing costs

6 buildingSMART at work

1 buildingSMART developing infrastructure engineering standards

Highways and Rail authorities in the Netherlands, Sweden and Finland are helping fund IFC work relating to infrastructure projects. The effort is being run in buildingSMART's '**Infrastructure Room**', and has been extended to cover other types of projects including railways and bridges. Supported around the world – and building on substantial developments from China, Korea, France and the US – the project's benefits will include:

- **faster project delivery, with resulting earlier revenue generation**
- **better whole life value**
- **improved quality and safety**
- **better planned maintenance and more predictable renewal**

2 buildingSMART improving construction data standards

Japanese 'super-contractor' Kajima is working with buildingSMART to create a '**Construction Room**' – a long-term project aimed at improving the use of open data standards during the construction phases of projects.

This forum brings together international construction companies to develop solutions for a more efficient future. The 'Room' will enable use of developing technology and innovative building practices. The ability to manufacture offsite and rapidly assemble onsite will become a reality with considerations such as robotics, the internet of things and combining trades.

3 buildingSMART facilitating airports data standards

Under buildingSMART's umbrella, one of the world's largest and busiest airports – Amsterdam Airport Schiphol – has launched an '**Airports Room**' to unify existing standards and help airport operators derive increased value across the lifecycle of their facilities.

Working with buildingSMART will also enable these airport standards to be used alongside Industry Foundation Class (IFC) standards being developed for buildings and infrastructure. Airport operators and their supply chains can then be more innovative in their design, build and maintenance decisions, able to repurpose facilities more easily and reduce disruption to airport customers.

4 buildingSMART expanding functionality for building design and construction

International design practices Arup and HOK are leading an initiative to extend Industry Foundation Class structures, expanding available parameters and improving the rate of development of new capabilities.

This task is supported by buildingSMART's technical community and leading vendors Autodesk, Nemetschek and Trimble. Run under the buildingSMART Standards Process, it will ensure the broadest technical and user-based inputs leading to an international consensus on the eventual outcomes.

7 Join buildingSMART

Join the only industry body dedicated to supporting open data standards in the built environment.

Organisational membership of buildingSMART International is open to governmental bodies, institutes, commercial and non-commercial entities, and major projects worldwide. There are three levels of membership:

- **Standard member**
- **Multinational member**
- **Strategic member**

STANDARD MEMBERSHIP

Standard membership is for organisations wishing to play an active role in standards development and also provides membership of a single chapter.

Standard members have full voting membership rights on the Standards Committee, enabling them to take an active role in the co-development of solutions to user or technical requirements.

Annual membership fees are €15,000 for companies with more than 250 staff and €8,000 for others.

MULTINATIONAL MEMBERSHIP

Multinational membership of buildingSMART International is for organisations active in multiple countries who want to participate in chapter activities across several countries as well as in our standards programme.

Multinational members have full voting membership rights on the Standards Committee and membership rights with up to five buildingSMART chapters.

Annual membership fees are €40,000 for companies with more than 250 staff and €20,000 for others.

STRATEGIC MEMBERSHIP

Strategic membership is the most senior form of corporate membership. It is designed to appeal to leading multinational enterprises who (i) believe that full implementation and adoption of open data exchange is strategically important to the built asset industry and to their own enterprise and (ii) who wish to play a strategic role in driving forward its implementation.

DIGITISATION

“..We believe that digitisation within the industry is gathering pace and that the key enabling technologies developed by buildingSMART are critical to the industry’s future.”

HIROYOSHI KOIZUMI - Executive Vice President, Kajima

Strategic membership includes a place on the Strategic Advisory Council. This council meets semi-annually to advise the board on:

- **strategy (all aspects) and priorities**
- **engagement with users and chapter operations**
- **user, Standard and Compliance programmes.**

Membership fees are €100,000 per annum, with funds used to support the leadership team and establishment. Participation in the Strategic Advisory Council is by invitation; interested parties are asked to contact the chief executive.

Solution development and standard project work is funded on a work-in-kind basis or from sponsorship.

buildingSMART is an international body
committed to creating and disseminating
common, open data standards.

buildingSMART chapters:

AUSTRALASIA

AUSTRIA

BENELUX

CANADA

CHINA

FRANCE

GERMANY

ITALY

JAPAN

KOREA

NORDIC

NORWAY

RUSSIA

SINGAPORE

SPAIN

SWITZERLAND

UK & IRELAND

USA



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