BIM meets Agile

AGILEBIM

PAPER

Rev. 2.5.0 – June 2025

AgileBIM

an AgileConstellation Star

Index

1 Introduction

Building Information Modeling (BIM) is a real revolution in the world of engineering, contemplating a new integrated vision of the creation of a work, from the idea to its maintenance.

To support the achievement of this goal, it is clear that it is necessary to look at new organizational and collaborative models that support the attached multidisciplinarity. In this context, one cannot fail to look at *Agile*, and the related mindset, which is deeply focused precisely on the active collaboration of all the professionals who are part of a working group.

AgileBIM is responsible for operationally combining the salient aspects and providing the essential tools to start working immediately according to this new mindset, espousing the mantra of *inspect-and-adapt,* or continuous improvement, to better support the ability to face challenges with *pragmatism* and *confidence*.

AgileBIM aims first of all to stimulate the ability to work in a team, and to think in terms of small improvement *experiments* that put it in a position to face new challenges, putting customers more and more at the center of its actions.

This Paper contains the operational indications to effectively place it in its context, thanks to practical suggestions deriving from concrete experimentation in the field, which has made it possible to identify a set of practices and tools that actually bring concrete value.

2 Building Information Modeling

The representation of a building project has undergone important evolutions over time, which have culminated in the use of models capable of supporting the flow of information as a whole and organizing the related operations with appropriate processes.

Certainly Building **Information Modeling** (**BIM**) is a real revolution compared to the past, defined by ISO 19650l as:

> *"The use of shared digital representation of a built asset (including buildings, bridges, roads, process plants, etc.) to facilitate design, construction and operation processes to form a reliable basis for decisions"[1].*

The goal is to respond to today's complexities, allowing to obtain a:

- increased productivity.
- reduction of time and errors.
- Streamlining processes.
- optimization of solutions and costs.

All this by focusing the design and construction of a work on three main assets:

- **Building**: the work to be carried out, for example a building or an entire city.
- **Information**: understood as a set of data that is organized, usable and exchangeable at any time.
- **Modeling**: initially *Modeling* or *Modeling*, currently the trend is increasingly towards *Management*, shifting the focus from the design phase to that of the management of the "Building".

The fundamental objective is to define an overall representation of the work in its entire life cycle, thanks to *dimensional*, *qualitative* and *quantitative data*.

Thanks to BIM, therefore, it is possible to recreate a **digital twin** of a work (**digital twin**) which is not a simple three-dimensional representation, but is a *dynamic model* containing a series of information on: geometry, materials, load-bearing structure, thermal characteristics and energy performance, systems, costs, safety, maintenance, life cycle, demolition, decommissioning, etc.

It is clear that the data that makes up the digital twin is a central element of BIM, which is why an alliance has been formed between the various manufacturers of digital tools to ensure their **interoperability**.

[1] "The use of shared digital representations of built assets (such as buildings, bridges, roads, industrial facilities, etc.) that serves to facilitate design, construction and management processes and to create a reliable basis for making decisions".

The alliance, known as **buildingSMART International** (formerly the International Alliance for Interoperability - IAI), focuses on three main standards:

- **IFC** *(Industry Foundation Class),* information exchange format. It is a structured data model, a classification and description system referring not only to the physical components of the building such as walls, windows, doors, etc. or their attributes such as transmittance, masses, etc. (physical quantities), but also to abstract concepts such as quantities, costs, time sequences of the processes.
- **IFD** (*International Framework for Dictionaries*), an international dictionary aimed at unambiguously defining the terms and related meanings of entities, products and processes in the construction world. If, in fact, the IFC standard describes the objects (entities and processes), how they are connected and how the data must be exchanged and stored, IFD provides the dictionary with the definitions of these objects, their properties, etc., to make possible a common understanding that is essential for the flow of information to take place smoothly.
- **IDM** (*Information delivery manual),* methodology for defining processes. The need for this standard stems from the need to optimize the quality of communication between the different participants in the construction process. To work efficiently, it is necessary for all participants to know what and when the different types of information should be provided.

2.1 A new Collaborative Design

To do this, it is essential to resort to collaborative **work** between the different figures involved, who have the opportunity to create and model the information model by inserting, updating, modifying and extracting the information according to the purposes.

For example: the architectural designer defines the shapes and geometries up to the 3D model, the structural designer defines the elements of the structure, and so on.

The work is then "built" before its physical realization, through a digital twin, through the collaboration and contributions of all the subjects involved in the project.

The need stems from the growing complexity of projects, which now goes beyond the purely construction sphere, as already highlighted in 2004 in the publication "*Collaboration, integrated information and the life cycle in the design, construction and use of the built environment*",[2] requiring a new organizational flow of work, as illustrated by the so-called **MacLeany Curve**:

---

[2] Patrick MacLeamy, *Collaboration, Integrated Information and Project Lifecycle in Building Design, Construction and Operaion*, 2004.

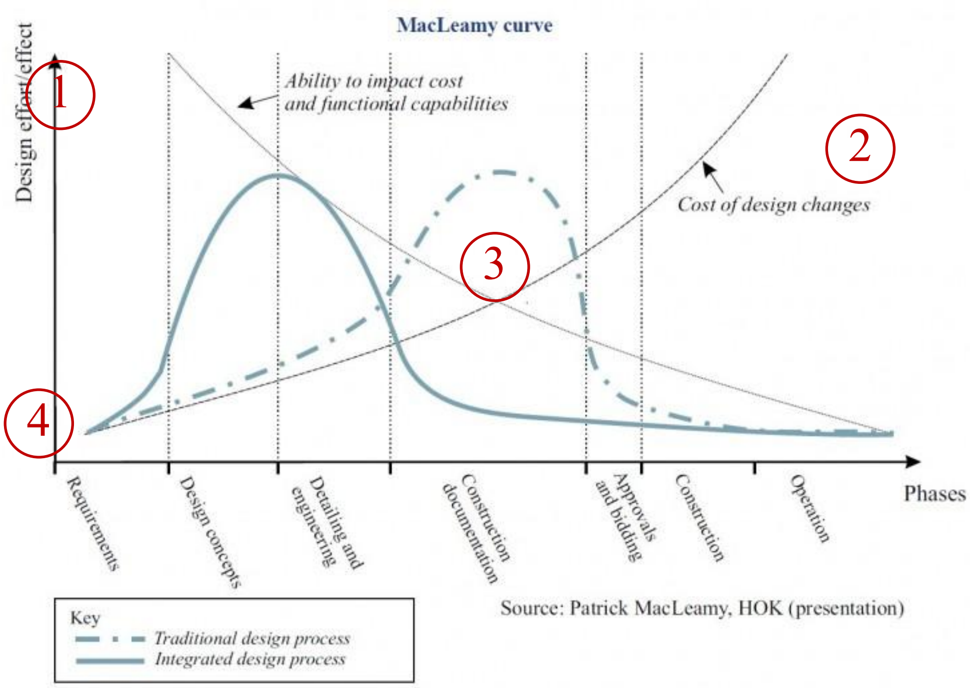


Figure 1 - MacLeany curve

The curve is drawn in a Cartesian plane with:

- **the time reported in abscissa**, which marks the progress of the design phases.
- **the efficiency of the action,** with the same effort on the ordinates.

The curve itself takes on a different meaning in relation to time:

- *The first curve can be seen as the "possibility of changing functions at the same cost".* You can see how at the beginning, in the first design phase, the possibilities of modifications are high but gradually become less and less as the project progresses, up to the as-built, in which the functional change is excluded except by resorting to disproportionate costs.
- *the second curve describes "the cost of the same design change in the various design phases".* It is evident that modifying the project before the construction site involves reduced costs, while as the construction proceeds the costs are increasingly higher.
- *The third curve describes "the efforts made in the various phases of a traditional design process".* According to MacLeany, it is during the last phase, before the construction site of the work, that efforts are concentrated, since only this phase involves all disciplines.
- *The fourth curve represents "collaborative design", i.e. a design* that involves all disciplines from the beginning, when the incidence of costs on design changes is minimal and there is still great design flexibility.

The summary is that **by anticipating efforts in the early stages of design**, greater control over the functionality and costs of the entire project can be achieved. It is not, as is evident, a question of reducing design "efforts", as the commitment can only be commensurate with the quality of what is intended to be achieved (the maximum points of the two curves representative of the BIM-oriented and traditional processes are almost identical), but of anticipating these efforts over time.

A new way of approaching design therefore comes to life, the result of its "technical practicability" made possible by the availability of the virtual model of the work, but above all of the economic convenience resulting from its implementation. Convenience that is evident by analyzing the trend of the curve relating to the costs of design changes, which are gradually lower as corrections and additions are anticipated.

In this way, new **collaborative and integrated** processes take shape, which require the co-presence of all the actors in the design and, hopefully, also of the customer, from the early stages of the design of the building intervention.

Figure 2 - Traditional Design Process

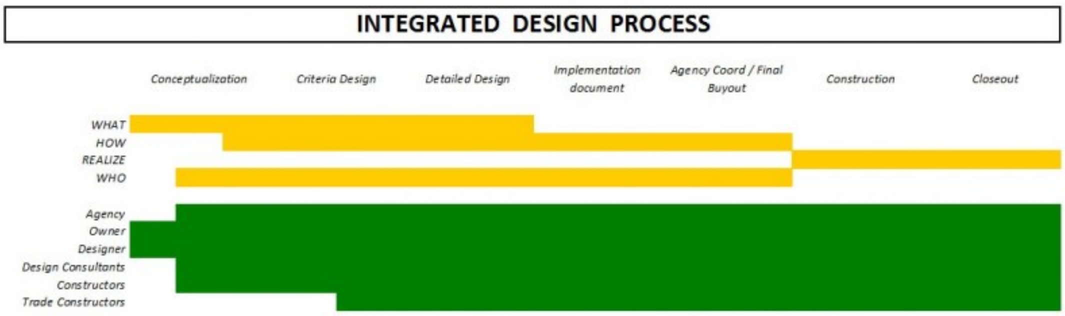


Figure 3 - Integrated Design Process

2.2 The 7 Dimensions of BIM

To identify the disciplines involved in the new integrated approach, we can refer to the 7 "dimensions" of BIM:

- **3D - Three-dimensional geometric model**. The use of tools for the creation of a digital model of the work allows us to take more and more care of the graphic detail of the design, ensuring a realistic rendering of the aesthetic appearance and an excellent geometric adherence of the modeled elements.

- **4D - Time analysis.** The need to manage time is far from being new: the methods traditionally used alongside building design (Gantt and Pert charts, etc.) for managing the duration of a construction site or more generally of a job are well known as well as their limits and criticalities:
    - the loss of information in the transmission of data from designer to company.
    - the lack of communication between construction management and suppliers.
    - the actual presence and precise location of the materials on site.
    - the status of the execution of the work.

  These are just some of the reasons that cause delays and inefficiencies with the consequent need to review what has been planned up to that moment. The need to be able to reduce, manage and reorganize order times in a dynamic way and open to analytical evaluations can be answered in the use of new tools and new methodologies.

- **5D - Cost analysis.** The subject of "computation" has also been the subject of study for some time: the nerve center is the "*Quantity Take Off*", i.e. the extraction of measurements from the project in order to define the quantities of material(s) necessary for the creation of one or more elements. Once this operation has been completed, the "computist" remains to choose the price list items to be assigned to the processes, with the relative unit price, thus determining the amount. In traditional design, the calculation is updated in parallel with how the design of the work evolves: the probability that some data will escape the updating process is very high. The result of the computation activity (metric calculation) is, moreover, a static product, closed to multi-criteria analysis, rarely connected with aspects, such as maintenance for example, which are closely interconnected but treated separately. Also in this case, it is clear how the rethinking of processes, interactions and tools can streamline and make the management of information data more efficient, and link this dimension to other aspects of "life cycle building".
- **6D - Management phase.** One of the objectives of the BIM methodology is to create a virtual model (three-dimensional and informative) that can be as faithful as possible to what has actually been achieved. Such a model is defined as "as-built" and reports not only what is designed but what is actually built during the construction phase. In fact, what is conceived during the design phase is traditionally revised and modified during the construction site to cope with any variations during construction or for the resolution of geometric or operational conflicts that had not been taken into consideration during the conception phase of the work. And again, the "model" in a broader sense, must contemplate the

transmission of the information database built around the virtual representation of the "building object", so as to be able to preserve and transmit what is produced.

- **7D – Sustainability.** The concept of sustainability can be examined from three different points of view:
    - *in* terms of the ability to reproduce and maintain natural resources.
    - *economic*, understood as the ability to generate income and work.
    - *social*, if we look at it as a generator of well-being for man.

Fitting this concept onto a work and therefore talking about sustainable design is not always easy, even more so from the perspective of innovation: designing in a sustainable way can be understood as designing in a qualitatively significant way.

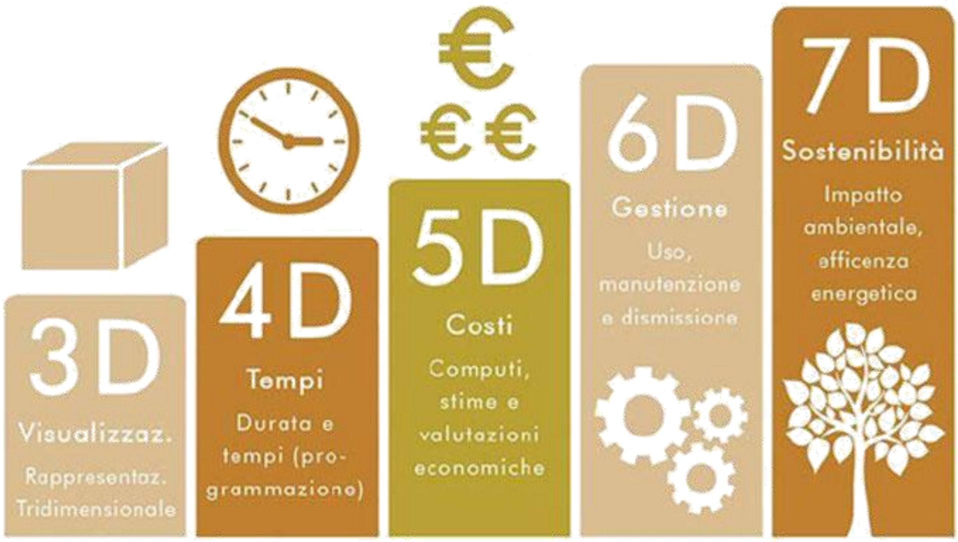


Figure 4 - The 7Ds of BIM

The adoption of a methodology that "obliges" the planning of processes and that opens the building organism to simpler management will make it possible to make the analytical processes currently involved in the evaluation of the concept of sustainability of a structure more efficient.

2.3 Common Data Environment

The process of creating, sharing, and releasing information must be consistent with what was established in the initial stages of collaborative design to ensure that all information is handled and delivered quickly.[3]

[3] http://www.ibimi.it/pas-1192-2-consegna-delle-informazioni/

The **CDE** (Common Data Environment or **ACDat**) is a means of providing a collaborative work environment organized into four areas:

- **Work in Progress**: here are the "in progress" relating to the various application areas such as, for example, the area relating to architectural design, structural design, etc. In each of these areas, the specific part of the project is developed and the documentation produced, with the various reworks and revisions, will remain within the area until an agreed degree of development is reached, when it can be made available to the other project teams. However, until this development threshold is reached, all documentation will only be usable by the technical team of reference in the area.
- **Shared**: it is the area in which the various design teams deposit the subsequent progress of their work, in the various agreed stages of development, sharing them: It should be noted that at this stage the project is still in progress and the documentation cyclically deposited and taken from the various teams allows everyone to quickly align with any changes and refinements made by each of them.
- **Published Documentation**: this is where the project documentation is deposited and shared by the various design teams and approved by the client. The documentation filed is adequate for the implementation phase.
- **Archive:** this is the area where the design information of the artifact as built is kept, for the purpose of preserving and making available all the related information, such as design, regulatory and legal requirements.

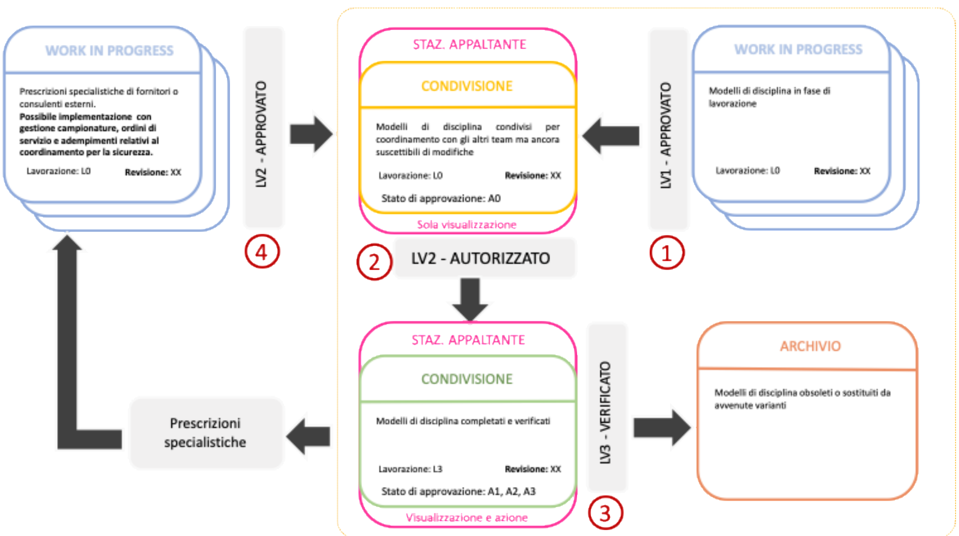


Figure 5 - The areas of the CDE

Through the four areas it is possible to develop an appropriate sharing of documents and information that allows:

- to the transferor, to retain ownership of the information, even if it is shared.
- to reduce the time and costs of the exchange itself.
- to define data in a granular and structured way in order to make it easy to reuse.
- a quick view of the information it contains.
- greater control over the revisions and versions of uploaded documents.

The procedures for the exchange of information are not limited to the design phase alone, but must cover the entire cycle: from construction planning, to cost estimation and planning, up to the management and maintenance of the building.

Such a structured use of the sharing environment requires **coordination** between all the professionals involved.

Within the environment, specific processes must be structured for sharing, verifying, reviewing and validating the information processed by the stakeholders involved in the project. For each document it will be necessary to define a processing status and an approval status: to move from one status to another, specific checks will be required, carried out by internal and external parties depending on the information maturity of the document itself.[4]

According to the UNI 11337-5 standard, this sharing environment must:

- be **accessible**, with pre-established rules depending on the role within the process.
- be **traceable** in the entire historical succession of the flow.
- **support** most data types and formats, as well as their processing.
- allow information to **be extrapolated** through interrogation.
- **to store** and **update** the information contained therein over time.
- be **safe** and **confidential**.

The objectives and advantages that can be obtained with a structured sharing environment are:

- the **automation of information coordination** between stakeholders.
- information **transparency** also in terms of authorship and temporal availability of information.
- the **automated management** of data revisions and updates.
- reducing **data redundancy**.
- the **reduction of risks** associated with data duplication.

[4] https://bim.oneteam.it/2018/03/30/come-implementare-lacdat-secondo-la-norma-uni-11337/

- communication between interested parties through reference forms and interfaces (requests for information, requests, correspondence, etc.).

2.4 The BIM Execution Plan

The **BIM Execution Plan (BEP),** also formalized at the contractual level, defines all the executive methods according to which the BIM order must be developed.
Its main purpose is to ensure that all those involved within the project are aware of the *risks* and *opportunities* associated with the adoption of BIM in the project workflows, and to fulfill its functions it must specifically define all the uses of the models as well as all the development directions of the BIM process, also through the planning of data management in the executive life cycle of the work.

The main purpose of the BIM Execution Plan is to **plan the client's BIM requirements in the** design and tender phase, and potentially in the **construction phase** as well as throughout the entire life cycle of the building. The American and British regulations take into consideration in detail the problem of project planning, albeit in different terms of contents, flows and definitions within a BEP.

In general, however, BEP can be defined as a **planning and management activity of the BIM order**, which in the most recent national legislation are reflected in the *Information Specifications*, *in the Order Management Offer* and in *the Project Management Plan*.

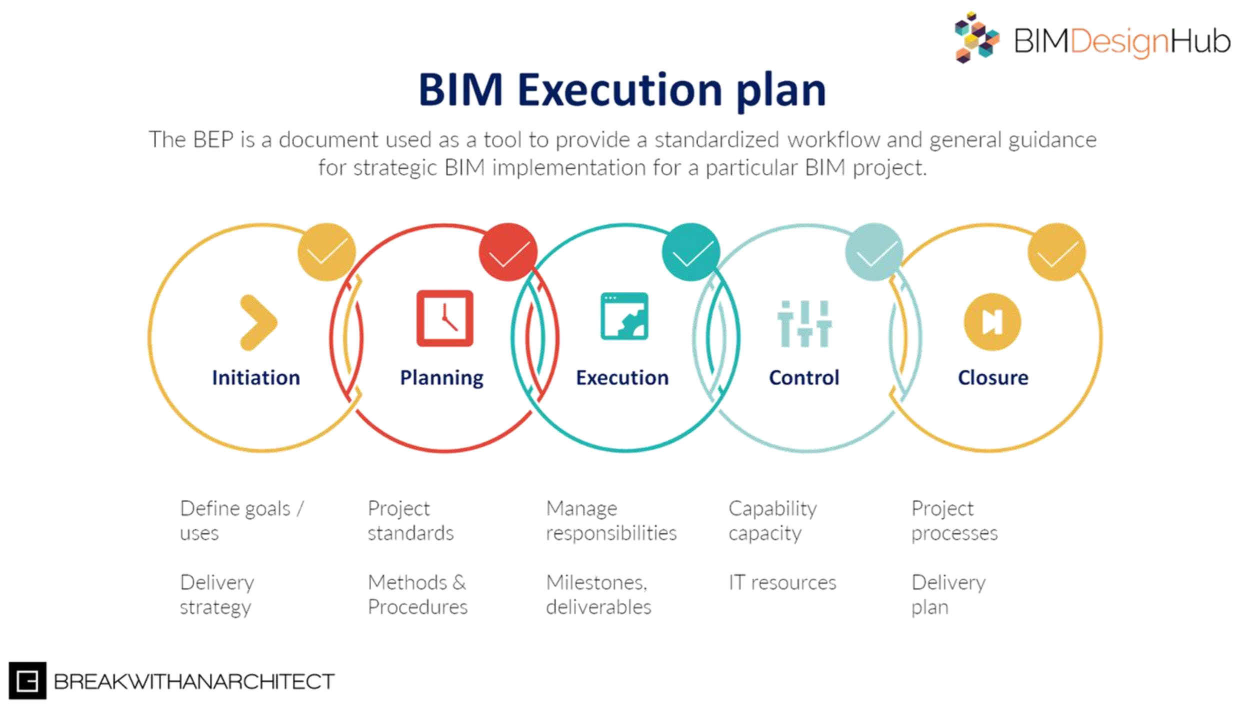


Figure 6 – BIM Execution Plan [source: https://www.breakwithanarchitect.com/post/the-bim-execution-plan]

In this regard, the BEP is explicitly referred to in Part 5 of the UNI 11337 standard as **a plan for Information Management** and defined by PAS 1192-2-2013 as *"Specification for information management for the capital/delivery phase of construction projects using building information modeling*".

The BEP provides for a **pre-contract** and a **post-contract**, and essentially represents *the plan drawn up by the designer and contractor to illustrate methods and tools aimed at achieving the objectives and requirements established by the client in the Employer's Information Requirement*(EIR).

The plan contains all the information relating to the BIM requirements that the project must meet for the design phase, which will be the basis for all future work on the project, and defines the standards that all members of the design team must adhere to in the development of the project.

Its drafting can take place:

- **during the bidding phase**. In this case we speak of **pre-contract BEP** and typically contain:
  - all specifications stated in the Exchange Information Requirements (EIR).
  - project implementation plan.
  - collaborative goals.
  - computerized model of the same concerning the strategy of the final result.
- **In** this case we are talking about **post-contract BEP** and, in addition to the requirements contained in the EIR, it contains four macro-groups of information:
  - management.
  - Planning and Documentation.
  - methods and procedures (standard method and procedure).
  - information technology solutions (IT solutions).

Thanks to the Building Execution Plan it is possible to ascertain the skills of the project team, assist the customer in assessing feasibility, know the responsibilities of the team, add the advice of a BIM Project Manager as an additional figure and, more generally, promote a better workflow.

2.5 From LODs to LOINS: details according to the project

The LODs **(**Level Of Detail or Development**) aim to define the perimeter of in-depth analysis of the information that contributes to the construction of the BIM model, allowing professionals to work in an iterative and incremental way, i.e. at different levels of detail in relation to the purpose of the phase in which they are operating.**

As a result, the model can be characterized by different levels of detail (graphic and informative), which has led to several standardization actions in different countries.

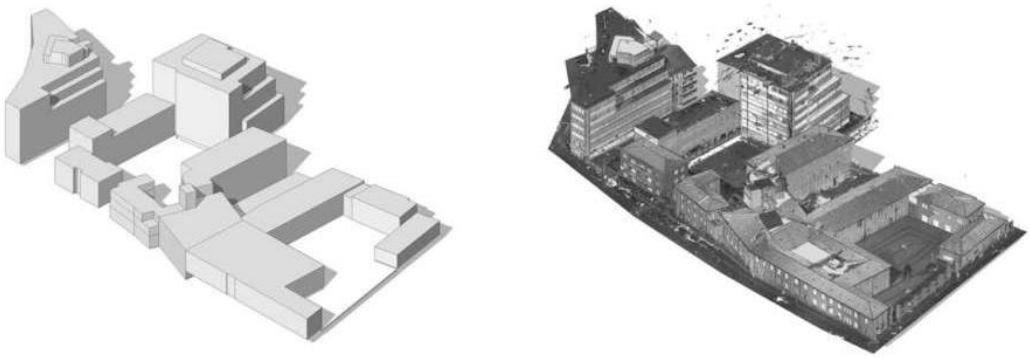


Figure 7 - LOD, different details of a work

Summarizing the characteristics of LODs (with reference to the US meaning) we have that:

- define the degree of reliability of the data.
- are defined by category.
- they are described through a progressive scale in which geometry and information are progressively deepened in direct correlation to the objective of use of the model.
- They are iteratively tied to the development stages: in the next stage, an item can never be less reliable than it was in the previous stage.

In the Italian panorama, the reference standard is **UNI 11337-4:2017**, which has among its prerequisites the possibility of using any of the existing Level Of Detail scales, without exclusions or priorities, according to the specific needs of the contract. This is provided that the specific references, logics, objectives and structure are defined a priori for the purposes of maximum transparency for the parties concerned.

The main problem of LODs (and their standardization by design) was to avoid incurring possible deficiencies in detail, which led the professional to exasperate the amount of information, thus causing the error of excess of information.

ISO 19650-1 thus introduced the concept **of LOIN** (**Level of Information Need**), i.e. the level of information needed, effectively overcoming the concept of LOD.

In addition to wanting to overcome the fragmentation developed by different standards and regulations, the most interesting objective is to avoid an excessive amount of information compared to what is actually necessary, facilitating its management and applying the principles of "information economy".

With the LOINs, the importance of **the information contents**, whatever their nature, is emphasized, together with the need that the number and type of information contained in the model be limited to that actually necessary for the specific project. All this always highlighting that the information levels are cumulative and developed throughout the entire evolution of the project.

The principle of standardization of information requests from the subjects responsible for drafting the specifications is thus overcome, **defining the level according to the project** and in particular, taking up a widely shared tripartition: **quantity**, **quality** and **granularity** of the information itself.

The trio, once defined, will represent the reference point for the entire project.

In concrete terms, for **each project, the levels of information** deemed necessary for the different phases of implementation must be established, and, since the information can come from different parties involved in the development of the project, the level of information needed is conceptually linked to the federation of the different models (architectural, structural, plant engineering).

3 Agile

Agile is the reference approach in all sectors with high variability and risk, **replacing the "heavy" development processes**, based on **documentation** and **massive planning**, with more **adaptive** approaches that aim to respond effectively and more adequately to market disruptions and continuous changes. You must therefore agree to operate in a *VUCA* market, i.e. a market characterized by: *Volatility*, *Uncertainty*, *Complexity* and *Ambiguity*.

3.1 Limitations of the Sequential and Linear Approach

A *sequential* and *linear* approach (known as a waterfall, or also "**classical**") is based on the assumption that complex systems can be implemented sequentially, in successive phases. The notion of the cascade process was first introduced in the article "**Managing the Development of Large Software Systems**"[5] written by *Winston Royce* in 1970 and intended, predominantly, to be used in large government projects.

In essence, it is a **linear** process, in which you start with the analysis and collection of requirements, proceed with design, implementation and a long testing phase. The whole thing is based on the assumption (or presumption if you will) that complex systems can be built linearly in finite sequential states, i.e. without having to revisit the requirements or design ideas.

Conceptually, the waterfall process is equivalent to a conveyor belt on a production line: requirements analysts compile the system specifications until they pass the completed system document to the software designers, who plan the software system and create all the diagrams necessary to document how the code will be written. The design patterns are then passed on to the developers, who implement the code from the project drawings.

Schematically, everything takes shape as in the following figure:

[5] http://www-scf.usc.edu/~csci201/lectures/Lecture11/royce1970.pdf

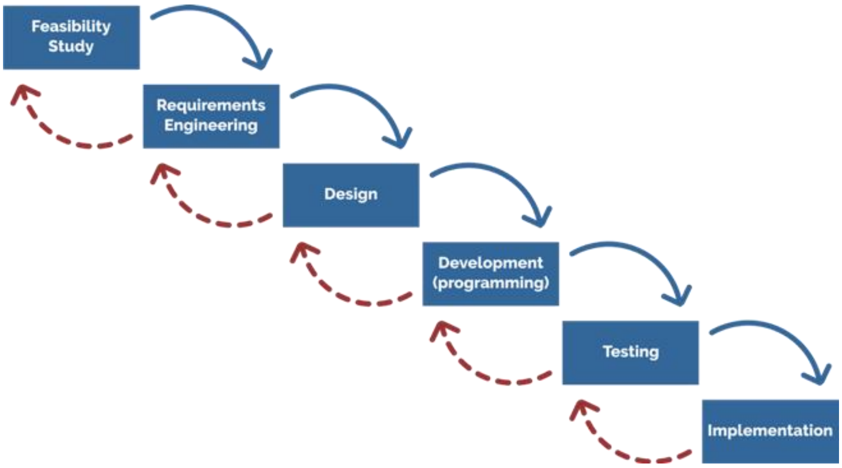


Figure 8 - Waterfall Approach

The waterfall approach creates a sort of *cognitive bias*, making it seem "obvious", both in definition and in intrinsic validity. Unfortunately, however, in reality this approach often leads to chaos and low productivity, not contemplating the importance of a *continuous review* of the hires made in relation to what concretely emerges from the field. In particular, it is a fact that, despite an attempt to create a specification of the detailed up-front requirements, it will not lead to defining them perfectly since the parties involved are not able to describe everything necessary at the beginning of the project and the needs change continuously.

3.2 The Agile Mindset

But what is Agile really? It is often easier to start by saying what *Agile is not*: it is neither a *methodology* nor a *process*, much less a miracle potion to make products or manage their production cycle. It is an *operational mindset*, based on the **Agile Manifesto**[6] that makes explicit its **Values** and **Principles**, from which countless *methodologies, frameworks and practices* developed over the years derive.

Agile implies **speed**, **lightness** and **ease of change**, thanks to a specific series of characteristics:

- *Iterative and incremental development:* the product is made in incremental units using short cycles (a few weeks) called *iterations*.
- *Active involvement of stakeholders*: in particular, the customer is constantly involved, allowing constant verification of what has been achieved and providing feedback on the matter.

[6] Agilemanifesto.org

- *Focus on value*: various components to be built are prioritized based on stakeholder needs, development risks, and business opportunities. The resulting order guides the short/medium-term development planning.
- *Fixed time*: each iteration has a limited duration of time, within which a new increment of the product is realized and delivered.
- *Adaptation*: the aim is to provide the appropriate tools for continuous adaptation to changing needs.
- *Team*: the development team is actively involved, and has a significant decision-making delegation.
- *People-centered: Strong emphasis is placed on how people work together, developing lasting social relationships*.
- *Rapid development and frequent releases:* allows for quick feedback and realigns with stakeholder expectations.
- *Focus on quality:* the specification of quality aspects, and the related related tasks, accompanies the entire development cycle, allowing defects to be resolved sooner, reducing their impact and cost.
- *Discipline*: Team members are called upon to be strongly focused on the related activities and respect the process that they themselves have helped to define.
- *Simplicity:* keeping everything as simple as possible promotes openness to change.

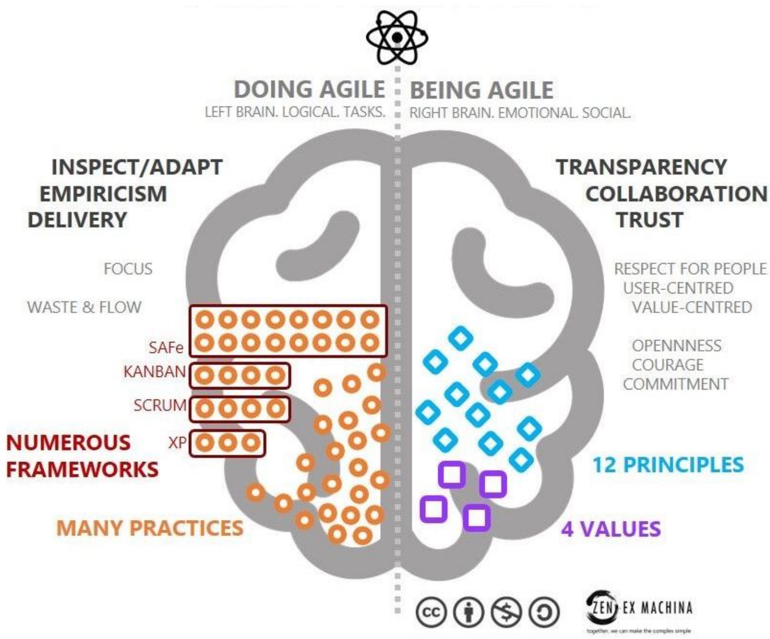


Figure 9 - The Agile Mindset

The goal is, therefore, to *satisfy all stakeholders*, creating the right balance with the needs and expectations attached to the sustainability and validity of the product. For this reason, it is necessary to have an organization that emphasizes the capabilities of product team members, emphasizing *collaboration*, rather than relying on a hierarchical formalization that attempts, in vain, to ensure the success of the initiative with bureaucratic methods and few inclined to change.

3.3 Modern evolutions of the reading of the Agile Manifesto

Although there are several Agile methodologies and frameworks, they all share a common vision and a set of basic Values, set out with simplicity in the **Agile Manifesto** [1].

Its formalization was the subject of the work of a group of 17 software designers and gurus and brought to the attention of the international community of professionals in the sector. The relative copyright (2001) indicates that what is contained therein can be freely reproduced in any form, as long as the copyright notice is included.

The Manifesto, under the pressure of movements such as *Modern Agile*[7] and *Heart of Agile*[8], is continuously the subject of reflection and in-depth analysis, and no longer considered only the prerogative of the software world. In particular, the **Disciplined Agile Manifesto**, i.e. the revision proposed by the *PMI Disciplined Agile framework*[9], expands the ecosystem of the sectors concerned, introducing only a few small variations to the *original Manifesto* in order to abstract it from the exclusive link with the software:

Individuals and interactions rather than processes and tools
Consumable solutions more than exhaustive documentation
Stakeholder collaboration more than contract negotiation
Responding to change more than following a plan

The fundamental thing, and well explained by the Manifesto itself, is that, without prejudice to the value of the voices on the right, those on the left are more important.
This clarification is very important, since in the past (but unfortunately still today) this aspect has been repeatedly underestimated, giving rise to myths or interpretations far from reality. For

[7] http://modernagile.org
[8] https://heartofagile.com
[9] https://www.pmi.org/disciplined-agile

example: in agile you do **documentation**, but not hundreds of pages that no one uses and updates, you do **planning**, but you recognize its limits in a complex and turbulent environment.

Moving on to the principles of the Disciplined Agile Manifesto, we have:

1. *Our top priority is to satisfy stakeholders by releasing valuable solutions, immediately and continuously.*
2. *We welcome changes in requirements, even at late stages of development. Agile processes leverage change to benefit the customer's competitive advantage.*
3. *We frequently deliver consumable solutions, ranging from a couple of weeks to a couple of months, preferring short periods.*
4. *Stakeholders and developers must work together on a daily basis throughout the project.*
5. *We build teams on motivated individuals. We give them the environment and support they need, and we trust them to get the job done.*
6. *A face-to-face conversation is the most efficient and effective way to communicate with the team and within the team.*
7. *Consumable solutions are the main measure of progress.*
8. *Agile processes promote a sustainable approach to release. Sponsors, developers, and users should be able to maintain a steady pace indefinitely.*
9. *The continuous focus on technical excellence and good design enhances agility.*
10. *Simplicity – the art of maximizing the amount of work left undone – is essential.*
11. *The best architectures, requirements, and design emerge from self-organizing teams.*
12. *At regular intervals, the team reflects on how to become more effective, then adjusts and adapts its behavior accordingly.*
13. *Leverage and help evolve the organizational resources available within your business ecosystem, and collaborate with the people responsible for this.*
14. *Always have a clear workflow so that you can develop a steady stream of releases that helps minimize ongoing tasks.*
15. *The organizational ecosystem must evolve to reflect and improve the activities of agile teams, but at the same time be flexible enough to support any non-agile or hybrid teams.*

Overall, the Manifesto highlights how at the center of all production action are the stakeholders (and end users in particular) and their needs, before any other aspect. An **Agile team** focuses above all on the quality perceived by the user, on his experience during the use of the product, on the satisfaction of needs and, consequently, on the continuous improvement of the production process and the technology behind the product.

The Manifesto does not specify any detail to be followed, which is indirectly left to specific *methodologies* or *frameworks* that define the set of supporting practices. It should be immediately emphasized that Agile is a means, not the end: the goal is not to "learn to do Scrum", but to learn the intrinsic value and create one's own declination of agility as soon as possible.

When you decide to embark on an Agile transformation journey, it is essential to ask yourself if you agree with the relevant Values and Principles, and only then start applying the techniques. If you start with the techniques, it is as if you were taking *the motorway in the wrong direction*, greatly reducing the possibility of having a real benefit from the route, if not, even, risking a worsening of the specific contextual situation.

3.4 Agile Development Cycle

As repeatedly highlighted, the *Agile Development Cycle* is characterized by the **iterative** and **incremental** approach: each iteration leads to the next piece of the puzzle, i.e. a working solution with its supporting elements (such as, for example, documentation, available for use by stakeholders). A typical iteration typically lasts two to four weeks and is on a fixed cadence.

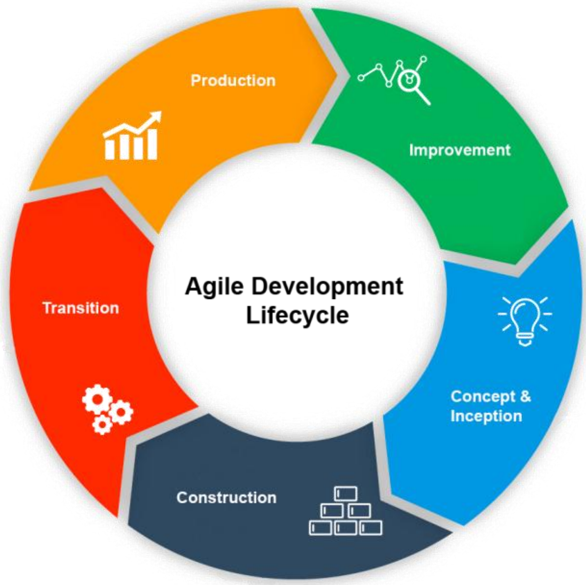


Figure 10 – Agile Development Lifecycle

Overall, an Agile Development Lifecycle can be represented by the following phases:

- **Concept & Inception**, in which the idea of the product is structured, its boundaries are defined and the sustainability of the initiative is evaluated and the main functions are defined. Typical activities are: team identification, creation of work environments, definition of the first backlog, etc.

- **Construction**, in which the product is developed iteratively and incrementally. The team works to deliver a working solution, working in successive iterations and leveraging ongoing feedback to align with updated stakeholder needs.
- **Transition**, in which the product is put into production (or delivered to the customer). Quality Assurance tests, internal and external training, documentation development and final release into production are carried out. All of this can happen, potentially, with each iteration.
- **Production**, in which the product is maintained and feedback is collected regarding its use and reliability.
- **Improvement**, in which the actions of evolution, improvement and maintenance of the product are implemented.

3.5 Main Frameworks and Methodologies

In general, **Agile** can be seen as an "*umbrella term*" that identifies a whole series of approaches capable of coping with the *risks* and *continuous changes* that affect complex areas.

Over the years, based on the Manifesto and empirical experiences, a series of frameworks and **methodologies** have been created that concretize everything in specific **practices**.

A **methodology** is a set of principles, tools, and practices that can be used to guide processes in order to achieve a certain goal. A **framework** is a loose, but incomplete, framework that provides the infrastructure of the process while leaving room for other practices and tools to include.

Each framework/methodology interprets and "makes its own" the Agile values through different practices, techniques, organizational structures and models, philosophical elements and principles. Some frameworks are designed to integrate with others, even in more traditional contexts, while others impose a specific model on the entire organization.

Among the most well-known frameworks (methodologies) are:

- ***Scrum**, certainly the most used framework at the individual team level for managing product/project development.*
- ***Extreme Programming**, the methodology most closely oriented to product quality.*
- ***Kanban**, of Lean derivation, focused on workflow optimization.*

Over the last few years, scaling frameworks have been added to the frameworks (methodologies) oriented to the individual team, which look at multiple teams, areas and the entire organization.

Generally, they are based on a mix of Agile and Lean elements, optimizing both effectiveness and efficiency in key *value streams.*

Among the most well-known frameworks are:

- ***SAFe*** *(**Scaled Agile Framework**), probably the most widely used scaling framework to date, even if the richness of what is proposed has led it to become particularly prescriptive and complex.*
- ***PMI Disciplined Agile****, the PMI framework, goal-driven and oriented to review the primary aspects of the organization according to the guided continuous learning philosophy.*
- ***Spotify "model",*** *a model derived from a photograph of Spotify's organizational model, particularly suitable in the evolutionary field.*
- ***LeSS*** *(**Large Scale Scrum),** designed to extend Scrum in relation to the collaboration of multiple teams on the same product.*
- ***AgilePM,*** *oriented to manage projects and not directly products in an Agile key.*

3 AgileBIM

3.1 Vision and Posters

The Vision of *AgileBIM* is well summarized by the **AgileBIM Poster** below:

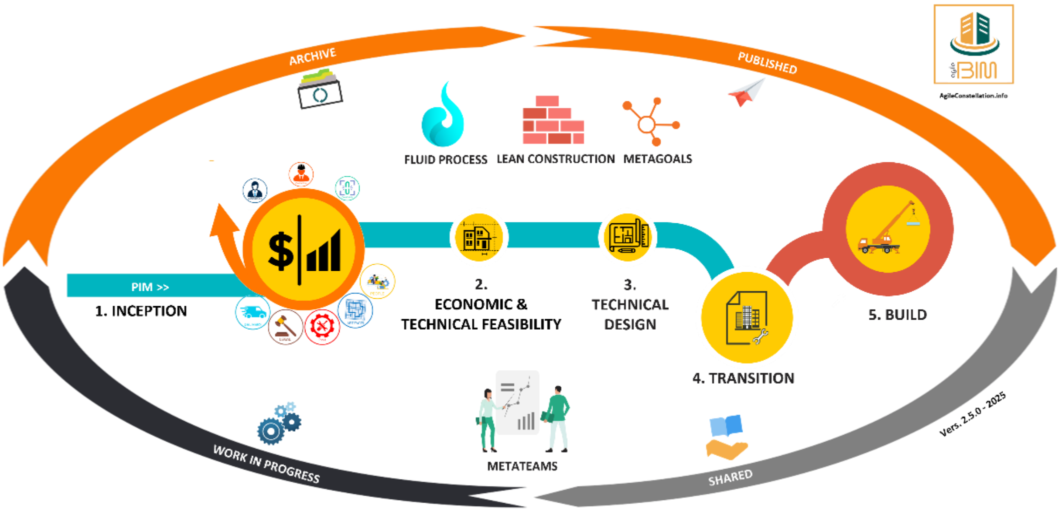
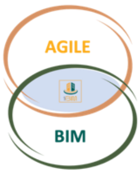


Figure 11 - AgileBIM Poster



The framework marries the Agile and Lean mindset, conveying the characterizing aspects of both approaches:

- *collaboration between all the figures involved in the different phases of the construction of a work.*
- *digital data sharing and interoperability through open formats.*
- *capacity for continuous improvement.*
- *propensity to constantly experiment with small incremental improvements.*

These aspects are at the intersection of BIM and Agile, as highlighted in the following table:

Agile	BIM
• **Active** customer engagement • **Multidisciplinary teams** with decision-making (power) delegation • **Requirements that evolve**, but in a time that is defined • Requirements expressed at different **levels** and in **a visual way**	• **Online platform** for collaboration, management and data exchange • Emphasis on **Team Collaboration** through Information Centralization (IFC, CDE) • **Involvement of customers/stakeholders** in the process (access to one or more of the 4 areas of the CDE)

• **Incremental** and **iterative** development in short cycles • Focus on **continuous release** • **Inspect and Adapt** • **Testing** as an integral part of development (early and often testing) • Collaborative **and** cooperative **approach** with stakeholders	• **Evaluation Gate** for information flow and coordination

Table 1: Central aspects of Agile and BIM

This results in a series of advantages that are the basis of the reasons for use:

- Faster **and More** Efficient **Machining**
- **Identification of bottlenecks in the process**, and related removal and/or mitigation actions
- Improved **Communication and Transparency**
- Time and **Cost Optimization**
- Increased **Quality of Work**
- **React to the unexpected**, without generating overloads
- **Work optimally without frustration**, thanks to satisfied and motivated teams
- Consistency with **BIM** Regulations **and** Reference Standards

As can be seen, much emphasis is placed on creating synergy between the people involved, putting them in the best possible operating conditions by focusing on the different operational phases.

This approach makes it possible to manage and validate the entire action of implementing the *Project Information Model* (*PIM*) up to the *Asset Information Model* (*AIM*).

3.2 Framework Fundamentals

AgileBIM introduces the concept of "Meta" (abstract) to frame the entire sphere of tools and activities that characterize the AEC (*Architecture, Engineering and Construction)* world:

- **Metaphases**: high-level work phases that take the form of a series of reference operational phases.
- **Metateams**: multidisciplinary teams with a common operational mindset that are specialized in relation to the metaphase and reference phase.
- **Metagoal**: common conceptual objectives, which make it possible to make the overall development action of a work coherent and comparable.

It is a guidance system that allows you to direct and factor efforts, making it possible to contextualize specific activities, while providing an overview consistent with the framework system.

Structurally, the framework is characterized by the following constituent elements:

- ***Metaphases and Phases***. The processes are divided into 2 *Metaphases, Design and Construction*. The Design Metaphase includes the phases of Inception, PFTE/Technical-Economic Feasibility (Economic & Technical Feasibility, Technical Design), Preparation (Transition). The metaphase of Construction is declined in the Construction phase (Building).
- ***Metateam and Team.*** The activities are developed by *the Design and Construction teams,* reference for the different metaphases, which specialize the general idea of metateam.
- ***Common Data Environment***, the environment for collaboration and management of models and documents.
- ***Fluid Process***, the operational process of design.
- ***Lean Construction**,* the construction process.
- ***Metagoal***, the conceptual set of standard processes.

Strong integration with the *Common Data Environment* (CDE) allows you to *collect*, *manage* and *exchange models*, *non-graphical data* and *documentation*, thus facilitating **collaboration** and helping to **avoid duplication and errors**. Please note that the CDE is developed through 4 stages (areas) specifying:

- **Work in Progress**, area of elaboration of the works.
- **Shared**, an area for sharing what has been achieved, not necessarily in a final state.
- **Published**, deposit of the final documents approved by the client: the work is ready to be carried out.
- **Archive**, storage area of all design and construction information.

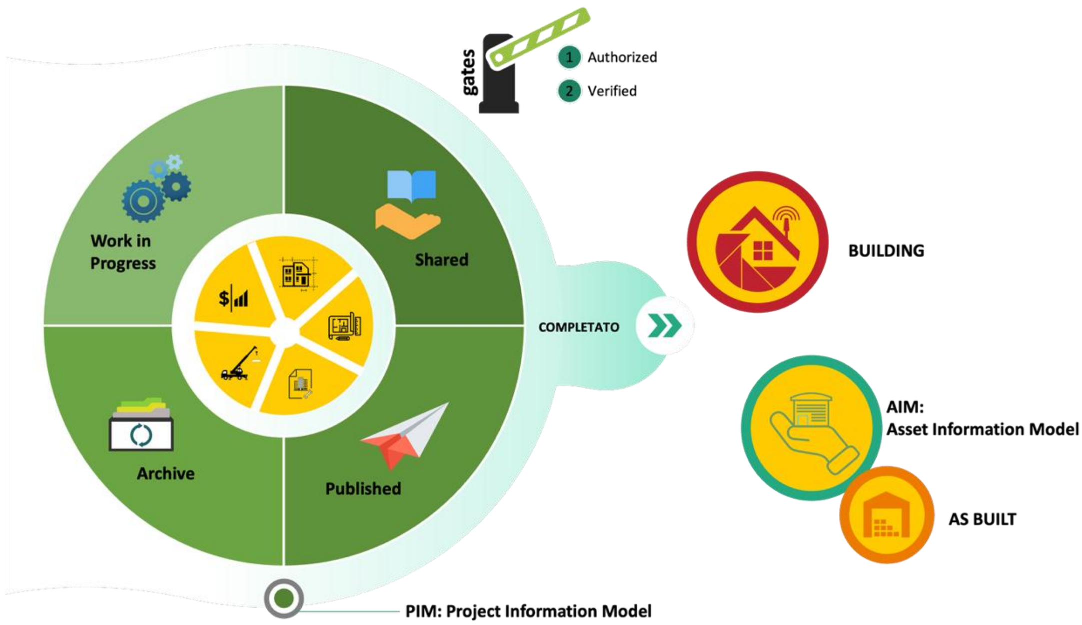


Figure 12 - AgileBIM & CDE

During each phase, team members use **work-in-progress** and **shared** environments to work on design elements and share them with other designers, the client, and related stakeholders. **Archive** is used as a continuous backup environment, while, once each individual phase is completed, the *gate authorized is activated* which brings everything to **published** and, consequently, updated again **archive**.

3.3 AgileBIM: an AgileConstellation Star

At the base of AgileBIM we find the Philosophy, *Principles and Practices* of the **AgileConstellation Manifesto**[10], of which AgileBIM is a *Star*, defining specific practices and principles related to the reference domain.

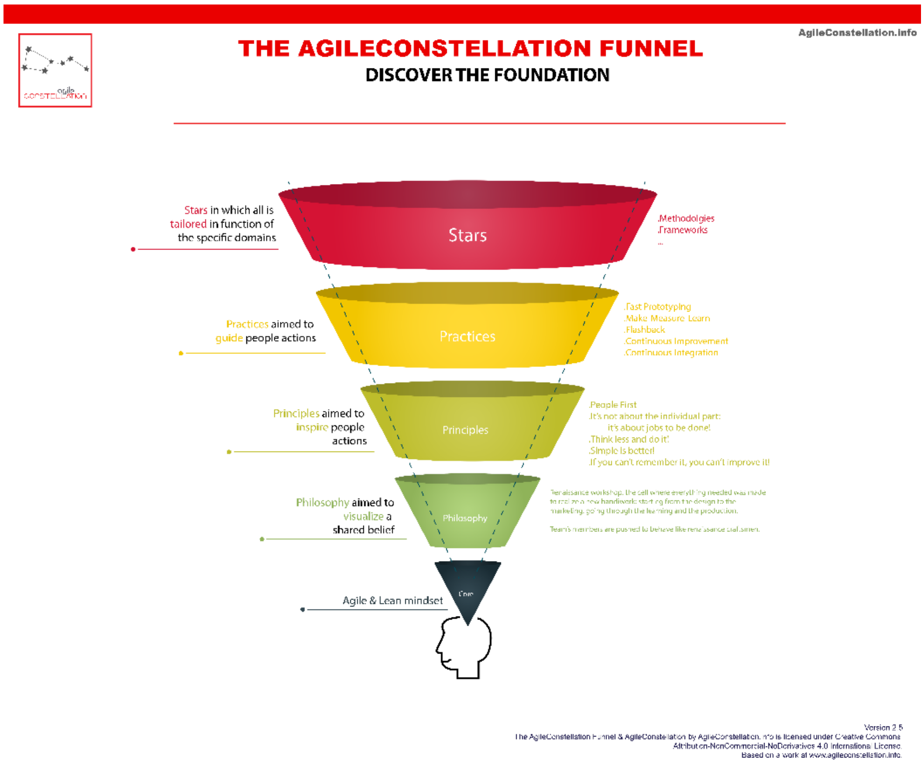


Figure 13 - AgileConstellation funnel

We have, therefore:

- **Philosophy**, inspired by the **Renaissance Workshop**, or the cell that fulfills what is necessary for the creation of a new work: from design, to construction and marketing.
- **Principles (core):**
    - *It is not a question of the individual parts: it is the whole that must be done well!*
    - *Think less and act sooner!*

---

[10] www.agileconstellation.info

    - *Simple is better!*
    - *If you can't remember it, you can't improve it!*
- **Practices (core):**
    - *Fast Prototyping*, validating the sustainability of the solution
    - *Make-Measure-Learn*, quickly experiment with different assumptions and assumptions
    - *Flashback*, quick alignment in which the observer goes to the work desk
    - *Continuous Improvement*, constantly improving every aspect
    - *Continuous Integration*, constantly integrating the different souls of the solution

3.4 Principles and Practices

The *principles* of AgileBIM, as anticipated, extend and specialize those of the *AgileConstellation Manifesto*, declining them in the specific domain:

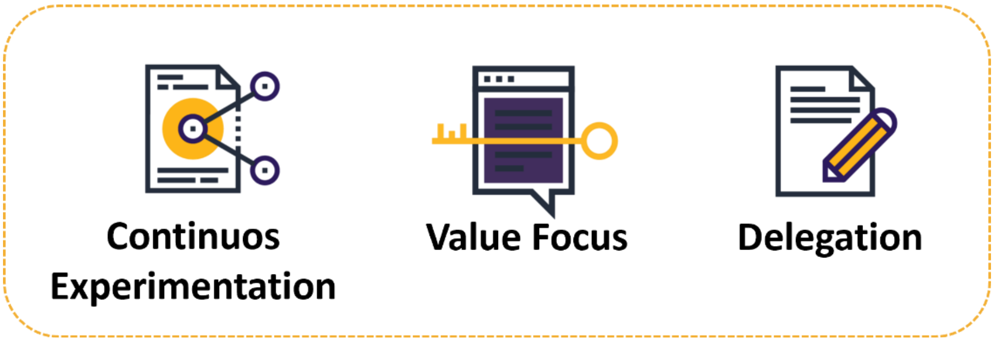


Figure 14 - AgileBIM Principles

In detail, we have:

- **Continuous Experimentation**. A mindset oriented towards Continuous Experimentation leads the work group to constantly experiment with new solutions. The *Inspect and Adapt* philosophy is part of the DNA of agile methodologies, pushing work teams to concretely engage in specific processes and adapt the operating model according to the evidence emerging from the field.
- **Value Focus**. Focusing on Value allows you to focus only on the elements that make a real contribution to the achievement of the project objectives. The goal is to phase out "ancillary" activities that create greater risk and lower value. The overall visibility of progress is supported by the use of *Visual Management tools*.
- **Delegation**. Each team member chooses for themselves which activity to do, among those planned, and commits to completing it to achieve the overall goal. Tasks are not assigned to team members by a team leader or project manager, *but each team member chooses for themselves* which task to do, among those planned, and commits to completing it to achieve

the overall goal. The team is *self-organized* and *multidisciplinary*, autonomously choosing the best way to achieve the goals.

In addition, the practice of *Fast Prototyping* (inherited from AgileConstellation) is the basis of the Inception phase, supporting the validation of the sustainability of the work and stimulating concrete feedback on what is about to be achieved.

Figure 15 - Fast Prototyping for AgileBIM

Compared to what was inherited from the basic practice[11], 3 new *reference aspects (bubbles)* are added:

- **Authorities**, i.e. the competent bodies and authorities to which authorizations are requested and on which one depends for the construction of the work.
- **Contractors,** professionals, specialists and third-party companies to be used in the project.
- **Constraints**, the specific constraints that the working group will have to explicitly take into account.

[11] AgileConstellation Manifesto – agileconstellation.info

4 Metateam and Team

4.1 Design and Construction Team

Starting from the already discussed concept of metateam, AgileBIM defines two specialization teams, directly connected to the Design and Construction Metaphases:

- ***Design Team**, focused on the metaphase of Design and related phases.*
- ***Construction Team**, focused on the metaphase of Construction and related phases.*

Each team is a *multidisciplinary working group* whose composition may vary with the addition of additional figures and experts.

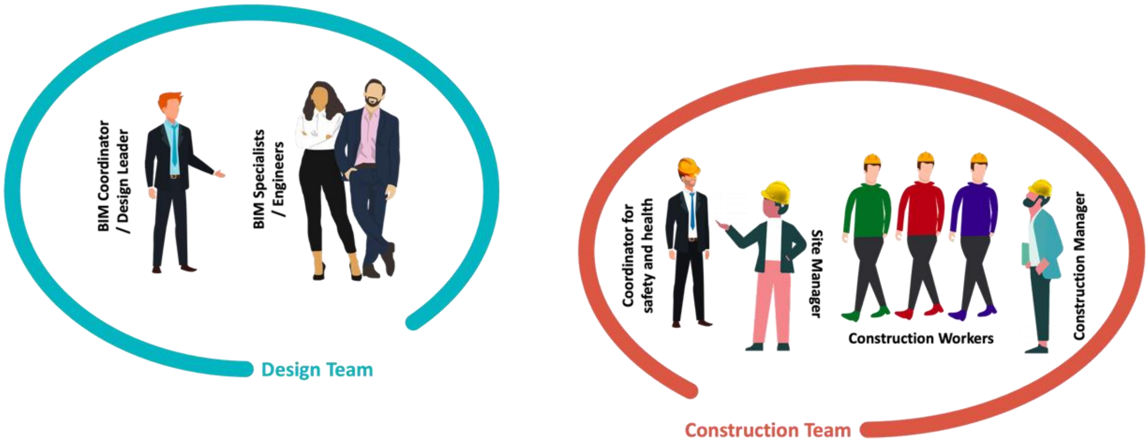
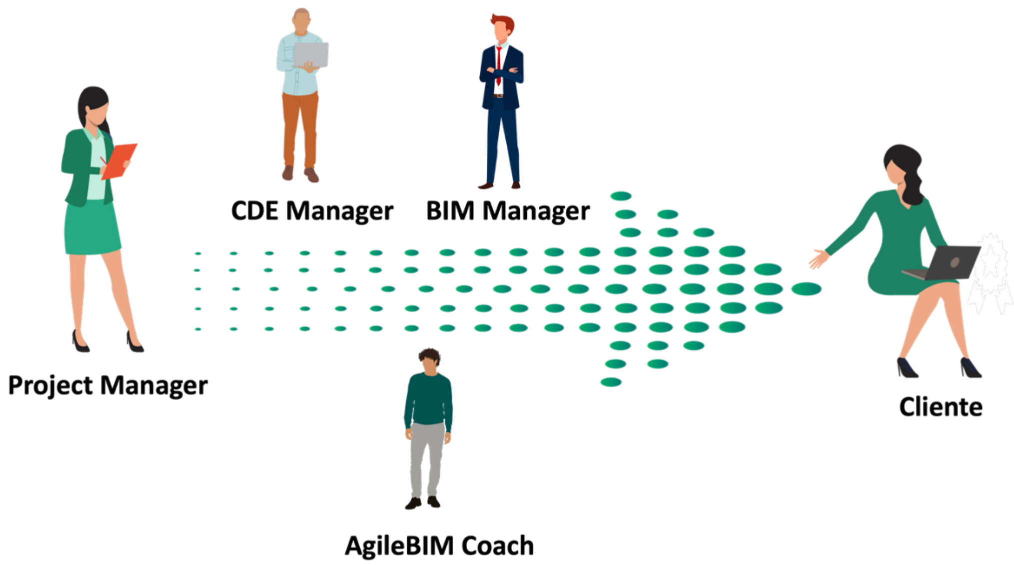


Figure 16 - AgileBIM Design and Construction Team

In addition, a series of key figures are identified that are transversal to the two teams:



4.2 Roles and Responsibilities

The **Roles** that characterize AgileBIM, and BIM in general, are indicated by the reference standards.

However, it is essential to avoid confusing roles with the professional titles of those belonging to the organization: rather, they are characterized by the **responsibilities** in managing the flow of information within the BIM process.

In addition, it is essential to highlight that the discussion is on the merits of the *Roles* and not of specific Positions. In this sense, it is not said that a specialist cannot temporally or stably cover several roles, if specific conditions make it necessary. However, it is recommended to have several people to whom at least the primary roles are associated, given the relative workload and the benefits that are generated by having multiple points of view on the project.

AgileBIM adopts the figures of the BIM world (*BIM Coordinator, BIM Manager, BIM Specialist, etc.)* by adding a series of roles to promote the correct management of the project and the adoption of the framework itself.

The different roles are detailed below.

4.2.1 Project Manager

The Project Manager adopts the mindset of Modern Management[12], and has the task of guiding and supervising the order in all its phases, ensuring compliance with times, costs, quality and customer satisfaction.

It is the point of reference between clients, internal teams and external stakeholders.

Placement in the AgileBIM framework

- Central role in every phase of the project cycle, with direct responsibility for Design and Construction.
- He collaborates closely with AgileBIM Coach, BIM Coordinator/Design Leader, Portfolio Manager.
- It uses the Project Backlog, Design Board and Construction Board as its main control tools.

Key responsibilities

- Definition and management of the contract and project objectives.
- Planning of activities and management of the interdisciplinary team.
- Monitoring costs, times, deviations, margins.
- Coordination of relationships with customers, institutions and suppliers.

[12] https://www.agileconstellation.info/it/stars-it/haikai-management-it

- Management reporting and review of project priorities.
- Management of risks, changes and criticalities.

Skills required

- Management of complex projects in the construction sector.
- Knowledge of project management techniques, works accounting, regulations.
- Leadership, communication, and negotiation skills.
- Familiarity with Lean and Agile methods applied to design/construction.
- Budgeting, planning and control skills.

Key Output

- Project Charter.
- Roadmap and milestones.
- Job budget and forecast.
- Variance analysis.
- Progress reports.

Tools used

- AgileBIM Project Canvas.
- AgileBIM Construction Board / Design Board.
- Planning tools (e.g. MS Project, Primavera).
- Dashboards and KPIs.
- CDE with technical and contractual documentation.

4.2.1.1 Measuring Role Effectiveness

The evaluation of effectiveness in the role passes through the following KPIs (Key Performance Index):

KPIs	Definition	Formula / Calculation Method	Objective	Motivation
% Iterations Completed in Time	Iterations completed on schedule	(Point Iterations / Total Iterations) x 100	≥ 90%	Measure the efficiency of the Fluid Process
Average Lead Time Processed	Average time to complete a paper from the backlog	Total days / Completed papers	≤ 10 days	Assesses the ability to iterative task management
Impediment Removal Index	Percentage of impediments resolved within 2 days	(Impediments resolved within 2 days / Total impediments) x 100	≥ 85%	Measures PM operational readiness
Board Update Compliance	Visual Board Update Frequency	Update Days / Iterations	≥ 1/day	Check continuous visibility of job status

Team Happiness Index	Team satisfaction and engagement	Survey on a scale of 1–5	≥ 4/5	Assess operational well-being according to Agile principles
Budget Adherence Index	Budget variance from planned	(Δ Budget / Expected Budget) x 100	±5%	Measure built-in financial control

4.2.2 BIM Coordinator/Design Leader

The **BIM Coordinator/Design Leader** is responsible for ensuring consistency and coordination between the BIM models produced by the various teams, ensuring compliance with standards, modeling rules and information objectives.

Placement in the AgileBIM framework

- A key figure in all phases of Design and in support of those of Construction.
- He collaborates with BIM Manager, BIM Specialist, Project Manager.
- It oversees the correct population of the CDE and the information quality of the models.
- Coordination of multidisciplinary BIM contributions.
- It promotes BIM culture within the organization.
- Supports the BIM Manager in the drafting and application of BIM procedures.

Main responsibilities

- Control of naming, classification, data structure rules.
- Support teams in modeling according to the expected standards.
- Validation of models for each Iteration.
- Verify the compliance of the models with the regulations and project standards

Skills required

- Excellent knowledge of BIM platforms (Revit, Archicad, etc.).
- Knowledge of UNI 11337, ISO 19650 standards.
- Technical design skills and multidisciplinary modeling.
- Organizational and relational skills.
- Clash detection and consistency issues.
- Knowledge of modeling and coordination software (Navisworks, Solibri, etc.)
- Mastery of the AgileBIM Design Board and BIM verification templates and standards.

Key Output

- Clash detection reports.
- Model validation reports.
- Compliance checklist.

- Contribution to BEP and updates.

Tools used

- AgileBIM Project Canvas.
- AgileBIM Design Board.

4.2.2.1 Measuring Role Effectiveness

The evaluation of effectiveness in the role passes through the following KPIs (Key Performance Index):

KPIs	Definition	Formula / Calculation Method	Objective	Motivation
% Projects in strategic alignment	Projects consistent with business objectives	(Aligned Projects / Total Projects) x 100	≥ 95%	Measures strategic coherence and effectiveness
% Projects in Limbo	Projects stopped beyond the limbo criteria	(Projects in limbo / Total projects) x 100	≤ 10%	Evaluate smooth portfolio management
Homogeneous load index	Resource Allocation Balance	Weekly analysis of capacity distribution	80–95%	Measure the balance in the distribution of work
% Timely and Complete Reporting	Regular and comprehensive reports to management	(Point Reports / Total Reports) x 100	100%	Evaluate transparency and governance
Project Turnover Index	Average metaphase crossing time	Days / Metaphases completed	Declining trend	Monitor project flow fluidity
Portfolio Value Index	Average value of ongoing projects	Average economic KPIs + stakeholder satisfaction	Growing trend	Measure overall portfolio effectiveness

4.2.3 BIM Manager

The **BIM Manager** defines the BIM strategy of the organization or project, overseeing the governance, standards, BEP, and consistency of digital processes.

Placement in the AgileBIM framework

- A programmatic or organization-level reference figure.
- He coordinates the BIM Coordinators of the various orders.
- He works in close synergy with the Portfolio Manager, PM, the AgileBIM Coach and the BIM Coordinators/Design Leaders, as well as with the Quality Manager.
- It facilitates communication between different project teams.
- Organizes and conducts coordination meetings.

Main responsibilities

- Select and integrate software and hardware tools for BIM implementation.
- Oversees interoperability between different systems.
- It ensures compliance with BIM regulations (e.g. UNI 11337, ISO 19650).

- Defines the procedures for information management.
- Defines and supervises digital processes at an organizational level.
- Coordinates BIM activities in company orders.
- He drafts and manages the BEP.
- Plan training and support for teams.
- Verifies the methodological consistency between orders.

Skills required

- Leadership in digitalization and BIM standards.
- In-depth knowledge of regulations, software and processes.
- Change management and digital governance skills.
- Skills in digital strategy and IT architectures.
- Use of the data sharing environment (CDE) and quality audit tools.
- Definition of standards, templates and naming conventions.

Key Output

- BEP and operational guidelines.
- Standard documentation.
- Information Specifications (CI), Information Management Offer (oGI) and Information Management Plan (pGI).
- Training and coaching plans.
- Project templates.

Tools used

- AgileBIM Project Canvas.
- AgileBIM Portfolio Board

4.2.3.1 Measuring Role Effectiveness

The evaluation of effectiveness in the role passes through the following KPIs (Key Performance Index):

KPIs	Definition	Formula / Calculation Method	Objective	Motivation
First Review Compliant Documentation	Papers corrected at the first revision	(Papers without reliefs / Total papers sent) x 100	≥ 95%	Reduces rework and increases quality
Lead Time Elaborated Design	Average time to complete a paper	Completed Days / Papers	≤ 12 days	Measures the speed and quality of the duty cycle
Visual Board Compliance	Design Board Refresh Rate	Update Days / Iterations	≥ 1/day	Ensures constant visibility of project status

Interdisciplinary Coordination Index	Multi-disciplinary team alignment	Survey + Monthly Feedback	≥ 4/5	Evaluate team management effectiveness
Reworking Rate	Index of rework of the documents	(Papers reviewed / Total deliverables) x 100	≤ 10%	Indicates initial quality and understanding of requirements
Iterative Completion	% items completed in a single iteration	(Completed Items / Iteration Items) x 100	≥ 80%	Verification of the effectiveness of Agile planning and delivery

4.2.4 BIM Specialist/Engineer

The **BIM Specialist/Engineer** creates the information models relating to his or her discipline (architectural, structural, plant engineering), taking care of quality, consistency and compliance with information requirements.

Placement in the AgileBIM framework

- He works in disciplinary teams within Iterations.
- He collaborates with the BIM Coordinator/Design Leader and the other BIM Specialists/Engineers.
- It feeds the Design Board directly through the drawings.
- Collaborate with other professionals to integrate different disciplines into the model.
- Provides technical support to team members.

Main responsibilities

- Contributes to information modeling in individual orders.
- Collaborate with the BIM Coordinator to ensure model consistency.
- Precision, attention to detail, collaborative skills.
- BIM modeling based on defined rules.
- Troubleshooting clashes and specific issues
- Ensures that models comply with regulatory requirements.

Skills required

- Use modeling software (e.g., Revit, ArchiCAD) to create and manage BIM models.
- Integrate technical data and information into models.
- Verification of models with check tools.
- Knowledge of BIM regulations and rules.
- It applies the procedures and standards defined in the pGI.
- Information population according to the expected standards.

Key Output

- Disciplinary models.
- Graphic drawings and calculations.
- Linked fact sheets.

Tools used

- AgileBIM Project Canvas.
- AgileBIM Design Board.
- BIM & CDE software.

4.2.4.1 Measuring Role Effectiveness

The evaluation of effectiveness in the role passes through the following KPIs (Key Performance Index):

KPIs	Definition	Formula / Calculation Method	Objective	Motivation
Quality Processed at the First Review	Percentage of unsurveyed papers	(Papers approved immediately / Total deliverables) x 100	≥ 95%	Measure technical and regulatory proficiency
Mentoring to Juniors	Weekly shadowing sessions	N° documented sessions / Week	≥ 1	Consider actively supporting your team's growth
Processed lead times	Average time to complete	Completed Days / Papers	≤ 10 days	Check technical productivity
Regulatory Compliance Index	Documents compliant with regulations	(Legally corrected documents / Total documents) x 100	≥ 98%	Ensures regulatory reliability
Next Review Index	Rework rate	(Rework / Total Processed) x 100	≤ 10%	Measure initial understanding of requirements
Qualitative Feedback from PM and DeL	Internal evaluation	Average feedback on a scale of 1–5	≥ 4/5	Detect internal professional recognition

4.2.5 Portfolio Manager

The **Portfolio Manager** ensures the strategic and integrated management of the BIM project portfolio and initiatives, ensuring that resources are directed towards the activities of greatest value for the organization.

He oversees the entire life cycle of the projects in the portfolio, ensuring alignment with the company vision, development objectives and sustainability, quality and innovation guidelines.

The Portfolio Manager monitors the progress, resource allocation, costs and expected benefits for each project, proactively intervening in the event of deviations or risks. It promotes decision-making transparency, communication between stakeholders and the prioritization of initiatives according to clear and shared criteria. It promotes the culture of incremental value and supports PMs in managing strategic trade-offs.

Placement in the AgileBIM framework

- Transversal figure with governance responsibilities.
- He collaborates with Project Manager, BIM Manager, BIM Coordinator/Design Leader and company leadership.
- He manages and keeps the AgileBIM Portfolio Board updated.

Key responsibilities

- Management and updating of the portfolio of projects and initiatives.
- Evaluation and selection of project proposals according to criteria of value and feasibility.
- Monitor costs, time, risks, and resources at an aggregate level.
- Portfolio analysis (scenario evaluation, impact simulations, rebalancing).
- Promotion of frameworks and tools for portfolio governance (dashboards, KPIs, lean/agile methods).
- Coordination between similar or interdependent projects.
- Strategic reporting for stakeholders and management.

Skills required

- Advanced knowledge of project, program and portfolio management (PPM).
- Familiarity with decision-making methods and prioritization (MoSCoW, WSJF, risk/value matrix).
- Strategic analysis skills and overview.
- Experience in complex multi-project contexts (preferably AEC).
- Communication, negotiation and indirect leadership skills.
- Use of portfolio analytics and KPI-driven management tools.

Key Output

- Updated AgileBIM Portfolio Board.
- Periodic reports on the performance of the portfolio.
- Cost/benefit, risk and resource analysis at the macro level.
- Project priority matrix.
- Strategic roadmap and management dashboards.

Tools used

- AgileBIM Portfolio Board.
- Portfolio Canvas (Project Canvas, Value Matrix).

- Digital monitoring and reporting tools (Power BI, Jira Align, Smartsheet, etc.).
- Aggregated indicators and portfolio KPIs (value, risk, progress, sustainability, available capacity).

4.2.6 Quality Management Manager

The **Quality Manager** ensures the application and monitoring of the company's and/or order Quality Management System (QMS), ensuring that the processes, activities and design and construction outputs comply with the regulatory and contractual requirements and the defined standards.

Placement in the AgileBIM framework

- It oversees the entire design life cycle (Design & Construction) in a transversal way
- He actively collaborates with the PM, the BIM Coordinator/Design Leader and the BIM Manager in the verification of the quality of the documents and in the management of the processes.

Key responsibilities

- Definition, updating and dissemination of quality procedures.
- Planning and management of internal quality audits.
- Support for the drafting of the Quality Plan (PdQ) and its updates.
- Monitoring of quality indicators (KPIs, NCRs, Lessons Learned).
- Coordination of corrective and preventive actions (CAPA).
- Monitoring compliance with applicable technical and contractual regulations.
- Verification of the quality of the works in line with the Design Board / Construction Board.
- Promotion of a culture of quality within teams.

Skills required

- In-depth knowledge of ISO 9001, UNI 11337 and industry standards.
- Ability to draft, implement and control quality systems.
- Familiarity with Lean, Agile approaches and Continuous Improvement tools.
- Mastery of document flows on CDE (Common Data Environment).
- Soft skills: attention to detail, interpersonal skills, problem solving, assertiveness.

Key Output

- Quality Plan.
- Audit and Non-Compliance Reports.
- Quality indicators and periodic reporting.
- Contributions to post-mortem / retrospective reviews.
- Improvement actions and CAPA.

Tools used

- AgileBIM Construction Board and Design Board.
- PdQ (Quality Plan) template.
- Non-Compliance Register (NCR).
- CDE with auditable traceability.
- Quality dashboard and KPIs.

4.2.6.1 *Measuring Role Effectiveness*

The evaluation of effectiveness in the role passes through the following KPIs (Key Performance Index):

KPIs	Definition	Formula / Calculation Method	Objective	Motivation
Non-Conformity Index	NC by process or project	(NC / Total Processes/Projects) x 100	≤ 5%	Evaluate the effectiveness of controls
Mean NC Resolution Time	Average duration for NC closure	Sum of days / NC closed	≤ 10 days	Corrective Reactivity Measurement
Audit Coverage	% audits carried out on planned	(Completed Audits / Expected Audits) x 100	100%	Check the completeness of the checks
Index of improvement actions implemented	% improvements implemented	(Actions Implemented / Actions Planned) x 100	≥ 90%	Monitor continuous improvement
Compliance Definition of Done	Completed tasks according to DoD	(DoD Respected / Total Item) x 100	≥ 95%	Measure the inherent quality of deliveries
Visual Board Quality Index	% of activities tracked on boards	(Board Assets / Total Assets) x 100	100%	Measure adherence to AgileBIM tools

4.2.7 AgileBIM Coach

The **AgileBIM Coach** guides the adoption of the AgileBIM framework within the organization or projects, supporting continuous improvement, training and the Lean/Agile mindset.

Placement in the AgileBIM framework

- Role across teams and organizational levels.
- He works alongside PMs, BIM Managers and BIM Specialists, Portfolio Managers and the entire organization.
- Oversees the correct use of canvas, boards and AgileBIM artifacts.

Key responsibilities

- Facilitation of teams in Iteration management.
- Coaching on AgileBIM tools and practices.

- Support for the definition of Project Backlogs.
- Retrospective support and continuous improvement.

Skills required

- Experience in Agile and Lean applied to the AEC sector.
- Facilitation, listening and problem solving skills.
- Familiarity with hybrid organizational models.

Key Output

- Coaching sessions.
- Retrospectives and lessons learned.
- Widespread adoption of the framework.

Tools used

- AgileBIM Project Canvas.
- Design/Construction Board.
- Retrospective and Iteration Planning format.
- AgileBIM maturity dashboard.

4.2.8 CDE Manager

The **CDE Manager** manages the *Common Data Environment* (CDE), ensuring the security, traceability and accessibility of project and contract information.

Placement in the AgileBIM framework

- He works transversally in Design and Construction.
- He collaborates with BIM Manager, BIM Coordinator/Design Leader and PM.
- Ensures the structure and information integrity of the document system.
- Collaborate with all team members to ensure effective communication.

Key responsibilities

- Manages the data sharing environment (CDE) to ensure the accessibility and consistency of information.
- Supports traceability and interoperability of project data
- Document versioning and publishing.
- Supervision of approval and signature flows.
- Integrate BIM tools with boards and other AgileBIM work tools.
- Implement IT solutions for secure and efficient data management.
- Monitor and maintain the CDE's infrastructure.
- Provides training on the use of the CDE.

Skills required

- In-depth knowledge of the main CDEs (ACDat, ACC, etc.).
- Familiarity with ISO 19650 standards and digital processes.
- Accuracy, analytical capacity and IT support.

Key Output

- CDE environment configured and running.
- User manual and operational support.
- It defines the rules for accessing and sharing information.
- Access log, versions, audits.

Tools used

- CDE platform.
- Access control dashboard.
- Document approval template.
- Electronic signature systems. Verification tool.

4.2.9 Client (Client)

The **Client** (**Client**) provides direction, requirements and strategic vision for the project.

He has an active role in defining value objectives, constraints and priorities, participating in Iteration Reviews and approving key deliverables.

Placement in the AgileBIM framework

- Oversees the initial phases of Inception and participates in the validation of each Iteration.
- Collaborate with the PM, the Project Team and the AgileBIM Coach to align expectations.
- He is an active part of the governance of the project.

Key responsibilities

- Definition of project objectives.
- Validation of the Project Canvas and the Project Backlog.
- Active participation in Reviews and Retrospectives.
- Evaluation of the value generated.

Skills required

- Ability to express requirements and priorities.
- Strategic vision and value orientation.
- Ability to dialogue with technical teams.

Key Output

- Requirements and constraints.
- Validation of the Project Canvas.
- Iterative feedback.
- Tools used.
- AgileBIM Project Canvas.
- Project Backlog.
- Iteration Review.

4.2.10 Construction Manager (DLL)

The **Construction Manager** (**DLL**) ensures the regular execution of the work in accordance with the approved project, the contract and the regulations in force.

Coordinates the players in the field, verifies quality, costs and times.

Placement in the AgileBIM framework

- Crucial figure in the Construction phase.
- He works with PM, Site Manager, RUP, CSP/CSE.
- Validate the papers in the Construction Board.

Key responsibilities

- Technical-administrative control of the work.
- Verification of the quality and conformity of the works.
- Issue of SALs, certificates and variants.
- Safety supervision.

Skills required

- Construction site experience and technical regulations.
- Authority, conflict management.
- Precision and contractual knowledge.

Key Output

- Verification and approval reports.
- Work Progress (SAL).
- Execution Quality Report.

Tools used

- CDE.
- AgileBIM Construction Board.
- Minutes, check-lists, accounting documents.

4.2.11 Site Manager (DC also Site Manager)

The **Site Manager** (**also DC**) is responsible for the execution of the work in the field.

It coordinates workers, suppliers, subcontractors, ensuring compliance with deadlines, safety and quality.

Placement in the AgileBIM framework

- Continuously present in the Construction phase.
- He collaborates with DLL, PM, CSP/CSE and Production Managers.
- Provides concrete feedback to the Construction Board.

Key responsibilities

- Planning and management of daily activities.
- Coordination of operational teams.
- Control of the progress of the work.
- Reporting critical issues and operational proposals.

Skills required

- Field experience and leadership.
- Technical-operational and regulatory skills.
- Decision-making skills, problem solving.

Key Output

- Work diary and construction site journal.
- Weekly planning.
- Operational feedback for Construction Board.

Tools used

- Operational planning.
- Construction site dashboards.
- Construction Board.

4.2.12 Coordinator for Safety and Health (CSE)

The **Coordinator for Safety and Health (CSE**) is Ensures compliance with health and safety regulations on construction sites.

It draws up and updates PSCs, assesses risks and coordinates the companies involved.

Placement in the AgileBIM framework

- Central figure in Pre-construction and Construction.

- He works with PM, DLL, DC and Corporate Safety Manager.
- He oversees the CDE for the necessary documentation.

Key responsibilities

- PSC drafting and updating.
- Coordination between companies.
- POS verification and security documents.
- Inspections, reports, work suspensions.

Skills required

- CSP/CSE Qualification
- Knowledge of construction site safety regulations
- Interpersonal skills, assertiveness

Key Output

- Coordination documents and minutes.
- Inspection and reporting reports.
- Auditable documentation.

Tools used

- CDE (security area).
- AgileBIM Construction Board.
- Security log.

4.2.13 Construction Workers

Construction Workers represent the operational force of the project during the execution phase.

They are responsible for the material execution of building, plant and structural work according to the drawings, operating instructions and safety requirements. Masons, carpenters, electricians, plumbers, welders and other specialized technical profiles contribute to the realization of the work, ensuring its executive quality.

Their role is essential for the success of the work: they operate with attention to detail, respect the assigned deadlines and collaborate with site technicians (DC, DLL, CSE) to report problems, critical issues and practical suggestions, contributing to continuous improvement in a Lean logic.

Placement in the AgileBIM framework

- Active in the Construction Metaphase.
- Coordinated by the Site Manager and in interaction with the Works Manager, CSE, Company Safety Manager.

- They can be involved in the Daily Briefing or the Construction Board's weekly alignment moments.

Key responsibilities

- Execution of assigned tasks according to project and schedule.
- Proper use of equipment, materials, and PPE.
- Timely reporting of anomalies, design errors or executive problems.
- Compliance with safety, environmental and quality standards.
- Collaboration in field checks and documentation of the activities carried out.

Skills required

- Technical qualification or direct experience in specific tasks.
- Basic knowledge of safety regulations.
- Manual skills and attention to the quality of work.
- Team spirit, autonomy and operational responsibility.

Key Output

- Work carried out according to project and schedule.
- Verification and traceability sheets.
- Any reports of anomalies, discrepancies or suggestions.

Tools used

- Operational tools and equipment.
- Paper or digital technical documentation.
- Construction Board (for briefing or visual management in the field).
- PPE and daily safety checklist .

4.3 Triumvirates

A **Triumvirate** is a small leadership group that meets constantly to define the guidelines for the team, in order to balance its different impactful souls.

For the Design Team, the **Triumvirate Design Team** consists of the PM, the BIM Manager and the BIM Coordinator/Design Leader.

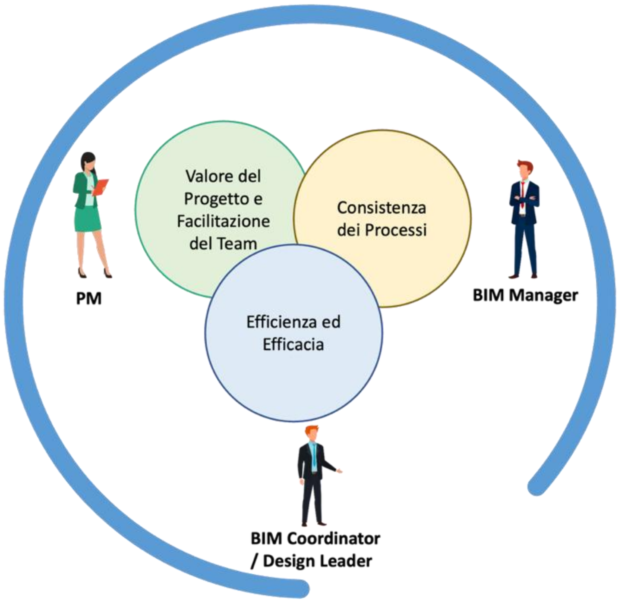


Figura 17 - Design Team Triumvirate

Looking at the **Construction Team Triumvirate in two**, we find the *Safety Manager*, the *Site Manager* and the *Construction Manager* give life to the **Construction Triumvirate.**

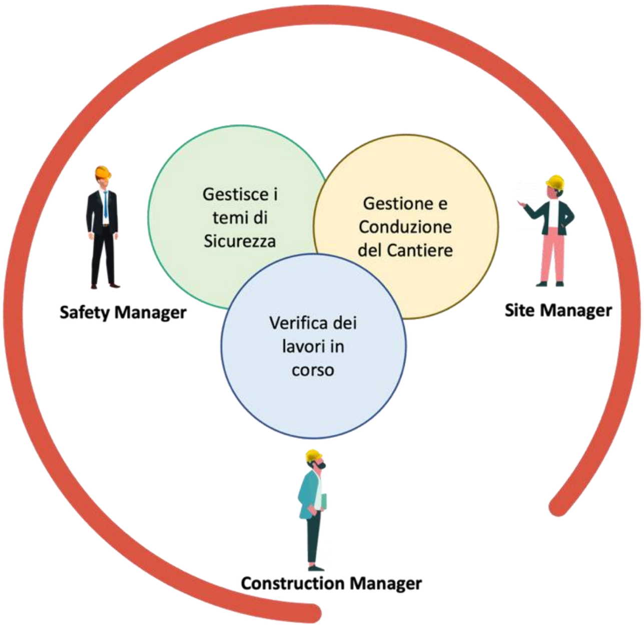


Figure 18 - Construction Team Triumvirate

5 Metaphases and Phases

In AgileBIM, **Metaphases** play a leading role as a synthesis: they are in fact reference "container phases". Dually, the **Phases**, representing the different moments of realization of the drawings, as well as the related information flow, necessary to advance the state of processing of a work.

Metaphases are

- **Design**, dedicated to design, consists of the phases of: Start-up, Technical Feasibility-Economy, Executive and Transition.
- **Construction**, dedicated to the construction phase of the work and consists of the Build phase.

In detail, the phases are:

- **Inception**, allows you to explain the objectives underlying the project itself, identifying the key aspects such as the work to be carried out and the related costs.
- **PFTE (Technical-Economic Feasibility - Economic & Technical Feasibility),** in which the project containing all the elements necessary for the purposes of the permits, the assessment of urban planning compliance or other equivalent act is drawn up. It consists of a descriptive report of the design elements accompanied by graphic drawings, preliminary investigations and calculations on the characteristics of the work, structures and systems, analysis of the quantities and expected costs, as well as an estimated bill of quantities. It consists of the following papers:
    - general report.
    - technical reports and specialist reports.
    - planoaltimetric surveys and detailed study of urban insertion.
    - graphic drawings.
    - environmental impact study where required by current regulations or environmental feasibility study.
    - Calculations of structures and systems.
    - descriptive and performance specifications of the technical elements.
    - census and interference resolution project.
    - expropriation parcel plan.
    - list of unit prices and any analyses.
    - Estimated metric calculation.
- **Executive (Technical Design),** in which the *executive project* is drawn up, in accordance with the final project, determining in every detail the works to be carried out and the relative expected cost. It must be developed at a level of definition such as to allow each element to

be identifiable in shape, type, quality, size and price. Only site operational plans, procurement plans, as well as calculations and graphs relating to provisional works are excluded. It must be drawn up in the most complete form, with a series of documents and attachments:
    - general report.
    - specialist reports.
    - graphic drawings also including those of the structures, plants and environmental restoration and improvement.
    - executive calculations of structures and systems.
    - maintenance plan of the work and its parts.
    - safety plan, coordination and workforce incidence framework.
    - Estimated bill of quantities and economic framework.
    - Timetable.
    - list of unit prices and any analyses.
    - draft contract and special tender specifications.
    - expropriation parcel plan.
- **Transition,** is the downstream phase of the executive design and is focused on the preparation of everything necessary to start the construction phase of the work. This phase can be approached differently depending on:
    - *Designer also in charge of the Works Management*, in this case the project advances in continuity and under the responsibility of those who also took care of the design phases.
    - *Works Manager different from the Designer*, in this case the transfer takes place to the works manager in charge, who is always a third party of the contractor. All the related documentation present in the Published stage of the CDE is made available in the form of a "BIM Package" and can be imported into a new BIM platform managed by the Works Manager or directly by the contractor.
- **Construction**, is the construction phase of the work, in which the companies and professionals of the various areas of intervention are engaged, directed and managed. At the end of the phase, in addition to the work, the *Asset Information Modeling* (AIM) will be obtained, containing, among other things, the documentation of the AS BUILT.

The design metaphase is focused on the creation of the **Project Information Model (PMI),** to support all the actions for the construction of the work, and of the **Asset Information Model (AIM)** which, downstream of the construction of the work, will reside in the Archive in the final version to be drawn on for subsequent interventions, such as maintenance.

One of the important elements of metaphases and *phases* is their ability to allow valid tracking of the status of the processes, thanks to appropriate tools that will be illustrated below, the specific progress status.

5.1 BIM Execution Plan Workflow

AgileBIM provides an overview of the activities related to the BEP, defining the **BEP Workflow** *(Business Execution Plan Workflow)* which aims to give a view of the primary steps attached, leaving the specific contextualization to the team in charge.

Still with a very abstract view, the relative BEP workflow is as follows:

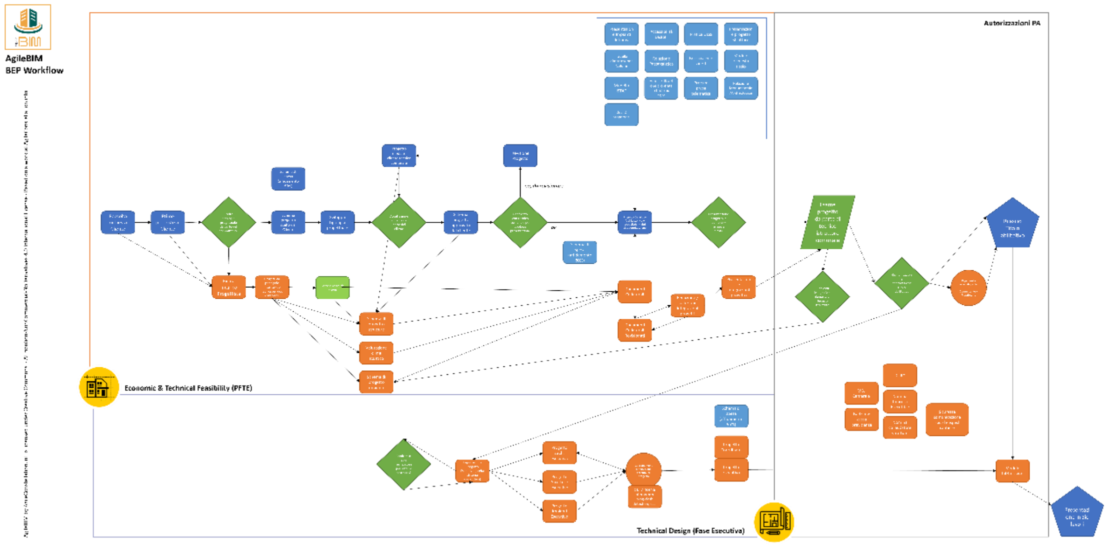


Figure 19 - Informative workflow of the design metaphase

Going to explode every single phase, we have:

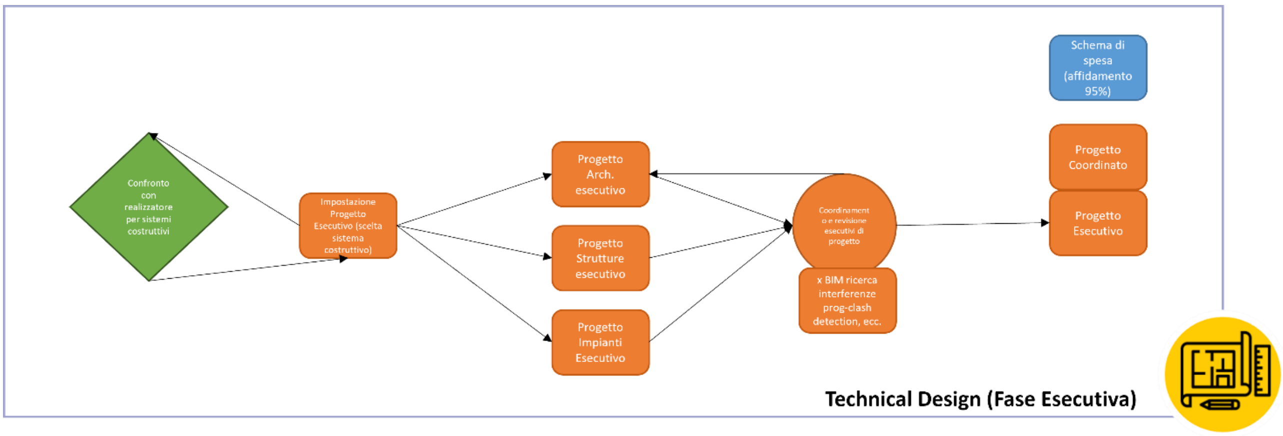


Figure 20 - BEP Workflow: Technical Design

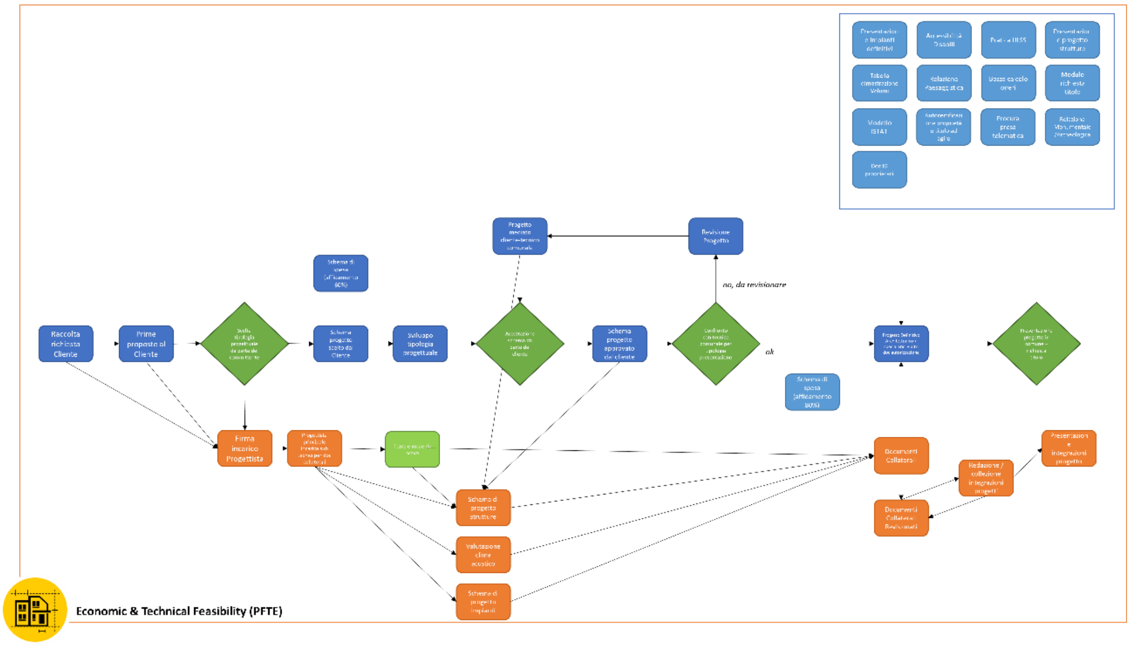


Figure 21 – BEP Workflow: Economic & Technical Feasibility (PFTE)

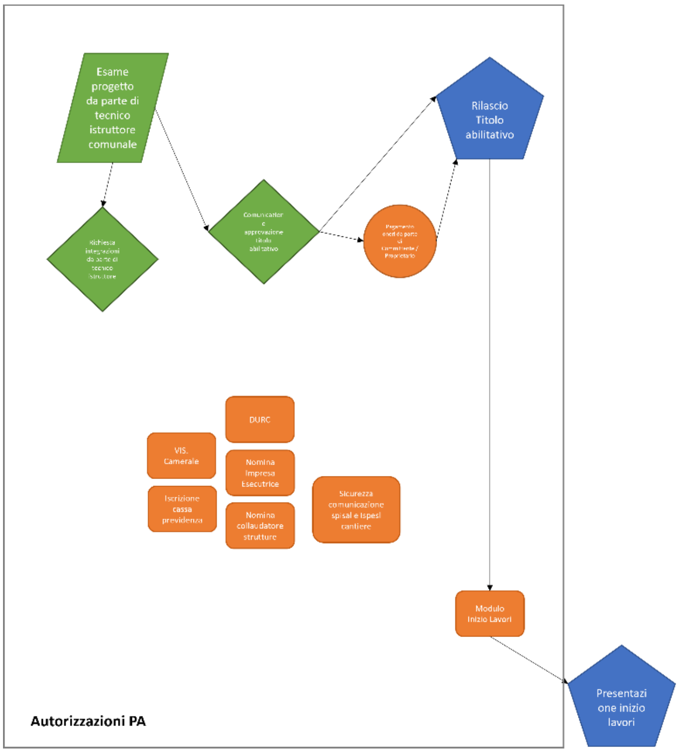


Figure 22 – BEP Workflow: public administration (PA) authorizations

5.2 Customizing Metaphases and Phases

Metaphases and phases are in themselves homogeneous containers of activities that allow the progress of the work in the different phases to advance.

Because of this, they can, and often must, be customized in relation to the specific project.
An example of customization is the one shown in the following figure:

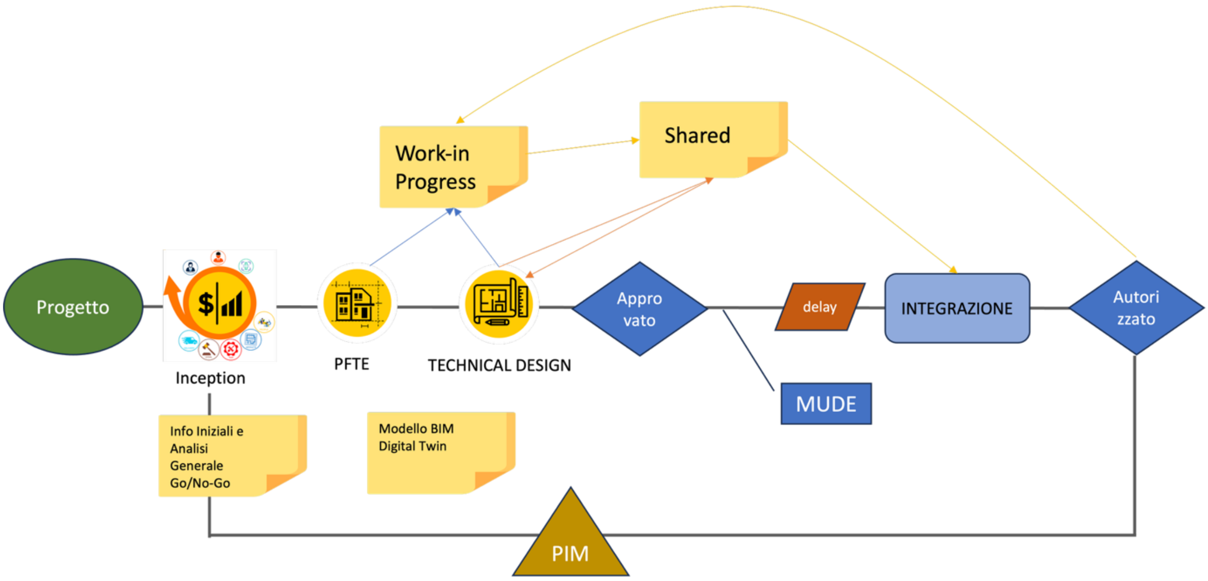


Figure 23 – Custom phases for a reconstruction project

In the figure it is possible to see how a specialization of the design metaphase adapted to follow the real information workflow.

In particular, the *Inception* and *PFTE* phases are substantially preserved, but the Final phase is removed and downstream two new phases are added, generically referred to *as MUDE* (in assonance with the management system of the Single Digital Model for Construction) and *Integrative Phase*, to group the activities necessary to integrate the executive project with the requests received from the public administration.

6 Design Metaphase

6.1 AgileBIM Fluid Process

The Design Team organizes its work based on the process called **Fluid Process**, which is based on the ScrumBan hybrid approach and takes the form of the following flow:

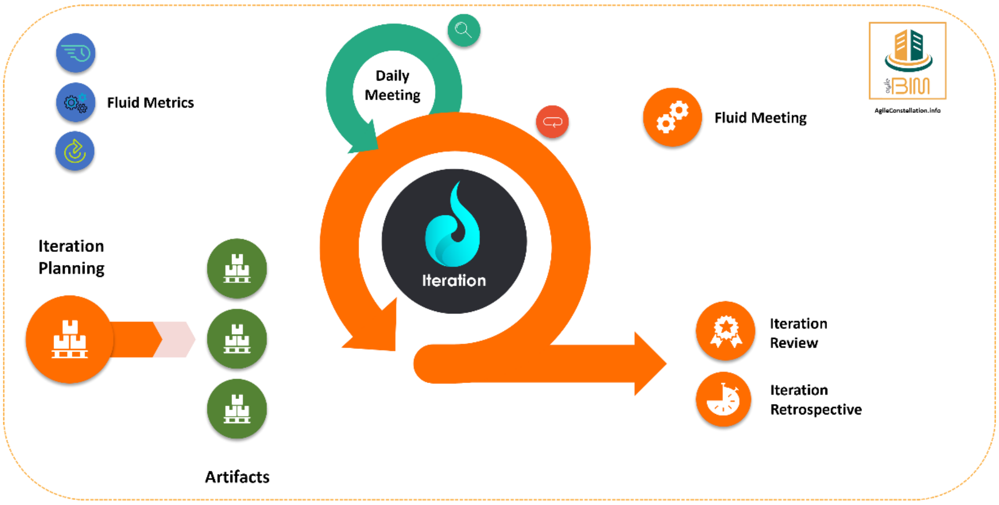


Figure 24 - Fluid Process

The **Fluid Process** is inspired by the *ScrumBan* approach, combining the prescriptive nature of the *Scrum* framework, particularly with regard to time management and event cadence, with the natural focus on the overall flow of Kanban.

The goal is to focus on the value to be achieved by making the load sustainable, always preferring an intrinsic quality of what has been achieved. All this favors the **flexibility to adapt to the needs of stakeholders**, as well as to those of production, without being **constrained** by an overly prescriptive framework that forces you **to find continuous workarounds in order to function in appearance**.

The salient aspects of the Fluid Process focus on:

- **Manage and Visualize the Flow**, so that you are constantly aware of what is happening in the workgroup.
- **Limit the Work in Progress**, i.e. size the number of jobs on the real operational capabilities of the team.
- **Working in Short Cycles**, which allow you to evaluate the progress of the work and that of improving the synergy of the team
- **Generate Multilevel Feedback**, to stimulate various moments of discussion, anticipating them as much as possible to reduce the impacts of any impediments and problems

- **Improving and Experimenting Continuously**, it is a matter of developing a *shared vision* on objectives and how to achieve them, in the logic of choice by *consensus*, helping the team to continuously improve its *Way of Working*. All driven by the continuous experimentation of new ways of collaborating and innovating in one's work.

Thanks to the Fluid Process, it is possible to intervene on the primary factors associated with **waste** (MUDA), i.e. overload (MURI) and *variability of an operation* (MURA), two phenomena that clearly lower the group's performance.

For example, you want to prevent activities from accumulating at certain points in the processing cycle ("bottlenecks") or from part of the team being completely unloaded (the "shoals" downstream of the shrinkage).

6.2 Practices

The Fluid Process consists of **12 practices.**

Figure 25 - Fluid Process Practices

In detail:

- **Project Vision**, adequately defining the **Project Vision** allows you to achieve an alignment of all the stakeholders involved in the project
- **Project Roadmap**, provides a high-level overview of the deliverables, allowing you to define priorities in relation to medium-wide time intervals.
- **Three Buckets Planning** (literally "3 bucket technique"), provides for dividing the processes according to three time segments, so as to always have a set of processes from which to draw.

- **Prioritization**, the papers must be **prioritized** in order to ensure the correct focus in relation to the reference roadmap.
- **React On-Deamand**, the team reacts on-demand to emerging conditions, both work blockages and unforeseen events. All this takes place while respecting the early iteration planning and the real capacity of the team as much as possible.
- **Execution**, the Fluid Process is an adaptive work approach, based on iterations, which contemplates the development of the documents in an iterative and incremental manner.
- **Metrics**, which are essential to be able to objectively verify how effective and efficient you are in the development of the papers and in the execution of the related activities.
- **Quality** must be at the center of developments, both those directly linked to the individual work and the overall one that requires a series of choices to achieve the best possible balance.
- **Risk Management** makes it possible to highlight conditions that may affect the value of what has been achieved, identifying appropriate mitigation measures where necessary.
- **Collaboration**, projects are made by people, so developing collaboration between the different actors involved is essential to ensure their success.
- **Communication**, for the success of each project it is essential to use the *most appropriate* tools *and channels* in relation to specific stakeholders
- **Governance**, using an appropriate level of formality for monitoring and reporting allows you to have continuous visibility into the progress of the project.

6.3 Events

Events are specific moments designed to allow the work team to constantly coordinate and identify solutions to emerging needs and problems. Events help create regularity and minimize time spent in meetings, thanks to the *timeboxed approach* that sets a maximum duration of meetings. Each event serves as a *formal opportunity* to *plan*, *inspect* and *adapt* work, as well as increase transparency about what is happening.

- **Iteration**, is the operational backbone of the Fluid Process, i.e. a time window of work during which all other events take place.

  *The whole team participates and lasts **from 1 to 2 weeks.***

- **Iteration Planning**, is the meeting that opens the work iteration and aims to plan the work to be done in it. It is a real planning activity, in which the processes plausibly achievable in the time available are identified.

  The whole team participates and has a maximum duration of 2 hours.

- **Daily Meeting**, is a quick meeting that the team holds regularly every day. Each participant takes stock of their work in progress and any need for support. The meeting allows those present to quickly update themselves on the progress of the work and to plan the subsequent work. One of the recommended techniques for carrying out the Daily Meeting is that of the "*stand-up meeting*", in which the participants must stand up, favoring concentration and speed of execution.

  The whole team participates and has an approximate duration of 15 minutes.

  During the Daily Meeting, any completed papers can pass early in the Shared stage to speed up the discussion phase with stakeholders.

- **Iteration Review**, aims to stimulate a discussion on the completed work and, depending on the objectives achieved, review whether what is in place for the following week is still valid or needs to be corrected in relation to what happened.

  The whole team participates and has an approximate duration of 2 hours.

  During the Iteration Review, the papers pass through the Shared stage, allowing them to be shared with stakeholders. In this way, it is possible to collect the relevant comments and decide on the actions to be taken in this regard.

- **Iteration Retrospective**, this event, to be held at the end of each iteration, allows to evaluate the effectiveness of the working method, the validity of the practices and tools used. The goal is to constantly identify improvement actions to make the processes more efficient.

  The whole team participates and has an approximate duration of 1 hour.

- **Fluid Meeting**, this event, to be held every week, is strategic (if any, chaired by the *Triumvirate*) and allows its members to evaluate progress, in relation to the way of working, processes and technologies implemented, revising, when necessary, also the aspects of the *BIM Execution Plan (BEP).*
  It is held at least once a week for a maximum duration of 1 hour.

6.4 Artifacts

Artifacts help your team get up to speed by providing up-to-date information, streamlining interactions, and visualizing work progress. The primary tools of the Fluid Process are:

- **Project Backlog**, contains the documents that the team will have to create. It is a concise list, preferably ordered by priority, at the top of which there are deliverables candidates for the next process.
  Used and owned by the whole team.

- **Iteration Backlog**, contains the processes (PBI and/or TASK) for the current iteration.
  Used and owned by the whole team.
- **Item and Task**. The **Items** represent the documents or processes to be carried out and can be divided into **Tasks** that can also be performed in parallel. The Items must be accompanied by the primary information that allows their development and progress to be tracked.
  Used by a professional who is in charge of the elaboration/processing and in ownership of the whole team.
- **Definition of Done**, represents a list of activities to be carried out that are essential to allow you to have a standard definition of when a work, or a process, is completed. An example can be: "the paper is considered completed if it is available in the Published stage of the CDE".
  Used and owned by the whole team.
- **Template**, allows the team to start from reference solutions, tested in different contexts, in order to support a rapid start of work. The hardeners are designed as starting-points and must be clearly customized and adapted to the specific context. A special chapter of the workbook describes standard templates in detail.
  Used and owned by the whole team.
- **Common Data Environment (CDE):** the CDE supports the different moments of the Fluid Process by offering an integrated digital environment for communication and management of the documents.
  Used by: the whole team and in ownership of the BIM Coordinator/Senior Engineer

6.5 Metrics

Metrics are a fundamental tool for objectively assessing the growth of the team and the benefits obtained by introducing changes to the Way of Working. Inspired by Lean, AgileBIM offers the following primary metrics:

- **Lead Time**, is the total time it takes to complete a job. The time (or iterations) that passes from when a work is put into work until it is marked as complete is measured. Its functionality is to highlight the average time relative to a specific type of processing, with similar characteristics, and identify the blocking points to make them more efficient.
  Used by the whole team and in ownership to the contact person of the drawing/processing.
- **Work in Progress**, represents the number of processes started in parallel. The goal is to have an adequate number of active processes, to avoid overloads or moments of inactivity.
  Used and owned by: the whole team.

- **Reworking**, tracks the number of times a completed job needs to be reviewed. The goal is to create a sort of "implicit quality index" of the processes in order to avoid returning too many times to the same elaboration/processing intervention on communication and collaboration flows.
  Used and owned by: the whole team.

7 Construction Metaphase

7.1 Lean Construction Philosophy and Fundamental Principles

Lean Construction is an approach to construction project management inspired by Lean Production (Toyota Production System - TPS). The primary objective is to minimize the waste of time, materials and energy and, at the same time, maximize the value generated for the customer and all the stakeholders of the project.

As defined by Howell[13], and other scholars, the basic principle is to design the production-building system in such a way as to eliminate non-value-adding activities (muda) and ensure that each step contributes to the final result desired by the customer. In construction, this means going beyond the traditional final control of costs and times, and instead proactively influencing and optimizing the design and construction process from the outset, involving all actors in a perspective of extended collaboration.

The key principles of Lean Thinking adapted to constructions can be summarized as follows:

- *Value for the customer*: clearly define what is value from the point of view of the client, the future user and the stakeholders, and orient the project to the maximum satisfaction of the final needs (functionality, quality, optimal time and costs). Any activity that does not contribute to the final value is potentially discardable or reducible.
- *Value Stream*: Map the entire workflow from concept to delivery (Value Stream) and eliminate barriers that prevent a continuous flow of operations. In a construction project, the continuous flow means that work crews, materials and information ideally flow without interruption or unnecessary waiting. As stated by Dennis Sowards: "the priority is to maintain the continuous flow of works so that designers, workers, supplies and deliveries are always productive, avoiding downtime, overloads and extra costs".
- *Pull instead of Push*: Introduce a "draw" logic where downstream phases recall what they need from upstream phases when needed, rather than working based on forecasts or top-down batches. In practice, this principle takes the form of pull planning (described below) and the reduction of inventories and unnecessarily anticipated works. The result is that the end customer "pulls" the process: what is needed, when needed, is built at the right pace (concept of Takt Time in production).
- *Pursuit of perfection (Kaizen):* establishing a mechanism of continuous improvement involving all the actors in the system. Every project is an opportunity to learn and improve: the team must regularly analyze performance (e.g. in retrospective meetings) and look for ways to get closer to the "ideal goal" of zero waste and maximum efficiency. This involves

[13] https://leanconstruction.org.uk/wp-content/uploads/2018/09/Howell-1999-What-Is-Lean-Construction-1999.pdf

creating a culture that encourages proactive problem solving and incremental innovation (Kaizen concept, daily improvements).

- *Optimization of the whole (system) and collaboration*: In contrast to the traditional silo approach, Lean Construction emphasizes the optimization of the project as a whole and not of the individual parts. This requires collaboration between all participants (designers, builders, suppliers, customer) from the earliest stages. For example, involving contractors and suppliers from the beginning of the design process (as in the "Integrated Project Delivery" method) helps to prevent executability problems and integrate everyone's knowledge (design for construction). In the same way, design and construction must no longer be totally separate processes, but connected at every point through effective and transparent coordination of roles.

A key concept introduced by Lean Construction is the **recognition of variability**: on construction sites, activities are subject to uncertainties, delays, unforeseen events. The Lean method seeks to mitigate variability in every aspect (from material supply to labor performance), using tools such as extra capacity, reduced time buffers, and quality control to absorb residual variability and respond quickly to problems. At each level, feedback loops (control and adjustment) are established to react to deviations and keep the project on track.

7.2 Waste in construction

As already pointed out several times, a fundamental element of the Lean mentality is the systematic elimination of **waste** (**Muda** in Japanese).

Figure 26 - Attention to Waste

In addition to waste as such, Lean introduces the concept of **Walls** and **Walls**: Walls (irregularities) and Walls (overload) are two other enemies of flow. For example: a process with phases that have very different times creates *Walls*, leading to imbalances that generate queues and then, in everyone's attempt to hurry up to recover, Walls are *generated*, in terms of stress and errors.

In construction we find many of the typical wastes identified by *Taichi Ohno*[14], with some specificities:

- **Overproduction**: Doing more than necessary or earlier than necessary. In construction, for example, casting concrete in areas not required by the project or preparing very detailed design documents for parts that will then be eliminated or redone.
- **Waiting**: downtime in which people, equipment or materials remain inactive. It is one of the most common wastes on construction sites (e.g. workers waiting for an authorization or material to arrive) and should be minimized through better planning and coordination.
- **Unnecessary transport**: unnecessary movements of materials or people. Example: moving a pallet of bricks from one side of the construction site to the other several times due to incorrect layout organization.
- **Over-processing**: Performing unnecessary tasks or adding unrequired features (gold-plating). In a construction project, it could mean higher quality finishes than required (wasting time/cost) or duplicating drawings and documents instead of sharing a single BIM model.
- **Overstocking**: Having too much material stored. On the construction site, excessive stocks of materials take up space, can be damaged or become obsolete (e.g. special parts ordered "for safety" and then not used). Lean aims at Just-inTime, i.e. deliveries of what is needed when needed.
- **Unnecessary movements (of people):** unnecessary steps, actions or physical movements of operators during work. For example, a bricklayer who has to make many trips to get tools far away because the construction site is not organized with equipped workstations near the work area.
- **Defects/Remakes**: Construction or design errors that require corrections, rework, or material scrap. An out-of-plumb wall to be demolished and rebuilt, a system installed in the wrong position to be moved. These are all defects that result in wasted time, materials and additional costs.
- **Unused talent (the eighth waste):** not taking full advantage of the skills and ideas of the staff. In construction, this happens when workers and technicians are not involved in decision-making or problem solving, missing out on the opportunity for improvements that only those who do the practical work can suggest. A Lean environment, on the other hand, values everyone's contribution (principle of respect for people).

[14] https://it.wikipedia.org/wiki/Taiichi_Ōno

7.3 Last Planner System (LPS) – Collaborative and Pull Planning

One of the operational pillars of Lean Construction is the **Last Planner System** (LPS), often referred to as the "last planner's system".

It is a production planning, scheduling, and control method developed by *Glenn Ballard* and *Greg Howell* in the 1990s, designed to improve workflow reliability and predictability in complex projects.

The concept of "Last Planner" refers to the last planners in the chain (typically foremen, site managers, department managers) or those who are closest to the actual work. The revolutionary idea is to involve these operational figures in the short-term planning process, because they are the most competent in assessing what is really feasible in the field and in what timeframe. Instead of a single planner who decides everything from the top, LPS creates a distributed collaborative planning system.

The six levels of the Last Planner System are presented in sequence:

1. **Master Planning (Should):** it starts from a high-level master plan (e.g. general project timeline) with the main phases and milestones. This initial plan indicates what should happen in the project, but it is often a forecasting plan.
2. **Phase Planning (Shoud):** for each main phase (e.g. completion of the structure, closures, systems, finishes), a pull planning session is held involving all those responsible for the activities of that phase. Starting from the final goal date of the phase, the team "works backwards" by defining all the necessary activities and their connection, asking each Last Planner what they can do and in what sequence to achieve the goal. This generates a realistic and shared phase plan, where the relationships between activities are based on real inputs (e.g. "to carry out the plastering (A) I must have finished the underground systems (B) two days earlier"). In this way, dependencies and times are established in a collaborative and consensual way.
3. **Lookahead (Can) planning**: once the phase plan has been defined, we look ahead on a rolling horizon (typically 6 weeks, but AgileBIM offers monthly windows as seen in the Construction Board). In this lookahead window, the team further details upcoming tasks and most importantly identifies and removes constraints that might prevent scheduled tasks from running. For example, if flooring is scheduled to be laid in 4 weeks, the constraints could be: "floor material delivered", "room free of other work", "team of tilers confirmed". Lookahead planning is therefore a make-ready phase: making activities ready to be done, ensuring that nothing blocks them.
4. **Short-Term Planning (Will):** on a weekly basis (Last Planner Meeting), all the Last Planners meet and each one makes concrete commitments for the coming week, declaring what activities they will complete (from the pool of activities made feasible by the lookahead).

These commitments are often displayed on a weekly planning board, with cards (or sticky notes) showing the work of each team day by day. It is here that we decide what will be done – what will actually be done this week – taking into account the real conditions. The rule "don't make commitments you can't keep" is adopted: if a certain activity is not free from constraints or appears risky, the team can postpone it and perhaps insert another activity in its place. This ensures that the weekly plan is 100% realistic.

5. **Progress Tracking (Did):** At the end of each week, you compare what has been done (did) with what you had planned. The Percentage of Plan Completed (PPC) is calculated: how many of the scheduled activities have actually been completed. For example, if 20 tasks were planned and 18 are completed, PPC=90%.
6. **Feedback and Learning (Learn):** The difference in expectations highlighted by PPC (unfinished tasks) is analyzed by looking for causes of non-completion (variants, quality issues, incorrect estimates, etc.). This moment of continuous learning is crucial: the team discusses the causes of the problems and identifies corrective actions for the future (e.g. improving the scheduling of that activity, or managing constraints differently). Thus the system learns and improves from cycle to cycle.

In the LPS, a key indicator mentioned is the weekly **PPC** (**Planned Percent Complete**), which serves as the "primary measure" of the reliability of the planning process. A low PPC signals systemic problems to be solved, a high PPC and progressively improving indicates that the team is becoming more efficient and predictable.

PPC is measured and tracked from week to week, perhaps displayed in a line graph displayed on site: in this way it reinforces continuous improvement because it makes progress or regression over time visible to everyone.

The primary benefits of the Last Planner System are:

- It drastically increases the collaboration and involvement of all workers in the planning process (breaking the siloed logic).
- Improve the reliability of on-site activities, fewer unforeseen events and less downtime, thanks to realistic schedules and constraints resolved in advance. This generates a more stable and continuous workflow.
- It reduces waste of time (e.g. waiting for materials or rework) and resources, because problems emerge before the activity begins (during the lookahead) and are proactively addressed.
- It introduces a culture of shared responsibility: Last Planners "give their voice" on their work and this empowers them to maintain it. The team as a whole feels the duty to respect each other's commitments.

- Promotes continuous improvement: Weekly performance analysis (PPC and causes of non-completion) creates a quick feedback loop, promoting a learning mindset (instead of looking for blame, focus on how to avoid the problem in the future).

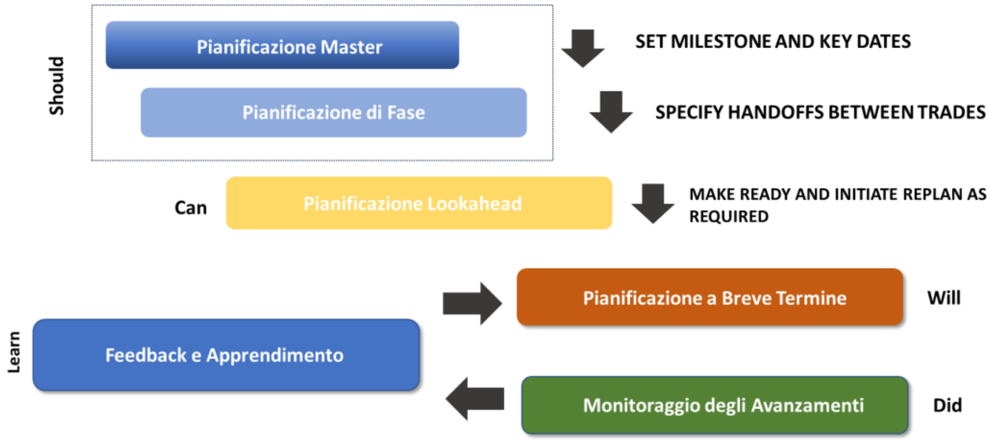


Figure 27 - LPS Phases

It should be emphasized that the Last Planner System is not just a tool but a change of management paradigm on site. Instead of a detailed timetable drawn up months earlier and then "immediately denied" by reality, a dynamic system is adopted that is continuously updated with the contribution of those who carry out the work.

This allows the project to react nimbly to unforeseen events (which always happen on site: from bad weather to delays from a supplier) without losing control, thanks to constant collaborative rescheduling.

7.4 Value Stream Mapping (VSM): Mapping and Improving Processes

Another fundamental tool of Lean is **Value Stream Mapping** (**VSM**). This is an original technique of Lean Manufacturing that has also been successfully applied in the information and management processes typical of construction (especially in the design phase or in the support phases, such as procurement, permitting, contract management).

VSM is defined as a method that allows you to visualize, analyze, and improve all stages of a customer value delivery process. In practice, it consists of drawing a detailed flow diagram of the process under consideration, showing each step (activity or phase), the flows of materials/information between the steps, the times taken (work times and waiting times), and other relevant information (such as quantity, quality, resources involved).

To build the map, proceed with the following steps:

- *Define the boundaries of the process to be mapped*: e.g. "from the application for a building permit to its issuance" or "from the preliminary design to the architectural executive project".
- *Map the current state (Current State Map):* identify all the current steps, draw them in sequence, and collect data for each one: cycle time (how long the operation lasts), waiting time before that step, any backlog in the queue, percentage of errors or rework, resources used. Information flows (e.g. documents, drawings, approvals) and physical flows (e.g. delivery of materials) are also highlighted. Standard symbols are often used for processes, documents, shipments, etc., to create a map that is understandable at a glance.
- *Analyze waste*: on the "as-is" map, activities that do not create value (e.g. with a red sticker) and points of inefficiency are highlighted. Typically, the total Lead Time of the process (from start to finish) and the actual Value-Added Time (adding only the processing times that create useful output) are calculated. The difference between the two highlights the total muda. For example, if 30 days pass to produce a structural executive but the sum of the actual design times is 5 days, it means that 25 days are useless waits/steps – enormous potential for improvement.
- *Designing the Future State Map*: in a collaborative (often multi-disciplinary) workshop, the team redesigns the process as it should be to eliminate or minimize the waste identified. The question arises: "can this unnecessary step be eliminated?", "can this wait be reduced by better integrating the activities?", "can we do these two things in parallel instead of sequentially?", "by adding in-line quality control do we avoid defects at the end of the process?", etc. Lean principles are applied to imagine a leaner future flow, then represented in a new map.
- Implement and measure: we then move on to putting into practice the solutions outlined to achieve the Future State, and gradually measure progress (reduction of lead time, decrease in defects, etc.). VSM often comes with a Kaizen action plan: a list of improvement actions to be made, responsibilities assigned and deadlines.

Balancing the flow is a Lean goal (concept of line balancing in production). In construction, this can mean, for example, leveling activities (Heijunka) in order to avoid days with 10 teams on site and days with only 2 teams – preferring a more constant productivity.

7.5 Other Lean Tools Applied to Construction

In addition to LPS and VSM, other tools derived from Lean Manufacturing and adapted to construction are:

- *5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke):* methodology of organization and order in the workplace. On a construction site, applying the 5S means having clean and tidy work areas, materials stored safely and accessible, equipment in order and shared standards to maintain discipline. This reduces wasted time (less searching for tools or materials), increases safety, and improves quality.

- *Kanban*: "tags" or visual cues system to manage workflow and replenishment of materials. For example, some companies use Kanban for the reordering of consumables on site: a tag on the container of screws that, when a certain level is reached, is sent to the central warehouse to request replenishment – avoiding both stock-outs (shortages) and overproduction (excessive orders). Kanban is also the basis of the boards seen in AgileBIM to limit the WIP and display the status.
- *Kaizen Blitz/Kaizen Event*: Concentrated rapid improvement events, where for 1-2 days a multifunctional team analyzes a specific construction site problem and immediately implements improvement solutions. For example, a Kaizen event could be organized to optimize the internal logistics of a large construction site: the team analyzes the material transport flows from the warehouse to the various areas and redesigns the layout or procedures to make them more efficient.
- *Poka Yoke (error-proofing):* Solutions that make human error impossible or obvious. In construction, for example, it can mean using prefabricated components that can only be mounted in the correct direction, or creating quality control checklists that block the passage to the next step if a requirement is not met (avoiding building on the wrong job).
- *5 Why*: An analysis technique for getting to the root cause of a problem by repeatedly asking "why" for each answer. It is mentioned as a useful tool during LPS learning meetings: if a task has not been completed, it asks "why?" Answer: for example "why didn't the material arrive" Why didn't the material arrive? "Because the supplier delayed." Why did the supplier delay? "Because the order started late". Why did he leave late? "because the purchasing department was not clear about the bill of materials" ... and so on, highlighting the real cause to act on (in this case internal communication).

These tools are integrated into the speech to give a complete picture of how the Lean toolbox can be used in construction. However, it should be emphasized that tools alone are not enough: they must be adopted within an overall Lean Project Delivery strategy, with the support of management and a cultural change.

For example, implementing LPS or Kanban in isolation might bring partial benefits, but it is by combining methods (LPS, Kanban, 5S) with principles (value, flow, pull) and enlightened leadership that the best results are achieved, as demonstrated by shared case studies.

8 Metagoal

Starting from the assumption that each project tends to be different from the others, it is however true that an important part of the activities that characterize them are often common, at least up to the executive part which could be done in completely different ways.

On these considerations, AgileBIM defines **Metagoal**, i.e. a *knowledge base* from which to draw to set up a series of standard activities within the different metaphases and phases.

Metagoals represent an abstract level of operational objectives common to all phases of the project. In other words, they are *a conceptual representation* of the common processes in the different metaphases by acting as conceptual containers of recurring activities in construction projects: they summarize *what needs to be done* in general terms, regardless of the specificity of the individual project, providing standard guidelines.

Their representation is developed through a **conceptual map** organized as follows:

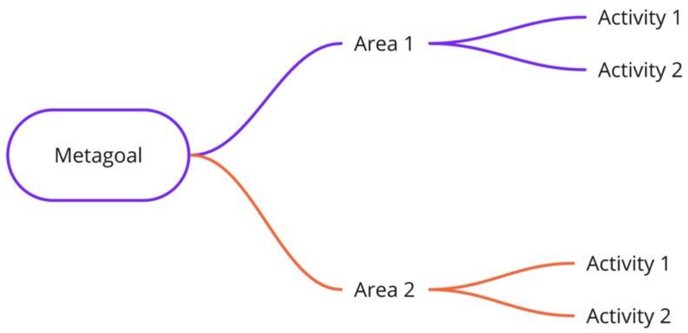


Figure 28 - Structure of a Metagoal

Each metagoal consists of several **Areas of Intervention** that are implemented by a series of **Activities**. Not all areas necessarily need to be covered, just as not all activities may be necessary.

Their flexibility is important: not all areas or activities envisaged by a Metagoal need to be applied in every project, but the framework provides a complete repertoire from which to choose what is relevant.

The value of having a series of metagoals is to put the specialist in front of the need to consult the map, evaluate what to do and what not to do, highlighting, if necessary, why some areas are not useful in the specific project.

Think of the practical case of starting work on site: the Works Manager, starting from an empty Construction Board, will evaluate the different metagoals to be achieved and will be able to place the related activities necessary on a time basis on it.

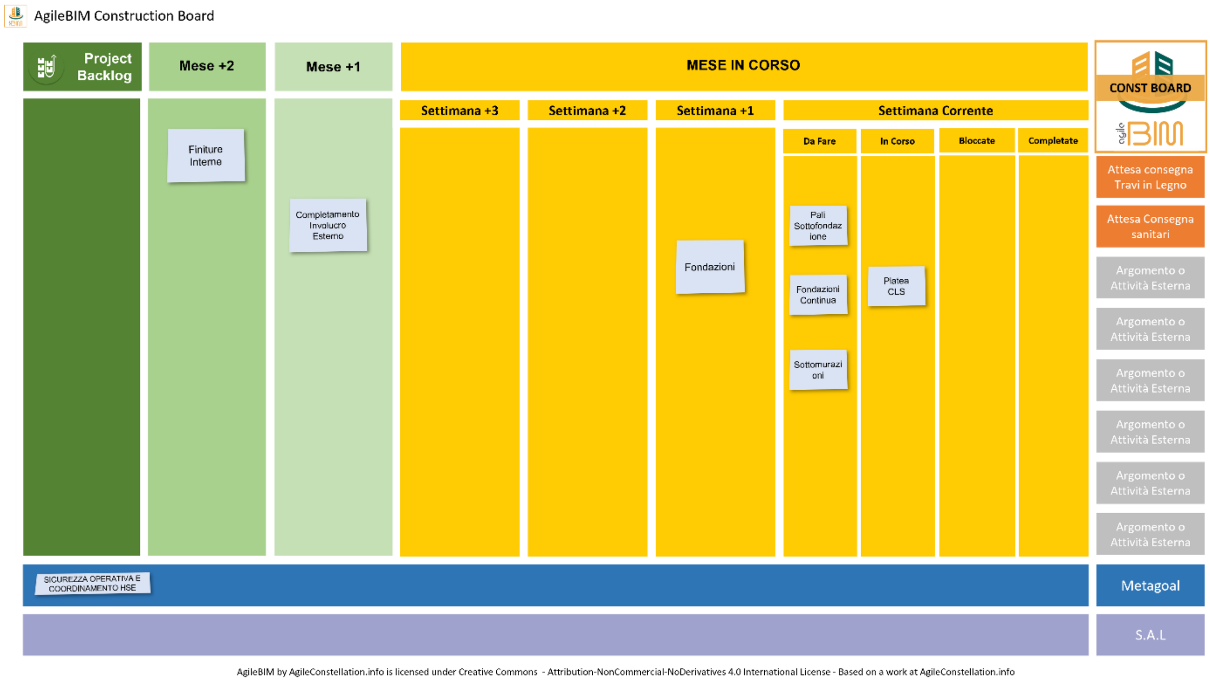


Figure 29 - AgileBIM Construction Board and Metagoal

8.1 General utility of Metagoals in AEC projects

The introduction of Metagoals in the AgileBIM framework responds to the need **to standardize** and make operational practices consistent between the various phases of a construction project.

Their main utility lies in providing the project team with a common reference of *best practices* and activities to be carried out, thus improving the completeness and quality of project management.

Through Metagoals, the team has a conceptual checklist of everything that normally needs to be considered (from initial planning, to interdisciplinary coordination, to quality control, to final delivery), which helps not to leave out critical aspects along the way. This approach helps to prevent the classic "ping-pong effect" of bouncing information or corrections between different parties, since everyone works on a common basis from the beginning.

In addition, using Metagoal means standardizing processes while maintaining the possibility of adapting them: each project can in fact select and customize the specific activities to be carried out according to its requirements, but within a shared framework of reference.

This translates into greater consistency between the processes followed by the different teams and in the different phases. The Metagoals also act as a conceptual bridge between the design and construction phases, ensuring that there is continuity in the objectives: for example, the control activities envisaged in the design metaphase will have their counterpart in the construction metaphase, so that what is planned and verified in the design is reflected in the execution.

Ultimately, Metagoals help to steer work towards the objectives of value for the client and the project, keeping different teams focused on the same macro-objectives despite the diversity of tasks.

This intrinsic alignment is consistent with the Agile principles promoted by AgileBIM, which emphasize both attention to the overall value generated by the project and the continuous improvement of individual processes, with constant alignment and sharing of results within the team.

8.2 Benefits of Metagoals: consistency, quality and alignment

The adoption of Metagoals in AgileBIM produces a series of tangible benefits in the management of AEC projects, contributing in particular to raising process consistency, the quality of results and alignment between teams and project objectives:

- **Consistency of process and deliverables**. Because Metagoals ensure that all teams follow common guidelines, there is greater consistency between what is designed and what is built. The information and objectives defined in the design phase are matched on site, reducing discrepancies and conflicts. For example, the use of a common data environment (CDE) and shared standards for nomenclatures, formats and procedures ensures that the flow of information is consistent and traceable from the first sketch to the as-built. This methodological alignment prevents waste of time due to reinterpretations or misunderstandings between designers and builders (less rework and fewer "surprises" on site). In other words, Metagoals act as a glue between phases, ensuring continuity and overall coherence of the project.
- **Quality improvement**. The integration of control and verification activities within Metagoals raises the quality level of both the project and the final product. For example, having a Metagoal dedicated to quality, the team implements verification routines at each stage (control checklists, cross-reviews, tests, inspections) that catch errors or inconsistencies in advance. This systematic approach leads to an increase in the quality of work and product, as explicitly sought by the objectives of AgileBIM. Furthermore, quality is not seen as something to be checked only at the end of the work, but as a continuous goal: the quality criteria established at the initial stage (e.g. performance requirements, BIM standards to be respected) remain a beacon that guides all decisions and activities, from design to final commissioning. This also leads to stricter compliance with regulations and standards: by following pre-established methods, the project is aligned with BIM regulations and technical regulations in the sector, reducing the risk of non-compliance.

- **Alignment between teams and goals**. Metagoals strongly contribute to the alignment within the team and alignment towards the strategic objectives of the project. Internally, they provide a common language: all members (from BIM specialists to site engineers) understand priorities through Metagoals and know what goals they are pursuing. This improves communication and collaboration, because each contribution is traced back to a shared goal (e.g., everyone knows that "ensuring customer satisfaction" is a primary goal and that activities such as reviews with the client or requested changes go in that direction). Externally, Metagoals keep the teams of the different phases synchronized: the design team and the construction team, although different in terms of skills and activities, work in a synergistic way because they are guided by the same macro-objectives. This continuous and adaptive alignment is precisely one of the Agile principles adopted by AgileBIM: the framework promotes *Inspect and Adapt*, i.e. the frequent verification of objectives and the adjustment of the focus if necessary, ensuring that everyone is rowing in the same direction even when the project undergoes changes. Ultimately, thanks to Metagoals, the project maintains a unified vision: every iteration, every sprint and every deliverable is evaluated according to the contribution to the final objectives (customer value, time, costs, quality, safety, etc.), preventing teams from losing sight of the big picture. This is reflected in greater motivation and clarity of role for team members, as well as higher customer satisfaction, as the final product better reflects the initial objectives.

8.3 Practical examples of Metagoal in Design and Construction

To make the concept concrete, here are some examples of typical Metagoals and how they are operationally declined in the design and construction phases:

- *Information Coordination (BIM) Metagoal*: In the Design phase, it involves establishing a *shared Common Data Environment*, defining conventions for modeling (e.g., subdivision into Worksets, unique codings), performing clash detection between disciplines, and holding regular BIM coordination meetings. In the Construction phase, the same metagoal translates into keeping the BIM model updated with the construction site conditions (*as-built model*), using tablets or on-site BIM workstations to coordinate teams, and ensuring that all variants or requests for information (RFI) are managed through the common platform. This guarantees a single and up-to-date flow of information, avoiding discrepancies between the technical office and the construction site.

- *Quality Control and Compliance Metagoal*: In design, it involves activities such as continuous verification that the project complies with functional and aesthetic requirements, cross-checks of drawings and models by supervisors (BIM manager, technical director) and preparation of regulatory compliance reports (e.g. compliance with anti-seismic and fire regulations, etc.). In construction, this metagoal includes quality inspections on materials and works (in situ tests, partial inspections at each construction phase), management of Non-Conformities (recording and resolution of defects or deviations from the project) and final audits to deliver a work that conforms to the approved project. The consistent application of this metagoal ensures that quality is "designed in" from the beginning and controlled to the end.

- *Stakeholder Engagement Metagoal and Goal Alignment*: During Design it involves engaging the client and key stakeholders through workshops, project demos and formal reviews at each milestone, incorporating their feedback into subsequent iterations (user-centric approach). It also means keeping track of high-level goals (e.g., environmental sustainability, budget targets) in the Project Canvas and verifying at each decision-making sprint that you stay aligned with those goals. In the Construction phase, this same metagoal is expressed in transparency and constant communication: periodic updates to the customer on the progress of the project, scheduled site visits with stakeholders to show progress, active management of expectations (e.g. if changes arise, promptly discuss the impact on costs / times with the customer). It also means keeping all the actors (contractor, subcontractors, construction management) aligned on the final objectives through progress meetings and shared reporting. This approach ensures that everyone has the same vision for success and that the final product truly meets initial expectations.

8.4 Design Metagoal

During the Design metaphase of a project, Metagoals guide the design team in organizing and prioritizing activities. In practice, the Design Team uses Metagoals as a reference to plan both the iterative cycles of design development (e.g. in the Agile iterations of 1-2 weeks typical of the Fluid Process) and the main delivery milestones.

At each design iteration, the team selects the necessary activities from Metagoal's repertoire: this can include, for example, interdisciplinary coordination activities (to ensure that architects, structural engineers, installers and other specialists align their BIM models without conflicts), requirements and regulatory verification activities (to validate that the project complies with the client's needs and building codes), and information management activities (such as updating the BIM model and centrally sharing documents through the Common Data Environment).

Metagoals ensure that the design team systematically addresses these areas: for example, a Metagoal related to *"Project Quality Control"* will ensure that quality checks are carried out at each stage of the design process (peer reviews of drawings, clash detection on the BIM model, control of technical specifications, etc.), preventing errors that could propagate downstream. Another Metagoal could be *"Stakeholder Involvement"*, encouraging the team to collect frequent feedback from clients or end users at each version of the project (e.g. through periodic presentations of the model/rendering) in order to ensure that the design remains aligned with the client's objectives.

Thanks to Metagoals, therefore, the design metaphase benefits from a structured but adaptable approach: the team works in an Agile way (gradually increasing the level of detail of the project in short cycles) while knowing that it must cover all the critical areas defined in the Metagoals. This leads to more robust and consistent designs, because aspects that will affect construction (reducing delays or variations on site) are already taken into account in the design phase.

In addition, having common Metagoals facilitates the handover: when the design is finished (or moves on to the next phase), all the necessary information has been produced and verified according to known categories, making it easier for the Construction Team to understand and use the design material.

Specifically, the goals that accompany the design metaphase are:

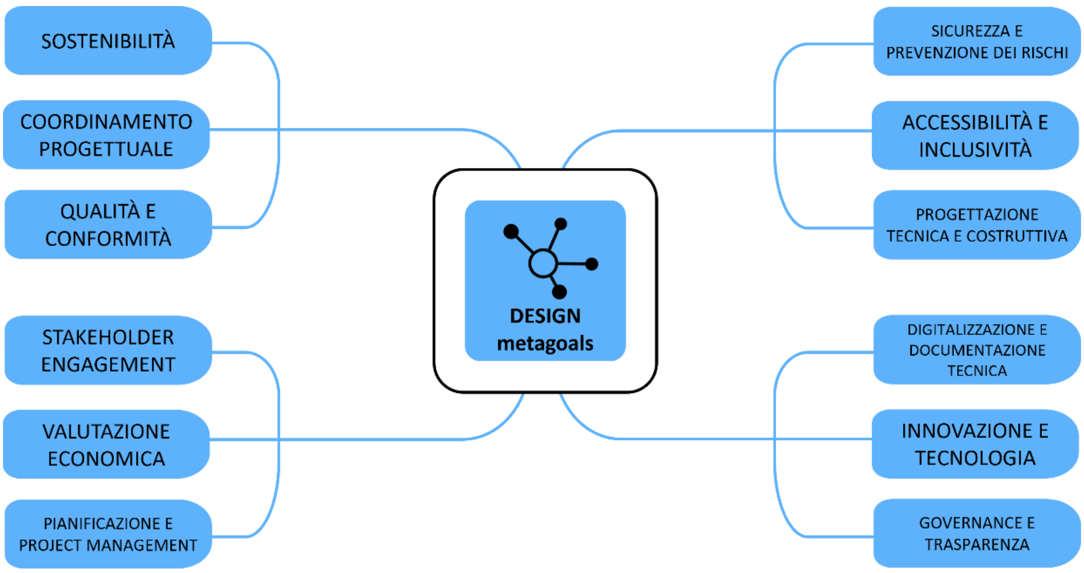


Figure 30 - Design Metagoals

8.4.1 Metagoal Design 1: Sustainability

Objective: To integrate environmental, energy and social criteria into design choices from the early stages, in line with ESG and PNRR objectives.

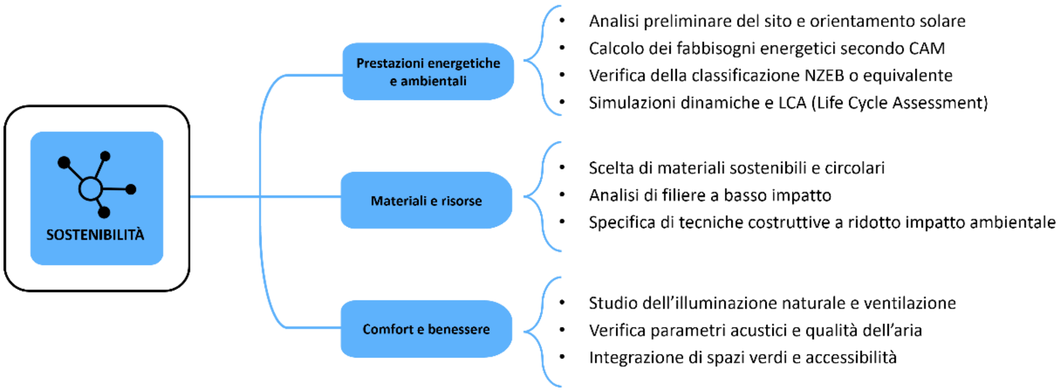


Figure 31 - Metagoal Construction 1: Sustainability

- **Impact Area: Energy and Environmental Performance**
    - Preliminary site analysis and solar orientation.
    - Calculation of energy requirements according to CAM.
    - Verification of NZEB classification or equivalent.
    - Dynamic simulations and LCA (Life Cycle Assessment).
- **Impact Area: Materials and Resources**
    - Choice of sustainable and circular materials.
    - Analysis of low-impact supply chains.
    - Specification of construction techniques with reduced environmental impact.
- **Impact area: Comfort and well-being**
    - Study of natural lighting and ventilation.
    - Verification of acoustic parameters and air quality.
    - Integration of green spaces and accessibility.

8.4.2 Metagoal Design 2: Project Coordination

Objective: To ensure information and geometric coordination between disciplines, according to interoperable BIM standards.

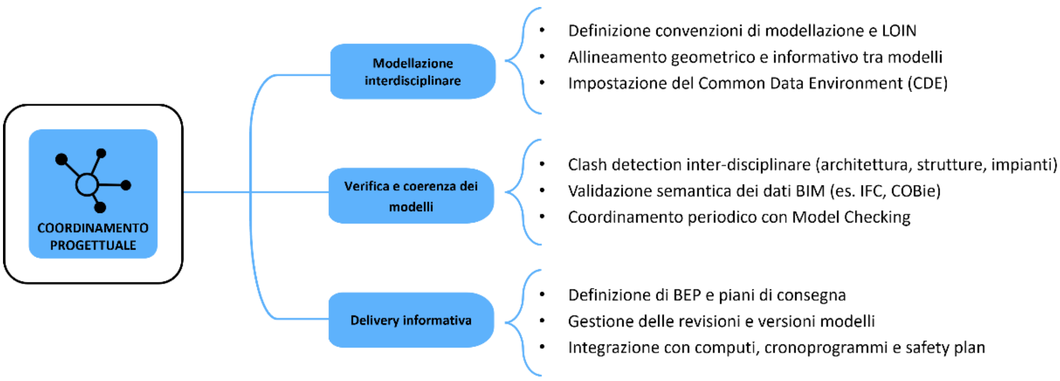


Figure 32 - Metagoal Construction 2: Project Coordination

- **Impact Area: Interdisciplinary Modeling**
    - Definition of modeling conventions and LOIN.
    - Geometric and informational alignment between models.
    - Setting up the Common Data Environment (CDE/ACdat).
- **Impact Area: Model Verification and Consistency**
    - Inter-disciplinary clash detection (architecture, structures, systems).
    - Semantic validation of BIM data (e.g. IFC, COBie).
    - Periodic coordination with Model Checking.
- **Impact Area: Information Delivery**
    - Definition of BEP and delivery plans.
    - Revision management and model versions.
    - Integration with calculations, time schedules and safety plans.

8.4.3 Metagoal Design 3: Quality and Compliance

Objective: To ensure the regulatory, technical and qualitative compliance of the project with the performance requirements and the standards in force.

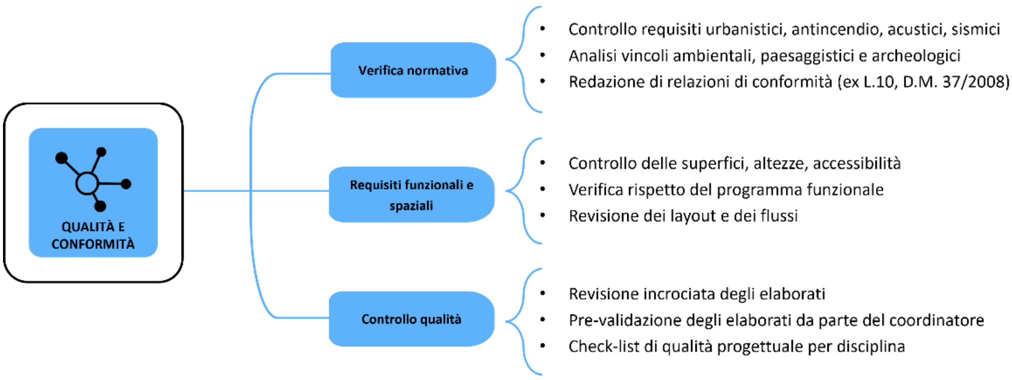


Figure 33 - Metagoal Construction 3: Quality and Compliance

- **Area of impact: Regulatory verification**
    - Control of urban planning, fire, acoustic and seismic requirements.
    - Analysis of environmental, landscape and archaeological constraints.
    - Drafting of compliance reports (pursuant to Law 10, Ministerial Decree 37/2008).
- **Area of impact: Functional and spatial requirements**
    - Control of surfaces, heights, accessibility.
    - Verification of compliance with the functional program.
    - Review of layouts and flows.
- **Impact Area: Quality Control**
    - Cross-revision of the papers.

- Pre-validation of the papers by the coordinator.
- Design quality check-list by discipline.

8.4.4 Metagoal Design 4: Stakeholder Engagement

Objective: To actively involve stakeholders (customer, end users, technicians) to align expectations and design solutions.

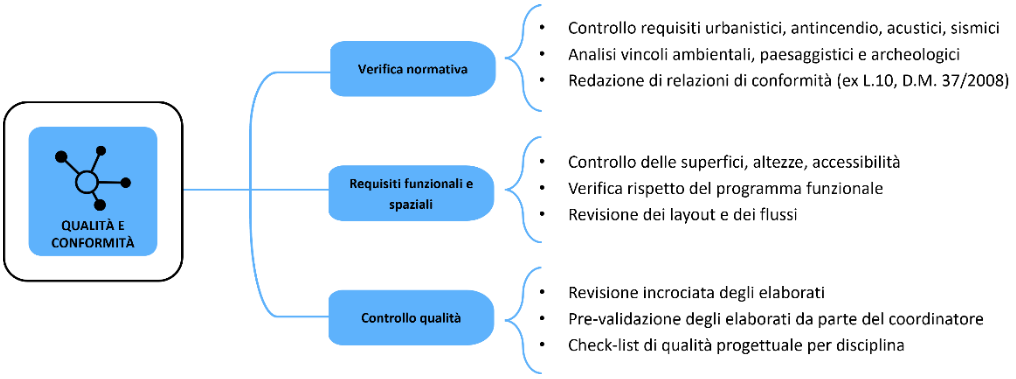


Figure 34 - Stakeholder Engagement

- **Impact area: Client and decision-makers**
  - Workshop with the client to identify priority requirements.
  - Alignment on cost, time and quality constraints.
  - Incremental validation of the papers.
- **Impact Area: Future Users and Operators**
  - Virtual interviews or walkthroughs with end users.
  - Simulations of the use of spaces with 3D prototypes or mockups.
  - Collection, iterative feedback and adaptation actions.
- **Impact area: Coordination with external bodies**
  - Discussions with bodies for authorizations and constraints (ASL, VVFF, Superintendency).
  - Preparation of documents for service conferences.
  - Management of authorization procedures and integration requests.

8.4.5 Metagoal Design 5: Economic Evaluation

Objective: To provide an updated and progressive picture of the costs of construction, management and maintenance of the work.

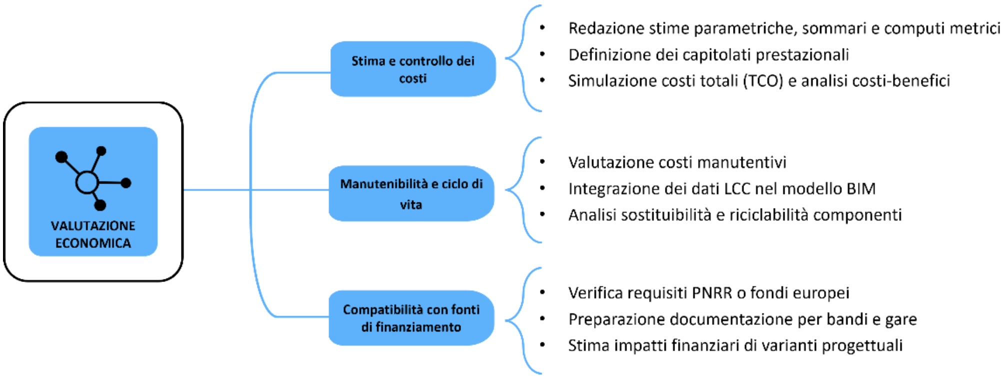


Figure 35 - Economic evaluation

- **Impact Area: Cost Estimation and Control**
    - Drafting of parametric estimates, summaries and metric calculations.
    - Definition of performance specifications.
    - Total cost simulation (TCO) and cost-benefit analysis.
- **Impact Area: Maintainability and Life Cycle**
    - Evaluation of maintenance costs.
    - Integration of LCC data into the BIM model.
    - Substitutability and recyclability analysis of components.
- **Area of impact: Compatibility with funding sources**
    - Verification of PNRR requirements or European funds.
    - Preparation of documentation for calls and tenders.
    - Estimation of financial impacts of design variants.

8.4.6 Metagoal Design 6: Planning and Project Management

Objective: Structure, plan and monitor project activities and critical milestones, promoting iterative work and transparency.

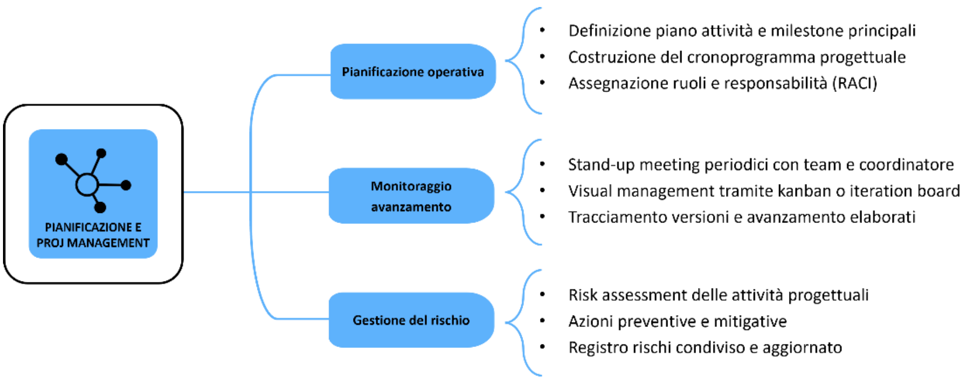


Figure 36 - Planning and Project Management

- **Area of impact: Operational planning**
    - Definition of activity plan and main milestones.

- Construction of the project timeline.
- Assignment of roles and responsibilities (RACI).

- **Impact Area: Progress Tracking**
  - Regular stand-up meetings with team and coordinator.
  - Visual management via kanban or iteration board.
  - Tracking versions and progress processed.
- **Impact Area: Risk Management**
  - Risk assessment of project activities.
  - Preventive and mitigative actions.
  - Shared and updated risk register.

8.4.7 Metagoal Design 7: Safety and Risk Prevention

Objective: To integrate safety in the workplace and in the future management of the construction site right from the design stage, according to current legislation.

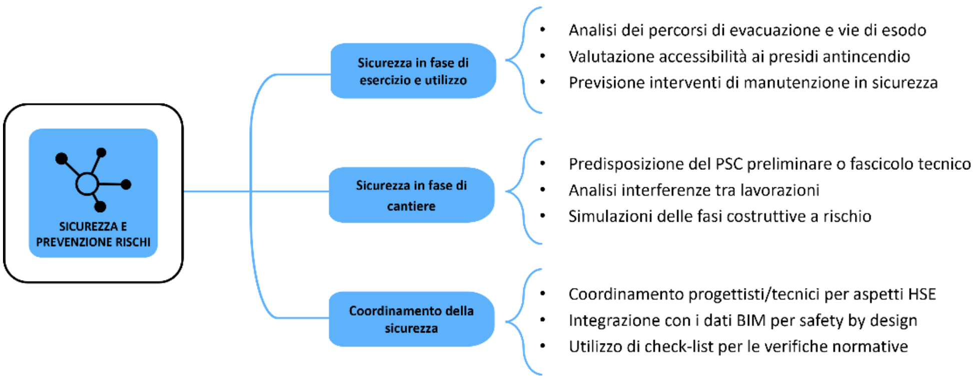


Figure 37 - Safety and Risk Prevention

- **Impact area: Safety in operation and use**
  - Analysis of evacuation routes and escape routes.
  - Evaluation of accessibility to fire-fighting devices.
  - Prediction of safe maintenance interventions.
- **Impact area: Safety during the construction site**
  - Preparation of the preliminary PSC or technical file.
  - Analysis of interferences between processes.
  - Simulations of the construction phases at risk.
- **Impact Area: Safety Coordination**
  - Coordination of designers/technicians for HSE aspects.
  - Integration with BIM data for safety by design.
  - Use of checklists for regulatory audits.

8.4.8 Metagoal Design 8: Accessibility and Inclusivity

Objective: To ensure universal access to spaces, including users with disabilities or specific needs, in compliance with regulations and design for all principles.

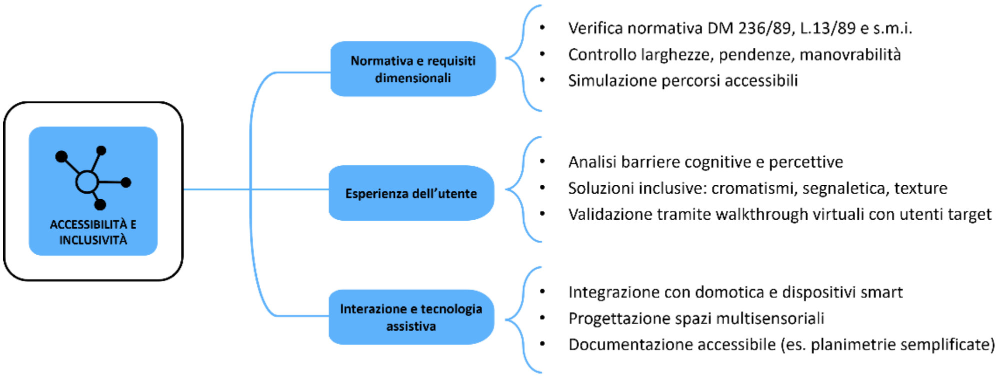


Figure 38 - Accessibility and Inclusivity

- **Impact Area: Regulations and Dimensional Requirements**
  - Regulatory verification DM 236/89, L.13/89 and subsequent amendments
  - Control of widths, slopes, maneuverability.
  - Simulation of accessible routes.
- **Impact Area: User Experience**
  - Analysis of cognitive and perceptual barriers.
  - Inclusive solutions: colours, signage, textures.
  - Validation via virtual walkthroughs with target users.
- **Impact Area: Interaction and Assistive Technology**
  - Integration with home automation and smart devices.
  - Design of multisensory spaces.
  - Accessible documentation (e.g. simplified floor plans).

8.4.9 Metagoal Design 9: Technical and Construction Design

Objective: To ensure the executive design consistent with the construction technologies adopted and the context of intervention.

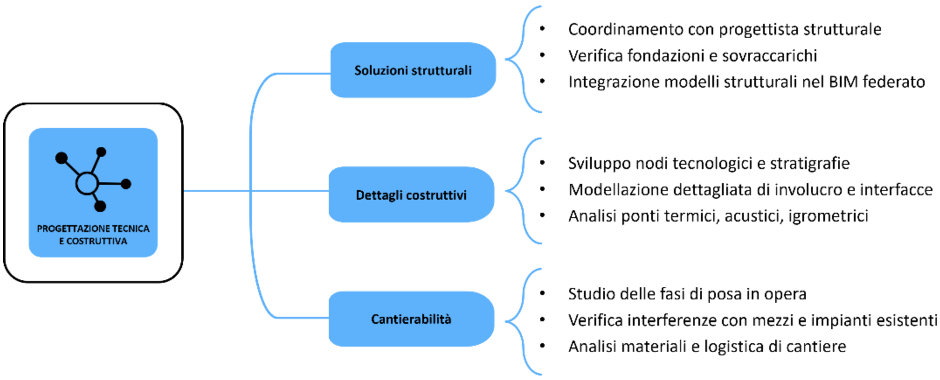


Figure 39 - Technical and Construction Design

- **Impact Area: Structural Solutions**
  - Coordination with structural designer.
  - Verification of foundations and overloads.
  - Integration of structural models into federated BIM.
- **Area of impact: Construction details**
  - Development of technological nodes and stratigraphy.
  - Detailed modeling of envelope and interfaces.
  - Analysis of thermal, acoustic and hygrometric bridges.
- **Impact area: Construction**
  - Study of the installation phases.
  - Verification of interferences with existing vehicles and systems.
  - Analysis of materials and site logistics.

8.4.10 Metagoal Design 10: Digitalization and Technical Documentation

Objective: To produce structured, coordinated and interoperable digital technical documentation, to support the entire life cycle of the work.

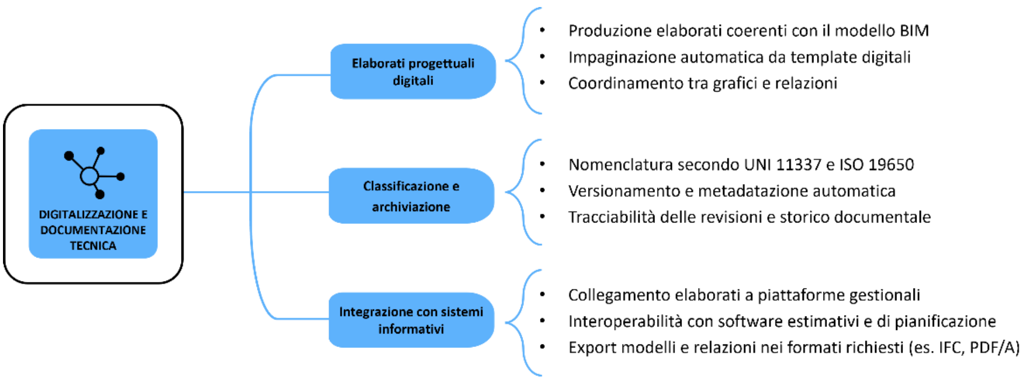


Figure 40 - Digitization and Technical Documentation

- **Impact area: Digital design documents**
  - Production of documents consistent with the BIM model.

- Automatic layout from digital templates.
- Coordination between graphs and relationships.

- **Area of impact: Classification and archiving**
  - Nomenclature according to UNI 11337 and ISO 19650.
  - Automatic versioning and metadating.
  - Traceability of revisions and document history.
- **Impact Area: Advanced Design Approaches**
  - Connection of elaborate to management platforms.
  - Interoperability with estimation and planning software.
  - Export models and reports in the required formats (e.g. IFC, PDF/A).

8.4.11 Metagoal Design 11: Innovation and Technology

Objective: To integrate innovative solutions and emerging technologies into the project, enhancing digitization, automation and smart approaches.

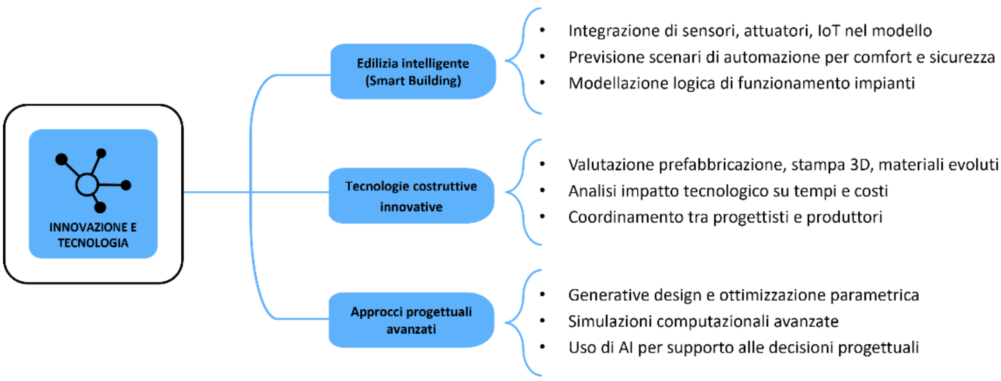


Figure 41 - Innovation and Technology

- **Impact Area: Smart Building**
  - Integration of sensors, actuators, IoT into the model.
  - Prediction of automation scenarios for comfort and safety.
  - Logical modeling of plant operation.
- **Impact area: Innovative construction technologies**
  - Prefabrication evaluation, 3D printing, advanced materials.
  - Analysis of technological impact on time and costs.
  - Coordination between designers and manufacturers.
- **Impact Area: Advanced Design Approaches**
  - Generative design and parametric optimization.
  - Advanced computational simulations.
  - Use of AI to support design decisions.

8.4.12 Metagoal Design 12: Governance and Transparency

Objective: To ensure transparency, traceability and accountability in the design process through documented tools, metrics and flows.

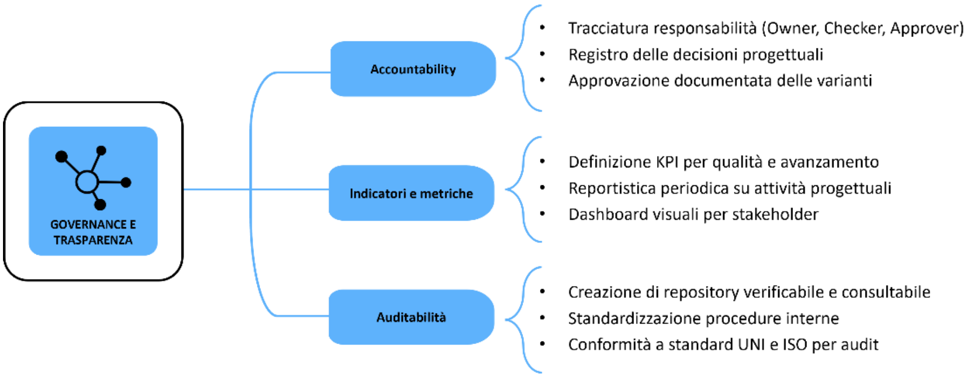


Figure 42 - Governance and Transparency

- **Impact Area: Accountability**
    - Liability tracking (Owner, Checker, Approver).
    - Register of design decisions.
    - Documented approval of variants.
- **Area of impact: Indicators and metrics**
    - Definition of KPIs for quality and progress.
    - Periodic reporting on project activities.
    - Visual dashboards for stakeholders.
- **Impact Area: Auditability**
    - Creation of verifiable and searchable repositories.
    - Standardization of internal procedures.
    - Compliance with UNI and ISO standards for audits.

8.5 Construction Metagoal

In the Construction phase, Metagoals continue to play a crucial role, adapting to the context of the construction site.

The Construction Team plans and manages the construction site activities inspired by the same Metagoals defined in AgileBIM, thus ensuring continuity with respect to the work carried out in the design. In practice, for every area covered by the Metagoals, there is an operational implementation on site.

For example, if in design there was a Metagoal of interdisciplinary coordination, in construction this translates into coordination between the workers and subcontractors of the different disciplines (construction, structural, plant engineering, etc.), often facilitated by BIM (for example, coordination meetings on the federated model to resolve interferences before implementation). Similarly, the quality control Metagoal continues in the execution phase with activities such as on-site quality inspections, on-site checks of tolerances and compliance of the works with project specifications and the updating of the BIM model to reflect the *as-built conditions*.

A key element is that Metagoals in the construction phase ensure that the objectives set in the design are reflected in execution. For example, if one of the objectives (Metagoal) + *"Security and risk management",* in the design phase this may take the form of security plans, risk assessments and the design of secure solutions. During the construction phase, Metagoal itself will translate into safety operating procedures, daily briefings on HSE (Health, Safety & Environment) before the works, monitoring of emerging risks and rapid corrective actions. In this way, there is consistency between the plan and the execution: the construction site is not something separate from the design process, but is a logical extension of it guided by the same macro-objectives.

Operationally, the use of Metagoals on site also means facilitating constant alignment: practices such as the Daily Meeting and the Periodic Reviews typical of Agile methodologies are also adopted in the context of the works, to monitor progress against plans and to quickly adapt activities if problems arise.

The team, having internalized the Metagoals, understands well what the priorities are: for example, giving priority to resolving a critical conflict reported by the BIM model (to comply with the coordination metagoal) or carrying out a acceptance test immediately after an installation (to respect the quality metagoal). In summary, in the Construction phase, Metagoals act as guarantors of consistency and quality – helping to maintain focus on the final goals despite the pressure of daily operations – and as tools for adaptability, as the team can react to changes while still maintaining a common direction thanks to the guiding principles provided by the Metagoals themselves.

Specifically, the goals that accompany the construction metaphase are:

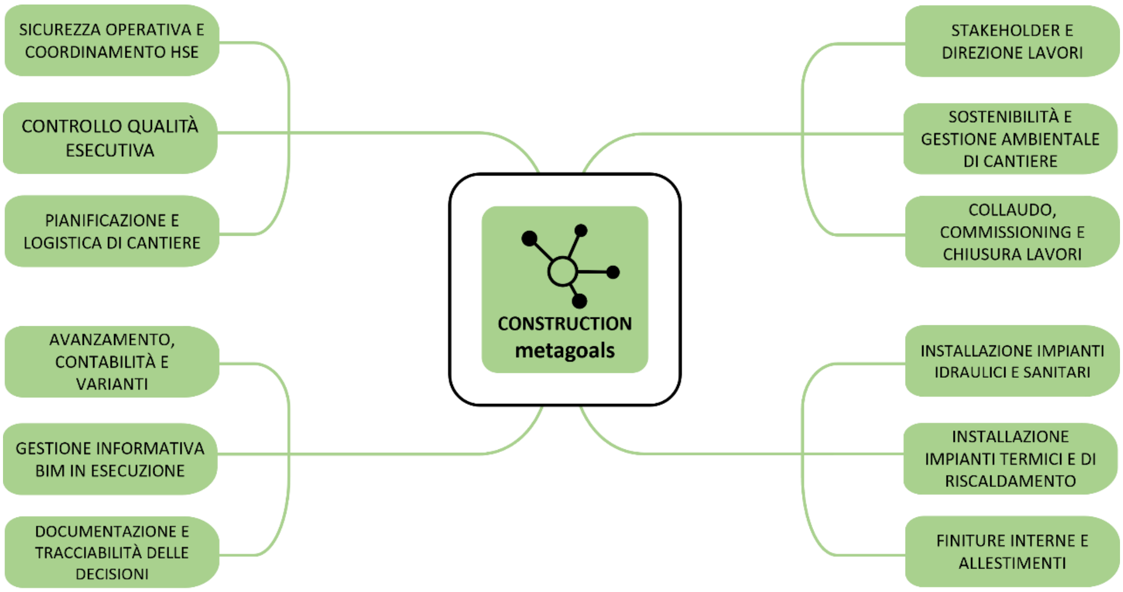


Figure 43 - Construction Metagoals

8.5.1 Metagoal Construction 1: Operational Safety and HSE Coordination

Objective: To ensure safe working conditions on site in compliance with the regulations and the PSC (Safety and Coordination Plan).

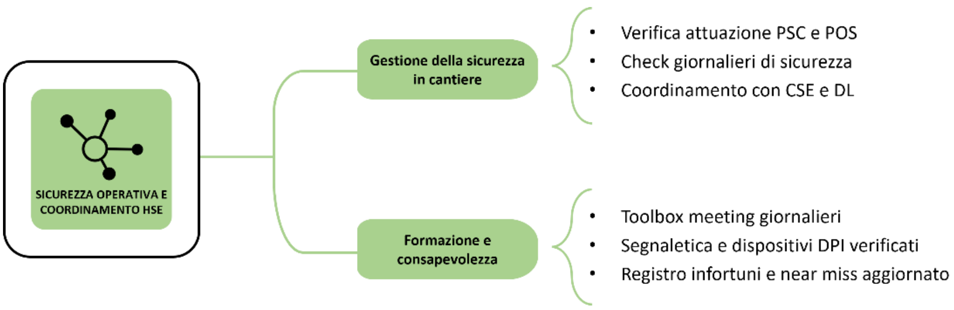


Figure 44 - Operational Safety and HSE Coordination

- **Area of impact: Construction site safety management**
  - Verification of PSC and SOP implementation.
  - Daily security checks.
  - Coordination with CSE and DL.
- **Impact Area: Training and Awareness**
  - Daily Toolbox Meetings.
  - Verified PPE signage and devices.
  - Updated accident and near miss log.

8.5.2 Metagoal Construction 2: Executive Quality Control

Objective: To verify that the works carried out correspond to the approved project in technical and performance terms.

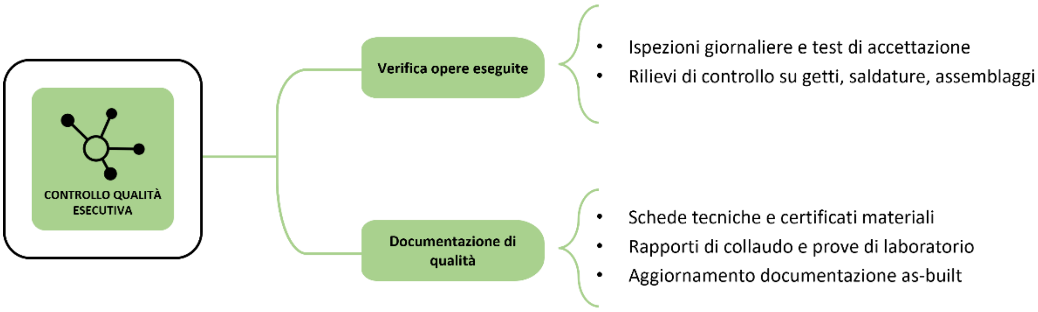


Figure 45 - Executive Quality Control

- **Impact area: Verification of works carried out**
  - Daily inspections and acceptance tests.
  - Control surveys on castings, welds, assemblies.
- **Impact area: Internal and external logistics**
  - Technical data sheets and material certificates.
  - Inspection reports and laboratory tests.
  - As-built documentation update.

8.5.3 Metagoal Construction 3: Construction Site Planning and Logistics

Objective: To ensure an efficient, orderly and coordinated sequence of construction activities.

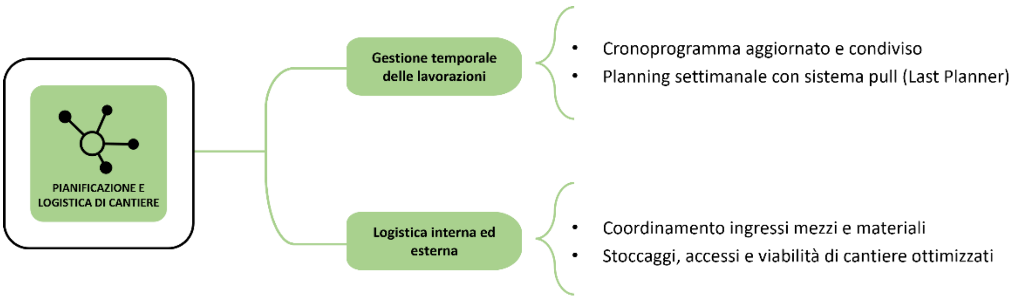


Figure 46 - Site Planning and Logistics

- **Impact area: Time management of machining**
  - Updated and shared timeline.
  - Weekly planning with pull system (Last Planner).
- **Impact area: Internal and external logistics**
  - Coordination of vehicle and material inputs.
  - Optimized storage, access and site viability.

8.5.4 Metagoal Construction 4: Progress, Accounting and Variants

Objective: To monitor the progress of the work and any contractual changes, ensuring transparency and economic control.

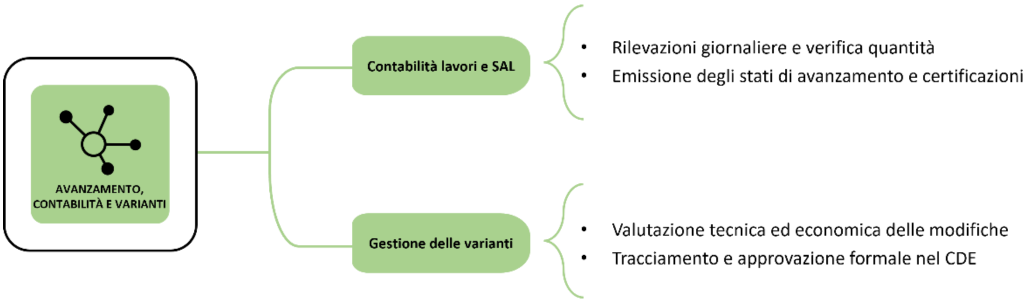


Figure 47 - Progress, accounting and variants

- **Impact area: Works accounting and SAL**
  - Daily surveys and quantity verification.
  - Issuance of progress reports and certifications.
- **Impact Area: Variant Management**
  - Technical and economic evaluation of the changes.
  - Tracking and formal approval in the CDE.

8.5.5 Metagoal Construction 5: BIM information management in execution

Objective: To keep the federated model and the information environment up to date, promoting coordination and traceability.

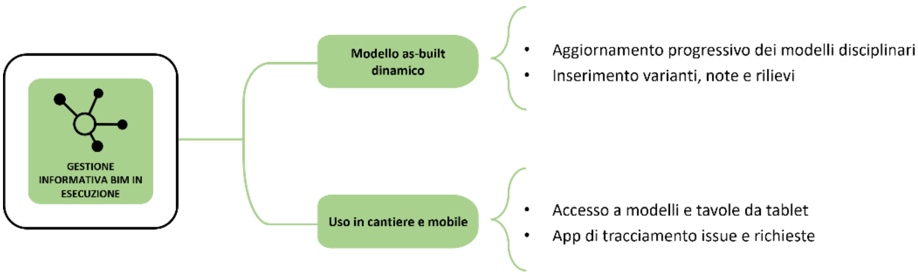


Figure 48 - BIM information management in execution

- **Area of impact: Dynamic as-built model**
  - Progressive updating of disciplinary models.
  - Insertion of variants, notes and surveys.
- **Impact Area: Construction site and mobile use**
  - Access to models and boards from tablets.
  - App tracking issues and requests.

8.5.6 Metagoal Construction 6: Documentation and Traceability of Decisions

Objective: To ensure that every choice, change or critical event is recorded, justified and accessible.

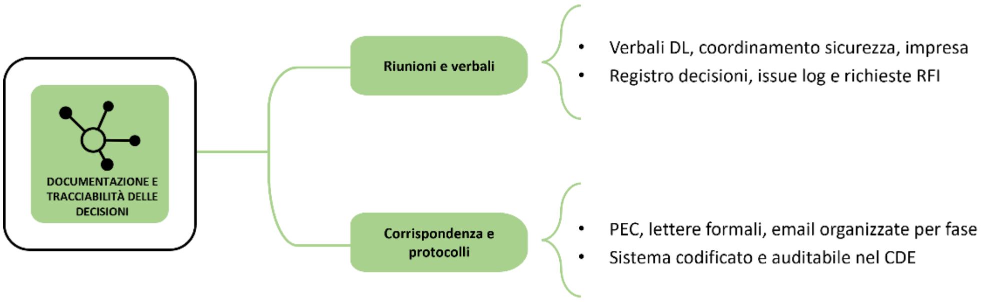


Figure 49 - Documentation and Traceability of Decisions

- **Impact Area: Meetings and Minutes**
  - DL minutes, safety coordination, company.
  - RFI decision log, issue log, and requests.
- **Impact Area: Correspondence and Protocols**
  - PECs, formal letters, emails organized by phase.
  - System codified and auditable in the CDE.

8.5.7 Metagoal Construction 7: Stakeholders and Works Supervision

Objective: To maintain effective alignment between the company, construction management, client and third parties.

Figure 50 - Stakeholders and Works Supervision

- **Area of impact: Operational coordination**
  - Weekly progress meetings (SAL, technical, safety).
  - Management of contradictory tests, intermediate tests, non-conformities.
- **Impact area: Commissioning and manuals**
  - Visual progress reports.
  - Periodic visits, inspections and KPI updates.

8.5.8 Metagoal Construction 8: Sustainability and Environmental Management of Construction Sites

Objective: To minimize the environmental impact of the construction site and comply with the minimum environmental criteria (CAM).

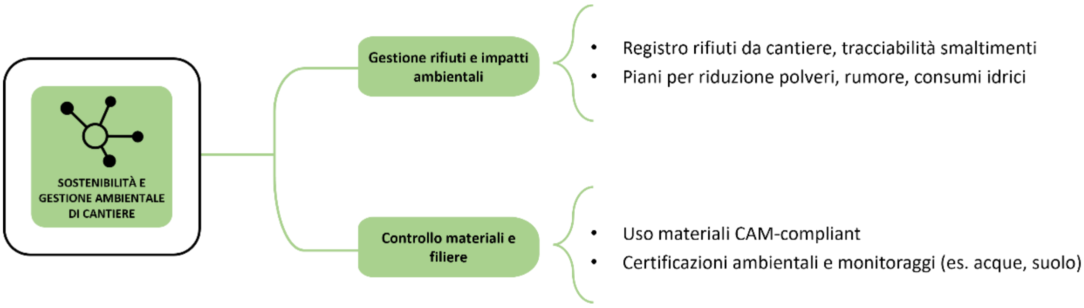


Figure 51 - Sustainability and Environmental Management of the Construction Site

- **Impact area: Waste management and environmental impacts**
  - Construction site waste register, disposal traceability.
  - Plans for dust reduction, noise, water consumption.
- **Impact area: Commissioning and manuals**
  - Use of CAM-compliant materials.
  - Environmental certifications and monitoring (e.g. water, soil).

8.5.9 Metagoal Construction 9: Testing, Commissioning and Closure of Works

Objective: To ensure the full functionality and conformity of the work for its final delivery.

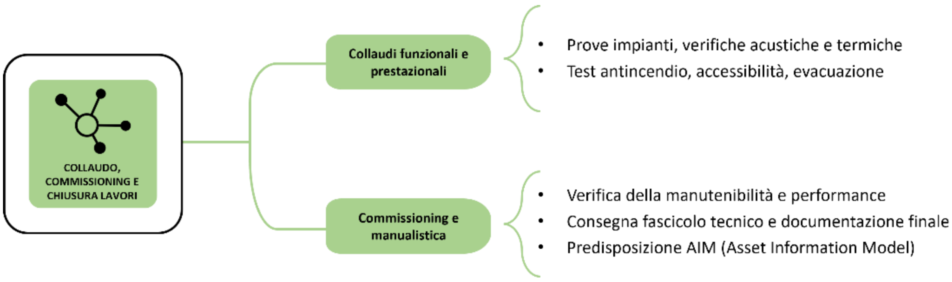


Figure 52 - Testing, Commissioning and Closure of Works

- **Impact Area: Functional and Performance Testing**
  - Plant tests, acoustic and thermal checks.
  - Fire testing, accessibility, evacuation.
- **Impact area: Commissioning and manuals**
  - Verification of maintainability and performance.
  - Delivery of the technical file and final documentation.

- AIM (Asset Information Model) preparation.

8.5.10 Metagoal Construction 10: Installation of Plumbing and Sanitary Systems

Objective: To ensure the state-of-the-art installation of water and sanitary systems, ensuring functionality, safety and regulatory compliance.

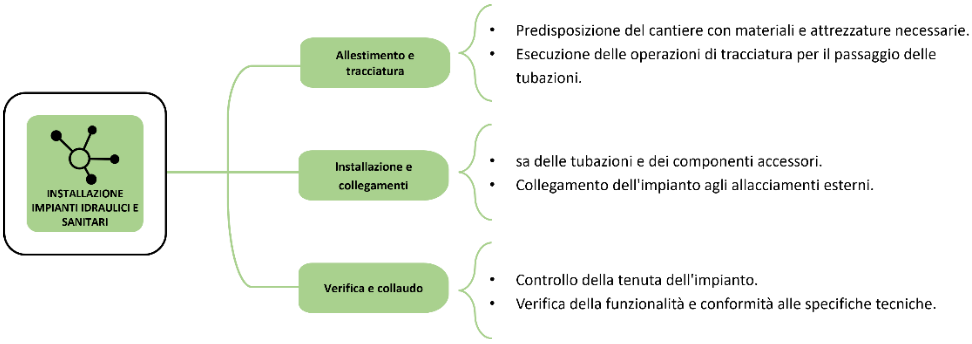


Figure 53 - Installation of Plumbing and Sanitary Systems

- **Impact Area: Set-up and Tracking**
  - Preparation of the construction site with the necessary materials and equipment.
  - Execution of tracing operations for the passage of pipes.
- **Impact Area: Installation and Connections**
  - Laying of pipes and accessory components.
  - Connection of the system to external connections.
- **Impact Area: Verification and Testing**
  - Checking the tightness of the system.
  - Verification of functionality and compliance with technical specifications.

8.5.11 Metagoal Construction 11: Installation of Heating and Heating Systems

Objective: To ensure the efficient and safe installation of heating systems, guaranteeing environmental comfort and compliance with energy regulations.

Figure 54 - Installation of Heating and Heating Systems

- **Impact area: Preparation and installation**

- Preparation of the construction site for the installation of the heating system.
- Installation of radiant panels or other heat distribution systems.

- **Area of impact: Component installation**
  - Assembly of boilers, heat pumps and other devices.
  - Connection of the system to the distribution network.
- **Impact Area: Testing and Adjustment**
  - Verification of the performance of the system.
  - Adjustment of operating parameters to optimize energy efficiency.

8.5.12 Metagoal Construction 12: Interior Finishes and Fittings

Objective: To create interior finishes with high quality standards, respecting the deadlines and design specifications.

Figure 55 - Interior Finishes and Fittings

- **Impact area: Masonry and cladding**
  - Laying of floors, coverings and false ceilings.
  - Painting and decoration of interior surfaces.
- **Area of impact: Installation of fixtures and furnishings**
  - Installation of doors, windows and other fixtures.
  - Installation of fixed and mobile furniture according to the project.
- **Impact Adrea: Quality Control**
  - Verification of the compliance of the finishes with the technical specifications.
  - Management of any non-conformities and their resolution.

9 Templates

Templates help speed up the adoption of the Fluid Process, and are of direct support to the different metaphases

AgileBIM offers a series of tools to develop collaboration between all team members by marrying the foundations of *Visual Management* in order to reduce bureaucracy in communication and processes.

Specifically, there are 2 types of tools:

- The **Canvases**, real "canvases" that serve to orient and guide the discussion, focusing on what are the most relevant aspects of the domain covered.
- The **Boards** (inspired by the well-known Kanban Board), support a quick visualization of the progress of the work.

9.1 AgileBIM Portfolio Board

The **AgileBIM Portfolio Board** is the general planning tool, i.e. cross-project, that allows you to create an overview of all existing projects and initiatives.

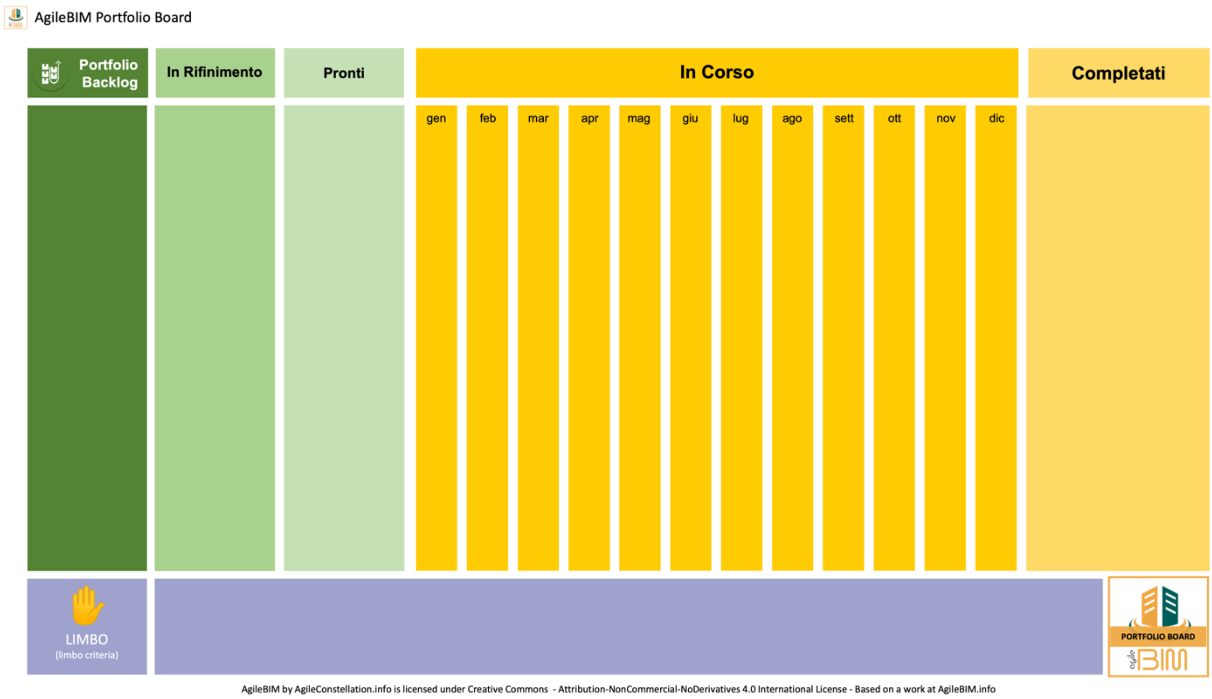


Figure 56 - AgileBIM Portfolio Board

The Portfolio Board allows you to have readiness for all projects in progress and is *governed* (horizontal axis) by the progress of the related documents/processes: if no change takes place, nothing moves on it.

The Portfolio Board consists of *6 areas* of reference:

- *Portfolio Backlog*, containing all the projects that are intended to be carried out.
- *In Refinement,* containing the projects that are in the advanced evaluation phase.
- *Ready*, containing the projects that can be put into work and with respect to which the appropriate evaluations have been made.
- *In Progress*, containing the projects currently in progress.
- *Completed*, containing the completed projects.
- *Limbo*, in which those projects that are blocked in relation to specific evaluation criteria (*limbo criteria*) are temporarily placed.

In particular, the ***limbo criteria*** must be defined with respect to contingent needs: just to give an example, it could be decided that a project stopped for more than 3 months automatically ends up in *limbo*.

On the board, each project is represented by a specific **Project Card**, similar to the following:

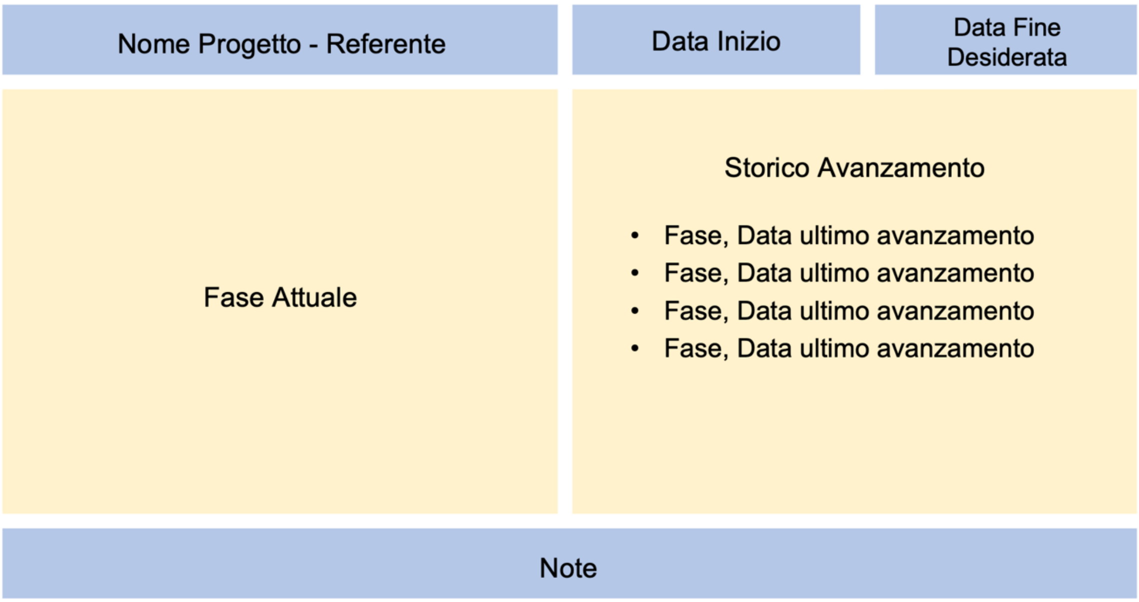


Figure 57 – Project Card

It highlights:

- **Project Name – Contact person**, project identifier and contact person.
- **Start date**, start of the relative operation.
- **Desired End Date**, Waiting End.

- **Current Phase**, the phase in which the project is currently located.
- **Progress History**, history of progress in relation to quarters.
- **Notes**, miscellaneous.

In particular, the project card remains "in progress" until it is completed or goes into limbo, and the progress of the work is reported in the "Progress History" area, allowing you to easily identify when the last action on the project took place.

If the last progress of the project triggers the conditions dictated by the *limbo criteria*, the project is discussed and possibly moved to *limbo*.

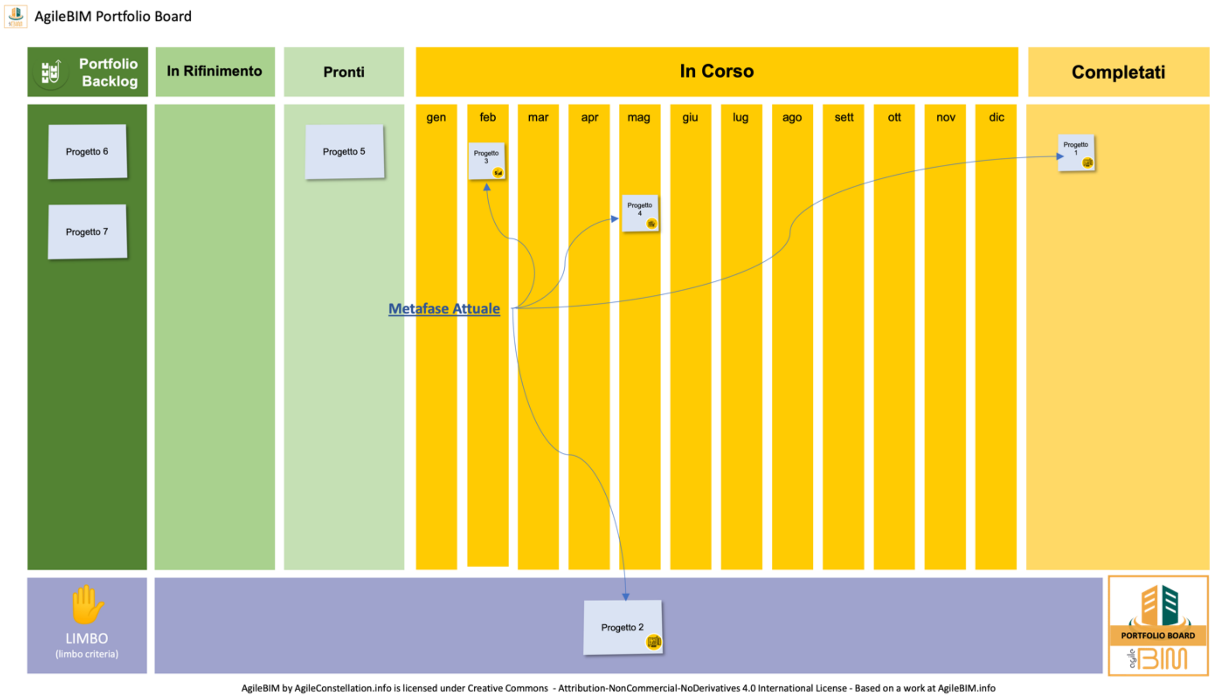


Figure 58 - Example of use of the AgileBIM Portfolio Board

9.2 AgileBIM Inception Canvas

During the Inception phase, AgileBIM offers two reference Canvases: the **AgileBIM Project Canvas** and **the AgileBIM Role Canvas**.

9.2.1 AgileBIM Project Canvas

The **AgileBIM Project Canvas** allows you to share the salient aspects of the project.

The goal is for the whole team to be aligned and to be able to represent their considerations on the matter.

While it is true that the first definition of the AgileBIM Project Canvas is created at the beginning of the new project, it is constantly updated and revised to reflect what emerged during all the metaphases contemplated.

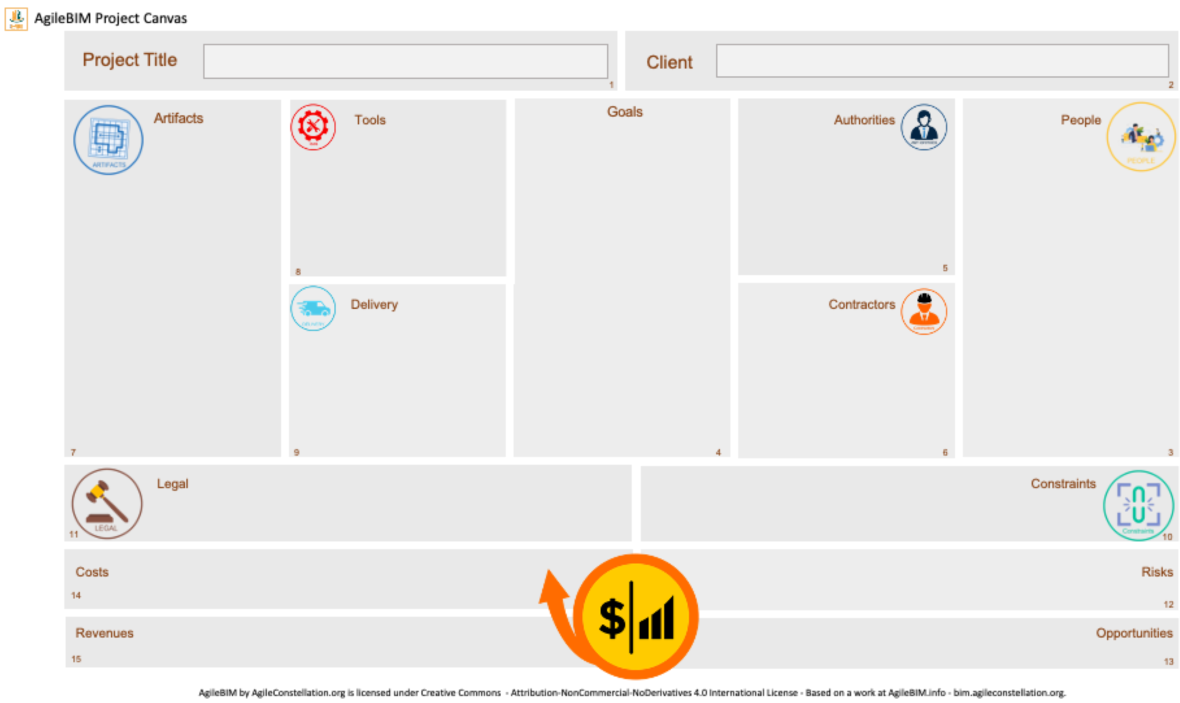


Figure 59 - AgileBIM Project Canvas

The AgileBIM Project Canvas is built in such a way as to emphasize the primary aspects relating to a typical project and concretizes the *Fast Prototyping principle* of AgileConstellation, declined in the BIM field.

Figure 60 - BIM Fast Prototyping

Specifically, the Project Canvas consists of **15 reference areas** :

- **Project Title**, the title of the project.
- **Client**, the client for whom the project is carried out.
- **People**, who are the people for whom the project generates value.
- **Project Goals**, the attached primary objectives: what value do I create for the people of reference?
- **Authorities**, the authorities that impact the project: *municipality, superintendence, etc.*
- **Contractors**, professionals, companies and other figures to be hired.
- **Artifacts**, drawings and elements to be produced: from the PIM, to the documents, to the final work.
- **Tools & Security**, tools for the design and management of the related security aspects.
- **Delivery**, how the various artifacts are delivered, e.g.: sending documentation via PEC.
- **Legal**, impactful legal aspects and reference legislation.
- **Constraints**, the constraints that exist in the realization of the project.
- **Risks**, the main risks present, e.g.: mandate of the administration expiring.
- **Opportunities**, which opportunities the project generates, directly and indirectly.
- **Costs**, main costs.
- **Revenues**, sources of direct income.

9.2.2 AgileBIM Role Canvas

The **AgileBIM Role Canvas** is designed to reflect on the contextual formation of the team, highlighting the challenges and the relationship of the members involved.

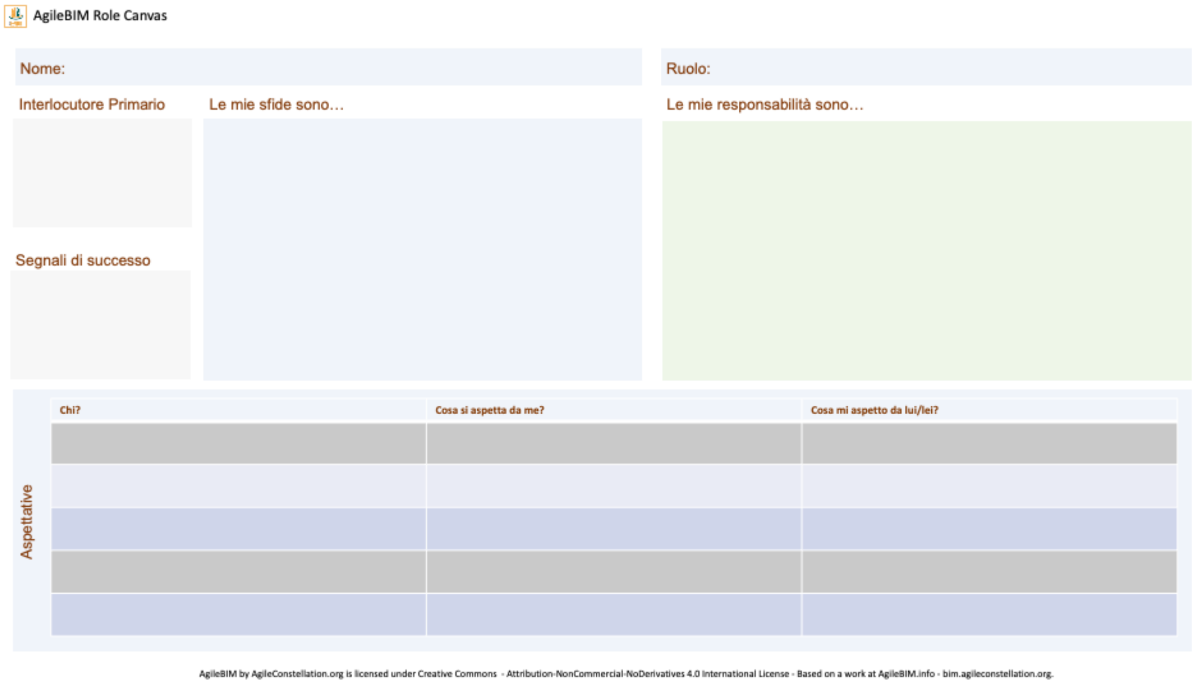


Figure 61 - Role Canvas

The Role Canvas consists of **6** reference areas:

- **Role**, the role for which you are interacting.
- **The primary interlocutor**, the direct contact person.
- **Signs of success**, as evidenced by the results achieved.
- **My challenges are...**, what challenges those who materially play that role will have to face.
- **My responsibilities are...**, what responsibilities are borne by those who materially impersonate that role.
- **Expectations**, compared to similar roles.

9.3 Design and Construction Board

The AgileBIM Design Board and the **AgileBIM Construction Board** allow you to visually track the progress of the work of the design and construction teams.

Both are inspired by the **Three Buckets Planning** technique of the Fluid Process, which is essential to avoid having stops due to the absence of workable elements when those in progress stop for some reason.

The Three Buckets Planning technique involves dividing the work according to three time segments, so that you always have a set of activities from which you can draw.

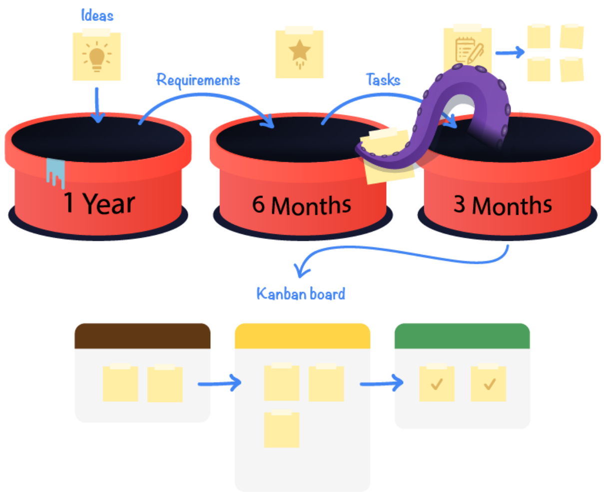


Figure 62 - 3 Buckets Planning

In this way, **long-term strategic planning** is developed, focusing on a *subsequent refinement of the processes to be developed*, until a degree of detail is reached that allows them to be taken over.
Downstream of the "3 buckets" we find the Kanban-style area (in the image "Current Week") which is more linked to the **tactical**, i.e. operational, aspect.
An example of characterization of "buckets" is the following:

- **1-year bucket (Ideas):** dedicated to long-term goals and ideas, strategic for the organization, For example: *how to penetrate a new market, how to release a new product, how to reinvent the existing product, etc.*
- **The 6-month bucket (Requirements):** this is the pivot point and is activated when the organization decides to move forward with a plan or idea from the 1-year bucket. Once the initiative is moved to the *6-month bucket,* the main requirements and key aspects are defined.
- **The 3-month bucket (Tasks):** When you are ready to start developing the initiative in the 6-month bucket, it is moved to the 3-month bucket and divided into tasks that can be worked on by the team. The latter will make up the To-Do column of the *Visual Board*.

9.3.1 AgileBIM Design Board

The AgileBIM Design Board is the tool that allows you to manage activities during design metaphases.

The board shows the **Deliverables** to be created, thanks to a specific card, allowing you to quickly identify those in *progress*, those *candidates for processing* and those that *may be blocked*.

Figure 63 - AgileBIM Design Board

The Design Board is divided into 6 primary areas:

- *Project Backlog*, contains all the documents to be carried out, added incrementally
- *In Finishing,* the information for understanding and processing the specific Deliverable is being refined and completed.
- *Ready*, contain the ready and candidate documents for processing.
- *Phase*, which groups the activities in progress. The area is divided into 4 sub-areas:
    - To Be Done, containing the documents taken in charge.
    - In Progress, containing the papers you are working on.
    - Blocked, contain the papers that for some reason (e.g. opinion outside the team) are stopped.
    - Completed, containing the finished documents.
- *S.A.L.*, which reports on reporting activities.
- *Topics or External Activities*, wildcard areas in which it is possible to trace further information of relevance to the works in progress.

In the following figure you can see an example of using the Design Board:

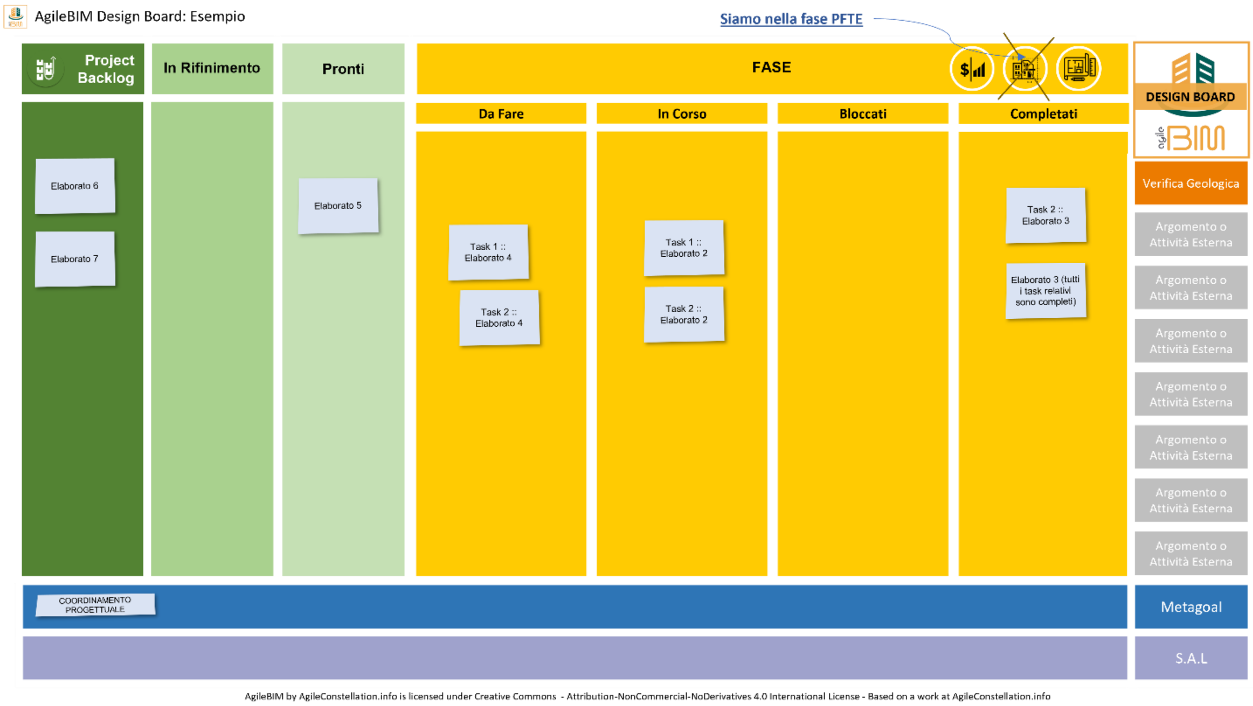


Figure 64 – Example of use of the AgileBIM Design Board

To make the design board aligned with the current phase, the "phase" title line shows the icons representing the metaphases themselves, highlighting the one currently in progress.

The *cards of the works* are as follows:

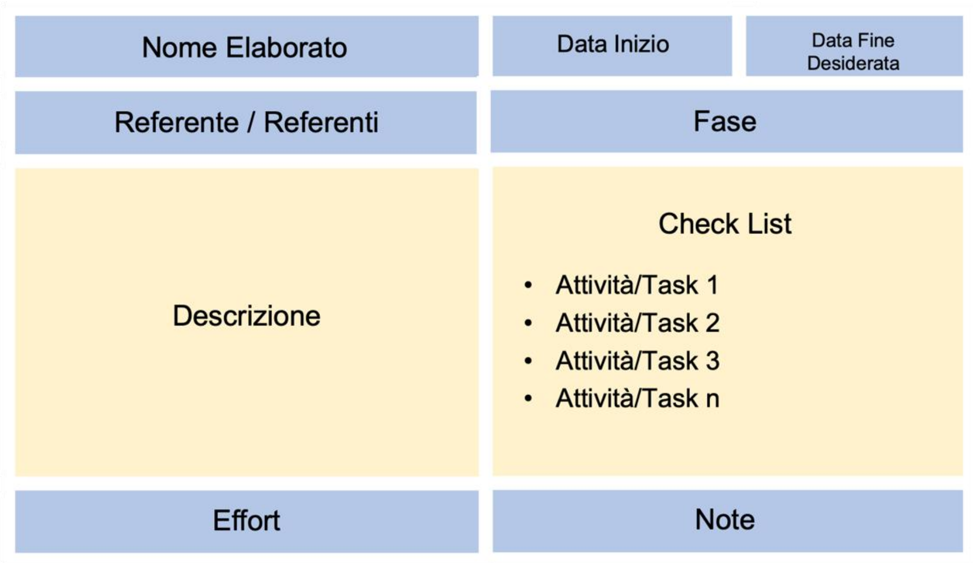


Figure 65- Papers Card

They highlight:

- **Submission Name**, identifier of the specific output.

- **Contact person(s)**, name of the contact person(s) who are responsible for the work.
- **Start date**, start of the relative operation.
- **Desired End Date**, Waiting End.
- **Phase**, phase in which the work is inserted.
- **Description**, summary description.
- **Check List**, list of the fundamental activities for the realization of the paper.
- **Estimated effort**/time needed.
- **Notes**, miscellaneous.

9.3.2 AgileBIM Construction Board

In addition to the Design Board, the **AgileBIM Construction Board** allows the Construction Team to constantly be ready for work in progress:

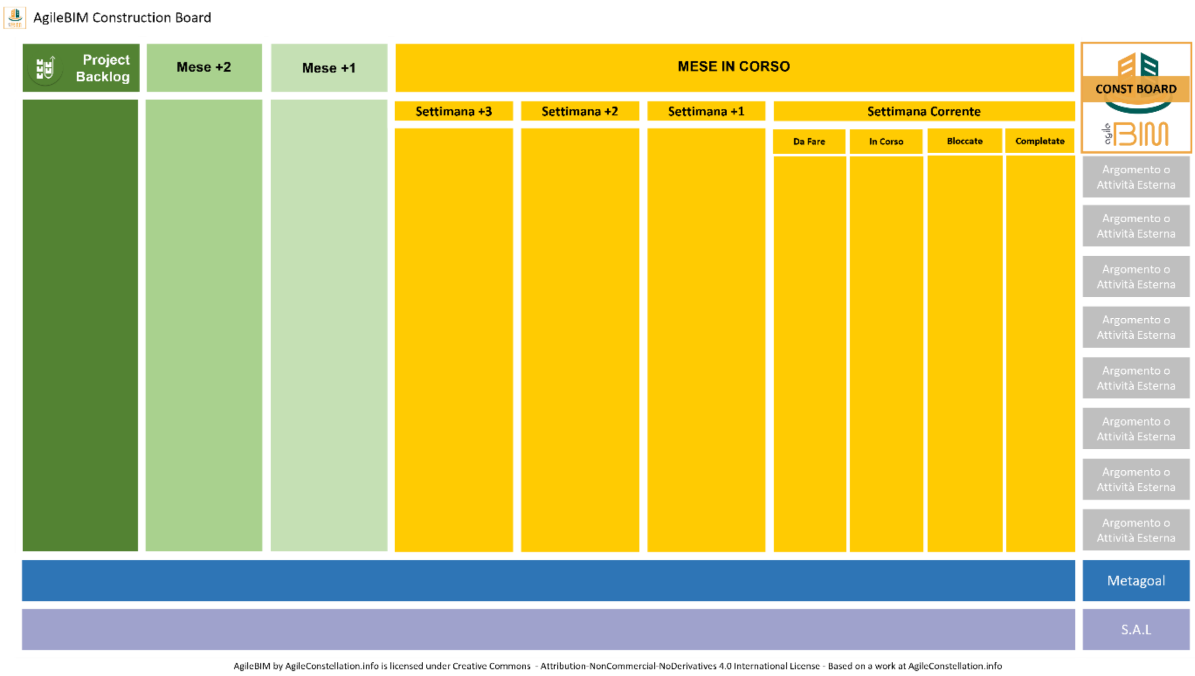


Figure 66 – AgileBIM Construction Board

The Construction Board shows the different processes to be carried out, represented by a special **Machining Card** that moves into *7 primary areas*:

- *Project Backlog*, contains all the processes to be carried out, added incrementally starting from the reference Metagoals.
- *Month +2,* contains the processes that should be put in place in 2 months.
- *Month +1,* contains the processes that should be put in place in 1 month.

- *Current Month*, contains all current tasks. It is in turn divided into 4 sub-areas, one for each week, with that of the current week divided in turn into detail columns:
    - To Do, containing the work taken over.
    - In Progress, containing the work in progress.
    - Blocked, contain the processes that for some reason (e.g. opinion external to the team) are stopped.
    - Completed, containing the finished work.
- *Material Order*, the material ordered or to be ordered for the work to be carried out is tracked.
- *S.A.L.*, which reports on reporting activities.
- *Topics or External Activities*, wildcard areas in which it is possible to trace further information of relevance with respect to the work in progress.

The Construction Board is accompanied by a special **Machining Card**, similar to the one shown below:

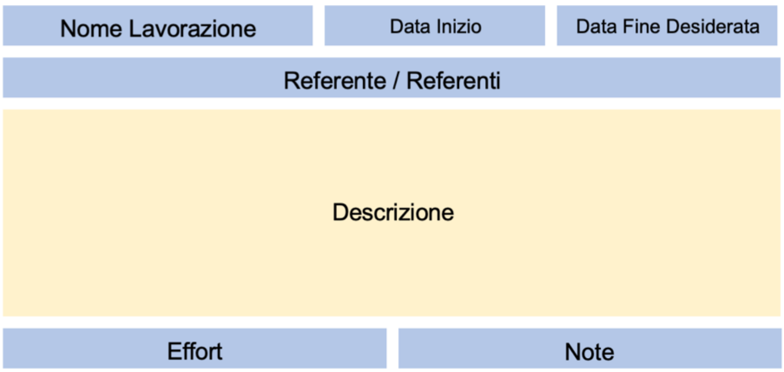


Figure 67 - Card Processing

The Processing Card highlights:

- **Job Name**, identification of the job to be performed.
- **Start date**, start of the relative operation.
- **Desired End Date**, Waiting End.
- **Contact person(s)**, name of the contact person(s) who are responsible for the activity.
- **Description**, description of the work to be carried out.
- **Effort**, estimate of the commitment/time needed.
- **Notes**, miscellaneous.

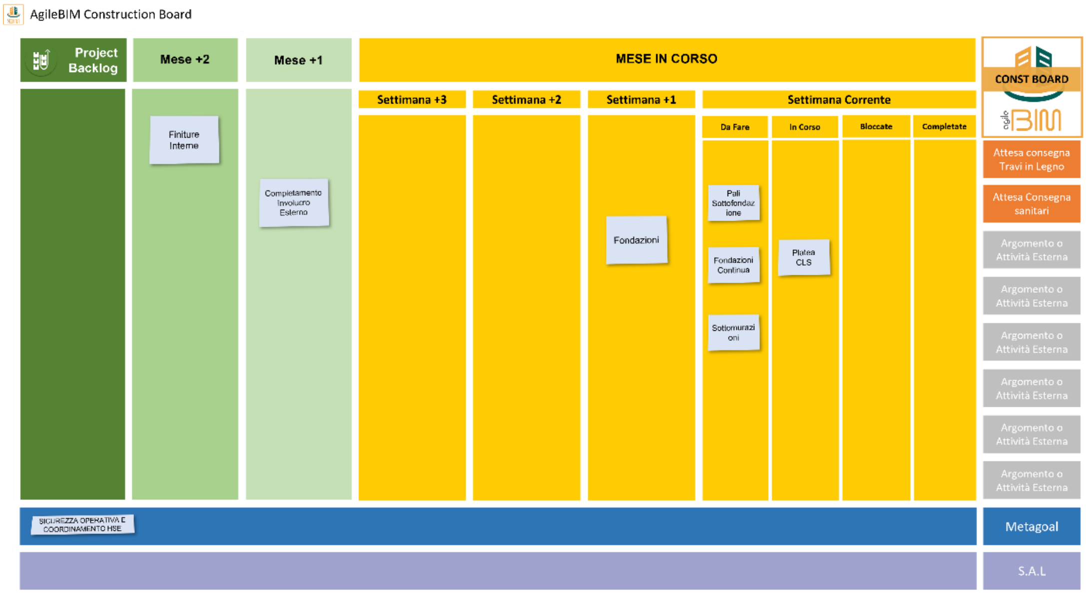


Figure 68 - Example of using the Construction Board

10 Conclusions

As we hope has emerged from reading the paper, the goal of its content is to present a structured path, to find out how to effectively implement a metrology that allows you to develop BIM culture within your reality.

If you are interested in the in-depth study and concrete application, you can contact us at the e-mail address info@agileconstellation.info or through our social channels that you find on the official website.

11 Authors, Acknowledgments and Use of Material

AgileBIM is developed by **Felice Pescatore** (@felicepescatore).

Thanks for the collaboration of

- **Daniela Rinaldi** (LinkedIn Daniela D. Rinaldi)
- **ACCA Software** (acca.it)
- **ArchLivIng** (archliving.it)
- **Michele Cicala** (bimlabsrl.it)
- **Cristian Seghetti** (caseinlegno.tech)