

# AN INFORMATION-BASED APPROACH TO “DIGITAL TWINs”

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Paula Gordo-Gregorio,

[paula.gordogregorio.auditeur@lecnam.net](mailto:paula.gordogregorio.auditeur@lecnam.net)

Ecole Nationale Supérieure d' Architecture Paris la Villette

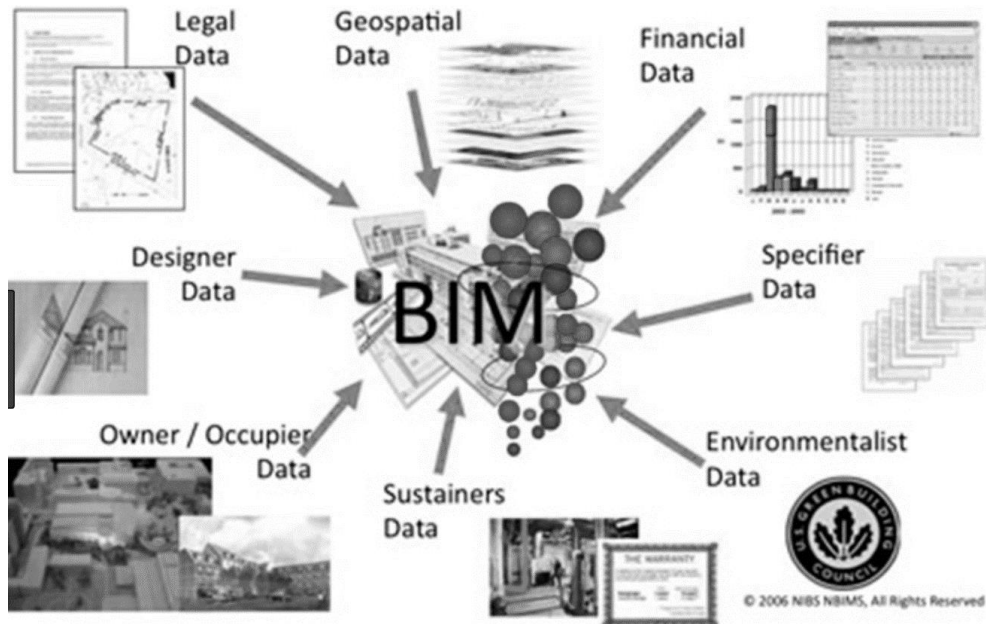
François Guéna,

[francois.guena@paris-lavillette.archi.fr](mailto:francois.guena@paris-lavillette.archi.fr)

Ecole Nationale Supérieure d' Architecture Paris la Villette

# AN INFORMATION-BASED APPROACH TO “DIGITAL TWINS”

We suggest that BIM projects should also be studied through the analysis of the information stored in the “digital twin” of the building.



Arayici, Y., Egbu, C. and Coates, P., Building information modelling (BIM) implementation and remote construction projects: Issues, Challenges and Critiques, *Journal of Information Technology in Construction (ITcon)*, 17(2012), pp. 75-92, 2012.

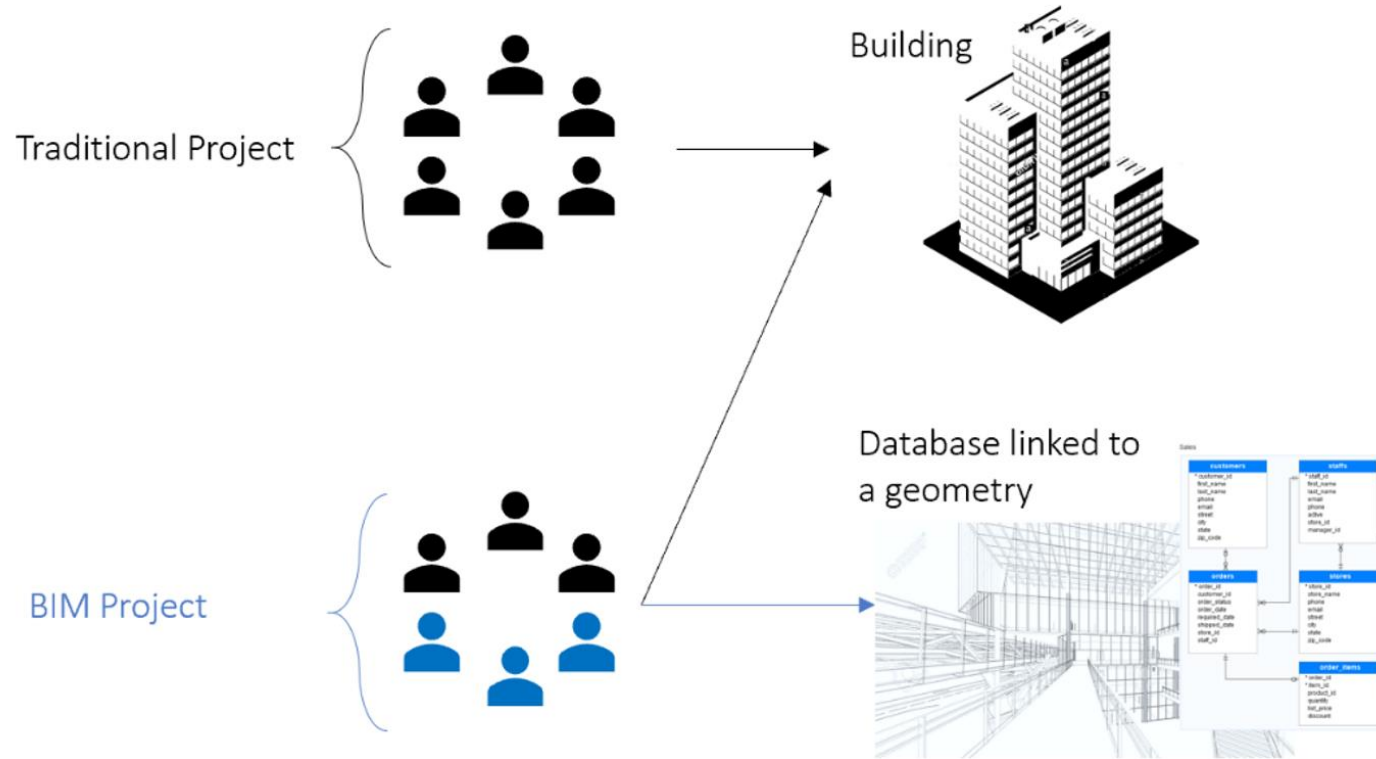
# THE ORIGIN OF "BUILDING DATA" AND THE "BUILDING DATA PROJECT"

- **Industrial revolution and standardization:** Building components and materials became more diverse and led to increasingly complex specifications to the point where their standardization and structuring became necessary. Today, there is a wide variety of **classification systems**, international classifications such as Unifomat, Omniclass, and Uniclass (integrated also into the ISO building standards (ISO 19650 and ISO 12006)).
- **The arrival of information technology** responded to this exponential increase in the quantity of data. In the construction field, the research work tried to develop new tools for Computer Aid Design in France - 80s and 90s (INPROBAT team, 1986) and abroad (Eastman, 1999).
- The developments in the field of computer science, together with the standardization of construction information and procedures, were the forerunners to the BIM software.

# THE ORIGIN OF "BUILDING DATA" AND THE "BUILDING DATA PROJECT"

- In BIM projects, "**iconographic data**" and "**written data**" are distinguished. These data are evaluated by two scales that are used by the client to measure the level of development of projects in BIM: the LOG (Level of Geometry) and the LOI (Level of Information).
- In "BIM" projects, the creation of the building database transformed into a separate project, what we refer to as the **Building Data Project**.

# THE ORIGIN OF "BUILDING DATA" AND THE "BUILDING DATA PROJECT"



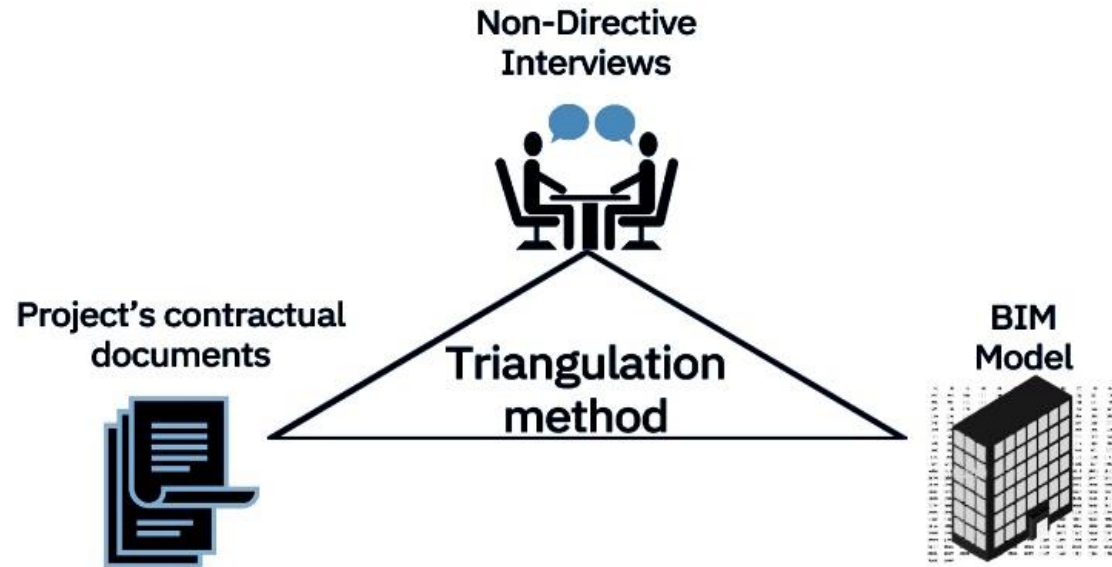
# THE BUILDING DATA PROJECT AS AN OBSERVATORY OF THE SYSTEM OF ACTORS

## The system of actors

- The **new tasks associated to the "BIM"** actors in these projects do not correspond to the traditional tasks they used to undertake. Designers and construction companies must therefore face a set of new tasks that did not previously exist. New tasks and new actors.

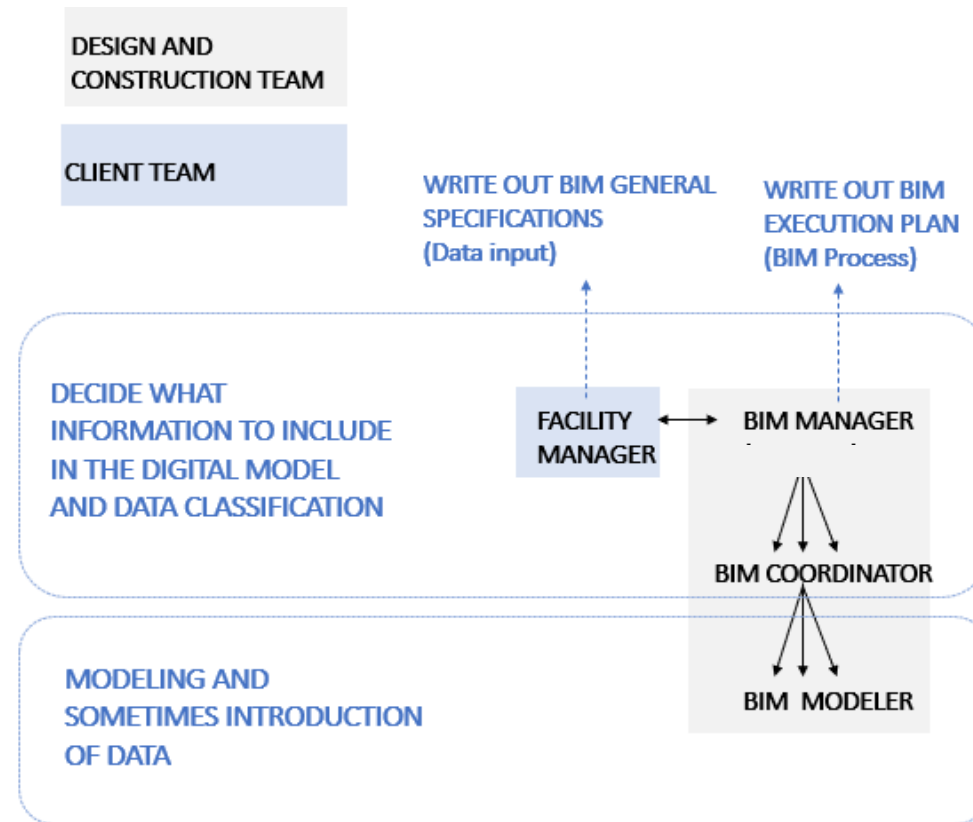
*Example: The parameterization, the implementation of Excel tables structuring the data to be retrieved or the verification of the introduction of information.*

# THE BUILDING DATA PROJECT AS AN OBSERVATORY OF THE SYSTEM OF ACTORS



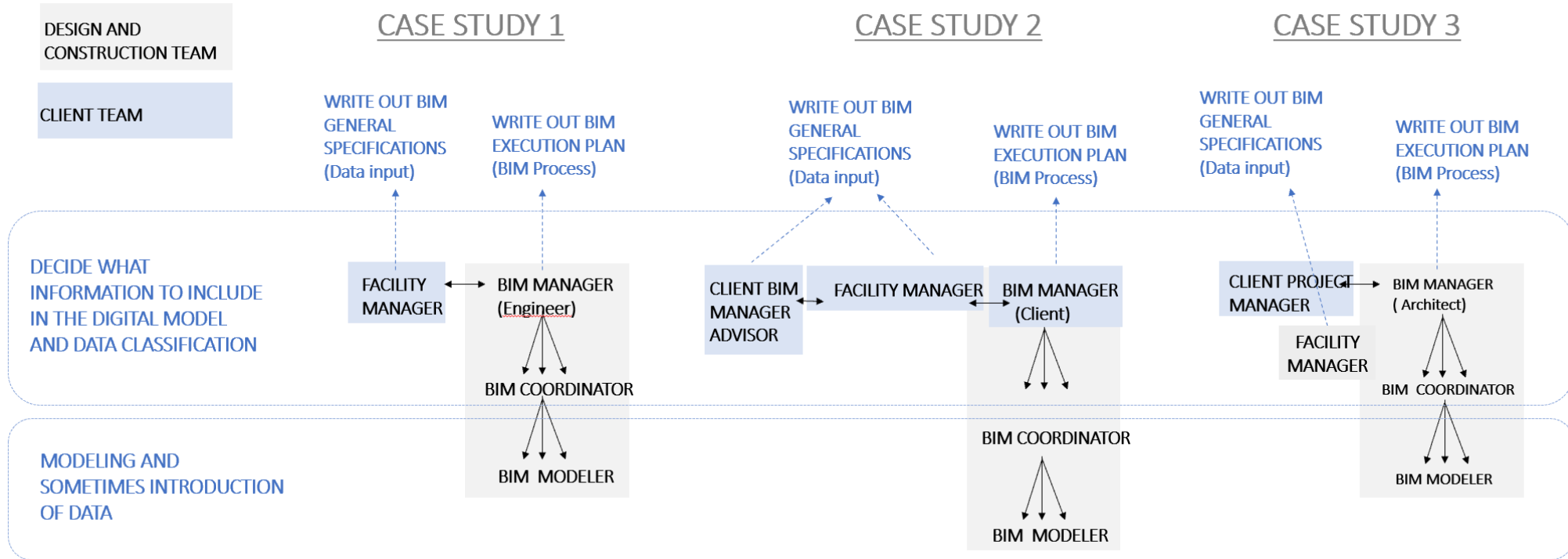
- **Triangulation analysis.** We present the results obtained from 3 case studies (2 educational buildings and 1 office building) in which information becomes a problem of collaboration between the stakeholders.

# THE BUILDING DATA PROJECT AS AN OBSERVATORY OF THE SYSTEM OF ACTORS





# THE BUILDING DATA PROJECT AS AN OBSERVATORY OF THE SYSTEM OF ACTORS



# BIM INFORMATION PROBLEMS

CASE STUDY 1	CASE STUDY 2	CASE STUDY 3
Educational building (University)	Office building	Educational building (High School)
<b>SITUATION</b> The facility manager helped the designers to structure the database in order to produce retrievable Excels for its maintenance operation tool.	<b>SITUATION</b> Since the beginning of the design phase of the project, the owner has established a table that structures the data for the operation of the building. An exhaustive parameterization is integrated since the beginning of the design in the model. The specifications require the recovery of quantities from the model.	<b>SITUATION</b> Within the framework of an environmental mission of life cycle assessment (LCA), the project manager tries to obtain information on the building materials from the digital model. The environmental project manager establishes a specification for the information of materials
<b>INFORMATIONAL ISSUES</b> 1.The client decides to change the facility manager, and everything had to be reconfigured. For the new facility manager, the data for maintenance had to be filled in by month (time parameters) and the tasks to develop every month had to be introduced as the information of the month parameter. However, the previous parametrization introduced the maintenance tasks as parameters, and they were filled with the data "periodicity. ". As a result, the data are the same, but the structure is completely different.  2.In the models, each object has about ten parameters and codifications introduced in the BIM model. This situation has caused an overload of work for the designers.	<b>INFORMATIONAL ISSUES</b> 1. Designers describe the model as unreliable. It lacks quantitative data.	<b>INFORMATIONAL ISSUES</b> 1.The construction materials are not well detailed.  2.The parameterization of the model has been done for the operation and maintenance of the devices.
<b>WHY?</b> Facility management' tools are not adapted to the BIM process. Before, the facility manager's job and the designer's job were not linked but now they need to work together if they want to retrieve data from the BIM model. In addition, we can find IT problems on this process.	<b>WHY?</b> Different BIM Managers for each phase of the project, less communication between the BIM Manager and the designers. The BIM Manager belongs to the client company, and he is disconnected from the design team.	<b>WHY?</b> Absence of concerns related to LCA and BIM, the BIM LCA specifications are a request from the design team (the environmental company) and not from the client. In addition, the BIM Manager works for the architectural firm who is in charge of introducing the characteristics of materials, and it would produce a workload to his firm.

# CONCLUSIONS

We propose the observation of work methodologies through the building data project, as it represents the singularity of BIM projects compared to traditional projects.

## The building data project:

- **An opening to new quality issues:** A whole set of new concerns like **circular economy, health, energy performance, cultural heritage etc.** through the building data project, find a way to be integrated into a design process that previously was much more focused on purely geometric issues.
- **An approach to the collaboration/cooperation processes:** To shed light on the main collaboration constraints that exist today. The term collaboration appears in almost all the publications about "BIM", however this collaboration is not yet real, since each actor has different concerns and needs.
- **Reflect on the life of data:** The analysis of information that disappears during the project, in order to understand what is intentional or what is the result of poor project management.

PAULA GORDO-GREGORIO,  
PAULA.GORDOGREGORIO.AUDITEUR@LECNAM.NET

FRANÇOIS GUÉNA,  
FRANCOIS.GUENA@PARIS-LAVILLETTE.ARCHI.FR

