Digi-CVET

Developing transversal digital competences for digital Continuous Vocational Education and Training in construction

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Digital collaboration in construction

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Chamber of Construction and Building Materials Industry of Slovenia
ΠΕΔΜΕΔΕ 1931 ΠΑΝΕΛΛΗΝΙΑ ΕΝΩΣΗ ΔΙΠΛΩΜΑΤΟΥΧΩΝ ΜΗΧΑΝΙΚΩΝ ΕΡΓΟΛΗΠΤΩΝ ΔΗΜΟΣΙΩΝ ΕΡΓΩΝ
PANHELLENIC ASSOCIATION OF ENGINEERS CONTRACTORS OF PUBLIC WORKS
Kröpelin Projekt GmbH
Co-funded by the European Union

What will you learn in this module?

- The module deals with digital collaboration in construction
- In this module, you will get an overview of digital collaboration tools and practices in the construction sector
- The module is divided in 3 chapters
  1. Importance of efficient collaboration
  2. Basics of cloud computing
  3. BIM collaboration tools

Chapter 1 – Importance of efficient collaboration

In a project, in general

An efficient collaboration can :

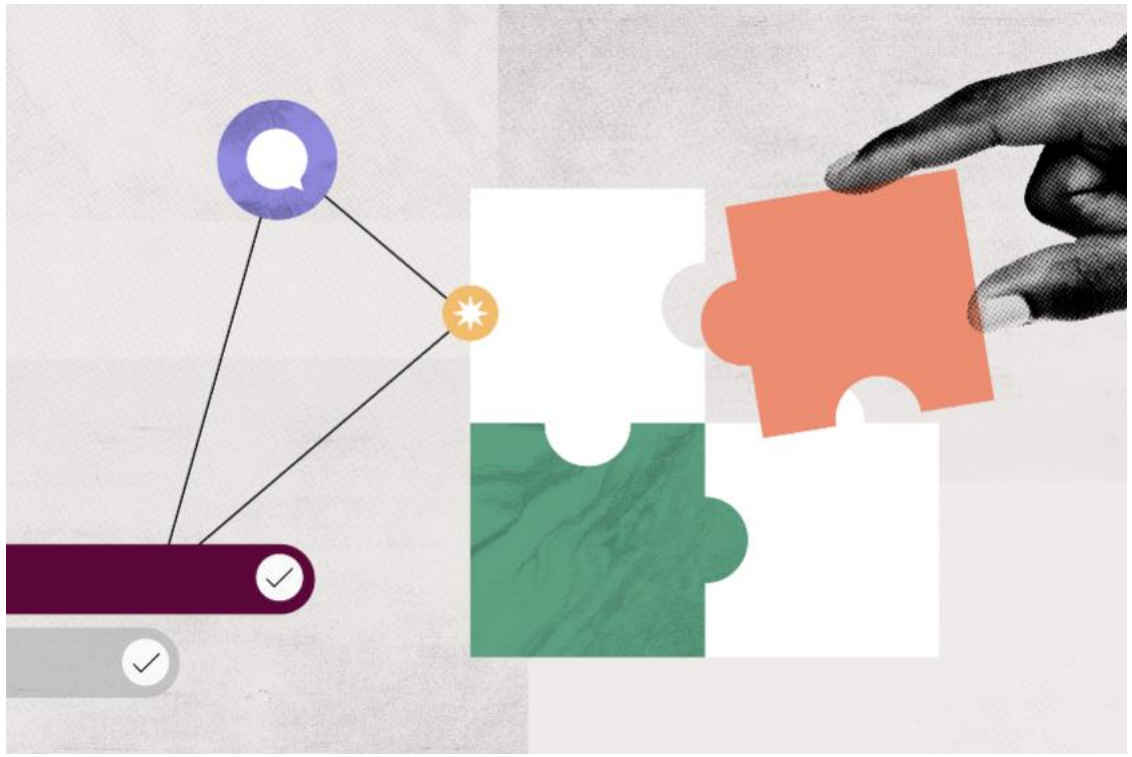
- Stimulate innovation
- Increase the productivity
- Improve team satisfaction
- Raise awareness of needs and time limits
- Increase team flexibility and team adaptibility
- Induce team involvment

It is important to bring together the skills of all collaborators to build a strong project.

Source: https://asana.com/fr/resources/collaboration-in-the-workplace

Chapter 1 – Importance of efficient collaboration

How do you recognize an efficient collaboration ?



- Diverse team with various profiles and skills (hard and soft skills)
- Frequent team brainstorming
- Open communication

Source: https://asana.com/fr/resources/collaboration-in-the-workplace

Chapter 1 – Importance of efficient collaboration

Evolution of the construction sector

Construction projects are getting more and more complex

- New technologies
- New regulations
- Multidisciplinarity
- Multiplication of actors and teams

Efficient collaboration between all involved actors will save time, energy and money !

Source: https://www.ecmag.com/section/your-business/what-expect-collaboration-construction-projects

Chapter 1 – Importance of efficient collaboration

Differentiating offline and online collaboration

Offline collaboration, especially on the work site, remains paramount.

Online collaboration is not intended to replace this essential aspect.

Online collaboration will support efficient, time and cost effective collaboration on the construction site !

Source: https://www.fieldwire.com/

Chapter 1 – Importance of efficient collaboration

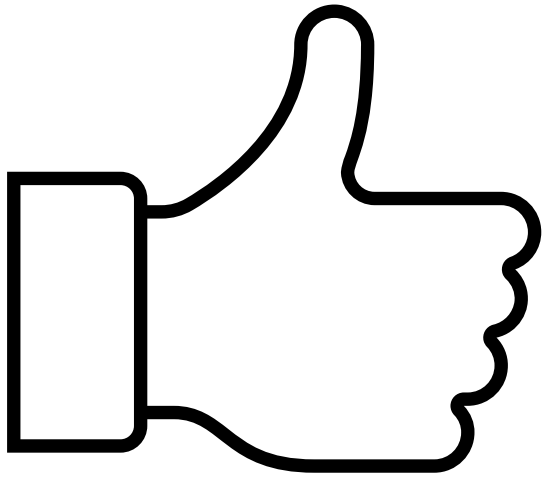
Differentiating offline and online collaboration

Discover more in a short video

Source: https://www.fieldwire.com/

Chapter 1 – Importance of efficient collaboration

Advantages of online collaboration

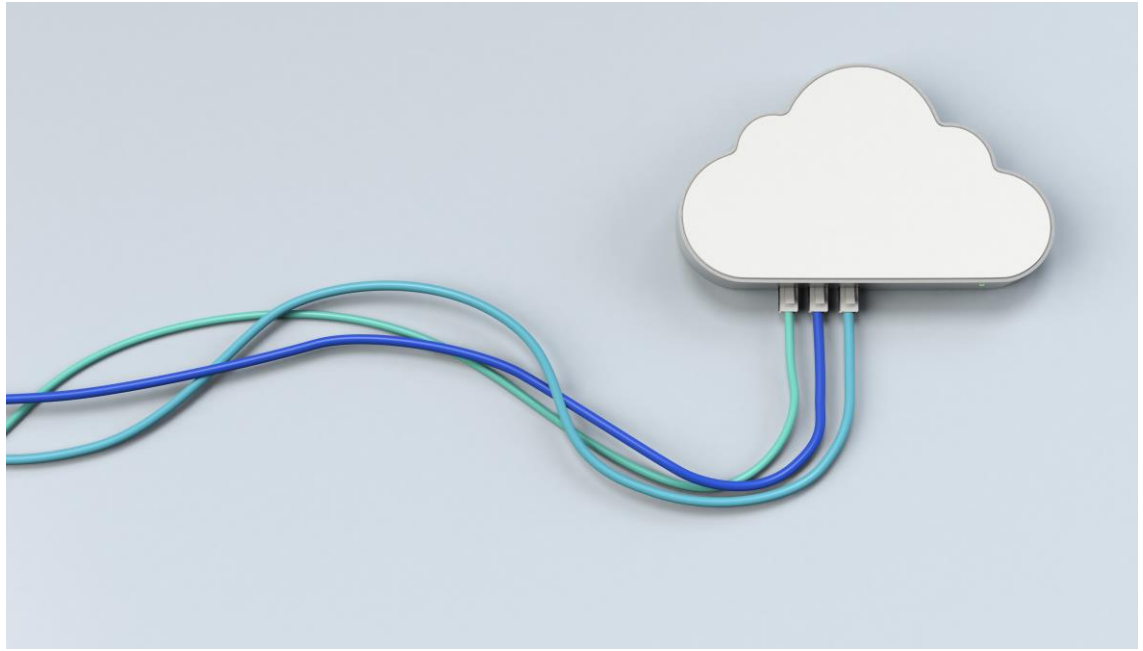


- Facilitating exchange and storage of project data
- One common source of information through the lifecycle of the building
- Identifying potential problems and clashes before starting the worksite
- Saving time and money

Let’s learn more in the next chapters!

Chapter 2 – Cloud computing

What is a cloud?

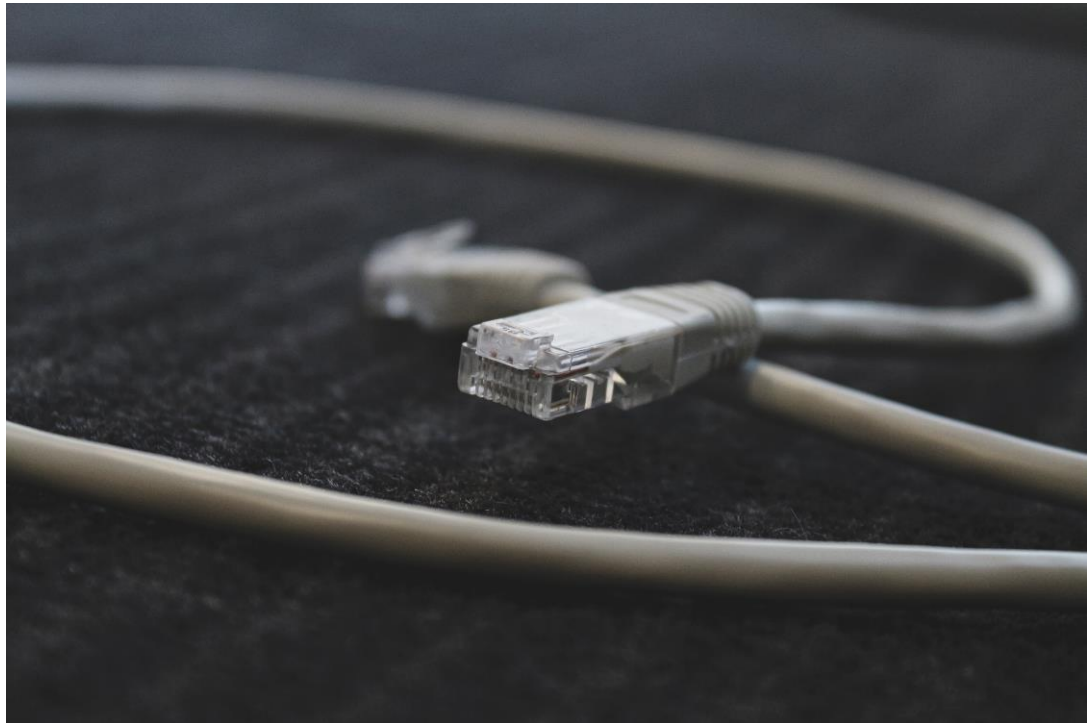


Cloud computing is a digital service that allows users to access important programs and data stored on a remote server anywhere they have an internet connection.

Source: https://www.oodrive.com/fr/blog/productivite/quels-sont-les-avantages-du-cloud-pour-les-entreprises

Chapter 2 – Cloud computing

Cloud computing : Pros & cons



Source: https://www.oodrive.com/fr/blog/productivite/quels-sont-les-avantages-du-cloud-pour-les-entreprises

Pros:

- Accessibility wherever there is internet connection
- Increase employee mobility and agility
- Possibility of working with several people on the same document
- Real-time date sharing
- Easiness to communicate with people all around the world
- Quick to set up
- Saving money on complex server and other equipment

Cloud explained in 2 minutes

Chapter 2 – Cloud computing

Cloud computing : Pro & cons

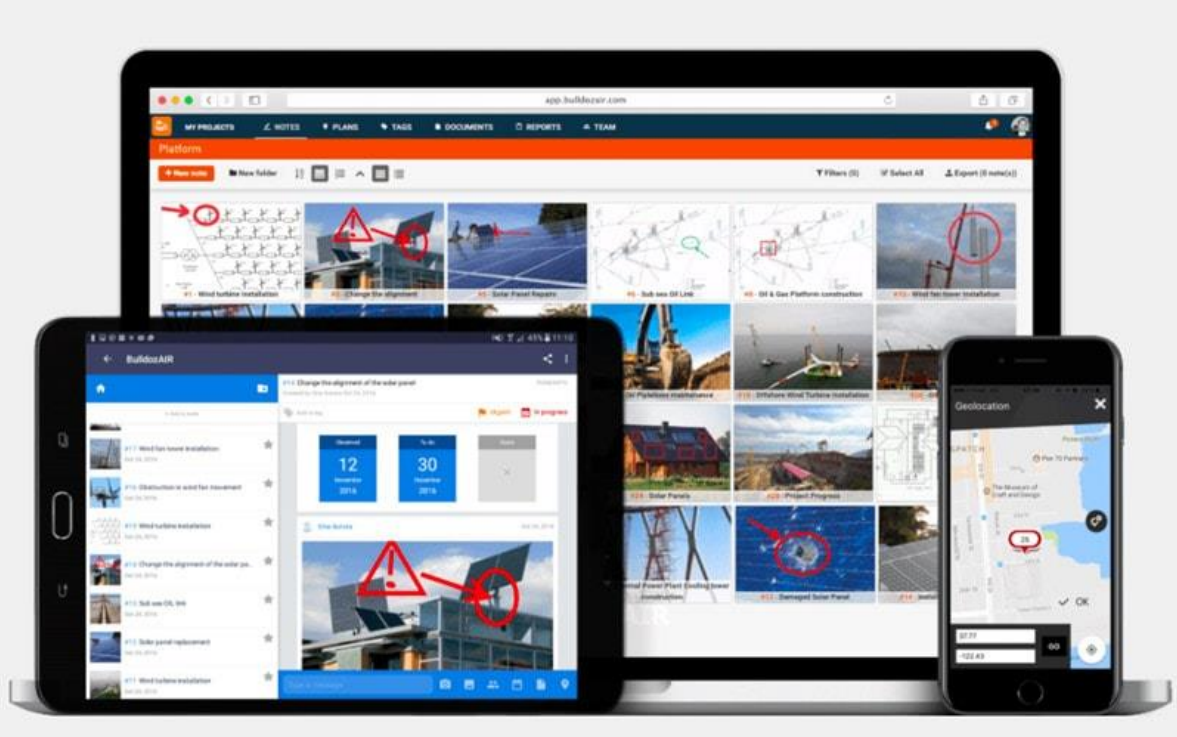
Cons :

- Dependence on internet connection
- The data is entrusted to the cloud provider. It is therefore important to read the general conditions carefully
- Sometimes, cloud leads to additional costs. It is important to choose a structure that will build the cloud according to your company's needs and no more
- Technical issues must be taken care of by a technician from the supplier

Source: https://www.oodrive.com/fr/blog/productivite/quels-sont-les-avantages-du-cloud-pour-les-entreprises

Chapter 2 – Cloud computing

Equipment

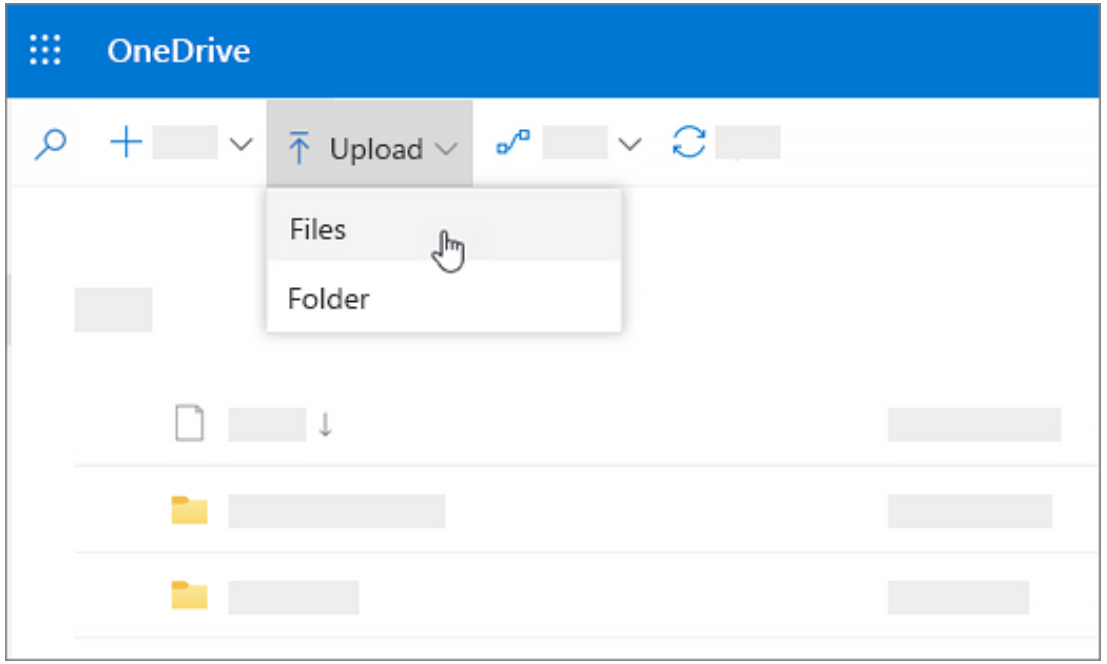


- Internet connection
- Computer or mobile device
- Cloud infrastructure

https://blog.bulldozair.com/fr/cloud-computing-pour-entreprise-construction

Chapter 2 – Cloud computing

Creating folders and uploading files in the cloud – step by step



Cloud platform are easy-to-use

- Upload a file (drag and drop)
- Organize files in folders
- Administrator rights allow you to grant different roles to each user of the program

https://support.microsoft.com/en-us/office/upload-and-save-files-and-folders-to-onedrive-a1397e56-61ec-4ed2-9dac-727bf8ac3357

Chapter 2 – Cloud computing

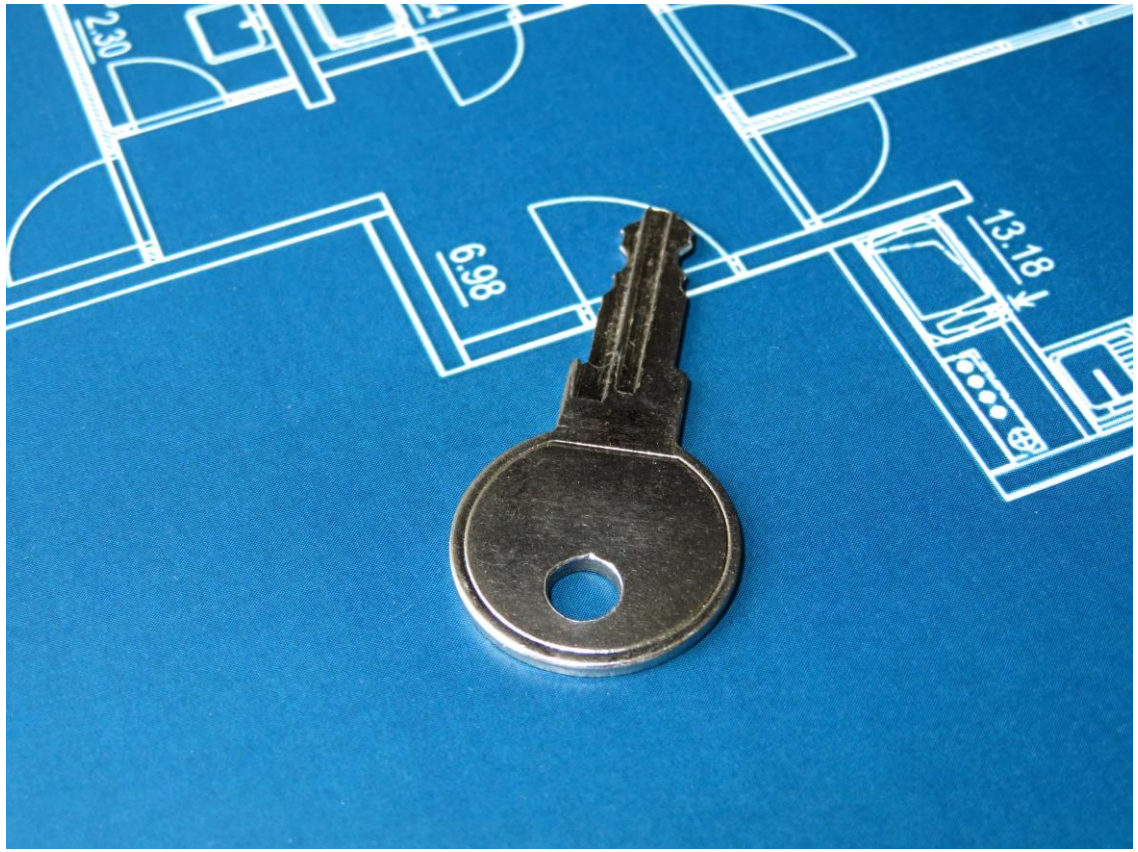
Access rights

- Decide who can see a file
- Decide who can modify a file
- Decide who can create a file

https://theconstructor.org/digital-construction/cloud-computing-construction-benefits/87574/

Chapter 2 – Cloud computing

Data security



Cloud services potentially pose a security risk if you choose a service whose storage model doesn't align with the size of your business and its needs.

Public platform : Shared Environment and costs are lower

Private platform : preferred for companies that have a lot of constraints in terms of security

Hybrid platform : flexible and tailor-made

More information : Here

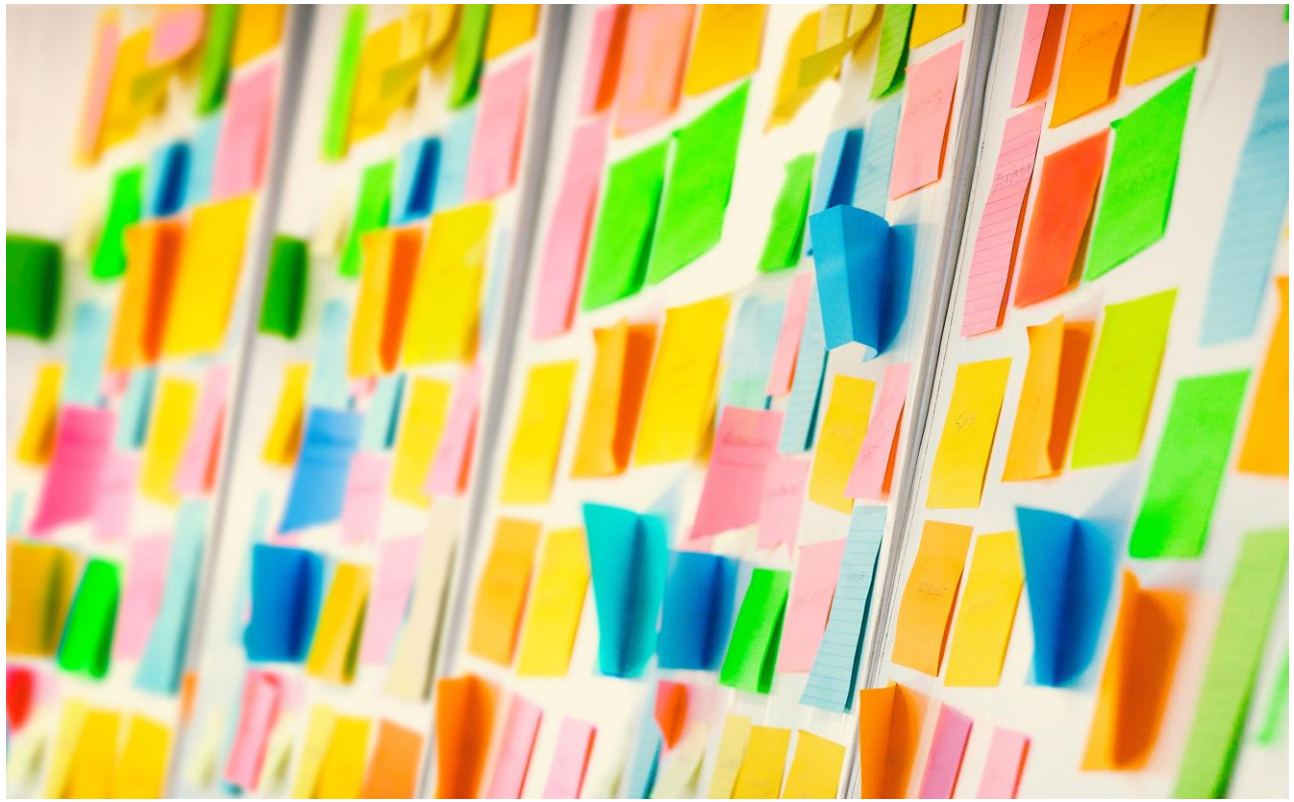
Chapter 2 – Cloud computing

Examples of cloud service providers

- https://cloud.google.com/
- https://azure.microsoft.com/
- https://www.ibm.com/cloud
- https://www.salesforce.com/eu/?ir=1
- https://www.oracle.com/
- https://aws.amazon.com/

Chapter 2 – Cloud computing

Other online collaboration tools



To-Do lists

- Trello : https://trello.com/
- Miro : https://miro.com/

Sharing tasks

- Odoo : https://www.odoo.com/
- Monday : https://monday.com/
- Sharepoint

Chapter 2 – Cloud computing

Other online collaboration tools

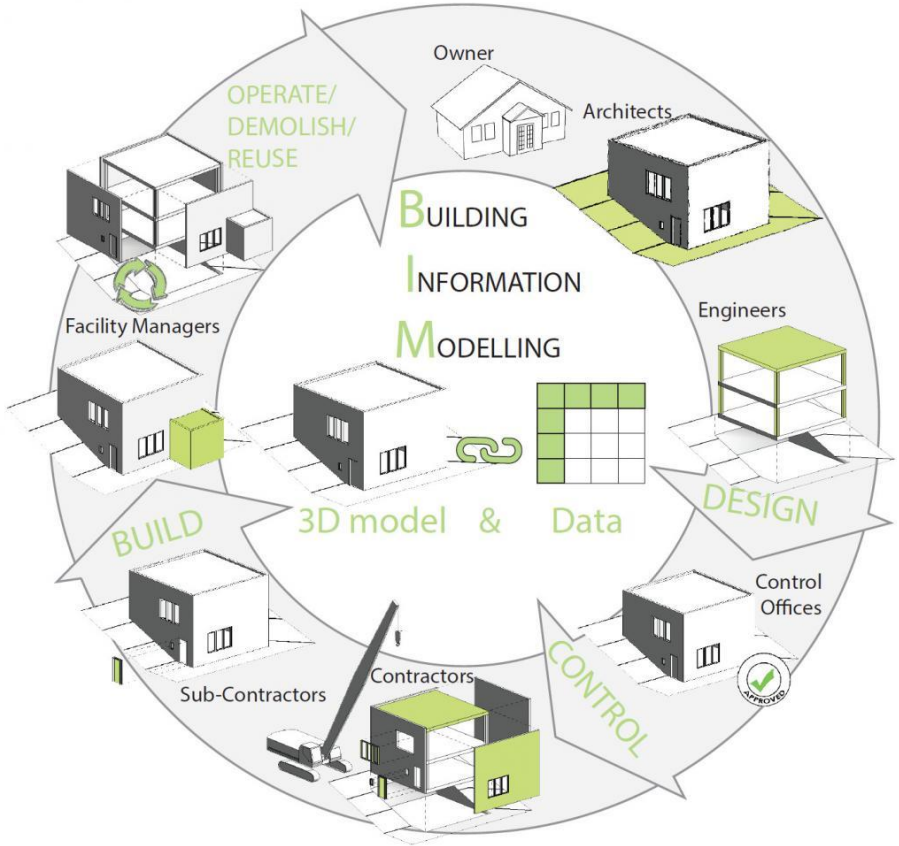
Instant messaging in groups

- Zoom : https://zoom.us/ / Video
- Teams : Video
- Slack : https://slack.com/ / Video

Source: https://www.revesoft.com/blog/enterprise/instant-messaging-for-business/

Chapter 3 – BIM collaboration tools

What is BIM?



Source: https://www.guidebatimentdurable.brussels/bim

BIM is the acronym of **B**uilding **I**nformation **M**odelling.

It is:

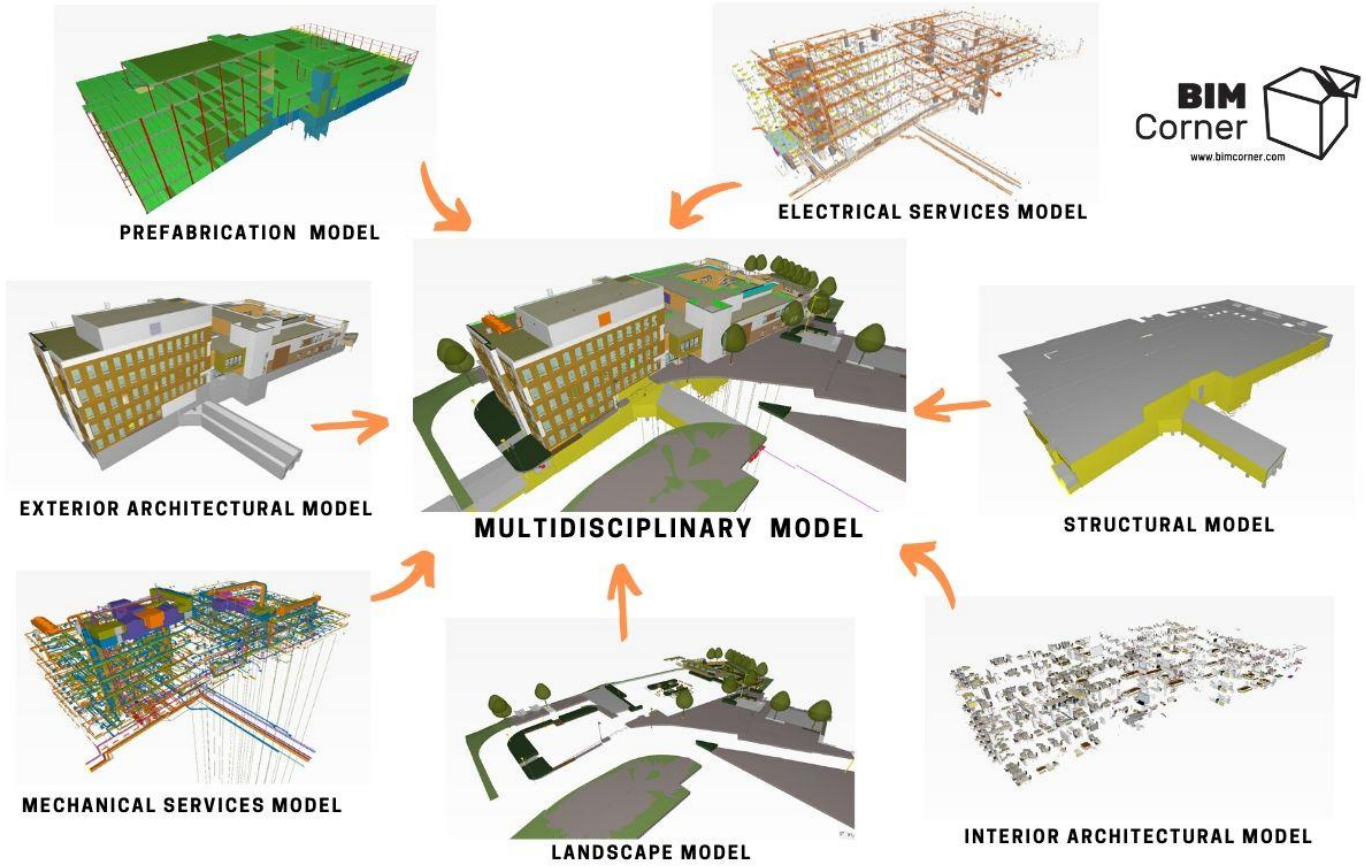
1. a **collaborative working method** that uses a **3D digital model** that contains **technical and structured data**.

2. a **process of sharing reliable information** throughout the **life cycle of a building**.

Introduction to BIM in 2 minutes

Chapter 3 – BIM collaboration tools

1. BIM is a **collaborative working method** that uses a **3D digital model** with **technical and structured data**



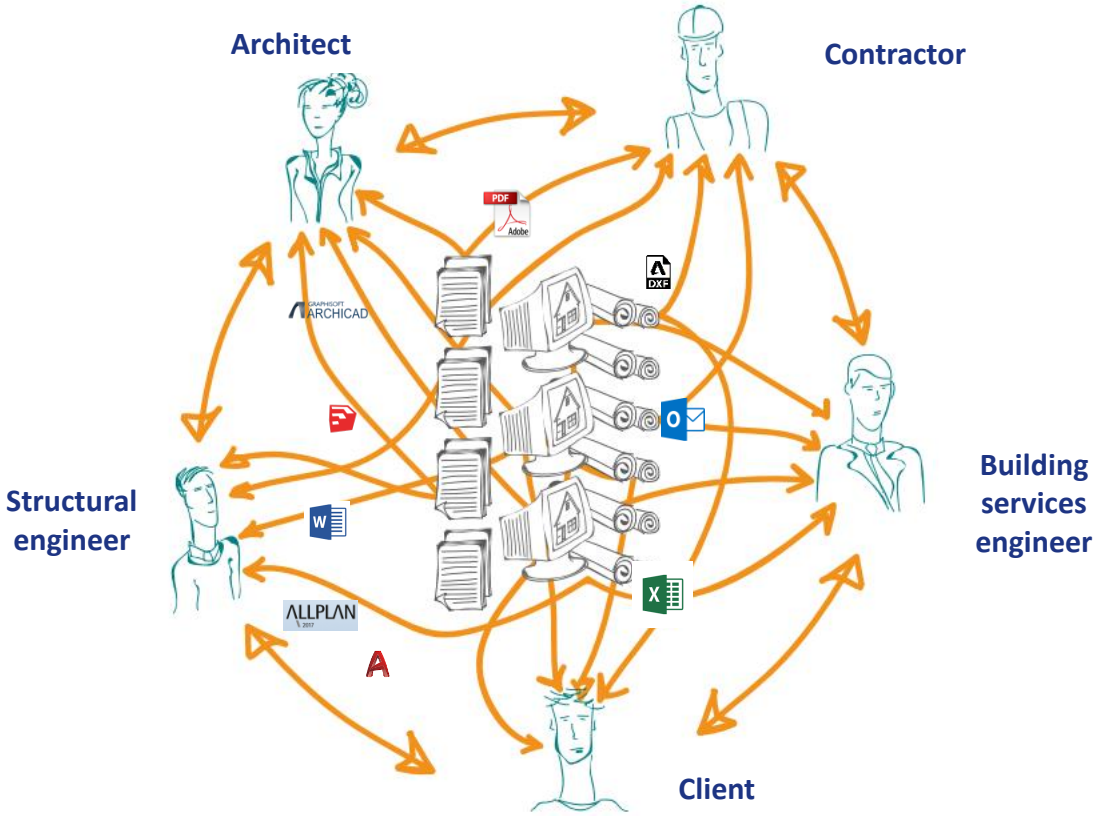
The BIM coordinated 3D model makes it possible to combine models from different disciplines and trades (architecture, structure, electricity, heating, ventilation, etc.)

BIM allows to **build (digitally) before building (in real life)**.

An example : Video

Chapter 3 – BIM collaboration tools

2. BIM is a **process of sharing reliable information** throughout the life cycle of a building



Source : CSTC – Contact – Le numérique pour tous

WITHOUT BIM

Involvement of different actors who develop their plans and models in parallel, each with their own communication tools and methods.

Consequences:

- Difficulty of coordination and lack of clarity
- Risk of inconsistencies and errors due to multiple versions of documents
- Risk of data loss
- Risk of wasting time (and therefore money)

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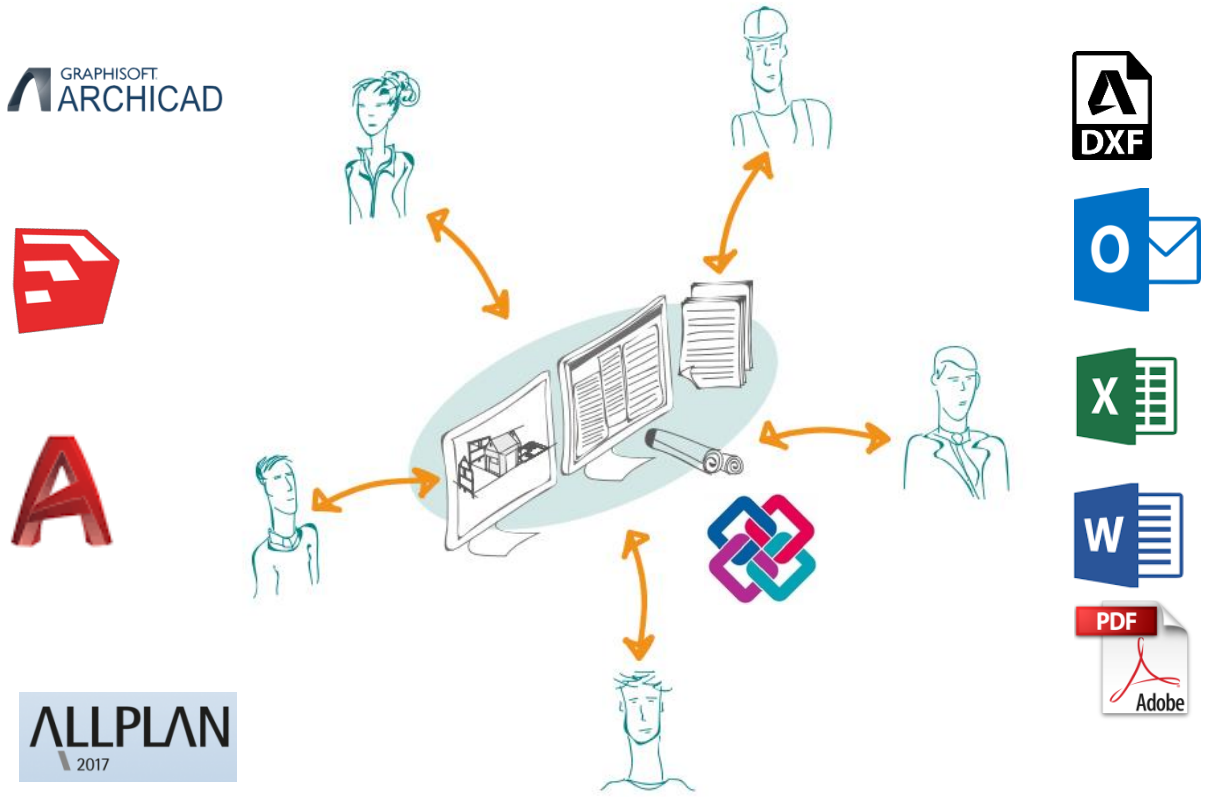
2. BIM is a **process of sharing reliable information** throughout the life cycle of a building



Source : CSTC – Contact – Le numérique pour tous

WITH BIM

All project information is centralised on a collaborative platform accessible to all parties so that everyone can consult up-to-date information.

All stakeholders have a clear overview of the project and can keep themselves informed of its progress.

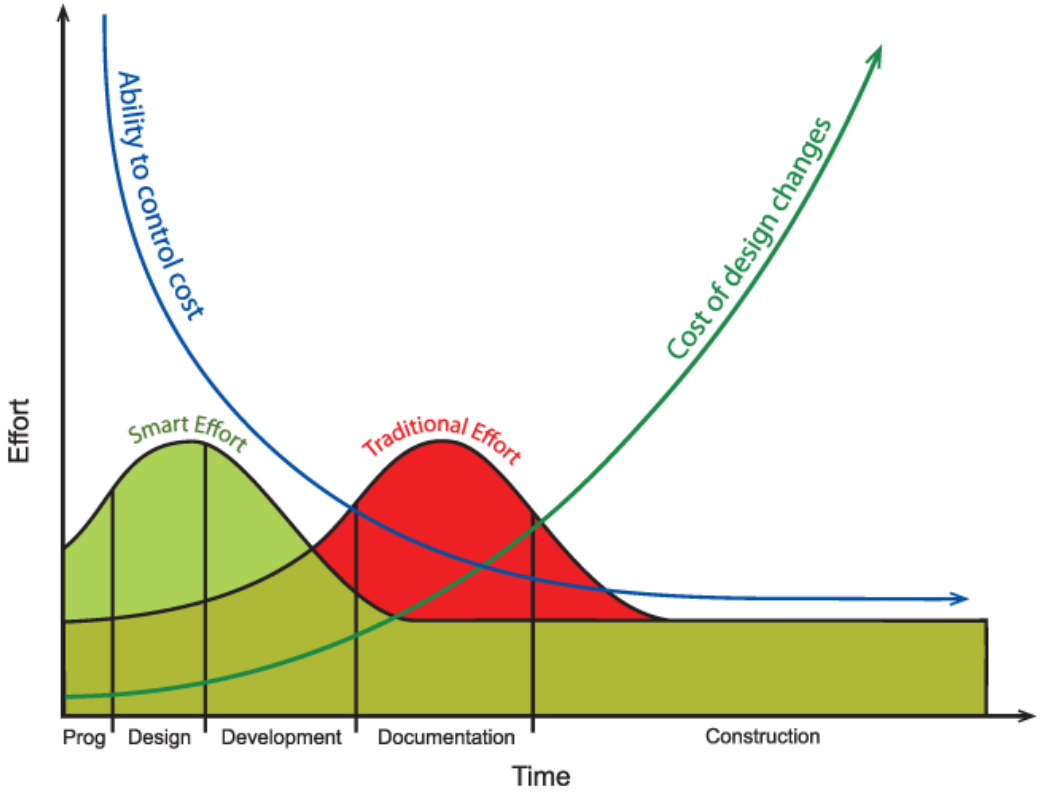
This allows real-time design adjustments and developments.

Chapter 3 – BIM collaboration tools

Benefits of BIM in terms of collaboration

The BIM methodology allows :

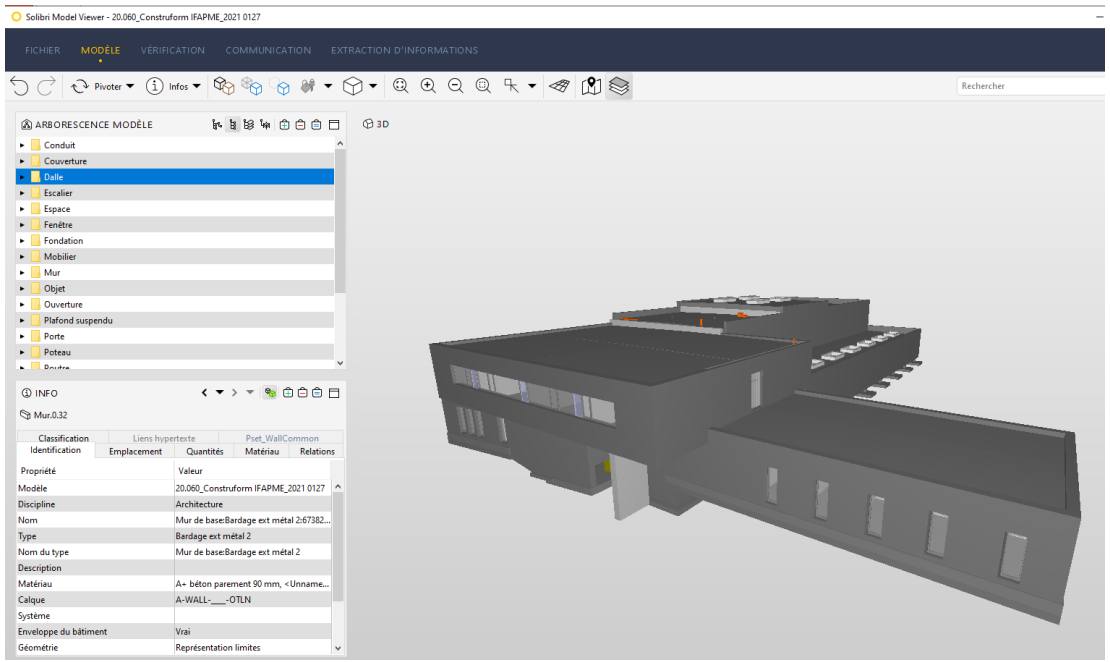
- to construct the building virtually before physically constructing it, and therefore to **anticipate building site issues** and to **solve them at a lower cost**, before starting the construction.
- to **save time**
- optimized collaboration by giving all stakeholders **access to information**
- all stakeholders to work on the same basis, thus **reducing information transfer problems** and therefore errors both during design and execution
- to **optimize** both human and material **resources**



Source : https://bimthoughts.com/e2025/

Chapter 3 – BIM collaboration tools

Common Data Environment – a common shared repository of data



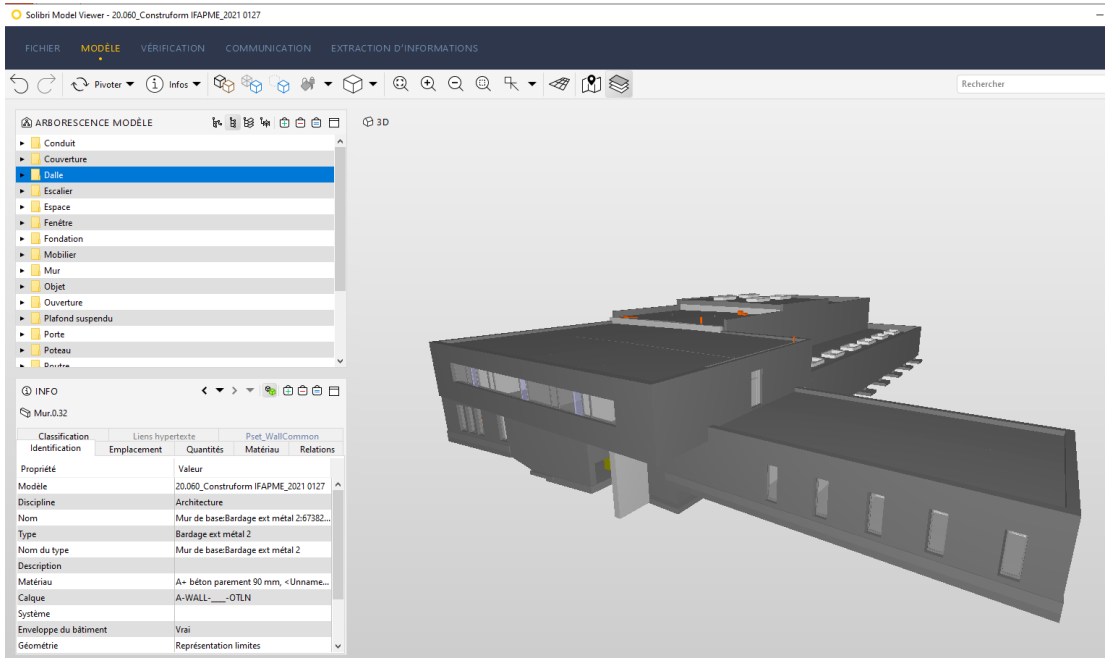
The BIM digital model is linked to a **database,** referred to as **Common Data Environment (CDE)**

a **cloud-based space** where **information** from construction projects is stored and accessible to project participants, such as:

- Documentation on the construction project
- Construction phases and logistics
- Financial aspects
- Energy performance of the building
- Materials and components
- Maintenance of the building

Chapter 3 – BIM collaboration tools

Common Data Environment – a common shared repository of data



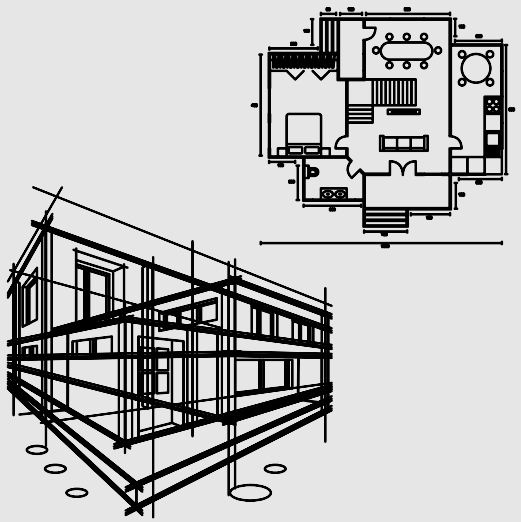
More information in this video

Chapter 3 – BIM collaboration tools

Types of information stored in the CDE

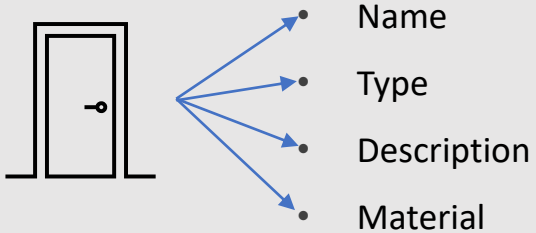
Graphical

2D or 3D



Non-graphical

Digital attributes to the 2D or 3D objects



Documents

Examples:

- Specifications
- Schedules
- Bills of quantities
- Product manuals
- Properties of materials
- Certificates
- Warranties
- Contracts

Chapter 3 – BIM collaboration tools

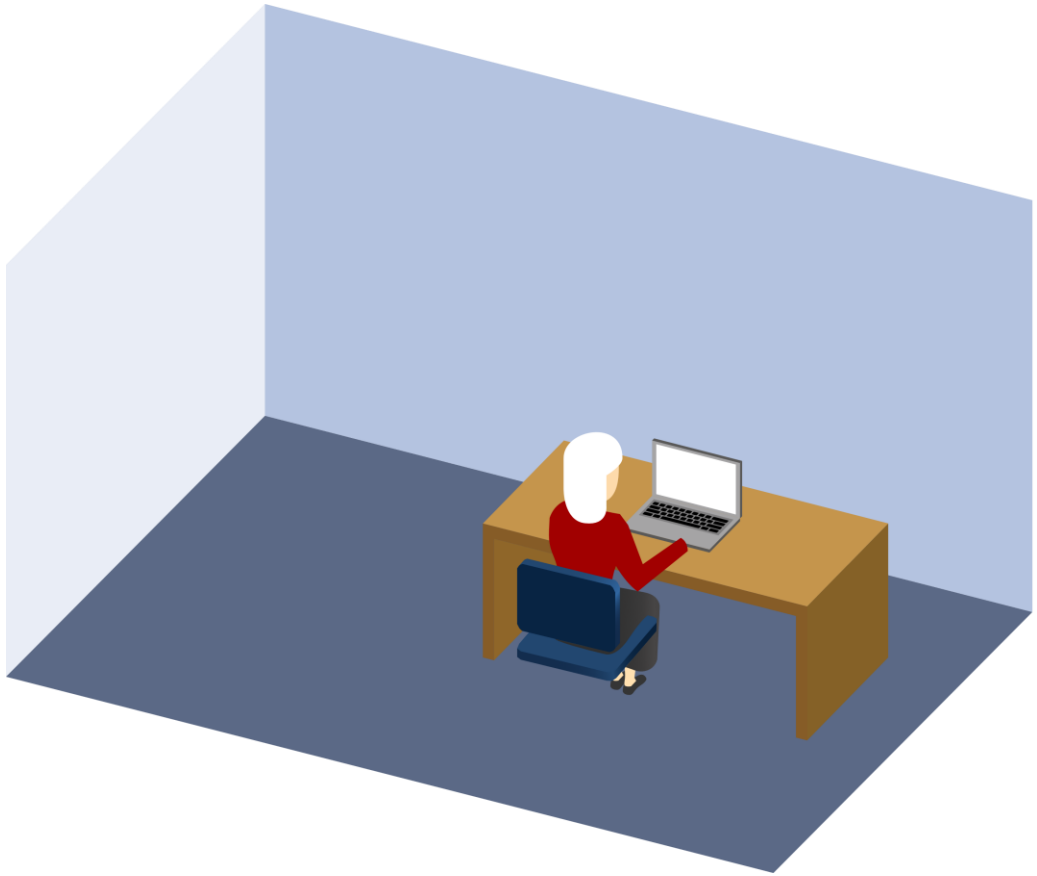
How does a CDE work?

Access Protocols

CDE enables every participant access to the platform in order to share their documents and models.

CDE is facilitated by an online server or, more frequently, it is cloud based.

Data security is guaranteed by operating an account based system.



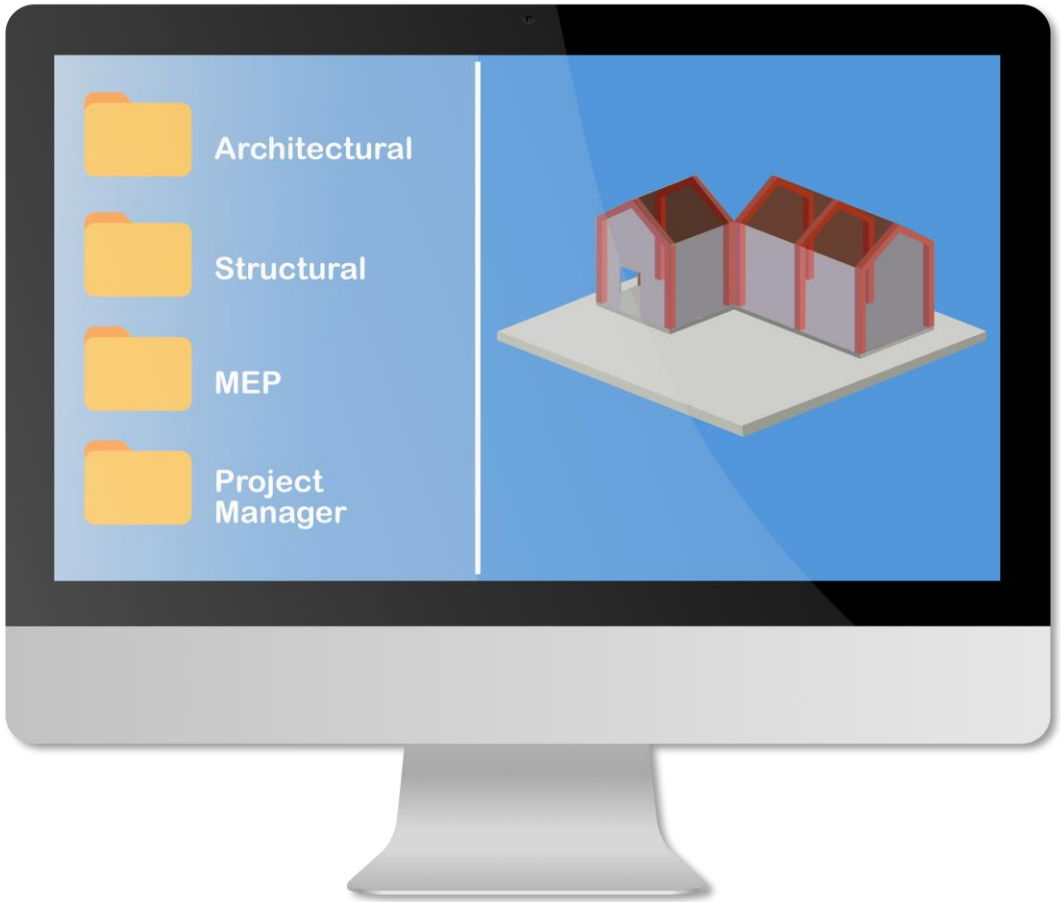
Chapter 3 – BIM collaboration tools

What does it look like?

CDE interface

A Common Data Environment works more or less like a system of shared folders that are freely organised by the team.

This platform also enables viewing of more then one model at a time, so users can identify if any inconsistencies occur.



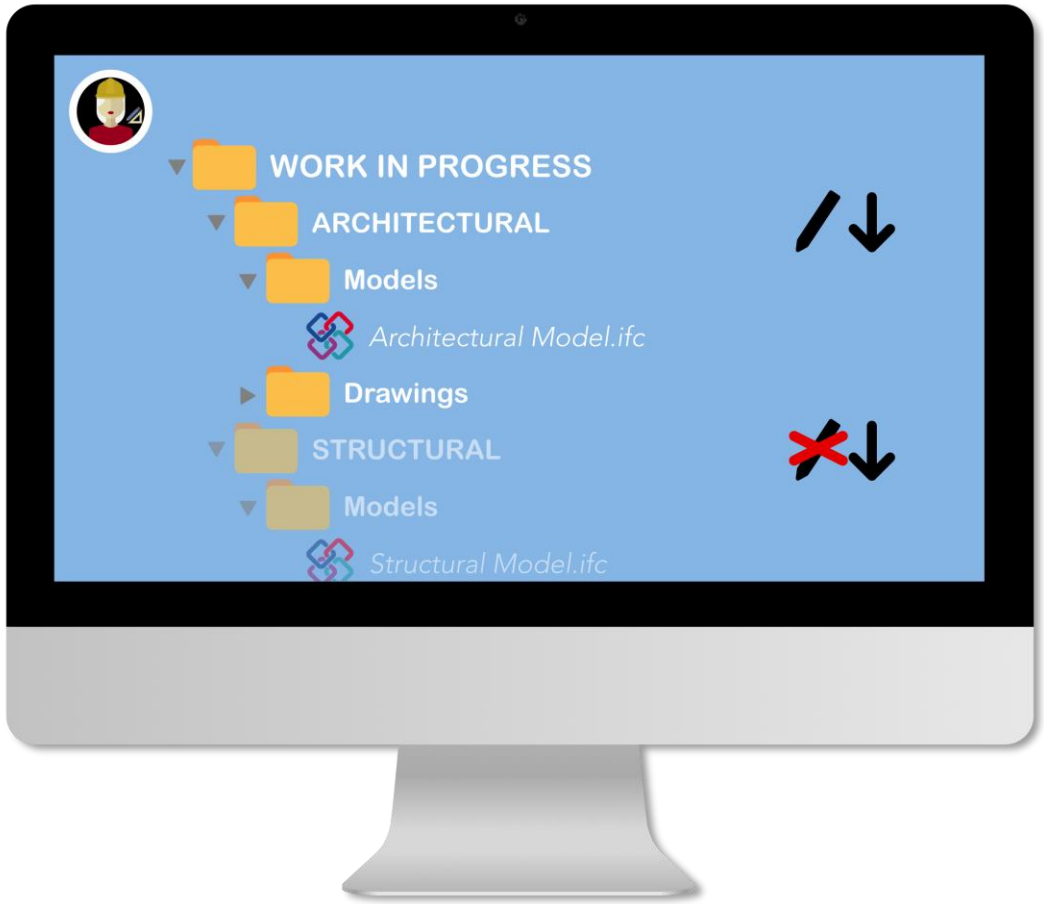
Chapter 3 – BIM collaboration tools

What does it look like?

Account based access

This access method enables allocating different levels of access to different users. The Information Manager controls the kind of operations that any particular user can do to any of the folder's content.

For example: an architect can see and download elements in the «Structural» folder, but cannot edit the content!



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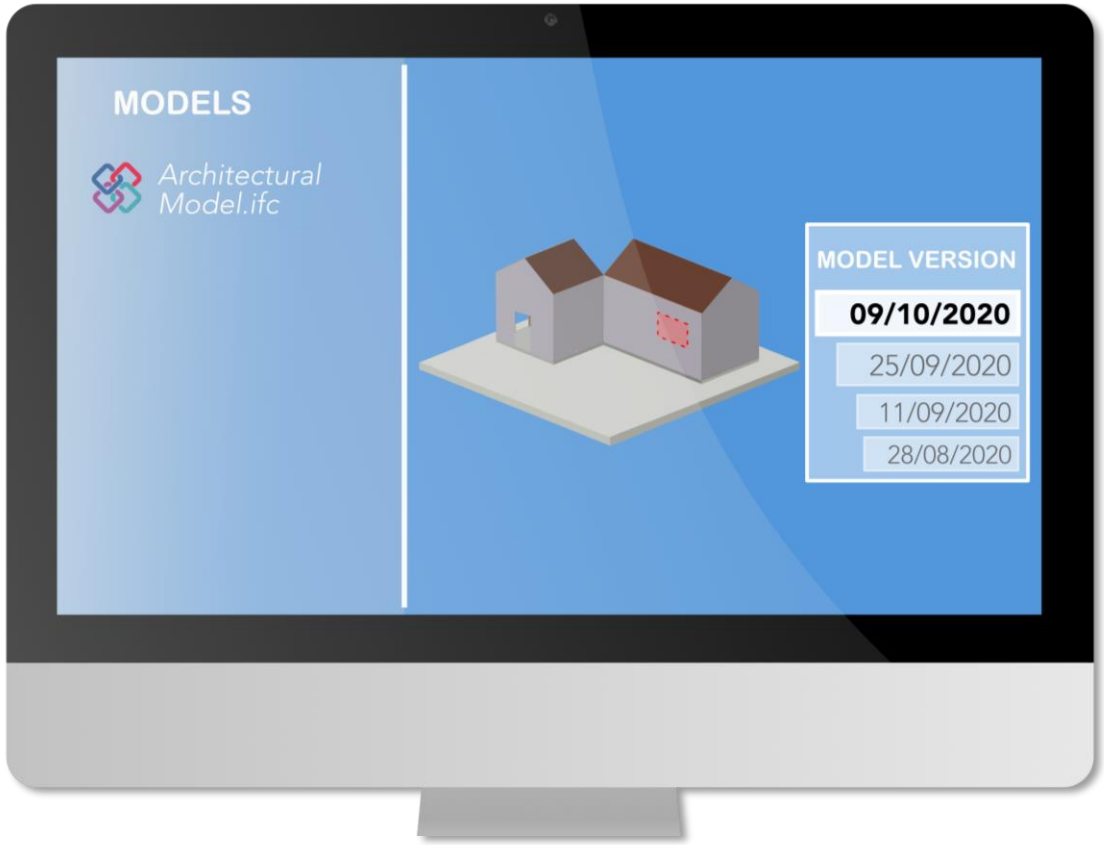
What does it look like?

Model version

Whilst work is in progress project files in CDE are updated frequently.

Old versions of the same file are not deleted.

In fact the CDE maintains all the copies of a model, to enable users to identify file changes.



Chapter 3 – BIM collaboration tools

Smart Connectivity

Notification system

CDE also provides a multi-platform system that can be used in the browser on a desktop computer, tablet, or on the Apps on a smartphone. Authorised users are usually notified of any updates to the model.

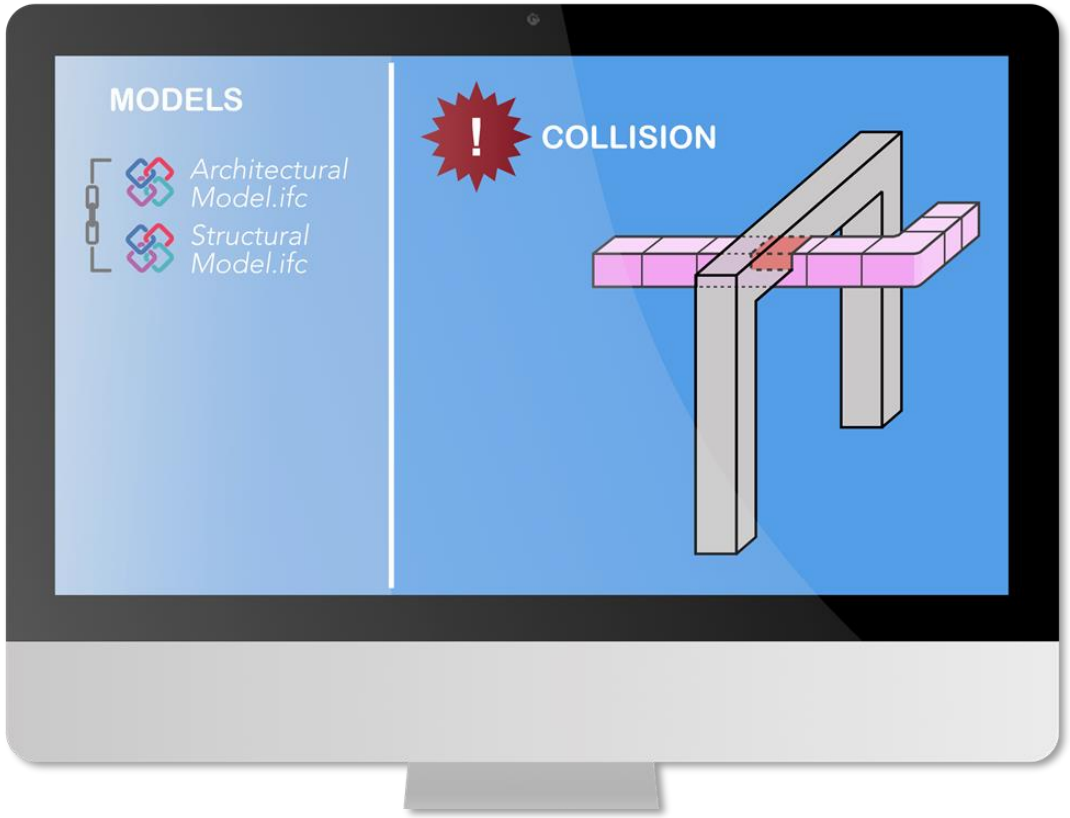
Chapter 3 – BIM collaboration tools

Clash detection

This is a critical part of the integrated BIM process. Clash detection identifies where the different disciplines' models clash with each other – finding where elements from one model overlap the elements of others.

Clash detection ensures every aspect works hand-in-hand and nothing is incompatible.

Play for more information



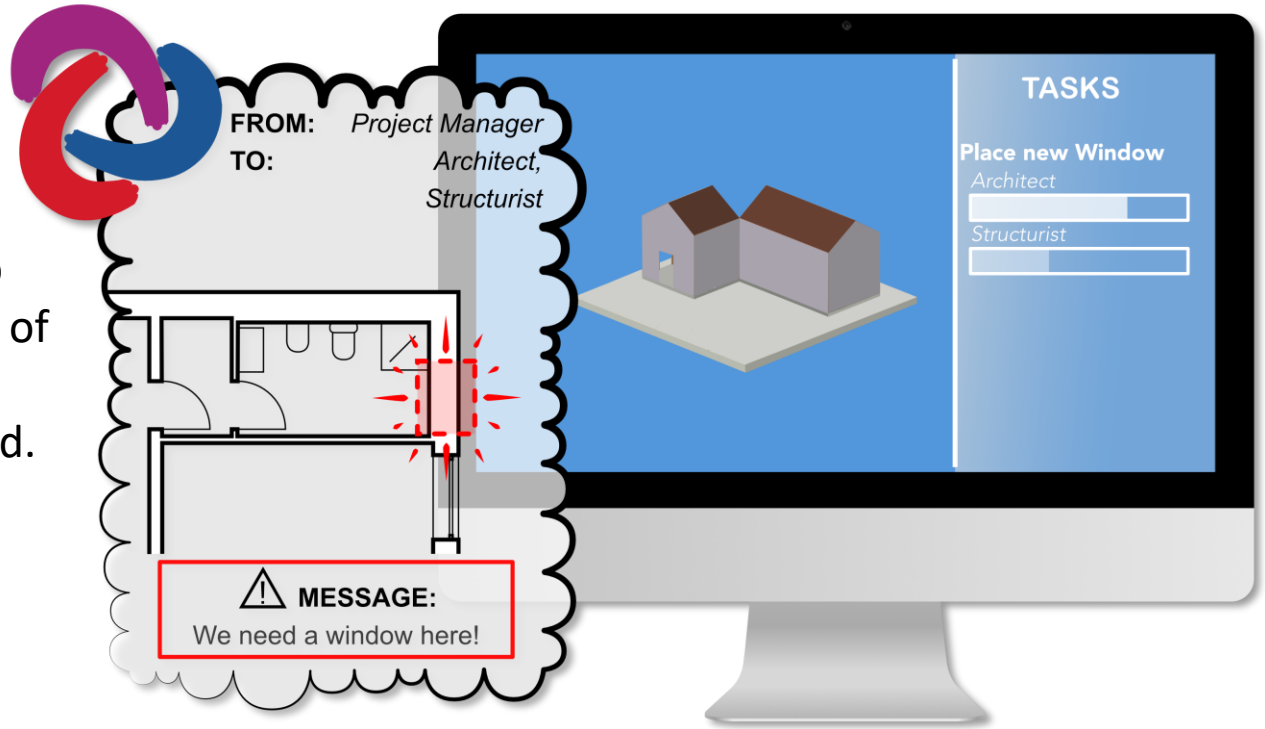
Chapter 3 – BIM collaboration tools

To do lists

Communication is at the heart of the BIM process.

CDE enables users to directly communicate with relevant members of the team.

Most of the CDE features also allow the possibility to create **Tasks** and **To do lists**. This informs other users of tasks they may need to do as well as giving them an indication of the percentage of work being completed.

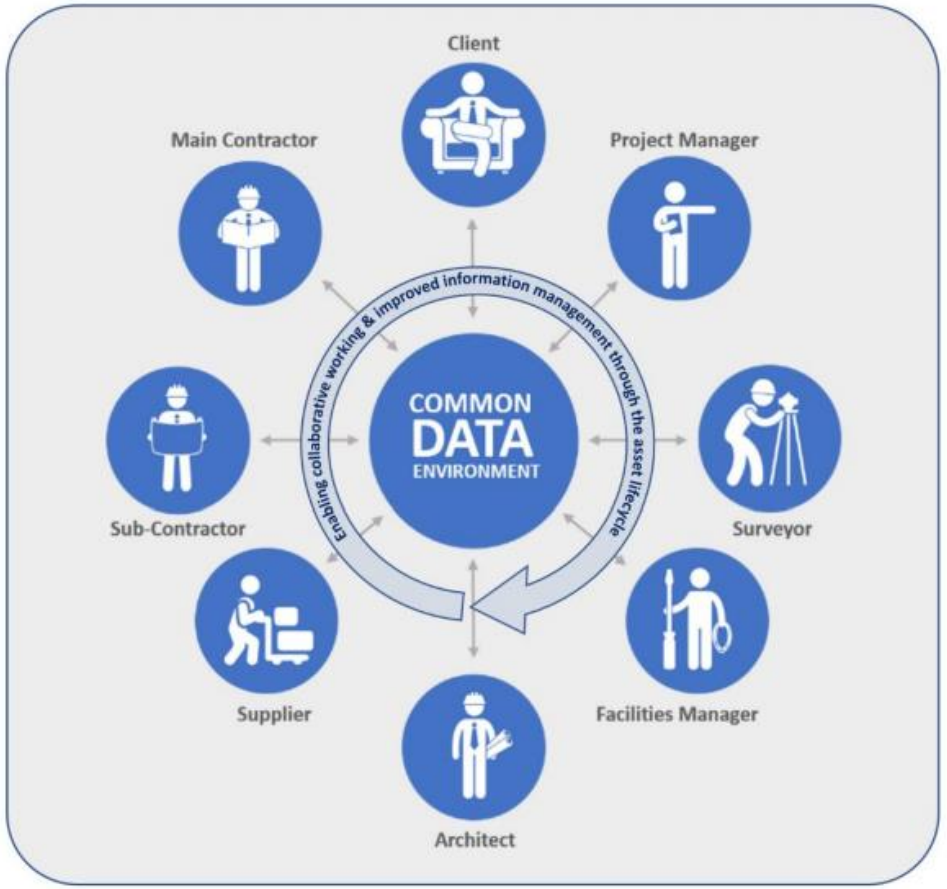


Chapter 3 – BIM collaboration tools

Examples of good practices

BIM enables collaborative working and improved information management through the life cycle of the building.

- **Design phase**
  - **Project visualisation**: for clients with limited construction knowledge, a 3D BIM model is easier to understand than 2D drawings → easier to correct potential misunderstandings before construction
  - **Better coordination and detection of conflicts between models** → easier and cheaper to solve conflicts on the digital model than on the work site
  - Improved **scheduling** and sequencing of the work site (BIM 4D)
  - Better construction **cost estimation** (BIM 5D)



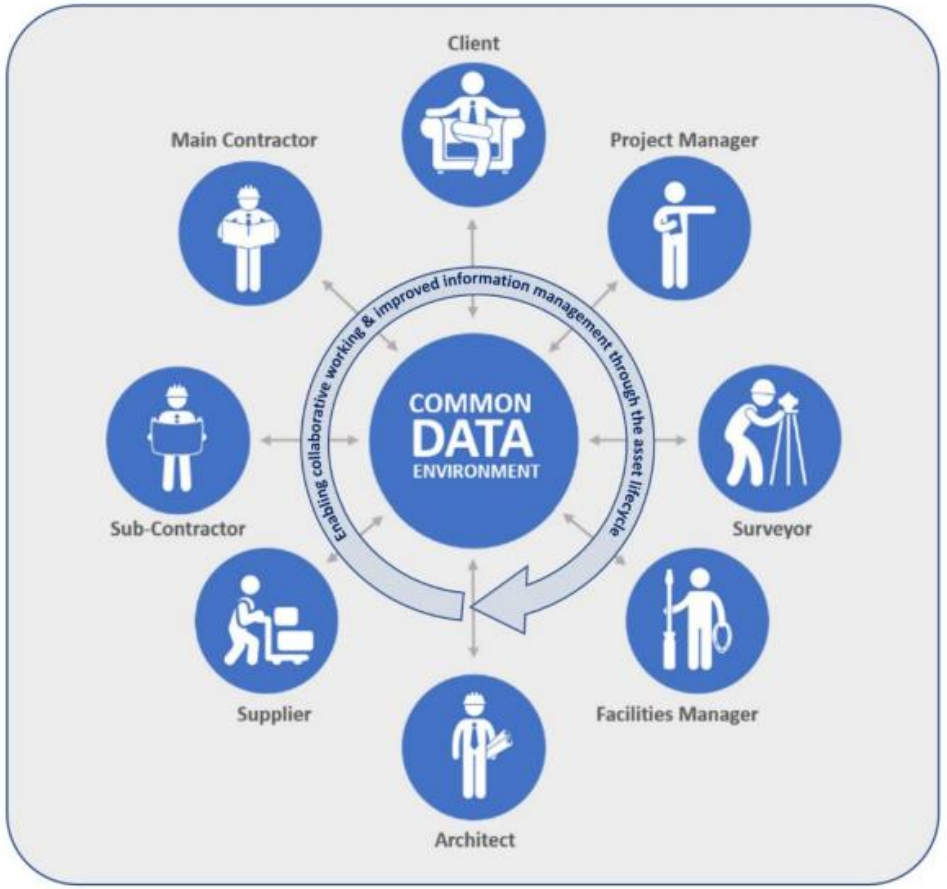
Source:
https://www.scottishfuturestrust.org.uk/storage/uploads/cdeimplementaionresearchaug18.pdf

Chapter 3 – BIM collaboration tools

Examples of good practices

BIM enables collaborative working and improved information management through the life cycle of the building.

- **Construction phase**
  - **Simplified project management**
  - **Better safety** on construction site by detecting hazards on the digital model
  - **Location management of tower cranes**: with the 3D model, possible to simulate the movements of the cranes and position them in the best places to have a maximum range, avoiding mobile cranes during the construction site.



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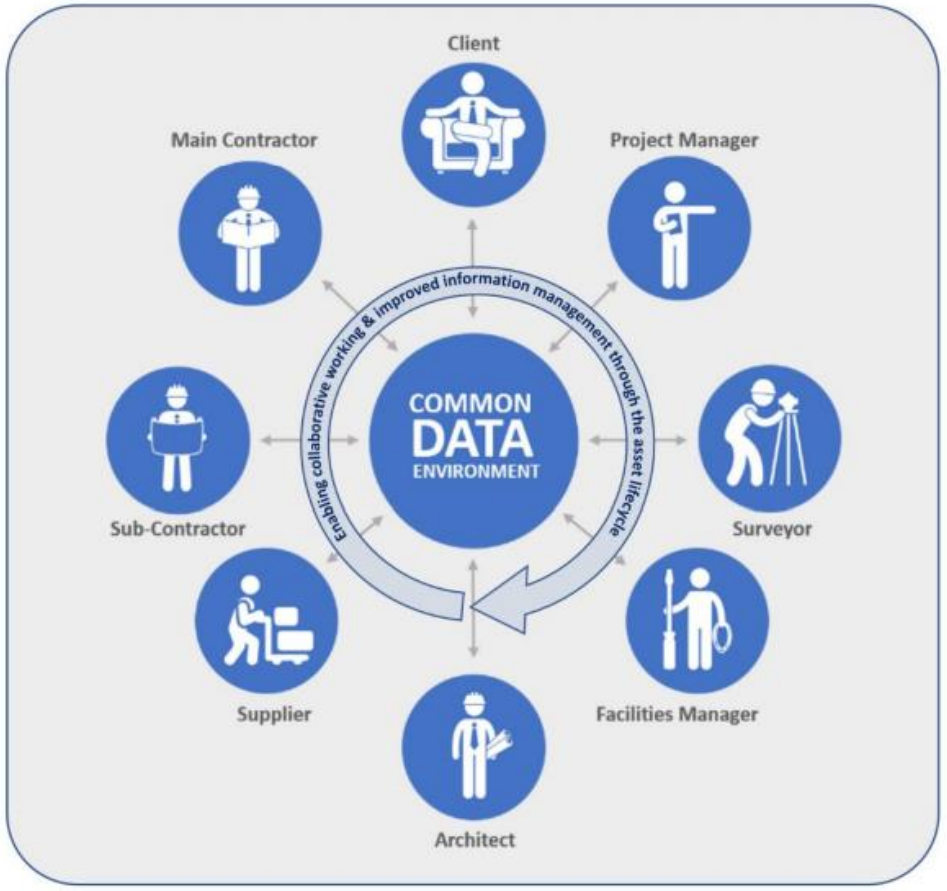
Chapter 3 – BIM collaboration tools

Examples of good practices

BIM enables collaborative working and improved information management through the life cycle of the building.

- **Exploitation and maintenance of the building**
  - **Centralization of all information** on building components and equipment: manufacturers, lifecyle, maintenance schedule, …
  - **Easier to find information** on the CDE: no need to go through files and papers (saving paper, ink and storage space) and not necessary to go on site to get information
  - Easier to schedule and monitor the **maintenance** of the building assets
  - **Optimization of the technical functioning** of the building: water and electricity consumption, etc.



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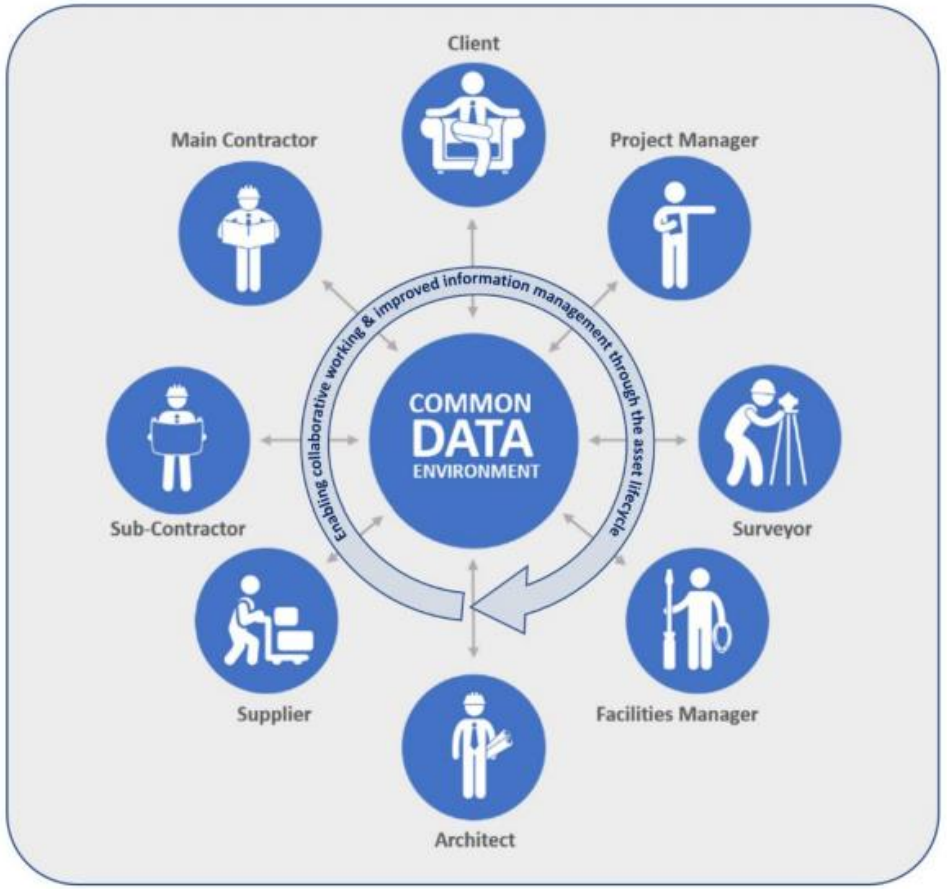
Chapter 3 – BIM collaboration tools

Examples of good practices

BIM enables collaborative working and improved information management through the lifecycle of the building.

- **Deconstruction phase**
  - The BIM model contains all the **information (including location) concerning materials** and construction elements, which can be used to
    - Organise and plan the dismantling
    - Evaluate recycling and reuse opportunities of materials
    - Evaluate constraints regarding the disposal of materials



Source: https://www.scottishfuturestrust.org.uk/storage/uploads/cdeimplementaionresearchaug18.pdf

Chapter 3 – BIM collaboration tools

Getting started with BIM: Pros & cons

https://constructible.trimble.com/construction-industry/what-is-a-common-data-environment-and-how-is-it-used-in-construction

Pros:

- Better visualization and collective understanding of the project (e.g. with virtual reality)
- Strengthened collaboration between the trades
- Cost-effective conflict anticipation and resolution
- Facilitation of building maintenance
- Modern image and attractiveness of the construction company using digital tools like BIM
- Competitive advantage when clients (especially public authorities) require BIM for their projects
- Saving time and money in the long term

Chapter 3 – BIM collaboration tools

Getting started with BIM: Pro & cons

Cons :

- Necessary to get trained in BIM
- Investment in digital devices and tools
- Resistance to change: need to change mindsets and work habits

Source: https://www.travelers.com/resources/business-industries/construction/how-to-onboard-construction-workers

Chapter 3 – BIM collaboration tools

In conclusion

Getting started with BIM will require time and money, but the investment is worth it!

Even if the deployment of BIM requires (depending on the needs and objectives) significant efforts, it is important for construction companies to be trained in these new techniques so as not to miss opportunities.

A first step could be learning how to use a digital mobile device (tablet, smartphone) and how to explore the digital model and exchange platform.

It is also important to remember that it is not always necessary to invest in paid software to participate in a BIM project. In some cases, consulting the digital model with free BIM viewers may already be sufficient.

References

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