



## WORKSHOP IV BIM IN FM

**Strasbourg, 20th - 21st February 2024**

## WORKSHOP IV

### BIM IN FM

# THE WORKSHOP



#### WHY?

Response to the needs of GA members, other big public clients and policy makers to share knowledge, experience, concerns and challenges they face when implementing information management (BIM) in their daily practice, with a focus on BIM for FM in the context of public institutions.



#### WHAT?

Practical experience, insights and case studies on the use of Building Information Modelling for Facility Management.



#### GOAL:

To go into practical details about BIM for FM, facing everyday life challenges in maintenance, evaluating the requirements and elaborating a successful implementation strategy.

Furthermore, the workshop aims to encourage participants' reflection on the advantages of BIM for FM, but also on its limitations and critical points for a continuous improvement in daily practice.



#### WHO?

The 32 workshop participants were representatives of large public clients and EU policymakers from 14 countries - Austria, Belgium, Croatia, Czechia, Denmark, Estonia, France, Germany, Greece, Hungary, Italy, Latvia, Luxembourg and Spain.



#### THE OUTPUT IS INTENDED FOR THE ACHIEVEMENT OF COMMON GOALS

- Effectiveness in public buildings management
- Efficient spending of public money for operation and maintenance costs
- Improving data sharing and updating the information model (structured data, documents, processes and communication) for quality decisions based on trustworthy data
- Improved information requirements based on international, national and organisational standards used for the operational phase of the buildings
- Sharing and describing achievable purposes in FM
- Communication improvement among the stakeholders involved in Facility Management
- Getting more involved in the FM needs during both the design and construction phase to well define purposes with connected information requirements
- Smoother transition from construction to operational phase through strategic guidance



## WORKSHOP IV BIM IN FM FINDINGS

1

In BIM, it is crucial to differentiate between the **AIM (Asset Information Model)** used during the maintenance phase and the **PIM (Project Information Model)** utilised in the design and construction phases. These models **interact** and exchange information with each other both at the initiation and upon completion of building projects as described in the ISO 19650 series.

2

The **BIM Uses** (purposes) refer to the tasks or processes for which we utilise **information models**. Defining them at the **initial stages** of BIM implementation is crucial and precisely they must be based on our daily tasks and processes. Not all the BIM purposes are easily compatible with each other within the same model, also due to current technological limitations. This is why it is very important to anticipate how they can be **integrated, modified** and **removed**, selecting them really carefully. This is a key process during the handover phase when **PIM is merged into AIM**. In the information model, we will have the **objects** and their **information** that will be stored in the **parameters**.

3

**BIM standards** in FM can be used as a **guide** to refine processes. These can help to better address organisational needs, develop documents, and align technology with goals, ensuring effective **information management**.

4

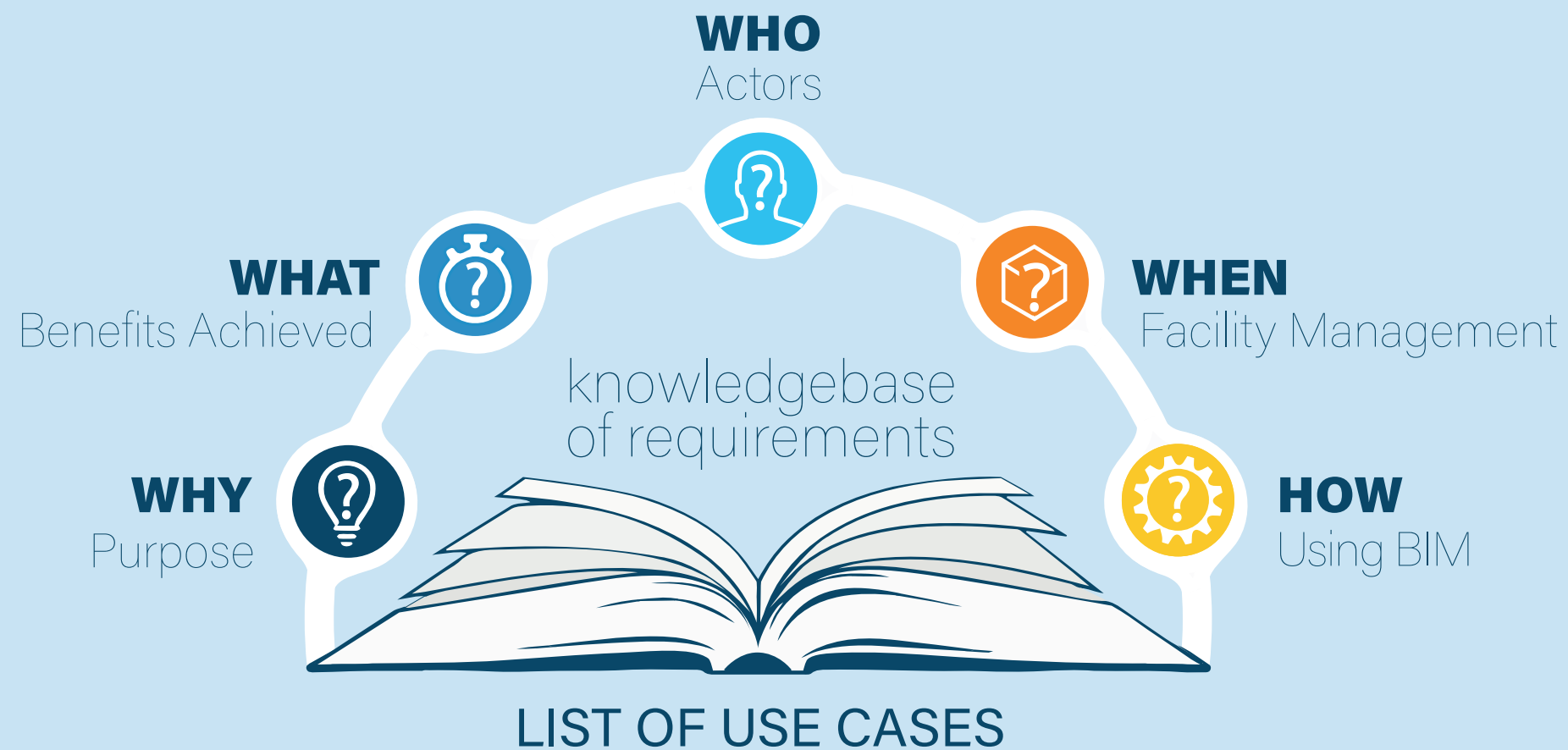
One of the greatest strengths of the **Digital Twin** in the FM environment is its descriptive and predictive capabilities, serving as a reliable **central data repository** and **knowledge distributor** to other FM teams.

5

In recent years, the FM management sector in **public organisations** has become more and more digitalised, thus requiring effective **BIM for FM integration**. In this sense, **Change Management** models are a way to prepare, support and sustain this process over time. One of the most suitable ones for FM is **Kotter's model**, based on eight points and with a **cyclical conception**. The model can be used as a starting point to implement an organisational **strategy** to introduce BIM for FM in a public client's internal environment.



## BIM USES (PURPOSES) DEFINE HOW TO ACHIEVE SPECIFIC OBJECTIVES THROUGH THE USE OF BUILDING INFORMATION MODELLING ACROSS THE WHOLE LIFECYCLE OF A FACILITY



- Human Resources
- Costs
- Simulations
- Space
- Quantities
- Security and Safety
- Reporting
- Visualization
- Audit

	PURPOSE	DESCRIPTION	BIM BENEFITS	ACTORS
Human Resources	Wayfinding	Use of signage, colours and other architectural elements to help people to orientate themselves in the space. Wayfinding is particularly important in public buildings and infrastructure. It is possible to integrate signage design into the information model and in the Open BIM Library to perform analyses and better decision making.	<ul style="list-style-type: none"><li>Ease of choice by comparing different signage solutions based on structured information and on a better integration of signage data with other information contained into the model: accessibility, security, materiality, space functions, installations, etc;</li><li>Good approximation of users' perception in the different project scenarios by using virtual reality simulations.</li></ul>	<ul style="list-style-type: none"><li>- Asset Manager</li><li>- BIM Team</li><li>- FM Team</li></ul>
	Occupation	Management of spaces within a facility in terms of use or usability (occupied or unoccupied spaces, for what activities, in what times of the day, for how long in the distant horizon and by whom, etc.) thanks to the integration of this data in the information model.	<ul style="list-style-type: none"><li>Better management of spaces and resources on a daily basis and over the long term.</li><li>Dynamic visualisation of how space is being utilised, which is useful for phasing.</li><li>Cross - reference with other BIM purposes, such as 4D and 5D planning, space management and preventive maintenance.</li></ul>	
Costs	Renovation costs	Process in which current bases are used to make decisions on small and large reconstructions and maintenance works, such as repainting, changes in the surface of floors, and relocation of internal partitions.	<ul style="list-style-type: none"><li>The geometrical visualisation with easily mined data based on different criteria can deliver valued, trustworthy data;</li><li>It is easy to define alternatives for decision-making, including plans for restriction of operation of designated parts of the building, based on all connected data from the information model. All those expenses should be part of the total cost of the renovation.</li></ul>	<ul style="list-style-type: none"><li>- Asset Manager</li><li>- Top Management</li><li>- Financial Department</li></ul>
	Calculation of the surface use	For many tasks like rental and cleaning, it is necessary to know the exact area of specific spaces, rooms and zones in a building.	<ul style="list-style-type: none"><li>Using an IFC, or any other structured model, with properly used zoning and classified spaces with useful properties can deliver additional information to use for summary reports or analysis;</li><li>Those data can be easily used for alternative calculations to get optimal solutions and decisions. For example, the surface of the windows is utilized for annual cleaning.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- FM Team with the help of BIM Team</li><li>- Financial Department</li></ul>
	Consumptions	Evaluation of energy consumption with the help of a BIM software, possibly integrated with calculation or visualisation tools.	<ul style="list-style-type: none"><li>Control on money and expenses;</li><li>Structured data used to make forecasts about the future consumptions within the facility;</li><li>Monitoring over the money spent for consumptions over the year and easier comparison between data;</li><li>Through the use of a visualization software, it is possible to make charts and share the data with all the actors involved in the evaluation process.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- MEP</li><li>- Coordinator</li><li>- Financial Department</li></ul>



	PURPOSE	DESCRIPTION	BIM BENEFITS	ACTORS
Maintenance	Cleaning management	Activity to run the cleaning of a working environment within a facility, in collaboration with external contractors and with the help of an information model.	<ul style="list-style-type: none"><li>• Correct estimation of quantities to be cleaned;</li><li>• Good definition of the different types of spaces and equipment to be treated;</li><li>• Evaluation of phasing and costs for cleaning;</li><li>• Possibility to create simulations and consider different organizational alternatives for cleaning management.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- FM Team</li><li>- FM Contractors</li><li>- BIM Team</li></ul>
	Preventive Maintenance	Management of the good functionality of building components (walls, floors, ceilings, structures etc.) and equipment (mechanical, electrical, plumbing) in a facility over its Lifecycle.	<ul style="list-style-type: none"><li>• Better management and reduced maintenance costs;</li><li>• Evaluation of different maintenance approaches based on optimized costs and efficiency;</li><li>• Improvement of building performances;</li><li>• Reduction of corrective maintenance works and emergency repairs;</li><li>• Tracking of maintenance history thanks to the use of the information model.</li></ul>	<ul style="list-style-type: none"><li>- Asset Manager</li><li>- FM Team</li><li>- FM Contractors</li><li>- FM Manager</li></ul>
	Ticketing 24/7	Control over daily maintenance operations through the use of a ticketing system, trying to meet the exigencies and problems faced by the users within the facility. In this case, the information model can be used as a tool to efficiently perform the maintenance operations necessary to solve the issue and close the ticket.	<ul style="list-style-type: none"><li>• The use of the information model allows the FM Team to have a quicker access to the data needed to solve the encountered problem;</li><li>• This operation allows maintainers to react as quickly and efficiently as possible, making interventions on the basis of integrated and structured information</li></ul>	<ul style="list-style-type: none"><li>- FM Team, with the help of the BIM Team to extract the data</li><li>- FM Operators</li></ul>
	Warranties	Items and products warranty evaluation through the creation of specific BIM parameters and connection with the project documentation.	<ul style="list-style-type: none"><li>• Creation of shared parameters in the BIM software (e.g. warranty deadline) to have control over the maintenance of the items;</li><li>• Link between the "As Built" documentation in pdf, or other traditional format, and the information model;</li><li>• Better evaluation of costs for maintenance thanks to the check of warranties and less emergency maintenance interventions.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- FM Team</li></ul>
Security	Secure and Safety	Methodology to ensure the security and safety of the users of the facility with the help of an information model and in collaboration with the security team (controlled access with a badge system to certain areas of the building, occupancy control, etc.).	<ul style="list-style-type: none"><li>• Draft location of badges systems and locked doors with special passes required</li><li>• Effective control of the facility's spaces (locals, doors, accesses), defining who can have access to certain spaces and who cannot;</li><li>• Automatic calculation of maximum room occupancy to ensure safety.</li><li>• Simulations and analyses for decision-making prior to reconstructions, especially when they are partial and the asset is in use during them.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- Department</li><li>- Security</li><li>-FM Team</li></ul>

	PURPOSE	DESCRIPTION	BIM BENEFITS	ACTORS
Simulations	4D Phase Planning	Process in which a 4D information model is used to effectively plan the steps of renovation/construction and space requirements of a facility. The model is a general 3D model with the added dimension of time.	<ul style="list-style-type: none"><li>• Better definition of Lifecycle phases based on data;</li><li>• Identification of sequences and schedules;</li><li>• Planning of future activities;</li><li>• Showing the critical steps within the process;</li><li>• Possibility of considering multiple solutions for spaces though the use of phasing plans and simulations;plans and simulations;</li><li>• Resolution of space conflicts.</li></ul>	<ul style="list-style-type: none"><li>- Owner</li><li>- Top Management</li><li>- FM Manager</li><li>- BIM Team Department</li></ul>
	5D Costs estimation	Process in which the 3D model is associated not only to phasing and timeline definition (4D), but also to the estimation of costs (5D) in order to better plan future decisions.	<ul style="list-style-type: none"><li>• Better planning of future activities thanks to a good estimation of costs in each steps of the process;</li><li>• Binding costs and estimation processes directly to the 3D models (connection between space - time - costs);</li><li>• Better decision-making based on structured and complete data.</li></ul>	<ul style="list-style-type: none"><li>- Owner</li><li>- Top Management</li><li>- FM Manager</li><li>- BIM Team</li><li>- Financial Department</li></ul>
	Energy	During the operational phase, with the aid of dedicated software, the information model and the data stored in it can be used to create energy simulations in order to evaluate different scenarios in terms of systems, climatic conditions, technical solutions, consumptions and, consequently, assess their costs and impact on the environment.	<ul style="list-style-type: none"><li>• More detailed evaluation of environmental impact and footprint;</li><li>• More efficiency in the management of energy costs and consumptions;</li><li>• Possibility to consider alternatives and different future scenarios with related pros and cons to get to the optimal solution in terms of energetic systems within the context of the facility.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- FM Team</li><li>- FM Contractors</li></ul>
	Lighting	Study of the different conditions of lightning over the day and the year in certain areas of the building, taking into consideration the activities carried out in those spaces through the creation of special BIM parameters inserted into the information model.	<ul style="list-style-type: none"><li>• BIM parameters entered in the model (e.g. Lighting LUX), depending on the type of room and its function that can allow an efficient management of spaces and resources;</li><li>• Control on design and FM interventions based on the presence of natural or artificial illumination, presence of windows, etc.</li></ul>	<ul style="list-style-type: none"><li>- BIM Team</li></ul>
Space	Space management	Process to track, monitor and manage appropriate physical spaces within the organisation (meeting rooms, parking lots, etc.) and related resources	<ul style="list-style-type: none"><li>• Tracking of the existing use of spaces and evaluation of the efficiency of it;</li><li>• Identification of appropriate spaces for buildings uses and functions;</li><li>• Elaboration of effective future planning by comparing different spatial configurations.</li></ul>	<ul style="list-style-type: none"><li>- FM Manager</li><li>- FM Team</li></ul>

	PURPOSE	DESCRIPTION	BIM BENEFITS	ACTORS
Quantities	Space	Calculation of the square metres designated to certain activities and functions within a facility, using a BIM software.	<ul style="list-style-type: none"><li>• More precise evaluation of characteristics and quantities, such as square metres that are already intended for or will be intended for certain activities;</li><li>• Important connection with other BIM purposes: costs of renovations and energy consumption.</li></ul>	
	People	Control over the occupancy of spaces within a facility, considering the type of users and the functions of spaces. The aim is to assure people's security and comfort, as well as a good usability of the building.	<ul style="list-style-type: none"><li>• Easy calculation of the maximum occupancy of each room thanks to the use of the 3D model;steps of the process;</li><li>• The use of this data can help a lot in space management operations and security measures.</li></ul>	<ul style="list-style-type: none"><li>- Asset Manager</li><li>- BIM Manager</li><li>- BIM Team</li></ul>
	Windows	Evaluation of windows in terms of quantities and characteristics, taking into account the technological systems and materials.	<ul style="list-style-type: none"><li>• Calculation of the square metres and number of windows surfaces;</li><li>• Estimation of the characteristics of the window: functioning, type of opening, material, etc.;</li><li>• Important relationship with other BIM purposes, such as the cleaning quantities and estimation of costs for cleaning;</li><li>• Evaluation of the type of access and functioning of the window and, consequently, of the financial impact of windows surface for maintenance.</li></ul>	
	Asset management	Strategic approach in which the management of systems is connected to the information model in order to efficient maintenance and facilities operations. The assets consist of physical buildings, systems, equipment and environment.	<ul style="list-style-type: none"><li>• Assisting in short and long-term planning;</li><li>• Daily maintenance operated in a more efficient way;</li><li>• Making decisions in a cost-effective manner;</li><li>• Maintaining up-to-date facility and equipment data;</li><li>• Verifying systems during buildings occupation;</li><li>• Providing one source for tracking maintenance, uses and performances of buildings assets.</li></ul>	<ul style="list-style-type: none"><li>- Asset Manager</li><li>- Operators</li><li>- Maintenance Team</li><li>- FM Contractors</li><li>- FM Manager</li><li>-Financial Department</li></ul>
Space	Meeting rooms reservation	The information model is the base to manage spaces and room occupancy. In this sense, it is possible to develop solutions, systems or software that, starting from the dynamic data contained in the model, enable the facility users to view the available meeting rooms and reserve them without being a BIM user.	<ul style="list-style-type: none"><li>• More effective space management in real time;</li><li>• Good and quick connection between FM Team and facility users;</li><li>• Expansion of the information model potentialities through the link to other applications specifically used for room reservations.</li></ul>	<ul style="list-style-type: none"><li>- Facility users</li><li>- FM Team</li></ul>



	PURPOSE	DESCRIPTION	BIM BENEFITS	ACTORS
Reporting	<b>Energy Analysis</b>	With the help of specific software, information models can be used to conduct energy assessments of the buildings. Energy performances can be analysed by using simulations in order to propose optimised solutions for the buildings.	<ul style="list-style-type: none"> <li>Reduction of environmental impact and lifecycle costs by making decisions based on energy assessments;</li> <li>Improvement of buildings energy consumption predictions.</li> </ul>	-Top -Management -FM Team -BIM Manager -BIM Engineers
	<b>Financial</b>	Tracking and possible prediction of costs to be designated to certain types of activities, such as energy and renovation expenses.	<ul style="list-style-type: none"> <li>Prediction of the consumptions and the cost of energy;steps of the process;</li> <li>Prediction of the costs for daily maintenance and renovation projects.</li> </ul>	- Asset Management - FM Manager - Financial Department
Visualization	<b>3D Modelling</b>	<p>Creation of a virtual accurate prototype of the facility (assets, environment and physical characteristics).</p> <p>The 3D model usually reports information regarding the architecture, structure and installations (MEP) of the facility and it is often linked to external resources, such as “As Built” documentation or any other type of files related to the daily maintenance of the facility.</p>	<ul style="list-style-type: none"> <li>Better decision-making based on objective and centralized data collected in the model;</li> <li>Improvement of documentation management during the whole Lifecycle of the facility;</li> <li>Creation of a database which contains the history of the facility;</li> <li>Possible starting point to define other BIM purposes;</li> <li>3D visualization of spaces and installations in order to help the communication of future projects to the other stakeholders involved, thanks to a more intuitive visualization of the characteristics of the facility.</li> </ul>	-BIM Manager -BIM Coordinators (Architecture, MEP) -BIM Specialist -BIM Modeller
	<b>Indoor navigation</b>	Use of BIM software to perform 3D visualisations and move through the spaces of a facility in more easily and realistically.	<ul style="list-style-type: none"> <li>Check on the geometry of the building or the position of the installations;</li> <li>Importance of showing different alternatives in the case of renovation projects for a better decision making process, considering several options based on data;</li> <li>Democratisation of design permitting anyone to have a visual simple idea of project alternatives and spaces conformation.</li> </ul>	- Project Manager - BIM Manager - FM Team
Audit	<b>Audit databases</b>	<p>Check on the operations carried out in the database to verify the information entered in the model.</p> <p>Not all the parameters present in the model are useful for the purpose or have been inserted in the correct way. In this case, it is needed to perform a control over operations from time to time.</p>	<ul style="list-style-type: none"> <li>Quality check of the information inserted into the model;</li> <li>Export of data and comparison of the information;</li> <li>Checking on the missing data and a more efficient communication of it: e.g. filtering in green if the data is present, in red if absent, or using a percentage to indicate the missing data.</li> </ul>	- BIM Team

## WORKSHOP IV BIM IN FM CONCLUSIONS

1

When defining the **BIM Uses (purposes)**, it is important to **gather input from various stakeholders** (actors) in the construction and maintenance process, focusing on the **why/who/when/what** (following EN 17412 series) and establishing the priorities for their implementation.

2

When defining the parameters, **each parameter** should have a **purpose** and be well defined. Moreover, **assigning responsibility matrix** for entering, modifying and updating each **parameter** should be determined upfront. It is important to create the right names and relations between objects in order to **avoid duplicate** information. The **standards** are there to help us.

3

A well-defined **BIM organisational Strategy document** is key to aligning technology and capabilities with organisational objectives. This shall be backed by **industry standards** to ensure its effectiveness. This shall also address **short and long-term vision**, such as the implementation of a **Digital Twin** platform.

4

**Kotter's model for Change Management** is a good starting point for implementing BIM strategy in **public institutions**. Its development highlighted the centrality of the **human factor**, both as an opportunity and an obstacle, the importance of top management support, **gradual implementation**, **midterm wins** and sharing of **good examples**, as well as the **connection** between any **phase of Lifecycle Management**.

5

**Case Studies** are important to bind the strategic perspective and the concrete state of affairs, often more problematic than any theoretical speculation. Moreover, **practical examples** of BIM implementation help reflect on **how to link the various stages** (design, construction, operational) and help all actors better understand each other's specific needs. That all supports finding ways to make the transition from one to the other stage smoother and more successful avoiding misunderstandings and loss of information.

