



Module 3

Introduction to Digital Tools

Digitalisation in Construction



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partners

12
countries

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To equip the learner with the relevant knowledge and skills required to access and use digital tools and mobile Apps to communicate and collaborate effectively with others to support construction



Introduction to Digital Tools | Objectives



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1. Understand the **importance** of effective communication and collaboration
2. Outline the **use of cloud-based storage** to access and exchange information
3. List and outline the **benefits of digital communication tools** suitable for the laptop and mobile App.
4. Demonstrate using digital devices (online and portable), how to access, review and use files to **exchange information**
5. List and outline **digital collaborative tools** suitable for the purposes of construction
6. Demonstrate using digital devices (online and portable), how to access, use and review files, **transfer data and store files**
7. Identify and list **other collaborative digital tools** used for information and knowledge transfer and storage for the purposes of construction. (BIM, Construction Apps, etc)



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Topic 1 – Communication Tools

Topic 2 – Collaborative Tools





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1. Communication Tools



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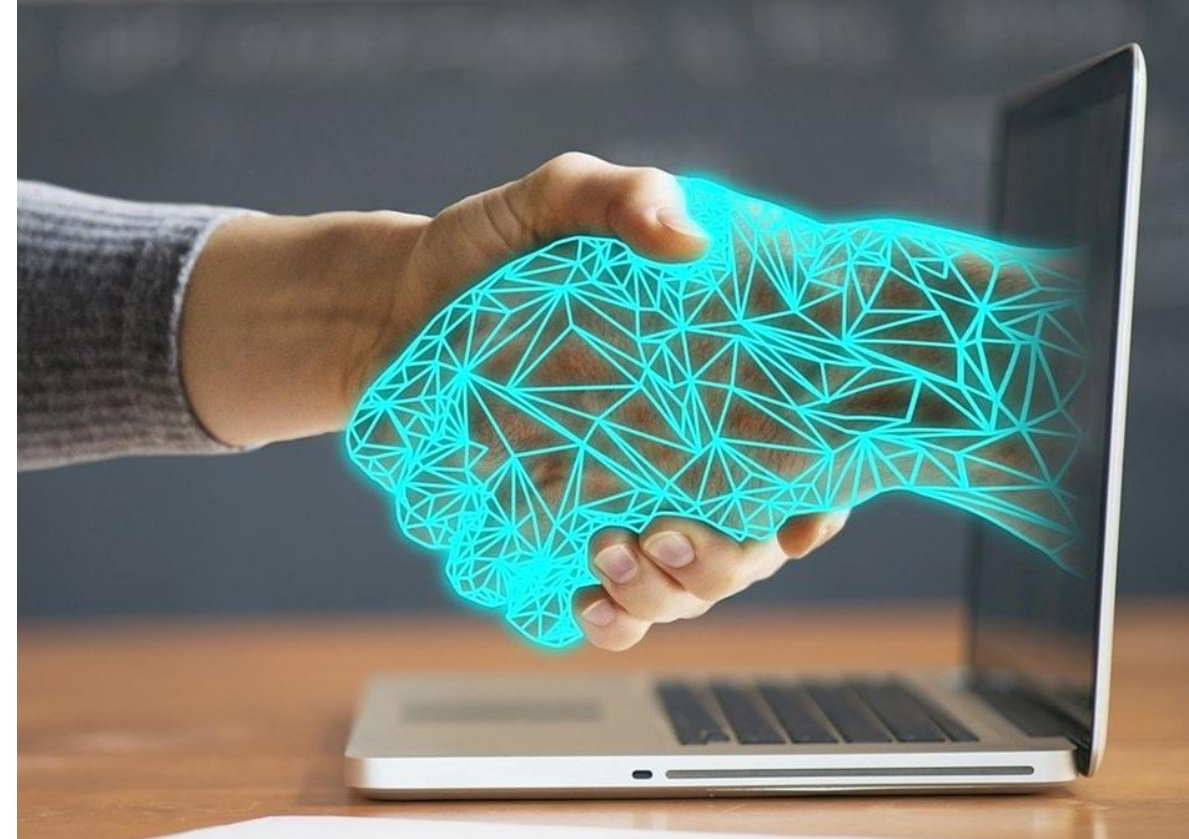


Digital tools- mobile technology



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- One of the major issues with construction projects is having a highly fragmented industry.
- With workers, engineers, and equipment distributed around a site, plus offsite architects and clients, it can be hard to get everyone on the same page when a decision needs to be made.
- Smartphones and mobile apps have made communication and collaboration on projects easier. Instead of driving to the office for meetings, companies now hold meetings using mobile technology, sync in real-time, add notes, change drawings and respond to RFIs instantly and then share that information with everyone involved with the project at the same time



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Communication



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- It is essential that all trades communicate well with each other on site and understand their roles. Being organised is part of working in a team.
- This topic will introduce a number of digital tools that can help improve communication, problem solving workflows and knowledge transfer throughout the construction chain and in particular for on site works.
- Information can also be stored and transferred easily to clients, building owners and occupants of the building.

RACI matrix example

R	Responsible
A	Accountable
C	Consulted
I	Informed

Project Activity / Deliverable	Project Manager	Consultant	Architect	Contractor	Client
Define functional and aesthetic needs	I	I	C	I	R
Assess risk	A	R	I	C	I
Define performance requirements	A	R	I	I	I
Create design	A	C	R	I	C
Execute construction	A	C	C	R	I
Approve construction work	I	I	C	C	R

Deliverable	Project Manager	Technical Lead	Architect	HVAC Contractor	Electrical Contractor	Client
Approved Project Brief	AR	C				C
Approved Project Plan	AR	C	I			I
Completed Requirements	A	C	R	I	I	C
Approved Drawings	A	C	R	C	C	C
Completed Site Survey	A	R	I	C	C	I



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Collaboration and System Thinking

- There are a number of collaborative tools that can support construction workers on site. Streamlining communication to better organise the team and individuals.
- Some examples are-
 - Slack
 - Google Hangout
 - y
 - Microsoft Teams
 - Sharepoint
 - Cisco Webex
- We will look at two of these- Slack and Microsoft Teams- but they all have similar features.



Collaboration and System Thinking

Slack

- **Use one platform for your team and your work**
- Unlike emails, conversations in Slack are easy to follow. They are more like conversations — **you can make calls, share files, and even connect with other apps.**
- **Slack gives you access to real-time conversations** with any teammember or team.
- Unlike emails, where every new message is weighted alike, it's easy to grab the attention of a specific person, with a notification, when you need a quick response
- Organise conversations
- Hold discussions in Public and Private channels.
- Streamline management systems



Channels

Stay organized and focused with central spaces for conversations, files, tools and people.



Slack Connect

Collaborate with teams at other companies the same way you do with teams at your own.



Messaging



Voice and video calls



Workflow Builder

Automate routine actions and communication, so you can get back to the kind of work only humans can do.



Apps and Integrations

Streamline work by connecting Slack with other services like Google Drive, Office 365 and over 2,200 more.



Search



File sharing



How relevant is Slack to on-site construction?

- In construction - **project managers may communicate general site information with all site workers** via the public channel (e.g. - updated changes, building regulations, site closures etc).
 - They can then **communicate trade specific information with individual trades** via private channels (e.g. - post electrical layouts in the electrician's private channel).
 - All users can **privately message** each other for one to one interaction (e.g. – specific questions about a detail).
 - **This format ensures all site workers receive relevant information, but are not overwhelmed with information that does not relate to their role.**
 - In addition, Slack has customisable notification settings, ensuring you receive important notifications, but are not distracted by parts of a project that do not concern you.
- Documents can also be shared and edited within slack, ensuring conversation threads and documentation can be kept together.
 - Such conversations can easily be revisited by searching the central knowledge base, which automatically groups and archives conversations and documents.
 - The “mention” feature allows you to alert specific people or groups to relevant information in the following way:
 - @username – sends a notification to the person mentioned
 - @here – sends a notification to everyone currently active on a channel
 - @channel – sends a notification to everyone in the channel, currently active or not
 - @everyone – sends a notification to everyone who is a member of your Slack workspace



Collaboration and System Thinking



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MS Teams- Construction Collaborative Project Management Software

- Easy to use and affordable, the 100% online project management software can be accessed from the field or the back office. No expensive hardware installations, and no intensive training sessions are required.



Online Gantt Charts

Create interactive Gantt charts online and share project plans online.



Schedule Tasks

Simply drag the task bars on the Gantt to quickly adjust dates.



Task Lists

Your team always knows what to work on with personal project task lists.



Manage Teams

Assign tasks to your team by availability and workload.



Timesheets

Get online timesheets your team can update anytime, anywhere.



Import & Export

Import Microsoft Project Plans, Excel & Word files seamlessly.



Collaborate

Your team can update their tasks, add files and comments right on the project plan.



Share Online

You can share your project plans with your team online or print them out.



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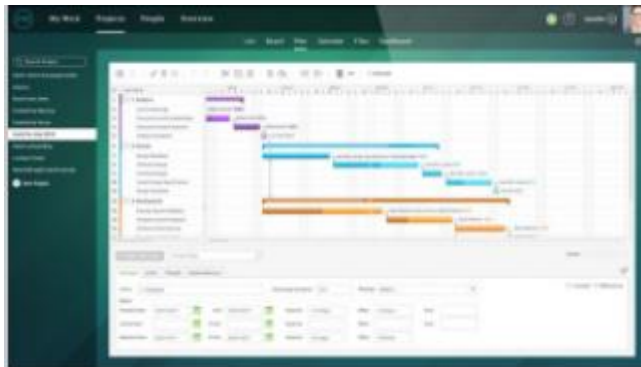
Collaboration and System Thinking



Microsoft Teams

- **Manage Projects & Field Teams In The Cloud.**
- **Tutorial Videos:** <https://www.projectmanager.com/product-videos>

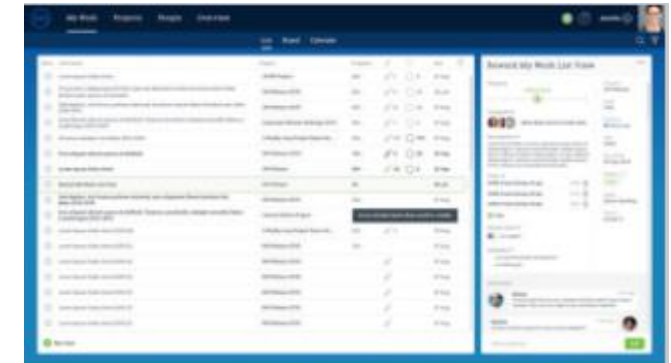
Gantt Charts - Gantt chart tools that help you and your team plan, schedule and update your projects in real-time.



Kanban Boards - Display Workflows for collaboration on site and outline responsibilities. Plan simple workflows and manage work with drag-and-drop cards



Task Lists - Simple task lists with powerful features: assign tasks, add start & due dates, attach files, collaborate, and track time.



Collaboration and System Thinking



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**Planning &
Scheduling**



**Online
Timesheets**



**Team
Management**



**Control Costs &
Resources**



**File
Storage**



Reporting



Microsoft Teams

1. Create Task List

Import your task list into MTeams software. Import MSP files, which can easily edit and share them with your team. Or start from scratch and add tasks on any of the project views.

2. Add Task Description

Add brief descriptions or directions to the tasks. Set priorities and create tags to make the task easy to find.

3. Switch to Gantt Chart View

The Gantt chart maps all your tasks across a project timeline. Estimate the duration of each task by adding a start and end date. You can link dependent tasks to avoid bottlenecks. Also, add summary tasks and create phases by setting milestones to schedule tasks.

4. Onboard Your Team

When the project schedule on the Gantt chart is finished. Invite others to the software on the team page. They will get an email notification.

5. Add Availability

Define your team's availability so you can assign tasks properly and hit deadlines. Even add team's labour cost.



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**Planning &
Scheduling**



**Online
Timesheets**



**Team
Management**



**Control Costs &
Resources**



**File
Storage**



Reporting



Microsoft Teams

6. Assign Work

Assign tasks directly from the Gantt chart. Click on a task and use the pulldown menu to select one or more team members to execute it. Add comments, documents and images as needed. Teams are notified by email and alerted whenever there's a change made to the task.

7. Kanban for Task Updates

Use the kanban board view to see all of the assigned tasks laid out as cards under columns representing production phases. Teams can use the board to manage their work without affecting the Gantt chart.

8. Monitor Progress

Review the actual progress compared to your planned progress to stay on track. Get a high-level view with the real-time dashboard. You can monitor project time, cost, tasks and more in colour coded graphs and charts.

9. Adjust Workloads

Use the workload page to make sure tasks are distributed evenly. Correct any scheduling errors and keep the project moving forward.

10. Make Reports

Create reports to keep everyone in the loop. Detailed reports can be filtered to get only the data you want to see. See reports on project status, variance and much more. All the reports can be easily shared.



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Reach people
faster

Spend less time
switching
context

Stay looped in,
not out

Give projects a
dedicated channel,
not endless email
chains

Resources: Slack

- <https://slack.com/intl/en-ie/downloads/windows> (download Slack for Windows)
- <https://slack.com/intl/en-ie/help/articles/207677868-Download-Slack-for-Mac> (download Slack for Mac)
- <https://slack.com/intl/en-ie/downloads/android> (download Slack for Android)
- <https://www.youtube.com/watch?v=7YUTc4Cigc8> (video on how to use Slack, how to create account, invite people, create channels)

Resources: MS Teams

- <https://www.projectmanager.com/freetrial-3?edition=d> (Download MSTeams for construction free trial)
- [https:// www.projectmanager.com/product-videos](https://www.projectmanager.com/product-videos) (Overview and videos on how to use MS teams how to create account, set up project, invite people, create tasks, etc)



Benefits of mobile apps



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- Mobile apps are changing the way that modern construction projects are being done from start to finish.
- Not only can apps help construction companies be more efficient and cost effective, but they can also help improve workflows and manage documents.
- They are helping workers and managers stick to strict schedules with inspection points, improving communication and coordination, and streamlining the required paperwork.
- Mobile apps specifically designed for construction are making a huge impact, both back at the office and in the field.



Source: en.Wikipedia.org



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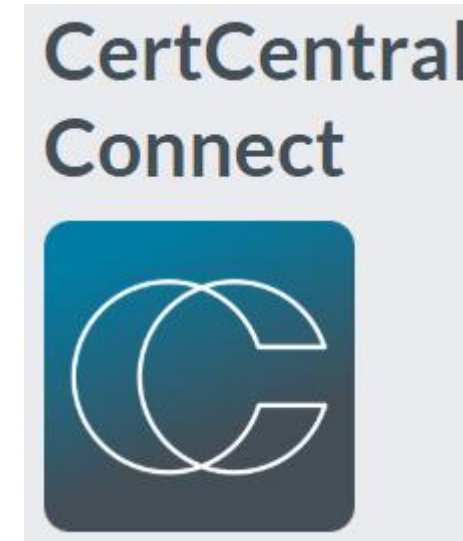


Field apps



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- There are a number of popular Field Apps for the construction site
- We will review 2 Field Apps which are available for on-site construction
 - ❖ **Cert Central**
 - ❖ **Trello**
- Trello will be used in this training but tools such as "Asana" and "Monday" can offer similar features



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Cert central field app

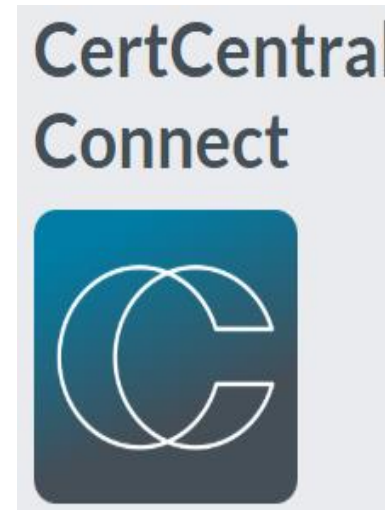


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- CertCentral is a software that uses live data analytics and reporting to **improve integration between the on-site team and the design team**. The primary function of this software is to track progression on site and demonstrate quality.
- The CertCentral field app allows users to use their mobile phone to:
 - Link construction snags/defects and inspection reports to drawings and zones.
 - Capture evidence of quality and compliance (thermal bridge details, fire blocking).
 - Raise RFI's and queries from the field (installation details).
 - Close-out and review issues on-site.
 - Complete QA check-sheets and mark-ups (airtightness checks prior to plaster boarding).

- CertCentral has four features; Quality Management, Project Management, Design Management, and Document Management, with Project Management being the most relevant feature for site workers.

- ☐ Requests for Information (RFI) - Queries
- ☐ Minutes and Action – PM feature
- ☐ Reviews – updates and recording



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Trello field app



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- Trello is a web-based Kanban-style **list-making application** and can be accessed via a tablet, mobile phone or on the desktop.
- It is free, Just sign up.
- Trello is a tool that **helps teams work more collaboratively and get more done more efficiently.**
- Trello's boards, lists, and cards enable teams to organize and prioritize projects in a flexible and rewarding way in one handy resource. It's easy to get your team up and running with Trello.



Web

[Trello.com →](https://trello.com)



Mobile



Desktop



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Trello field app

➤ Work with any team

Trello helps your team stay organised. Integrate the apps that your team already uses directly into your workflow. The Trello boards stay in sync across all of your devices allowing you to collaborate with your team anywhere, from the office, site or in transit.

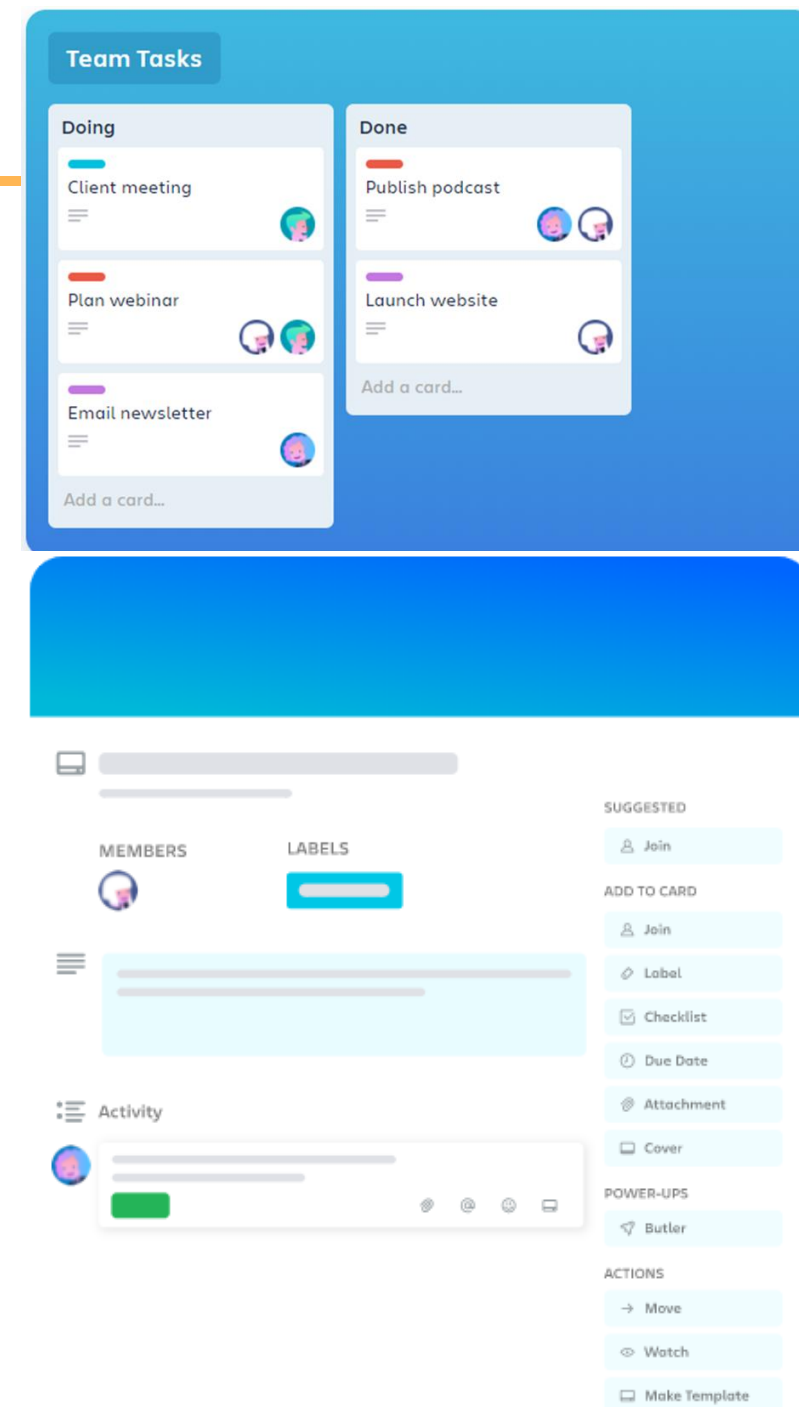
➤ Information at a glance

See all the details by adding comments, attachments, due dates, and more directly to Trello cards. Collaborate on projects from beginning to end.

➤ Built-In Workflow Automation

Boost productivity by unleashing the power of automation across your entire team, and remove tedious tasks from your to-do lists with:

- Rule-Based Triggers
- Custom Card & Board Buttons
- Calendar Commands
- Due Date Commands



Trello field app



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- The basic version of Trello, which we will explore during this lesson, is freely available.
- Trello interface is called a 'Board' which has 4 main components:
 - Boards
 - Lists
 - Cards
 - Menu



Boards – A board is the term used to describe the project you are organising. The board is where you organise tasks and where collaboration can take place.

Lists – Lists are used to keep 'Cards' (explained below) organised based on their level of progression. They are used to create workflows, where cards are moved across lists from start to finish. It is recommended that lists are used as a 'to do', 'doing', 'done' progress tracker. This is a useful tool for tracking progress across the construction industry. For example, penetrations to the airtight membrane could be listed as 'Expected Building Services', 'Unsealed Penetrations', and 'Sealed Penetrations'.



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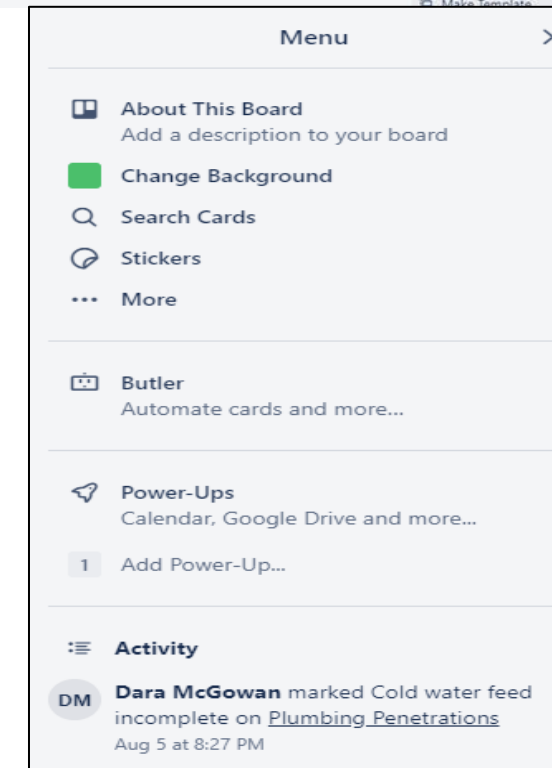
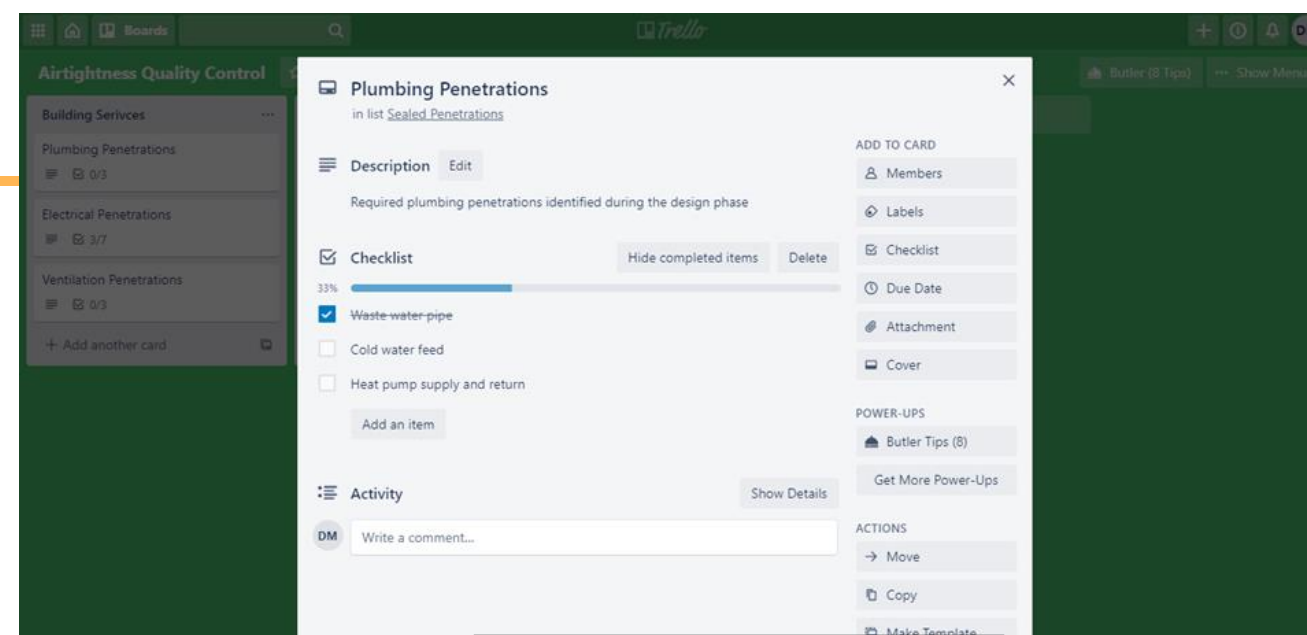


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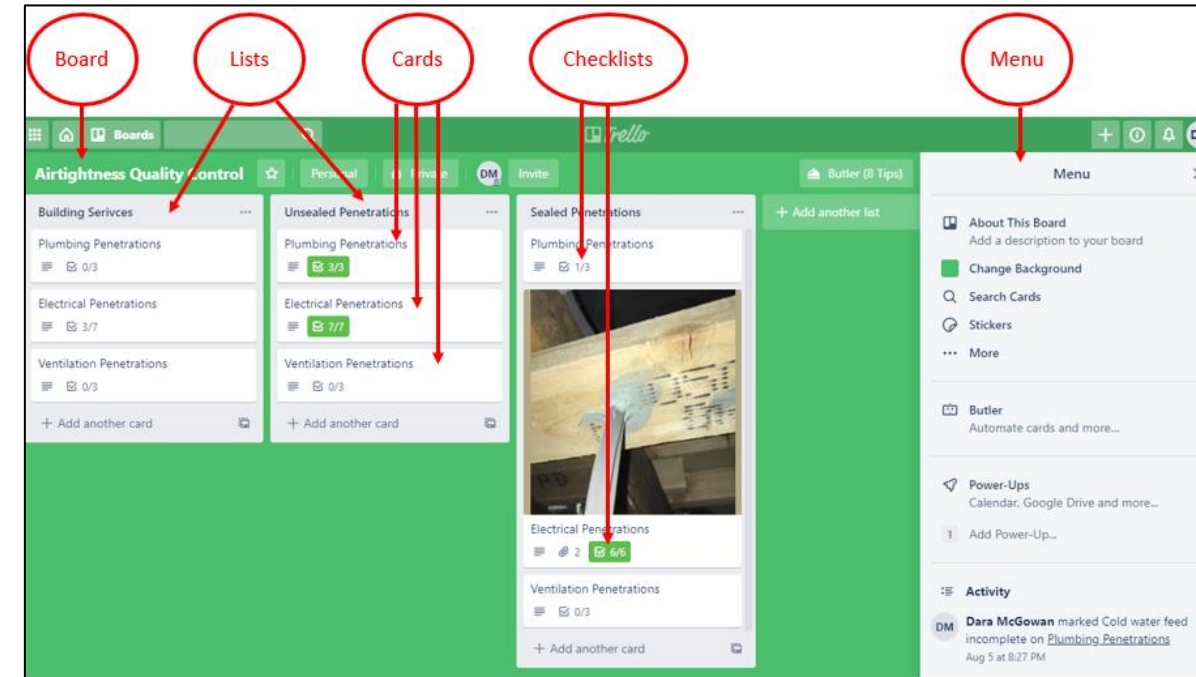
- Cards – Cards are used to represent tasks at a relatively high level. In the construction industry, cards might be used to represent a trade for example, with 'checklists' used to track specific jobs to be complete by each trade. Cards have several useful features for construction workers. Checklists can be created, ensuring nothing is missed, such as individual penetrations to the airtight membrane. Due dates can also be scheduled, such as scheduled blower door tests. Images can also be added to cards, such as pictures of sealed penetrations or fire stopping for quality control purposes. The image below shows a card, and some of its functions.
- Menu – The menu is located to the right side of the Trello board. This allows the user to include or remove members from the Trello board, allowing for controlled collaboration. You can also track user activity on the Trello board via the 'activity feed'.



Trello field app

We will look at using the Trello App to help achieve an excellent level of airtightness in a building

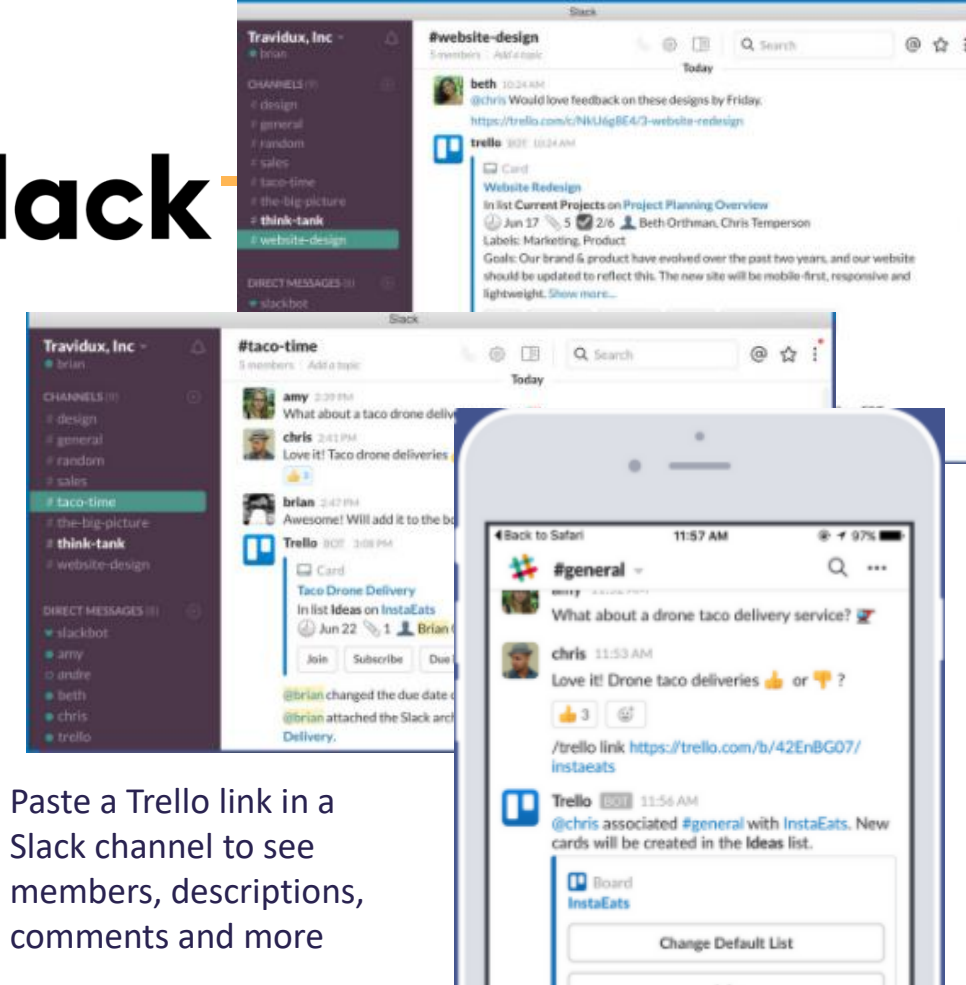
- Resources:
- <https://trello.com/en/platforms> (links to download app)
- <https://www.youtube.com/watch?v=xky48zyL9iA>
- Video in how to use Trello - 4.55mins
- <https://trello.com/guide> (Helpful guides to using Trello)
- 7 Tips in setting up your Trello Board – 12.41mins
- <https://youtu.be/HvkTamEjDXk>



Trello field app

➤ With Trello for Slack, you can

- Add new Trello cards to boards directly from Slack with /Trello add
- Join Trello cards (and boards!), change due dates, attach conversations and a lot more.
- Invite @trello to a channel for automated card & board previews including members, descriptions, comments and more.
- Allow Slack team members to join your Trello team & boards in one click.
- <https://slack.com/apps> (apps that integrate with Slack)
- To get updates in Slack when activity occurs on Trello cards, lists and boards check out the Slack Power-Up for Trello:
- <https://info.trello.com/power-ups/slack>



Paste a Trello link in a Slack channel to see members, descriptions, comments and more



Trello field app in MS Teams



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- The **Trello** app for **Microsoft Teams** links your **Trello teams** to those in **Microsoft Teams**. When you run **Microsoft Teams**, **Trello** is enabled by default and available to all your **teams**.
- There are 2 ways you can add Trello to Teams:
 - Trello Tab
 - Trello Connector
- See video How to add Trello to Microsoft teams:
- <https://youtu.be/Qm7yPBKf6ds>



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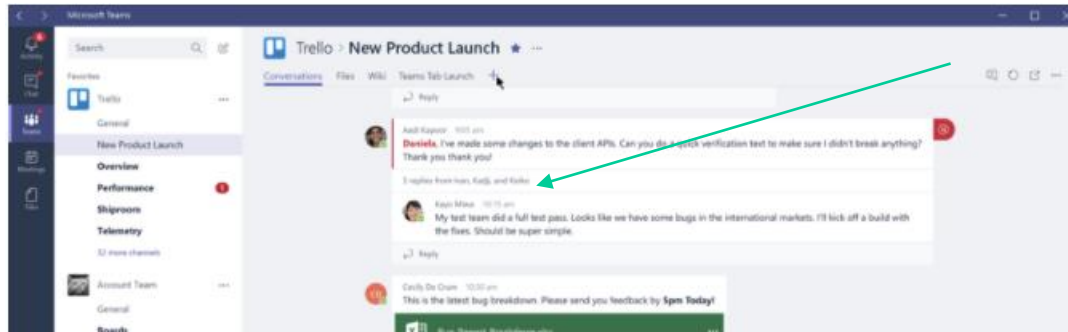
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Trello field app in MS Teams

Trello Tab:

To add a Trello tab to a channel, select the channel, then click on the “+” sign to the right of the existing tabs.



In the **popup**, select Trello from the list of apps, then click “Log in with Trello”.

In the next popup, enter your credentials and click “Accept”.

Once you do that, you can select the Trello board you would like to link to.

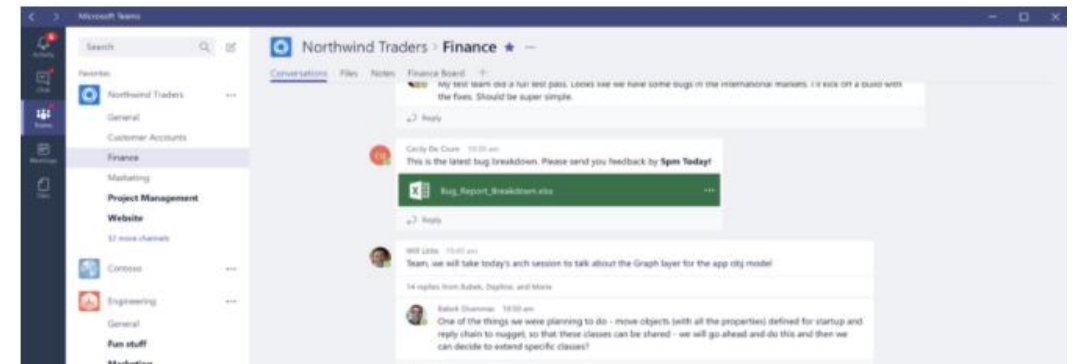
Trello will create a **new tab** named after the board and the tab will contain the lists and cards for that board.

Inside the tab, you can now interact with the board in the same way you would, had you logged in directly to Trello.com.

Trello Connector:

Connectors enable you to get notified in Teams of changes to Trello boards and cards automatically.

Just click on “...” next to the channel name and select “Connectors”.



Select “Configure” next to the Trello app. It will ask you to sign in to your Trello account.

Confirm that you want to “Allow” Microsoft Connectors to use your account.

Select the notifications you want added and click “Save”. Now when changes occur to your boards, lists or cards, Trello will notify teammates via the channel discussion. You can re-configure these notifications later by going through the same steps above.



Trello field app



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Start Tutorial.

Work to be completed by student –
using App

Discussions held at each part to
explain relevance to site works



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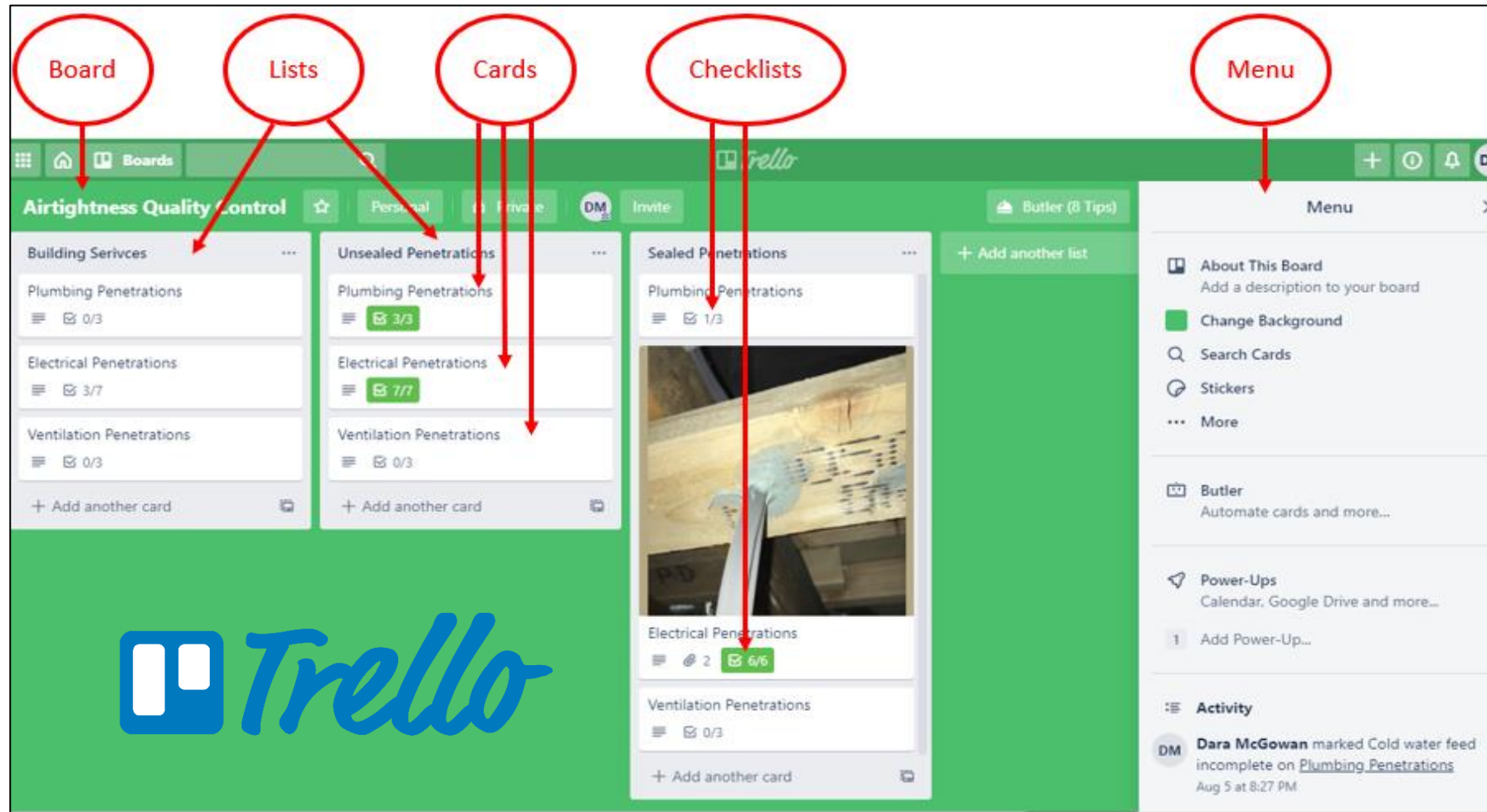
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Trello field app – air tightness strategy



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Tutorial

- Now, we will create a Trello board to help track progress in your specific field (in your trade, at management level etc).
- You should apply the use of the App to a hypothetical scenario, and should include lists, cards, checklists and explore the menu options.
- You should also include images and due dates to several of your cards.

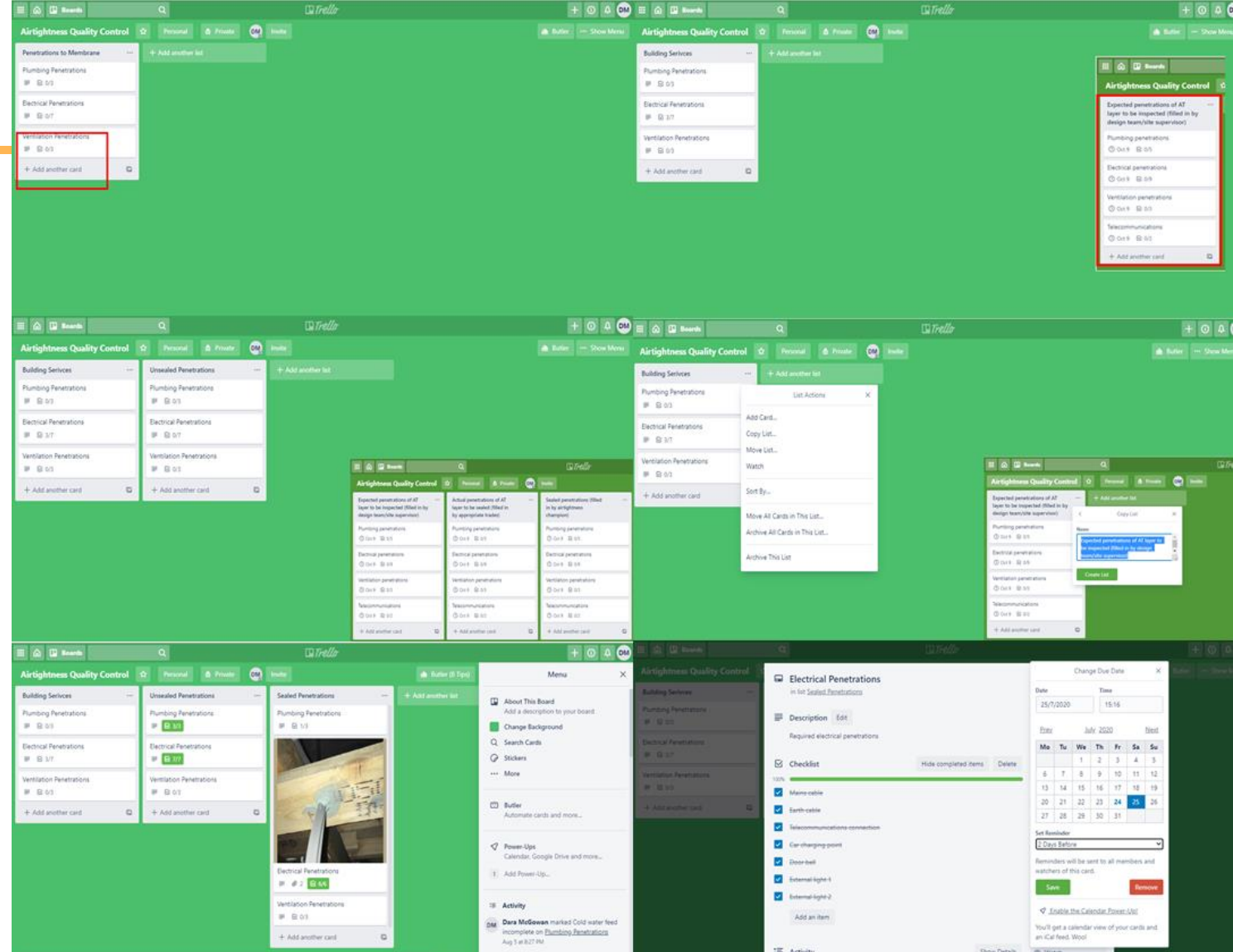
There are a number of useful resources to help you:

- Helpful guide to using Trello:
<https://trello.com/guide>
- Video in the use of Trello:
<https://www.youtube.com/watch?v=xky48zyL9iA>



Trello submission

- Now save your file.
- Label the file (add your name or ID number)
- Upload your models
- **Discuss** what we have completed and relevance on site and for the entire project



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2. Collaborative Tools



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What is the Cloud?



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<https://www.youtube.com/watch?v=i9x0UO8MY0g>



Digitalisation in Construction:
Introduction to Digital Tools

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Cloud in construction

Cloud computing is a relatively new phenomenon in the construction industry. It allows the delivery over the 'cloud' (the internet) of a range of computing services, such as storage, databases, networking, servers, software and analytics to allow building professionals access to faster and more flexible resources.



Photo by Jack Moreh from Freerange Stock



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Common Data Environment



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What is a common data environment (CDE) in construction?

A CDE is a **cloud-based space where information from construction projects is stored.**

It is accessible to all relevant project participants.
This access depends on participants' requirements or level of authorization, as well as their contractual obligations.



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Information is used throughout the entire LIFECYCLE of a building or infrastructure project

DESIGN



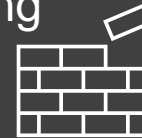
- Space programming
- Design coordination
- Design specification



CONSTRUCTION



- Planning
- Construction
- Commissioning



OPERATION



- Facility management /maintenance
- Reconstruction/Renovation
- Decommissioning
- Major re-programming



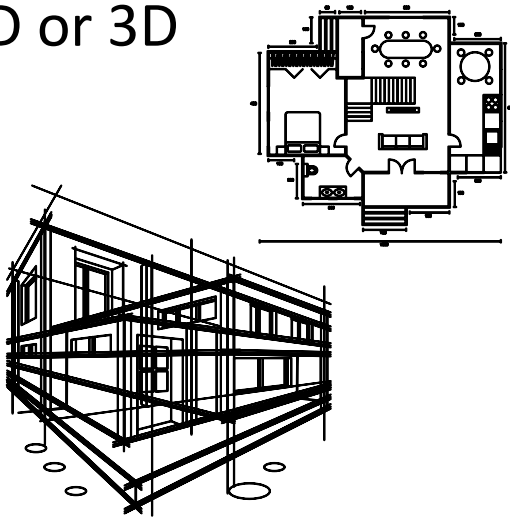
Types of information



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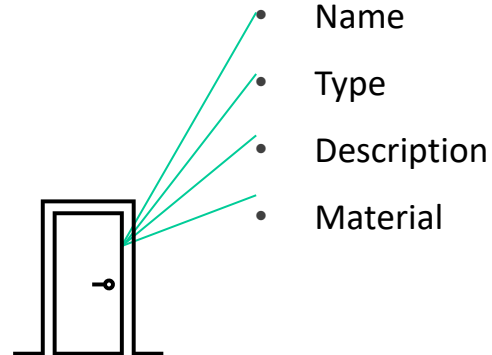
Graphical

2D or 3D



Non-graphical

Digital attributes to the 2D or 3D objects



Documents

Examples:

- Specifications
- Schedules
- Bills of quantities
- Product manuals
- Certificates
- Warranties
- Contracts
- BIM Execution Plan (BEP)
- Employer's Information Requirements (EIR)



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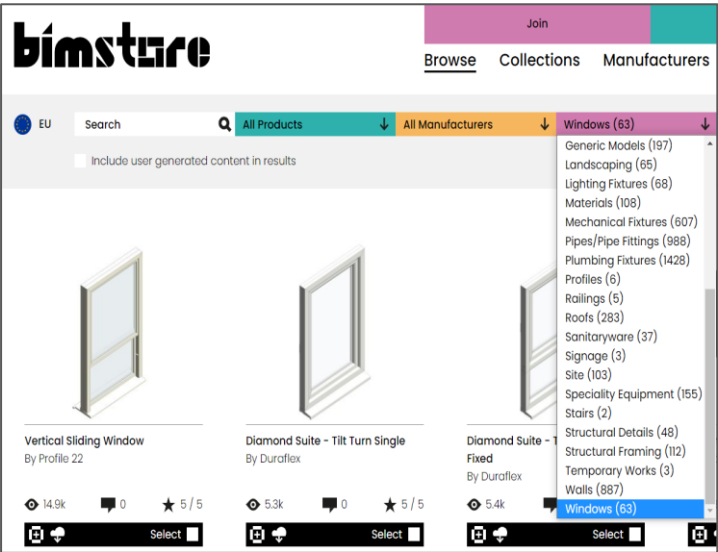
Information is often connected to the Building Information Model (BIM model) of the project.



- ✓ Checking dimensions and positioning is accurate and fast;
- ✓ Objects are parametric – modifications to the design are simplified;
- ✓ Visualising spaces and details is fast and easy;
- ✓ 3D printing based directly from the model;
- ✓ Ordering components directly from the model;
- ✓ Access to specifications of elements;



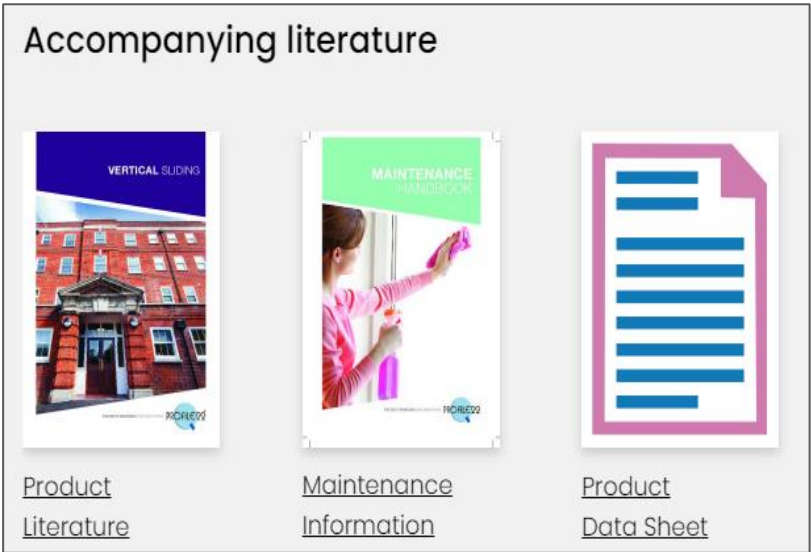
Example: A Window



Graphical

Default	Window_Windows-Profil_22-Vert
_BIMspec_GUID	0
_created by	Connor Laing
_current revision	1
_distributed by	www.bimstore.co.uk
Analytic Construction	Double glazing - domestic
Assembly Code	B2020100
Asset Type	Fixed
Base Frame Offset	85 mm
Classification Name	Uniclass 1.4
Created On	Feb 2015
Name	Vertical Sliding Window
Operation	Vertical Sliding
Product Brochure	www.profile22.co.uk/wp-content/uploads/2013/09/Vertical-Sliding-Window-System.pdf
Product Page URL	www.profile22.co.uk/commercial/products/window-systems/tully-reversible-windows/
Rough Height	0 mm
Rough Width	0 mm
Solar Heat Gain Coefficient	0.74
Thermal Resistance (R)	0.7100 (m²K)/W
Type Comments	Vertical Sliding Window
Type Name	Vertical Sliding Window
URL	www.profile22.co.uk/commercial
Visual Light Transmittance	0.81
Wall Closure	Both
Warranty Duration Unit	Years
Width	0 mm
Window Material	Windows_Glass_Clear

Non-Graphical



Images source Bimstore.co

Documents



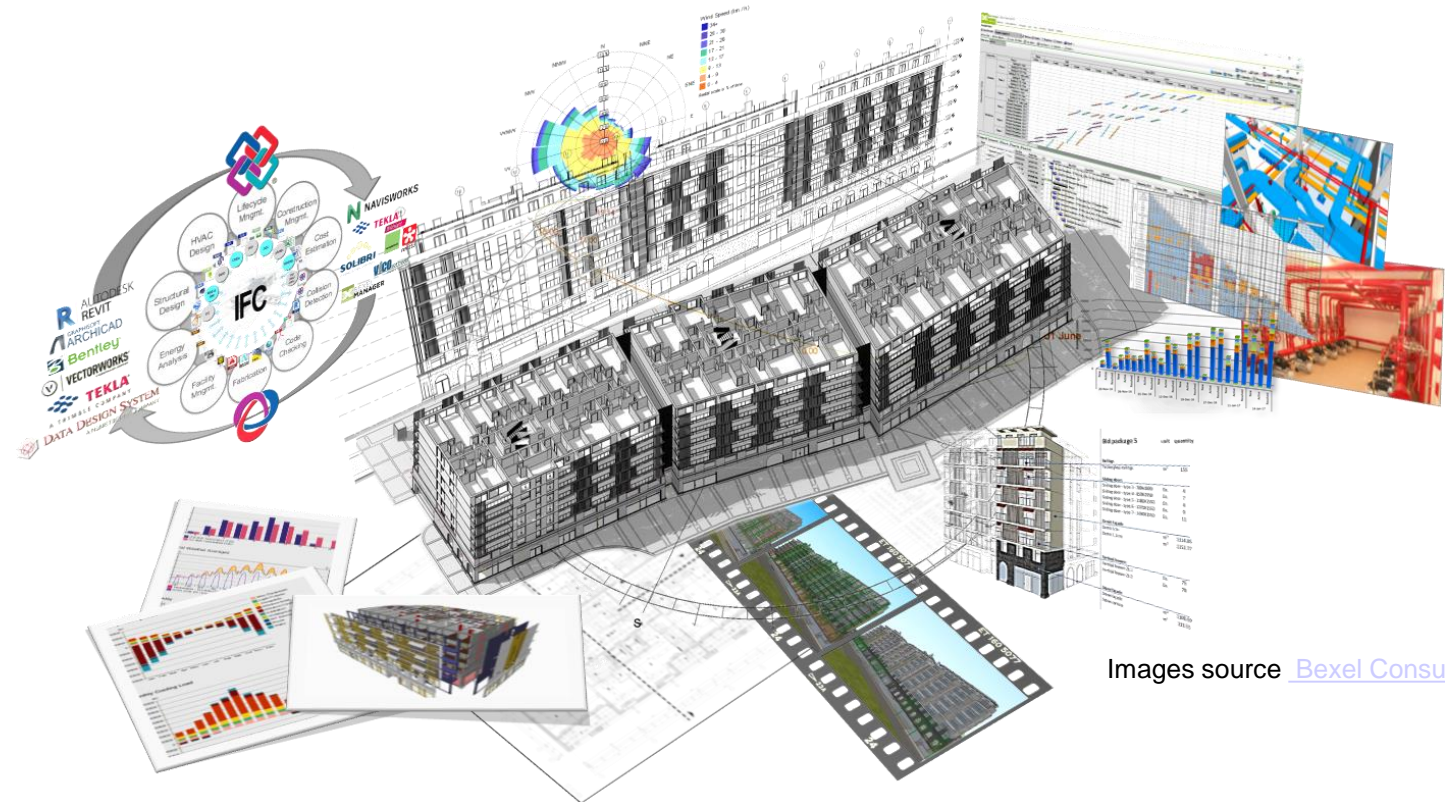
Exchange of data



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Information is created by project participants using BIM software tools and specialized software tools for:

- Documents;
- Modelling;
- Parametric design;
- Data management;
- Communication;
- BIM on the construction site;
- Simulations;
- Issue management;
- Clash detection



Images source [Bexel Consulting](#)



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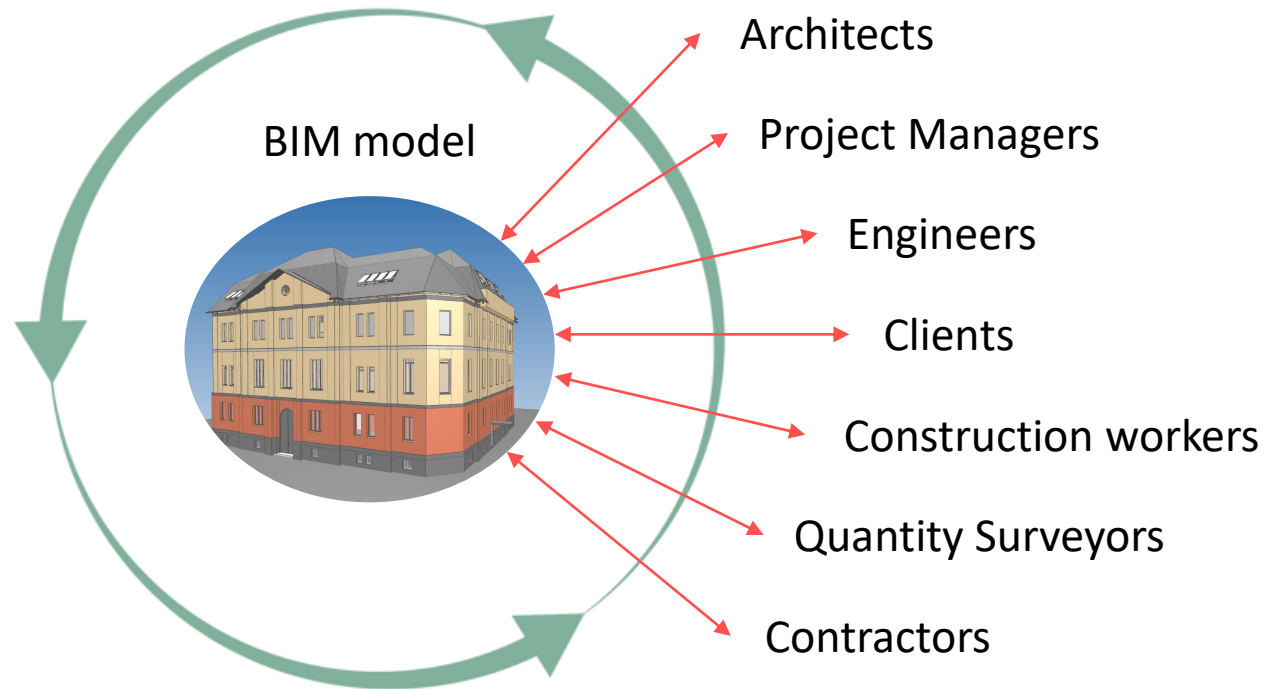


Exchange of data



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One of the main advantages of BIM is the communication between participants and the organization of all project information.



The BIM workflow is structured, and decisions, responsibilities and processes are transparent in terms of authorship and time.

It is important to mention that the access to the information can be limited (participants access the project in specific phases and/or only the parts where they are involved).



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Information exchange: team approach

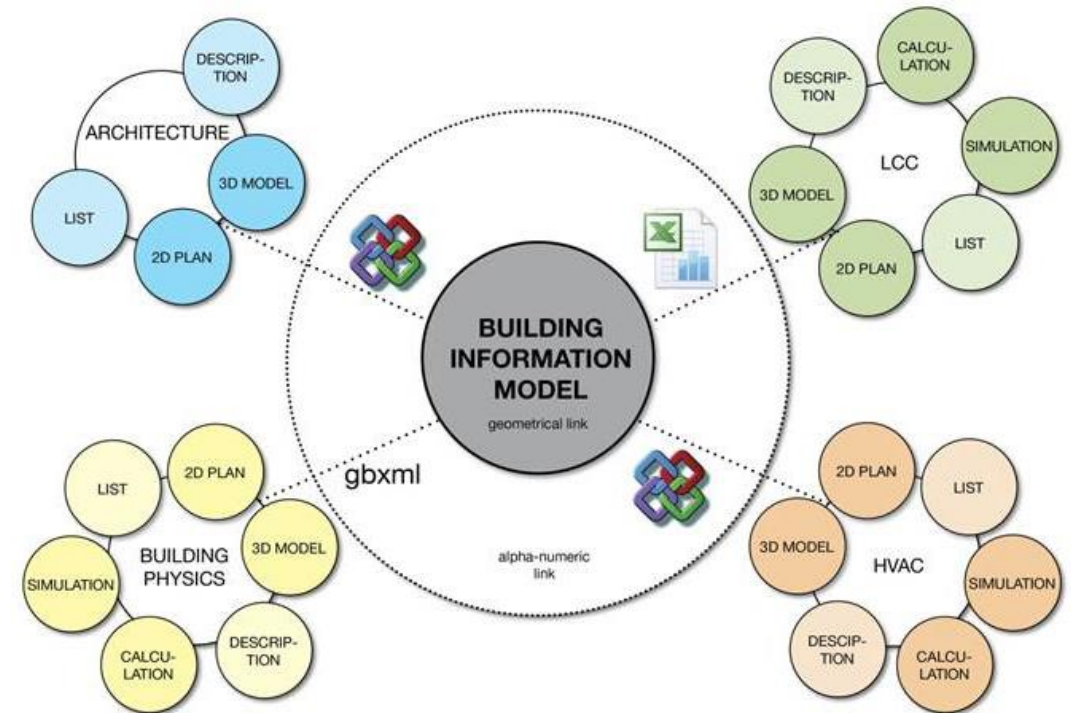


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BIM provides a platform for collaboration throughout the project's design and construction

BIM can combine in one **database/cloud** :

- Design Information for all disciplines,
- Product and Material Information,
- Installation Instructions,
- Project Management Logistics.



Source: Iva Kovacic, TU Wien, BIM_SUSTAIN



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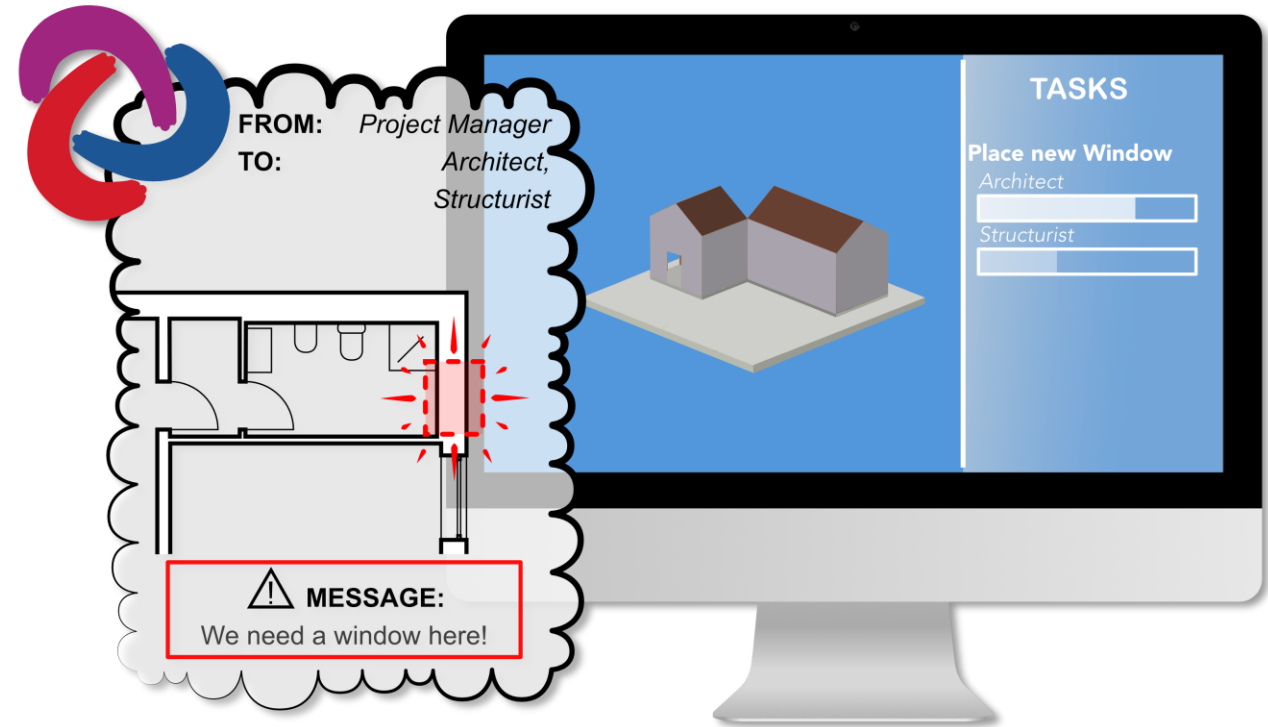


To do Lists

The Common Data Environment (CDE) enables users to directly communicate with relevant members of the team.

Most of the CDE features allow you 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.



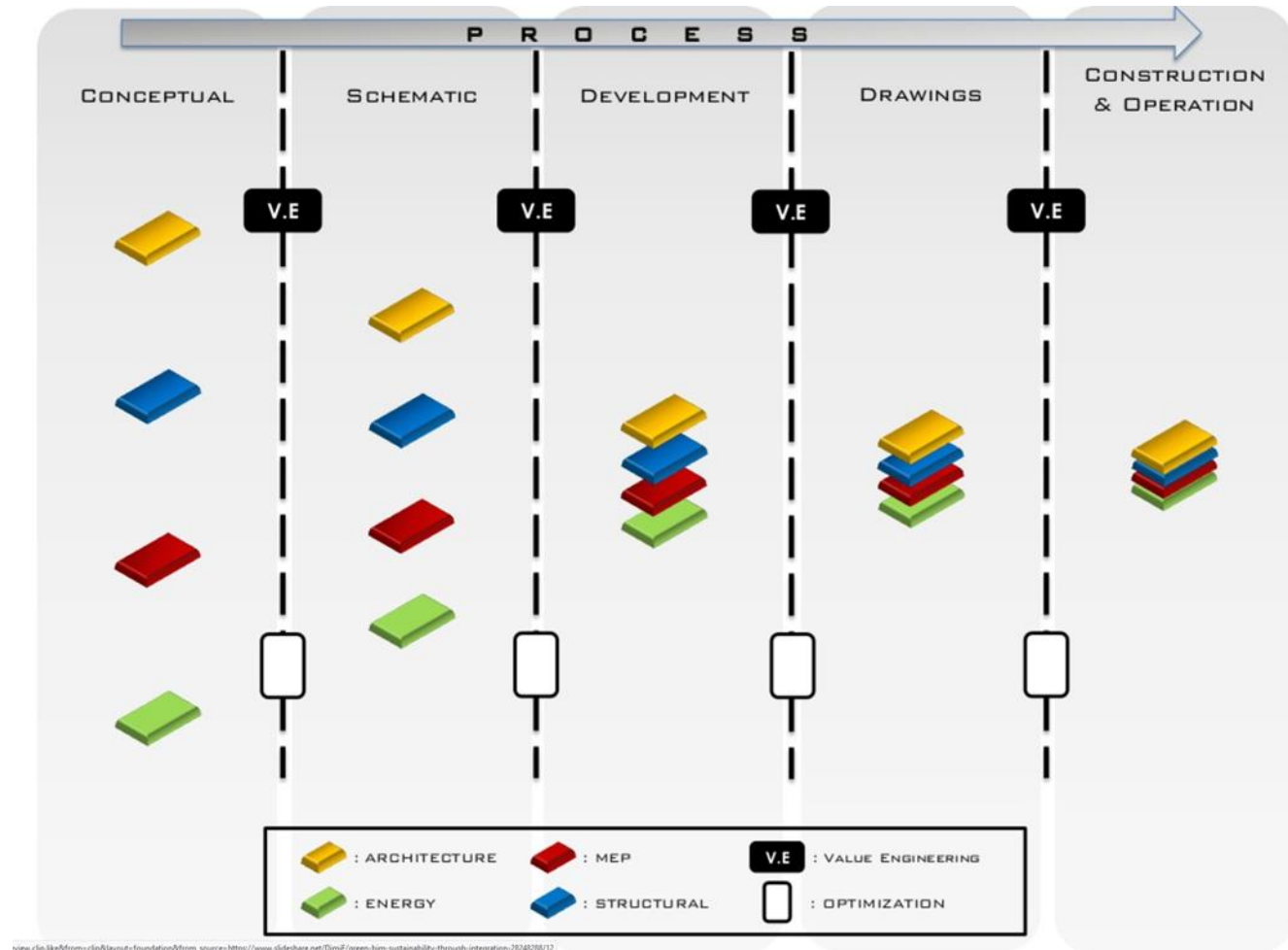
Importance of collaboration



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Digital tools allow the key team to be involved from the earliest practical moment:

- Decision making in early stages by ALL key players will improve Quality and time frame of the build
- Combined knowledge and expertise by ALL key players during the project's early stages will set out roles and responsibilities to improve production.



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Digital Tools conclusion

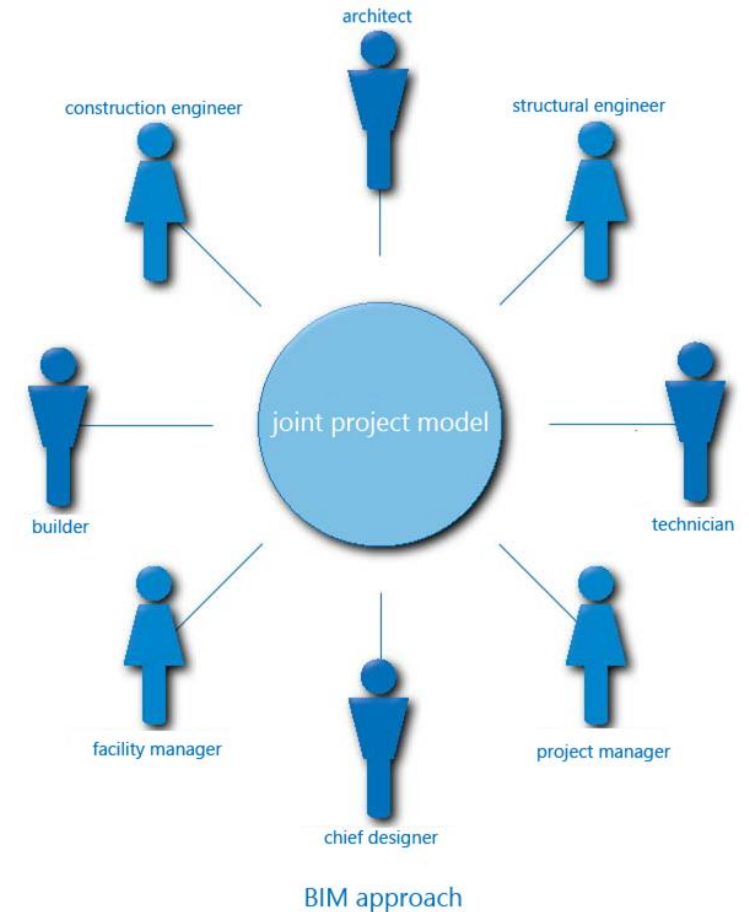


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The use of digital tools for communication and collaboration such as the mobile apps and using CDE for the storage of project information is becoming more and more common.

Information being shared, stored and accessed in real-time **boosts efficiency and builds stronger trust between team members.**

It protects a project's progress from serious mistakes, and can help avoid delays that may lead to going over budget.



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Source: BIMzeED Project

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