BIM-LCA

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An Innovative Circular Economy Training based on BIM and LCA technologies applied to the Construction Industry (BIM-LCA)
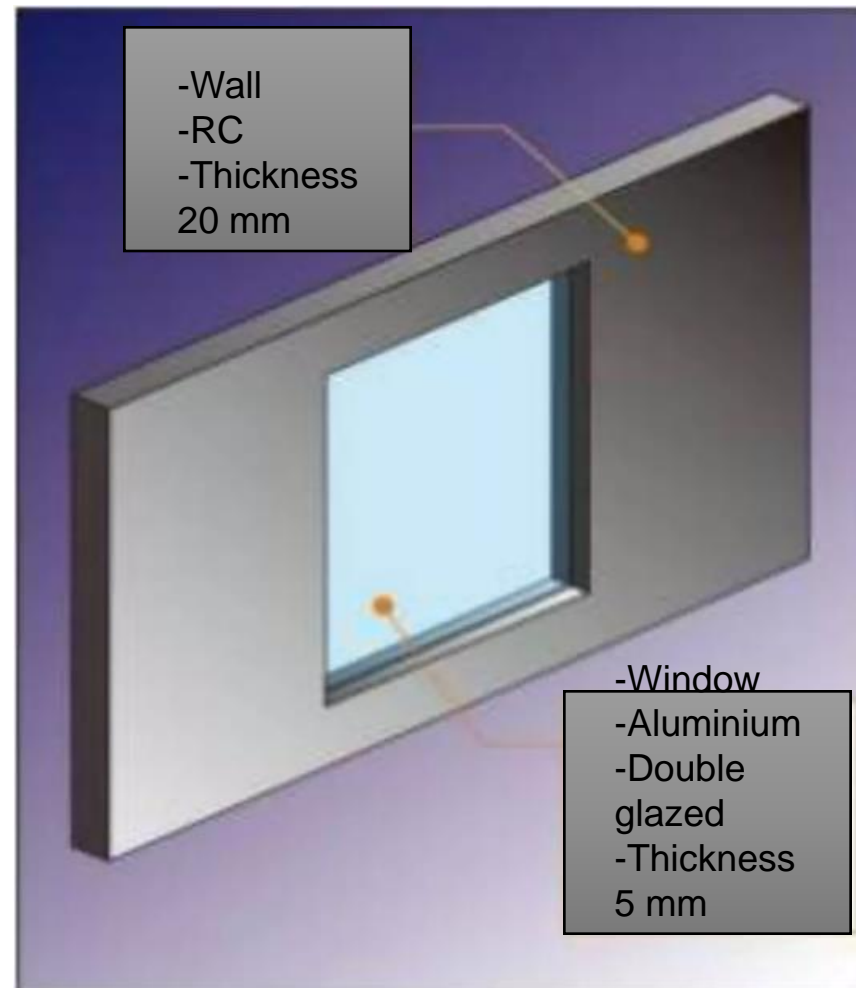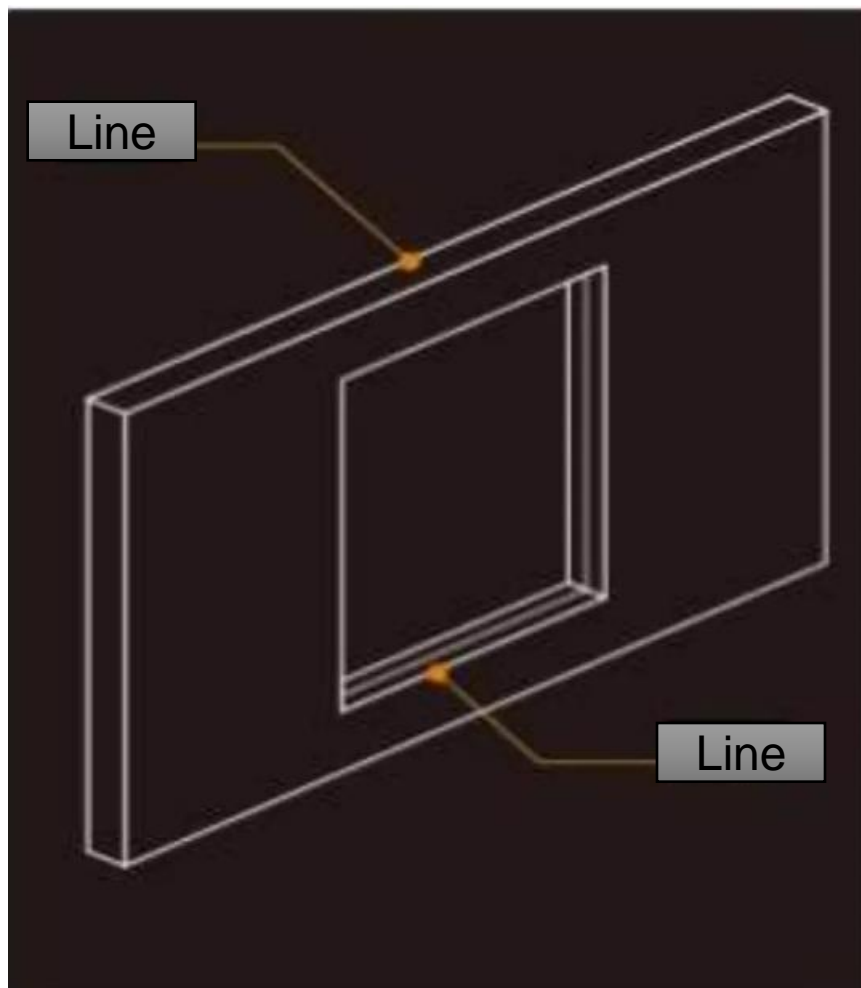
Open BIM Solutions

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DIN CLUJ-NAPOCA

evozon

Before CAD

With CAD

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CAD vs BIM

CAD diagram labels: Line, Line

BIM diagram labels:
-Wall
-RC
-Thickness 20 mm

-Window
-Aluminium
-Double glazed
-Thickness 5 mm

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CAD vs BIM

A major difference to consider in a CAD vs BIM discussion: while CAD refers to software that uses digital aid to render designs, BIM is far from just software. It is a **process**.

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	CAD	BIM
Workflow	**Computer-Aided Design (CAD)** is limited to rendering and drafting.	**Building Information Modelling-** tools, technologies and contracts involving the generation and management of digital design representations.
Drafting	2D and (limited) 3D	2D and 3D
Rendering	Limited	Yes
Parametric or Generative Modelling	Limited	Yes
Information Management	No	Yes, including 4D, 5D, 6D, 7D
Learning Curve	Easy, but gets much harder with 3D modelling.	Moderate

What is BIM?

American Institute of Architects (AIA) defines BIM as a digital representation of the physical and functional characteristics of the project.

There are three main ways to decipher the acronym that is "BIM", and all three of these explanations are closely connected:

- **Building Information Model** is what a lot of businesses often refer to as "digital prototype" – a 3D CAD model that also includes a lot of different data about the model as a whole and all of its parts specifically
- **Building Information Modeling** is an ongoing process of using the aforementioned digital prototype, accessing existing project data and adding new information to be accessed by other project participants
- **Building Information Management** is the process of controlling and organizing different processes using the aforementioned digital prototype as the main source of information

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BIM dimensions

According to project stage requirements and project complexity, specific parameters are added to the existing information contained in BIM. These additions of pre-defined used cases can be described as BIM dimensions.

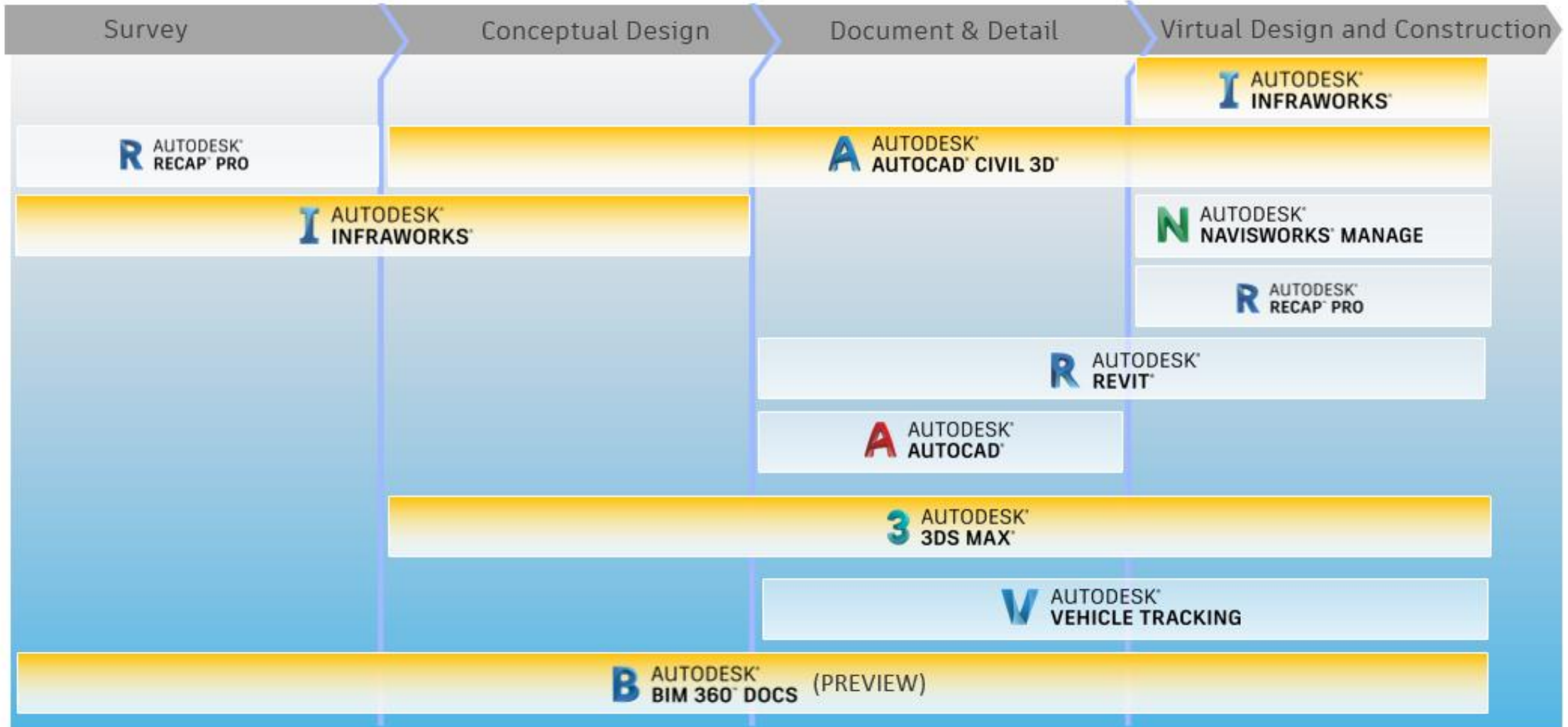| 3D	4D	5D	6D	7D
Geometry	**Time**	**Money**	**Sustainability**	**Facility Management**
3-dimensional (x, y, z) geographical structure.	Timeline, scheduling, and duration	Cost estimation, budget analysis	Self-Sustainable & Energy Efficient	Facility Management Information

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BIM Software producers – examples and workflow

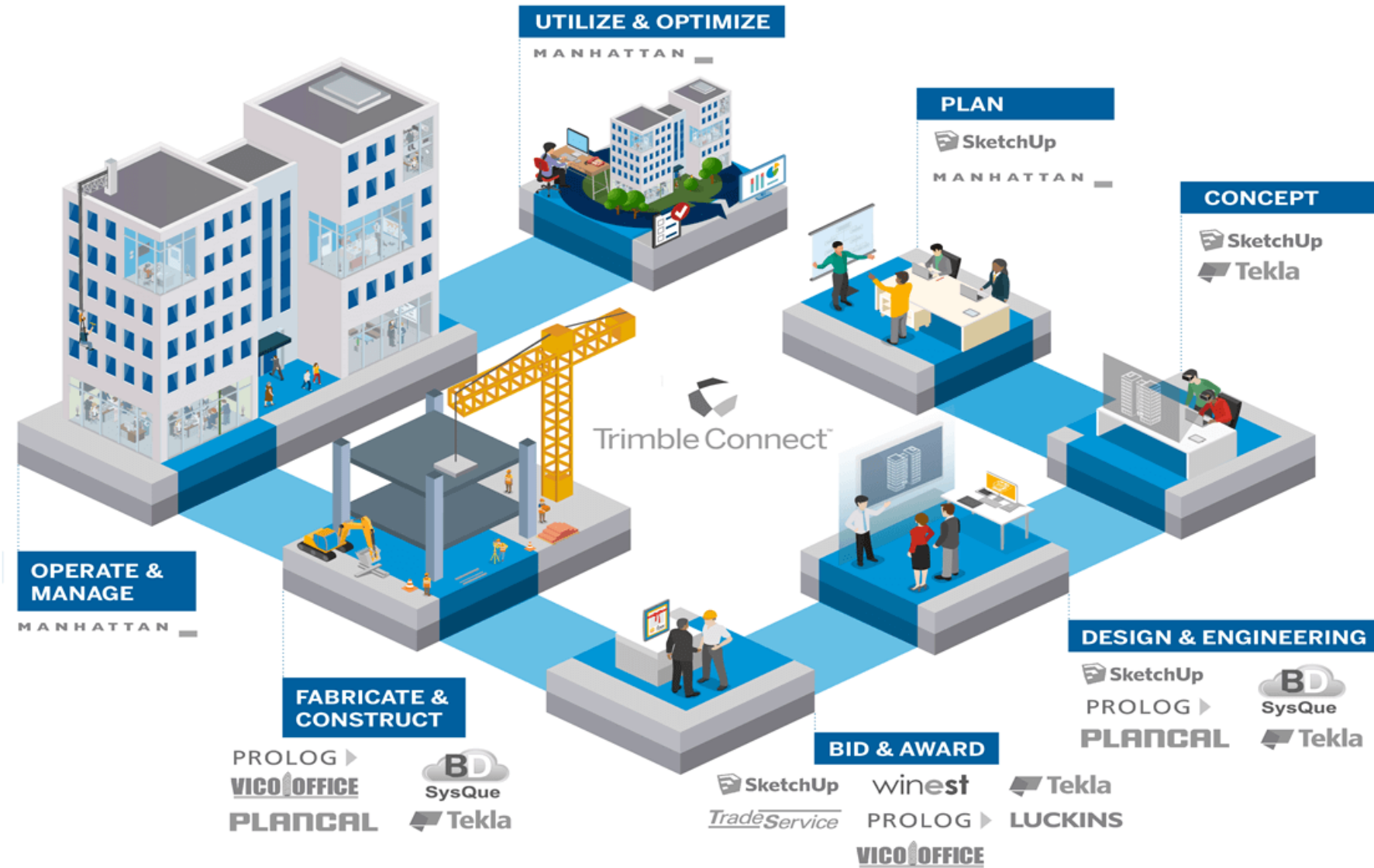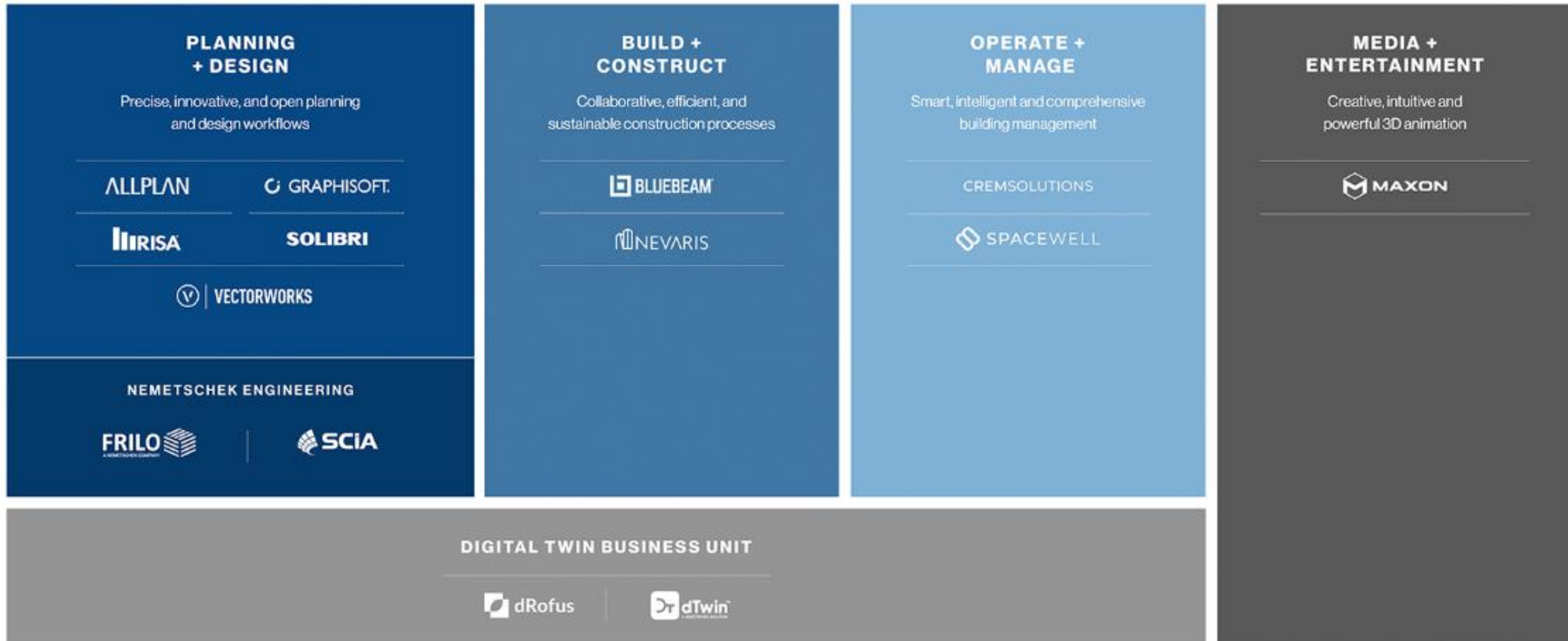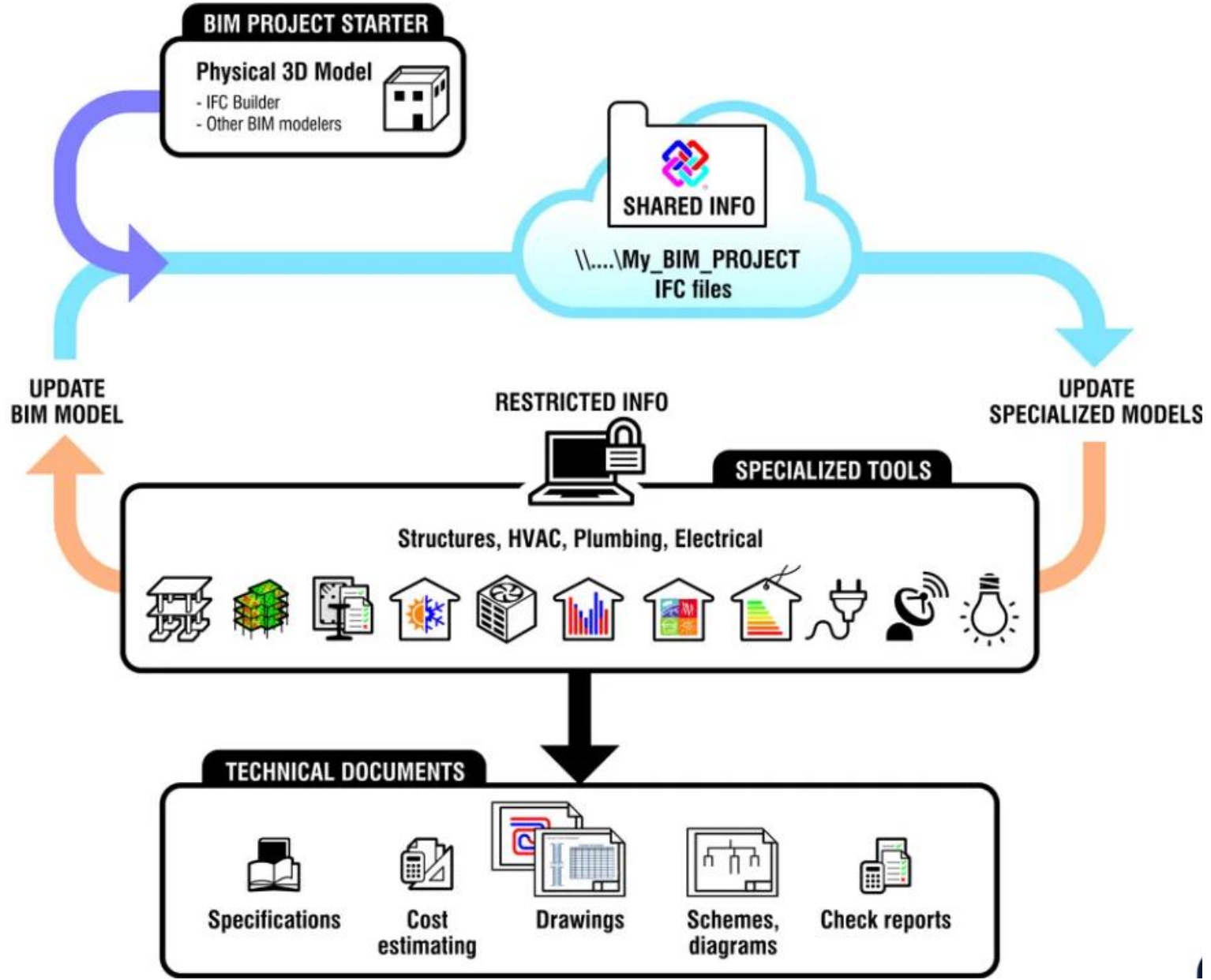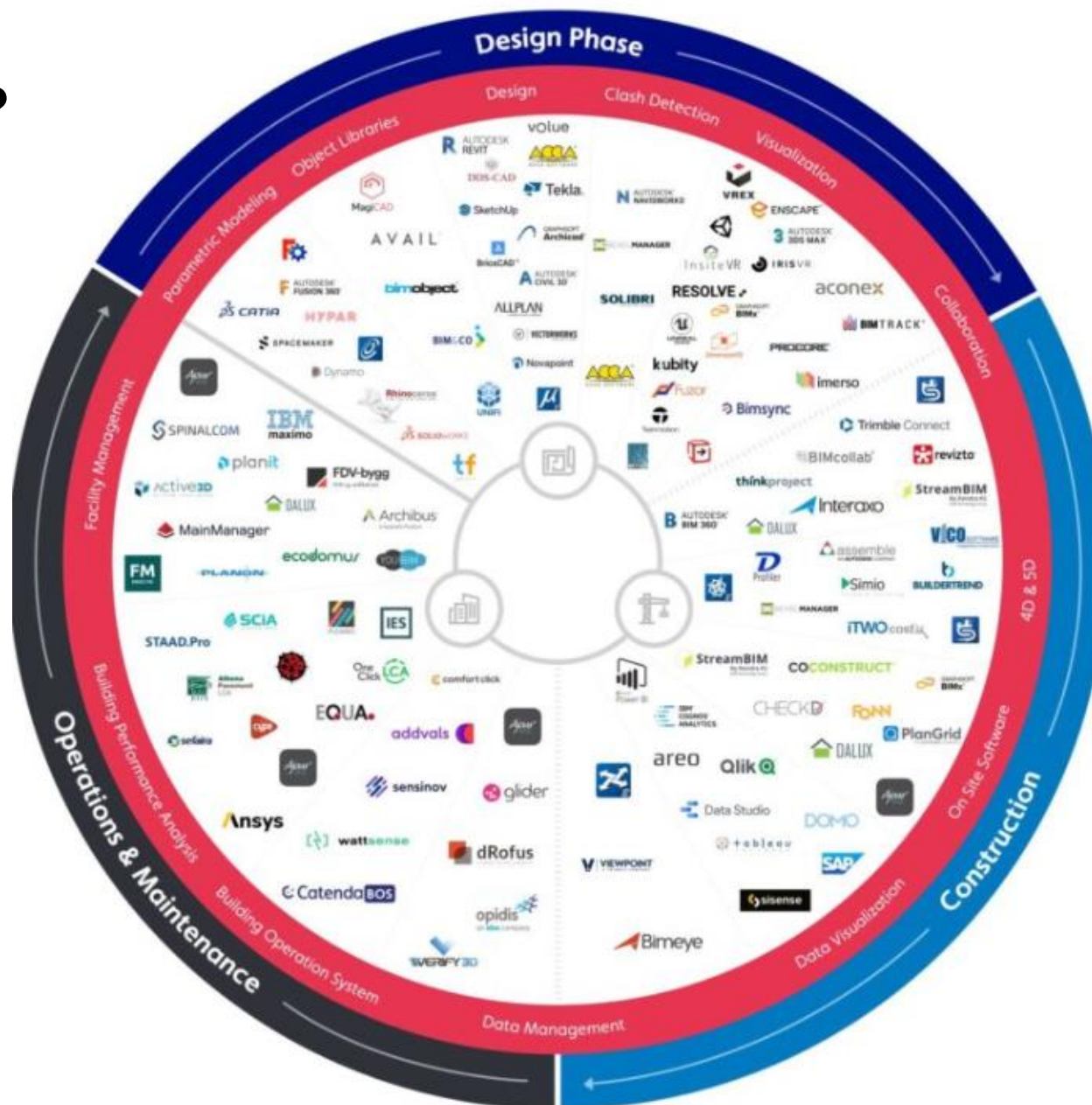# Autodesk

Trimble

Nemetschek

Cype

Closed BIM and Open BIM

Closed BIM performs BIM tasks and operations using a proprietary data format (that can only be opened in the same software or the software from the same software provider), creating a necessity to use a BIM solution from a specific developer or software provider – which is why it can also be referred to as "lonely BIM".

Open BIM means working with Building Information Modeling (BIM) using open software, processes, and standards. By facilitating information exchange, Open BIM aims to improve integration and efficiency for all design and construction professionals.

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Open BIM
Software products by different vendors and open formats for data exchange

Closed BIM
Software products by a single vendor and proprietary formats for data exchange

little open BIM | big open BIM
little closed BIM | big closed BIM

little BIM
BIM as an insular solution within a single discipline

BIG BIM
Continuous use of digital building models across different disciplines and life cycle phases

BIM can be used in four different ways:

•**Little Closed BIM**: The user works within his specialty on a digital model. He doesn't share his data with other fields and just uses one piece of software.

•**Big Closed BIM**: Participants in planning from various trades work with an electronic model. The several disciplines are handled by a single application, and data interchange occurs through a proprietary interface.

•**Little Open BIM**: The user uses a single piece of software to work on a digital model in his department. Both an open and a closed interface are used for data exchange.

•**Big Open BIM**: The largest BIM approach is this one. Collaboratively, users from many fields of expertise utilize the digital model. Different software solutions are used and data exchange takes place via neutral interfaces.

Open BIM vs Closed BIM

When using a "closed BIM" method, one provider is usually trusted to provide all the software tools required to coordinate the design and guarantee effective communication between the involved parties. Since the supplier handles everything, there is no need to worry about open, standardized formats when sharing data in such a closed software ecosystem.

Any decent software product can be used with an open BIM approach since data is seamlessly transferred using **open international standards** between the many vendor systems. Versions of the software are not a concern. It is not necessary to stick with a single vendor for the tools available. The success of the project is not reliant on one provider.

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Open international standards

Data Standards rely on two major points of interest:
- IFC- Industry Foundation Classes, are a data cataloging standard used for the majority of BIM-related data.
- MVD - Model View Definition (MVD) is a type of filter on an IFC file that specifies which data elements will be shared during a communication procedure.

Workflow Standards are mainly including BCF and IDM.
- BCF, or BIM Collaboration Format, is a method for streamlining communication and facilitating information sharing between specialists in the field.
- Information Delivery Manual, or IDM for short, is a standard operating procedure for the previously stated BCF.

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Industry Foundation Classes (IFC)

IFC, as a standard, can include various information, from identity data and information about people to object parameters, relationships between objects, and even entire processes related to these objects. IFC is the main answer to open BIM to all of the proprietary data formats on the BIM market.

The very nature of IFC as a format is considered much more future-proof than any closed BIM data format since it can still be viewed and modified even if the original software that created this model would not be available anymore.

There are currently three commonly supported versions of IFC: IFC2x3, IFC4 and IFC4x3.

- IFC 2x3 is considered the most popular version of IFC to this day, a staple of what this entire standard stands for

- IFC4 contains many new features compared to IFC2X3, such as improved geometry representations, geolocation support, and more element categories.

- IFC4x3 extends IFC4 to be better suited for linear infrastructure (Roads, Railways, Bridges, Earthworks, Geotechnics, Ports & Waterways)

BIM Collaboration Format (BCF)

BCF is an XML file that is used mostly for issue tracking and is structured like a server setup file. It provides a contextualized perspective of each issue using PNG and IFC coordinates, giving departments and individuals that require the information a more comprehensive understanding.

There are two main software types that BCF can be useful to, such as:

• the **coordination software**, which usually covers issue tracking and issue management concerns with the help of a flexible user interface

• the **authoring software**, which can both generate and distribute model problem data in BCF format – a BIM solution may have either a native BCF support or an add-on to create such compatibility

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Advantages of open BIM compared with closed BIM

• Flexibility in terms of software

• Reliability of data as a whole, making it possible to be used across different solutions

• Better interoperability via using open and neutral standards

• Higher long-term sustainability with commonly accepted data formats

• Better collaboration across departments as a whole

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What Is the Future of Open BIM?

- Internet of Things: IoT simplifies the process of data release to prefab workshops, contractors, and modelers. IoT devices can be used to capture real-time data and this data can be used to augment the design process.

- The Shift from Huge Files to Granular Data: Through the use of granular data enabled by APIs, industry services are connected. Compared to current approaches, the future appears to be more capable, automated and focused.

- Cloud collaboration: addresses especially the collaboration issue for geographically dispersed teams.

- Augmented/Virtual Reality: Examining 3D models becomes faster, better and easier

- Drone usage: Project managers are using drones for recording and reporting the progress on a construction project

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Thank You!