



openDBL

Improving Buildings is Improving EU

D5.1
Market overview and openDBL business models

Disclaimer and acknowledgements



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Glossary of terms and acronyms used

[Guidance: Please sort alphabetically]

Table 1 Glossary of terms and acronyms used

Acronym/Term	Description
AECO	Architects, Engineering, Construction and Operation
AUM	Assets Under Management
BEMS	Building and Energy Management System
BIM	Building Information Modeling
BREEAM	Building Research Establishment Environmental Assessment Methodology
CAGR	Compound Annual Growth Rate
CMMS	Computerized Maintenance Management System
CSR	Corporate Social Responsibility
ESG	Environment Social Governance
EPBD	Energy Performance of Buildings Directive
FM	Facility Management
HE	Horizon Europe
IFC	Industry Foundation Classes
KER	Key Exploitable Results
LEED	Leadership in Energy and Environmental Design
PPP	Public-Private Partnerships
TRL	Technology Readiness Level

Executive summary

The primary objective of this deliverable is to conduct a **comprehensive analysis of the markets** targeted for exploitation by OpenDBL partners. One of the key objectives of WP5 is to formulate a range of business models and outline the pathway for the exploitation of OpenDBL solutions. Within this framework, task 5.1 has been executed to meticulously scrutinize the sector's conditions, encompassing potential markets, their dimensions, entry barriers, trends, as well as the landscape of players and competitors.

For this analysis, desk research has been conducted, leveraging **various sources** such as reports, webinars, workshops, stakeholder interviews, deliverables from other Horizon Europe (HE) projects, technology platforms, and associations. Additionally, the expertise of the OpenDBL consortium has been integrated through surveys, questionnaires, and consultations pertaining to their specific **Key Exploitable Results (KERs)**, aiming to attain a comprehensive understanding of market conditions and establish a unified framework for exploiting OpenDBL solutions. The conclusions drawn from this analysis have been shared within the consortium for validation.

The structure of this report is outlined as follows. **Section 2** provides an overview of the three primary markets where the OpenDBL solutions are expected to operate, offering insights into the complex environment in which the KERs will be deployed. Additionally, this chapter presents an analysis of key players and competitors in these markets, examining their interests and influence.

Section 3 focuses on analyzing the potential opportunities for each KER within the context of the previously examined markets. This analysis is based on a series of interviews conducted with stakeholders by the consortium partners, providing valuable insights into market alignment and strategic direction.

Section 4 summarizes recommendations from stakeholders, derived from 50 interviews conducted as part of Task 1.1 of the project. These recommendations highlight the critical needs and concerns of various market actors, ensuring the project remains aligned with industry demands.

Section 5 presents the preliminary business models for each KER, outlining initial strategies for commercialization, revenue generation, and market entry. This

section offers a foundational perspective on how each KER can maximize its impact within the identified markets.

Finally, **section 6** concludes the report by synthesizing the main findings, offering strategic guidance for the project's next steps, and emphasizing the broader implications of the OpenDBL solutions for the AECO industry.

1. Introduction

1.1. OpenDBL project summary

openDBL intends to integrate multidisciplinary know-how to cover the requirements of the Call and solve the issues of the current situation. The challenge of the project is to allow, through the development of openAPI, the disposal of openDBL in a unique standardized platform and create useful content, to simplify the workload of the AECO industry.

The project pursues 3 objectives: 1) create a DBL with useful content and functionalities, 2) ensure openDBL is usable and simple to use, reducing the time spent to upload, search and process the information and data to facilitate usage and gain wide adoption, 3) ensure attractive economics, through value propositions and convenient pricing. We'll provide any user with an integrated platform for their digitization needs; ensure that information and data conform to the latest trends and needs of our target clients and support the EU's circular economy and green policies; develop automatic classification systems and data standards; facilitate the operation and maintenance activities of the buildings. This will be achieved creating an Information Delivery Manual and a Data Model and further developing our existing platform used to create a DBL for an important Italian Public Contracting Authority. openDBL will support data matching with external databases and will integrate state of-the art technologies (AI, Blockchain, IoT and VR). Our ambition is to make openDBL the platform of reference for the monitoring of building consumption, transparencies of transactions and official documents, and the positive impact on maintenance and environment.

To reach its goals openDBL is divided into 6 WPs with different goals, tasks and deliverables.

Mapping openDBL outputs

Table 2 openDBL work description

openDBL GA Component Title	openDBL GA Component Outline	Respective Document Chapter(s)	Justification
DELIVERABLE			
<i>D[5.1] [Market overview and openDBL business models]</i>	<i>Market analysis coupled with data-driven business plans will provide practical pathways for operational success, identify channels to market, licencing and pricing strategies</i>	2.3.3	<i>Detailed analysis of the market where the solutions from OpenDBL shall play and an overview of the business models of OpenDBL KERs</i>
TASKS			
<i>T[5.1] [Market opportunity identification]</i>	Goal is to: 1) identify targeted market(s) and estimated market size in the EU and globally, 2) identify user and customer needs, 3) ensure that openDBL will match the market and user needs in a cost-effective manner, 4) describe the expected market position and competitive advantage.	2.3.3	<i>Analysis of market and KER conditions to find the opportunities and matches among each one of the solutions within the OpenDBL context.</i>

1.2. Preliminary KER identification

1.2.1. Partners contributions (I). Identification of potential exploitable results

As part of our market analysis for the OpenDBL project, we collected comprehensive feedback from all project partners. Collecting detailed information on each of these fields was essential for conducting a thorough market analysis and developing effective exploitation strategies. For this purpose, a spreadsheet (Figure 1) was circulated among the partners. This structured approach allows us to assess the potential impact of each KER, identify target markets, and plan for successful commercialization. Below are the definitions of each information field we requested, along with the importance of the concept.

Information Fields

Title

- *Definition:* The name of the result or deliverable.
- *Importance:* Provides a clear and concise identifier for each result, making it easier to reference and discuss.

Description

- *Definition:* A detailed explanation of the result, including its features and functionalities.
- *Importance:* Helps in understanding the scope and potential applications of the result.

Type

- *Definition:* The category of the result, such as software, hardware, methodology, etc.
- *Importance:* Identifies the nature of the result, which is essential for determining its market and usage scenarios.

Owner

- *Definition:* The partner or organization that developed or owns the result.
- *Importance:* Identifies the responsible party for each result, which is important for management and potential commercialization efforts.

Partners Contribution

- *Definition:* The contributions made by other partners to the development of the result.
- *Importance:* Acknowledges collaborative efforts and helps in understanding the collective input and expertise involved.

Target Users

- *Definition:* The primary audience or end-users for the result.
- *Importance:* Identifies the market segment or user group that will benefit from the result, guiding marketing and sales strategies.

Demos

- *Definition:* Pilots where the solution or result may be implemented.
- *Importance:* Provides practical insights into how the result works and its benefits, aiding in promotional and educational efforts.

Is it a Key Exploitable Result?

- *Definition:* Indicates whether the result is considered a Key Exploitable Result (KER).
- *Importance:* Helps prioritize results that have significant commercial potential and strategic importance.

Preliminary Exploitation Strategy

- *Definition:* The initial plan for how the result will be utilized or commercialized.
- *Importance:* Outlines the roadmap for bringing the result to market, including potential business models and market entry strategies.

TRL Development

- *Definition:* Technology Readiness Level (TRL) of the result, indicating its stage of development.
- *Importance:* Provides a measure of the maturity and readiness of the result for commercialization or deployment.

Problem Addressed

- *Definition:* The specific problem or challenge that the result aims to solve.

- *Importance:* Clarifies the need for the result and its relevance to the target market.

Value Proposition

- *Definition:* The unique value or benefit that the result offers to its users.
- *Importance:* Highlights the advantages of the result, making it easier to communicate its benefits to potential customers or stakeholders.

Unique Selling Point

- *Definition:* The distinct feature or advantage that sets the result apart from competitors.
- *Importance:* Identifies what makes the result unique and compelling in the marketplace.

Potential IPR Strategy

- *Definition:* The plan for protecting intellectual property rights related to the result.
- *Importance:* Ensures that the result is legally protected, preventing unauthorized use or reproduction and securing commercial interests.

The results from the partners are added in Annex 1.

Name:		Expected results													
Partner:															
Date:															
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
1															
2															
3															
4															
5															
6															
7															

Figure 1 Spreadsheet of expected results of OpenDBL

1.2.2. Partners contributions (II). Identification of market opportunities.

As part of the comprehensive approach to identifying and evaluating the KERs from OpenDBL, we engaged in detailed interactions with the project partners. These interactions were essential for understanding the full potential of each result and identifying the most promising market opportunities.

Initially, we distributed a detailed spreadsheet to all partners to gather critical information about each KER (**Partners contributions (I). Identification of potential exploitable results**). To supplement the information gathered through the spreadsheet, we conducted individual interviews with each partner. The primary goals of these interviews were:

- To gain a deeper understanding of the KER.
- To clarify any ambiguities or uncertainties in the initial feedback.
- To explore in detail how each solution works.
- To identify and elucidate the potential markets for each KER.

These interviews provided invaluable insights and allowed us to capture the specific nuances and unique aspects of each KER that might not have been fully conveyed through the initial feedback forms.

The interviews had 3 main sections:

- Business strategy for the KER (Figure 2)
- Market characteristics (Figure 3)
- Stakeholder analysis (Figure 4).

The detailed analysis of these insights and their implications for market opportunities are presented in Section 3 of this deliverable: **KERs potential opportunities**. This section will outline the potential markets, competitive landscape, and strategic considerations for each KER, guiding our exploitation strategy for the OpenDBL project.

Business strategy of the KER:	
Is there a market for the KER?	
Is there a fit between the KER and your business strategy?	
Does the KER help you to secure existing or win new markets?	
Does the KER potentially block competitors?	

Figure 2 Business strategy for the KER

1. Market characteristics	
Market name Please provide a name for the market relevant for this KER (and / or the market that your company is active in)	
Types of products / services Please describe the products or services that are sold in this market	
Location of the market Please describe the geographic span of the market	
Market size for KER Please estimate the size of the market	
Market growth Please provide evidence or describe the market growth. Is the market emerging, growing or reaching maturity?	
Market drivers or trends Please describe trends, dynamics, developments that drive the market (growth)	
Players / competition Please describe the (type of) key players in the market (e.g. names of companies, organizations, etc.)	

Figure 3 Market characteristics

1. Stakeholders	
Name at least 3 stakeholders (customers) who you think would be interested in your service / product (KER) you develop in the OpenDBL project: <i>Please provide names of companies, organizations, etc.</i>	1. 2. 3.
Please name your main competitors for the KER you develop in OpenDBL: <i>Please provide names of companies, organizations, etc.</i>	1. 2. 3. ...
Mention at least 3 stakeholders who you think could facilitate the adoption of the OpenDBL KER in your business and explain how they could facilitate the adoption: <i>Please provide names of companies, universities, organizations, etc.</i>	1. 2. 3. ...
Mention at least 3 stakeholders who you think might form a barrier for adopting the KER in your business and explain why they might form a barrier: <i>Please provide names of companies, organizations, etc.</i>	1. 2. 3. ...

Figure 4 Stakeholder analysis

1.2.3. Partners contributions (III). Collaborative workshops

Description of the activities:

During the General Assembly of the OpenDBL project, a collaborative workshop was held involving all project partners. This workshop was structured to facilitate a thorough discussion and analysis of the results collected by CEMOSA. The primary objectives of the workshop were to identify which results could be classified as KERs, to discuss and select **potential markets** for these results, and to prioritize potential customers or end-users. The workshop was a critical step in ensuring that the project outcomes are aligned with market needs and have clear paths to commercialization.

Contributions in the workshop:

The workshop featured a roundtable discussion where all partners contributed their insights and expertise. The results collected by CEM were presented and analyzed, leading to the identification of several KERs. The key contributions from partners are summarized below:

Identification of Key Exploitable Results (KERs):

- *Algorithm for Identifying Construction Elements*: This algorithm facilitates the accurate identification of construction elements, enhancing project management and efficiency specifically, a smart door identification algorithm
- *VR Viewer*: A virtual reality tool that provides immersive views of building designs and progress.
- *Sensor in Pilot Actions*: Sensors deployed in pilot projects to monitor various parameters and collect data.
- *Interoperability via AI-based Mapping Service*: An AI-driven service that ensures seamless data interoperability across different systems.
- *Mobile APP* –
- *Mobile App - Quality Control/Data Verification*: A mobile application designed to streamline quality control processes on construction sites while verifying data accuracy and integrity
- *Sensor Fusion Solution for Advanced Parameter Monitoring*: A sophisticated system that integrates data from multiple sensors to provide comprehensive monitoring.
- *OpenDBL Common Data Environment*: A centralized platform for managing and sharing building data across stakeholders.

Market Selection:

After presenting the KERs, a brainstorming session was held to discuss potential markets. Partners shared their insights on various market segments, considering factors such as market size, growth potential, and relevance to the OpenDBL results. The selected markets were:

- *Technology Solutions in Construction*
- *Building Design and Construction*
- *Facility Management Market*

- *Energy Efficiency and Energy Audits*
- *Insurances*

Customer/End-User Prioritization:

The final part of the workshop focused on identifying and prioritizing potential customers or end-users for the KERs. Slides were presented showing potential customer profiles, and partners engaged in a brainstorming session to discuss and propose additional customer segments. The prioritized customers were:

- *Building Owners*
- *Architect and Engineer Firms*
- *Facility Managers*
- *Building Users*
- *Construction Companies*

Conclusions

The workshop was highly productive, leading to several key outcomes that will guide the exploitation strategy for the OpenDBL project.

Eight KERs were selected to address critical challenges in the construction and building management sectors. Five strategic markets were selected for their relevance to these KERs and their potential for growth and adoption, providing a focused direction for commercialization efforts. Additionally, prioritized customer segments were defined, ensuring targeted marketing and engagement strategies that align the KERs with the needs of end-users, maximizing their value proposition.

Overall, the collaborative efforts and insights from all partners during the workshop have laid a solid foundation for the successful exploitation of the OpenDBL project results. The identified KERs, selected markets, and prioritized customers will be instrumental in driving the commercialization and adoption of the project's outcomes.

1.2.4. Final KER selection

All this methodology carried out has materialized in a selection of 7 final KERs, with their owners already defined:

KER #1: Common Data Environment (EM). The Common Data Environment (CDE) is a collaborative digital platform designed to facilitate efficient data management and project collaboration in the construction sector. It simplifies workflows across all project phases, from design and construction to maintenance.

KER #2: Tool for identifying construction elements (CETMA-DOR). The Tool for Identifying Construction Elements is an AI-based service designed to analyze and interpret 2D floor plans. The tool automates the identification of building elements, such as doors and windows, from traditional 2D floor plans, transforming these into digital data usable for BIM and digital twin applications.

KER #3: VR Viewer (CETMA). The VR Viewer is an immersive digital tool designed to facilitate the visualization and management of BIM projects within a web-based 3D environment. It enables collaborative exploration of 3D building models (IFC format) and enhances user engagement through virtual reality capabilities.

KER #4: Tool for AI-Based Interoperability Mapping Service (IABI). The AI-Based Interoperability Mapping Service is an advanced tool designed to address the challenges of data interoperability in the Architecture, Engineering, and Construction (AEC) industry. The tool leverages AI to map attributes from IFC models and other data formats to various ontologies, enabling seamless integration across different Building Information Modeling (BIM) systems

KER #5: Mobile APP (CEM). The Mobile App developed by CEMOSA is a web-accessible tool designed to digitalize and automate onsite data collection and verification for quality control, fully integrated with the Digital Building Logbook (DBL). The app supports three primary use cases: Test Pits/Trial Pits, where it assesses building elements such as pillars, roofs, floors, and walls for their composition and condition; Damage Surveys, enabling the inventory of structural damages like cracks, landslides, and humidity issues; and Data Verification, which focuses on ensuring the accuracy of information used in energy and sustainability audits. This app enhances efficiency and accuracy, making it a critical tool for modern infrastructure quality management and digitalization.

KER #6: Methodology for digitalization over BIM (IN2IT). The Methodology for Digitalization over BIM, developed by IN2IT, is a standardized framework aimed at digitizing building-related data across the AECO (Architecture, Engineering, Construction, and Operations) industry. This methodology facilitates the efficient

management of building information throughout its lifecycle, enabling streamlined decision-making and ensuring compliance with EU sustainability directives. Key features include a comprehensive data model that integrates design, project, construction, and operational details; tools for automated updates, historical data comparisons, and real-time data integration; and robust support for compliance with EU regulations, such as the EPBD [1]. This methodology addresses critical industry needs for efficiency, sustainability, and regulatory alignment.

KER #7: OpenDBL (ALL). The OpenDBL platform is a standardized, openAPI-based digital solution designed to manage building lifecycle data, addressing critical challenges in the AECO (Architecture, Engineering, Construction, and Operations) industry. It enhances interoperability, transparency, and efficiency by providing a centralized repository for real-time building data. Key features include the integration of advanced technologies such as AI, IoT, and VR, tools for energy management, compliance, health & safety, and facility operations, and the adoption of openAPI and open standards to ensure seamless data integration across various systems. OpenDBL represents a transformative approach to managing complex building processes and driving digital innovation.

2. Market Assessment

The market for OpenDBL solutions can be broadly summarized as the **AECO (Architecture, Engineering, Construction, and Operations) market**, encompassing a wide array of stakeholders with diverse needs and roles. This market includes architects, engineers, contractors, facility managers, building owners, and public administrations, all of whom are integral to the lifecycle of a building. Despite their varied interests, these stakeholders share a common demand for enhanced **digitalization**, driven by the need for improved efficiency, transparency, and data management.

To address these needs, the OpenDBL project has identified **three strategic submarkets** or niches where its solutions can make the most significant impact:

- **Real Estate Investors:** Focused on data-driven decision-making, this submarket requires digital tools for lifecycle cost analysis, asset valuation, and transparency in operations.
- **Building Design, Construction, and Renovation, including Energy Audits:** This submarket demands advanced digital solutions to optimize workflows, support sustainability efforts, and ensure compliance with regulatory standards throughout the building lifecycle.
- **Facility Management:** As the operational phase of buildings increasingly relies on digital twins and real-time data, this submarket benefits from tools that streamline maintenance, improve energy efficiency, and enhance occupant experience.

These submarkets reflect the broader trends and challenges within the AECO market, emphasizing the critical role of digitalization in addressing stakeholder needs.

OpenDBL is uniquely positioned to bridge the gaps in data management, interoperability, and digital transformation across these submarkets. Beyond the OpenDBL platform itself, the project encompasses seven KERs that address diverse needs within the AECO market. These solutions, including tools for data verification, AI-based mapping, and VR visualization, can operate synergistically or independently as standalone innovations. This versatility allows the project's outcomes to meet

specific market demands while contributing to broader goals of innovation, efficiency, and sustainability in the construction sector.

By offering a portfolio of KERs that can be exploited individually or as part of an integrated approach, OpenDBL provides a comprehensive response to the digitalization challenges faced by the AECO market. The following sections offer an in-depth analysis of the three identified submarkets, examining their characteristics, opportunities, key players, and the strategic fit of the project's solutions within each. This analysis underscores the potential for all OpenDBL KERs to transform the construction sector and highlights actionable insights for their effective exploitation.

2.1. Real Estate Investors

The **Real Estate Investors market** encompasses individuals, corporations, and institutional entities that acquire, manage, and develop real estate properties as part of their investment portfolios. This market focuses on maximizing returns through property valuation, lifecycle cost optimization, and strategic asset management. Investors rely heavily on data-driven decision-making to assess risks, forecast market trends, and identify opportunities for growth. With increasing emphasis on sustainability, transparency, and efficiency, digital solutions are becoming essential tools in this sector, enabling investors to streamline operations, enhance asset performance, and align with evolving regulatory requirements.

2.1.1. Current market size and growth in next 5 years

The Real Estate market in Europe is anticipated to reach a significant value of €154.13 trillion by 2024. Among the various segments within the market, **Residential Real Estate** stands out as the dominant force, with a projected market volume of €125.39 trillion in the same year. Looking ahead, the market is expected to display a steady annual growth rate, specifically a Compound Annual Growth Rate (CAGR) of 3.27% from 2024 to 2028, resulting in a market volume of €175.29 trillion by 2028. [2]. This is reflected in Figure 5.

China leads globally in generating the most value in the Real Estate market, with an estimated worth of €125.39 trillion in 2024. In Europe, the growth of the real estate market is robust, with Spain experiencing a surge in demand for coastal properties due to its attractive climate and affordable prices.

The real estate market's promising outlook is supported by steady demand, particularly in the residential segment. However, challenges such as economic fluctuations and market instability may impact growth. Despite these challenges, the European real estate market is set to expand steadily, driven by consistent demand and strategic market positioning.

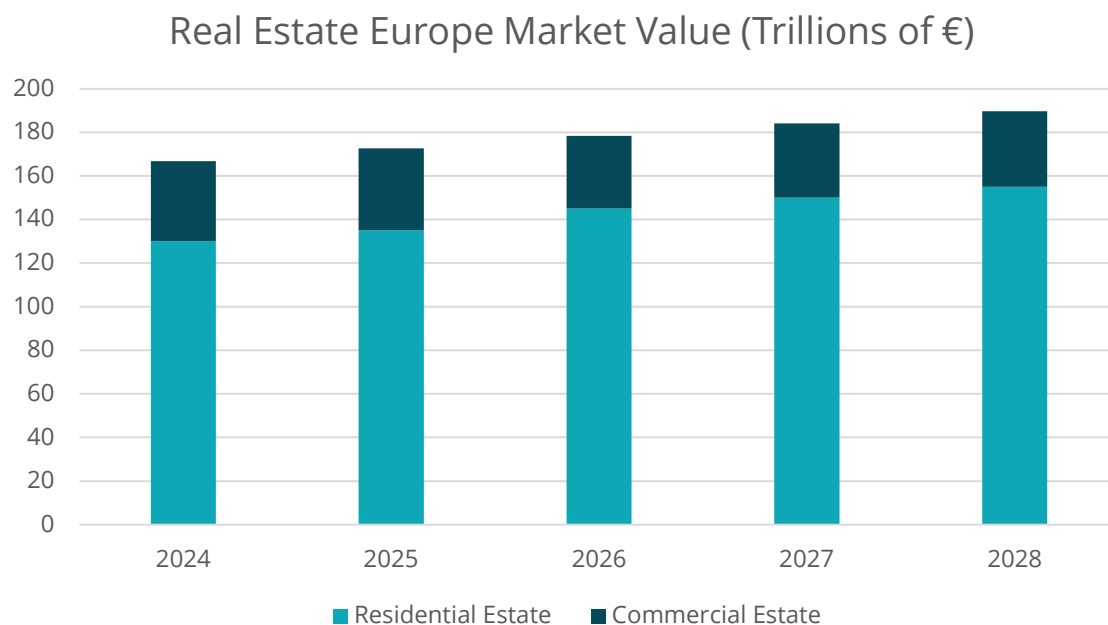


Figure 5 Real Estate Europe market value

2.1.2. Market structure

The market comprises various segments and activities, including property acquisition, development, and management, covering both residential and commercial sectors.

The key segments by property type can be summarized as:

Residential Real Estate. This segment focuses on housing solutions such as single-family homes, apartments, and condominiums, driven by urbanization, population growth, and shifting demographics. Homeownership rates in Europe highlight varying preferences across countries, with **Greece (69.6%)**, **Spain (75.3%)**, and **Italy (75.2%)** reflecting strong ownership cultures, aligning with OpenDBL demonstration sites. In contrast, **Germany (47.6%)** has one of the lowest homeownership rates, emphasizing its rental-driven market, while the **United Kingdom (65.2%)** and the

European Union average (69.2%) demonstrate a mix of ownership and renting dynamics. The rate of ownership in Europe is reflected in Figure 6 [3]. Trends in this sector include the rise of **Mixed-Use Developments**, blending residential, commercial, and recreational spaces, and increasing demand for **Sustainable and Smart Homes**, which prioritize energy efficiency and advanced technologies. These trends, alongside challenges like high property prices and economic shifts, underscore the need for digital tools like OpenDBL to optimize property management and enhance accessibility in the residential real estate market.

Commercial Real Estate. This segment includes office complexes, retail spaces, and business districts, driven by demand for mixed-use developments that combine residential, commercial, and recreational elements. This sector encompasses office buildings, shopping centers, hotels, and other business-oriented properties, with demand influenced by business expansion, the growth of industries like tech and e-commerce, and the rise of coworking spaces. Urban areas with strong job markets and business hubs experience higher demand, though factors like economic downturns and the shift to remote work models can reduce the need for traditional office spaces. Key trends shaping this segment include the growing popularity of **flexible workspaces** to accommodate hybrid work models, the **transformation of retail spaces** into experiential shopping and leisure hubs to adapt to e-commerce and increasing emphasis on **sustainability and ESG compliance** as businesses prioritize environmentally responsible buildings to meet corporate social responsibility (CSR) goals.

Home ownership rate in selected European countries in 2023

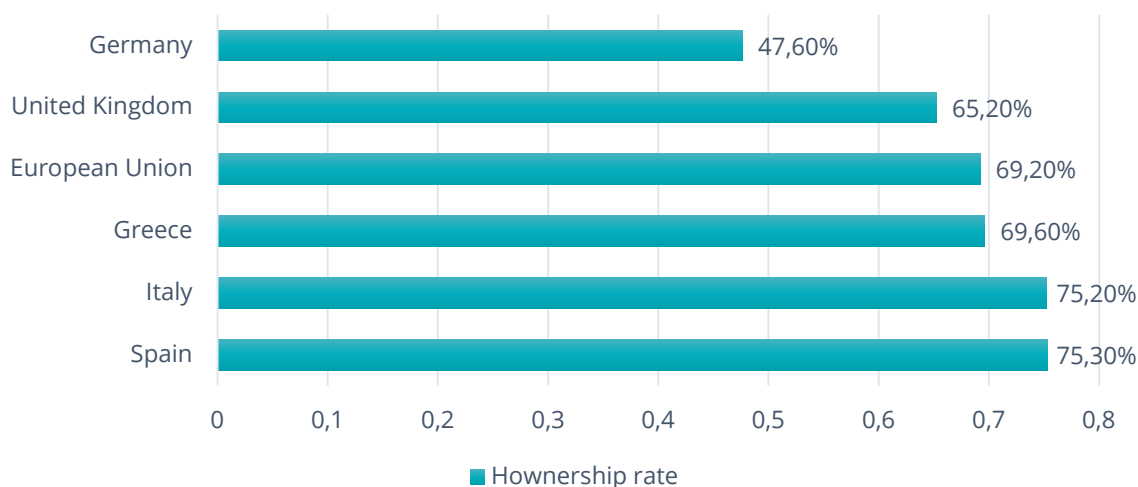


Figure 6 Home ownership rate in Europe

Industrial Real Estate: the third segment, focused on manufacturing, logistics, and warehousing infrastructure, is experiencing significant growth driven by the expansion of e-commerce. The rising demand for logistics hubs and distribution centers has led companies to invest heavily in warehousing infrastructure near key urban centers to ensure faster delivery and reduce transportation costs. However, growth in this segment is constrained by limited availability of suitable land, rising construction costs, and regulatory challenges related to zoning and environmental impact. Key trends include the increasing adoption of **automation and smart warehousing**, with robotics and AI transforming industrial space design, and the strategic focus on **proximity to urban areas** to improve last-mile delivery and operational efficiency.

Following, we can find an alternative classification of the business segments within the Real Estate market:

The **Sales segment** encompasses the purchase and sale of properties across all categories, including residential, commercial, industrial, and government. It includes both primary sales (new properties) and secondary sales (resale of existing ones). This segment is heavily influenced by factors such as economic growth, employment rates, interest rates, and broader real estate market trends. Key trends driving this

niche include **digital transformation**, with online platforms and virtual tours simplifying the sales process and enabling remote property exploration and transactions, and **foreign investments**, as many European countries attract international investors due to their political stability and favorable economic conditions.

On the other hand, the **Rental segment** focuses on renting properties to tenants for residential, commercial, or industrial purposes, covering both short-term and long-term agreements. Urbanization, rising property prices, and flexible work arrangements have made renting an attractive option for individuals and businesses unable or unwilling to purchase properties. Key trends include the rise of **Build-to-Rent (BTR)** developments, where properties are constructed specifically for rental purposes, particularly in urban areas with high rental demand, and the increasing popularity of **co-living and co-working spaces**, which cater to the demand for affordable housing and flexible workspaces in cities.

Finally, the **Lease segment** involves long-term property agreements, typically for commercial or industrial spaces, often lasting 5 to 10 years with renewal options. This model appeals to businesses in retail, logistics, and manufacturing sectors seeking stability and predictable operating costs. Current trends include **flexibility in lease agreements**, allowing tenants to adapt to economic fluctuations through renegotiation clauses or rent adjustments, and the integration of **sustainability clauses**, requiring landlords to meet energy efficiency standards as part of the lease terms. These trends reflect evolving tenant demands for adaptable and environmentally responsible leasing options.

2.1.3. Market trends

Uncertainty in European Real Estate

The European real estate market is entering a period of significant uncertainty as macroeconomic pressures, technological advancements, and geopolitical challenges continue to reshape the industry. Several specialized surveys about the sector [4] [5] sheds light on the trends and opportunities expected to impact the sector over the next several years. Inflation, interest rates, and the ongoing war in Ukraine have cast a shadow over the market, while environmental, social, and corporate governance

(ESG), artificial intelligence (AI), and demographic shifts are emerging as key drivers of future growth.

The Importance of ESG in Real Estate

Environmental, Social, and Corporate Governance (ESG) has become a central factor shaping the future of real estate. ESG considerations are now pivotal in property valuations, investor expectations, and overall business strategy, making it a core priority for real estate firms. Approximately 62% of industry leaders agree that **retrofitting or repurposing existing properties** is the most effective way to improve ESG compliance, rather than constructing new developments. This approach addresses the growing demand for sustainable buildings while minimizing environmental impact.

However, the industry faces significant challenges, including **high construction costs** and **labor shortages**, which hinder the speed and efficiency of meeting ESG objectives. Despite these obstacles, **ESG-driven investments** remain essential, as properties that align with sustainability and social responsibility principles tend to achieve higher valuations and generate better long-term returns.

To meet these evolving demands, some **KERs** play a critical role in advancing ESG compliance:

- **The Mobile App (KER #5)** supports data verification for **sustainability audits**, enabling real estate firms to verify and report on energy usage, materials, and other key ESG metrics.
- **The Common Data Environment (KER #1)** provides transparent tracking and reporting of sustainability metrics, aiding organizations in meeting their **ESG goals** and complying with **EU Green Deal regulations**.

AI and Technology in Real Estate

Artificial intelligence (AI) is set to revolutionize the real estate sector, improving operational efficiency, enhancing ESG compliance, and driving digital transformation. Although still in the early stages of adoption, AI offers immense potential across key areas, including **property management, planning and asset management, automating marketing and leasing processes**, and **climate risk modeling**. For example, AI is already being used to monitor the consumption of resources like heat, energy, and cooling, identifying inefficiencies to optimize operational performance.

Additionally, AI-powered tools are automating marketing and leasing operations, streamlining processes, and improving client engagement.

Despite its potential, AI adoption remains gradual, with many firms piloting the technology and broader implementation expected over time. Emerging technologies like blockchain, digital twins, and augmented reality (AR) are also gaining traction, although adoption rates are still low. For instance, blockchain is being used for payments by only 16% of firms in Europe, with 26% piloting its applications. Similarly, about 15% of firms have digital twins in production, with another 29% in the piloting phase. AR and the metaverse, while still nascent, are expected to transform tenant engagement through immersive virtual tours, though currently utilized by only 10% of firms. Figure 7 gives information about technology adoptions within the sector. [4]

The **AI-Based Interoperability Mapping Service (KER #4)** aligns seamlessly with these trends, addressing the growing demand for AI-driven solutions in real estate. This tool automates complex tasks such as attribute mapping and ensures interoperability between BIM systems, simplifying workflows and enhancing collaboration.

The **VR Viewer (KER #3)** is also well-positioned to capitalize on the rise of immersive technologies. By enabling virtual tours and immersive tenant experiences, the VR Viewer enhances client engagement and supports innovative approaches to marketing, property visualization, and project collaboration. These features are particularly valuable as firms adapt to trends in augmented reality and the metaverse.

As firms gradually adopt AI and related technologies, several OpenDBL solutions are set to transform real estate operations. They offer enhanced efficiency, improved

data management, and innovative engagement methods, supporting ESG goals and underscoring the strategic importance of AI in shaping the future of the sector.

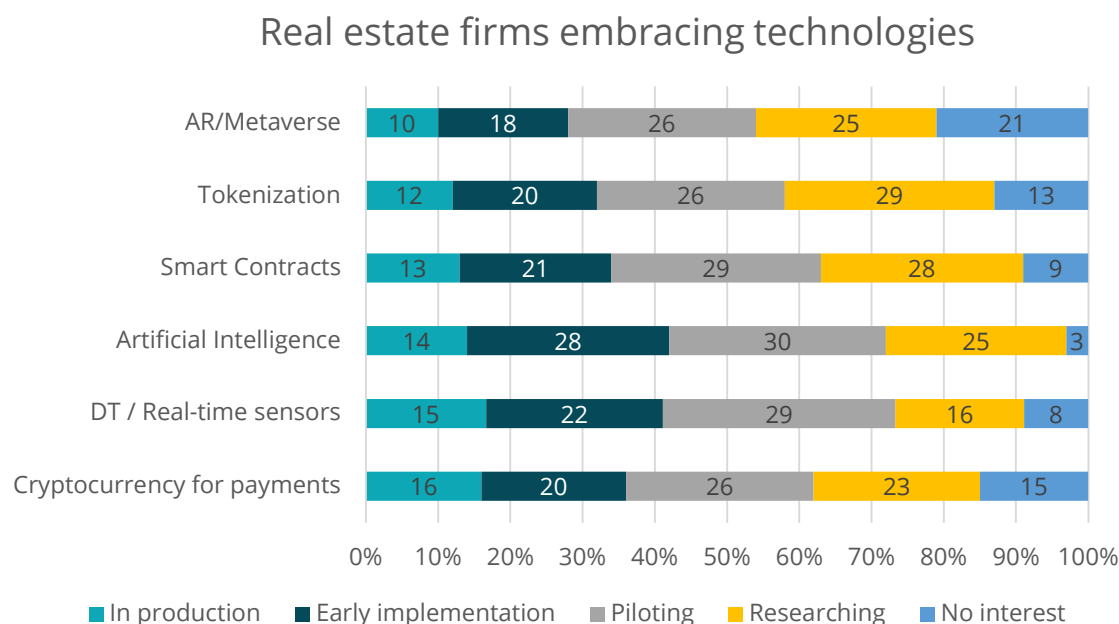


Figure 7 Adoption of technologies by Real Estate firms

Demographic Shifts: Opportunities and Challenges

Demographic changes, particularly aging populations and migration trends are reshaping real estate demand across Europe. The growing need for **senior living facilities**, **nursing homes**, and **healthcare real estate** creates significant investment opportunities, as these sectors respond to an aging demographic. Simultaneously, geopolitical events and climate change are driving inward migration to Europe, further increasing demand for **residential properties** and **community infrastructure**, such as childcare and elderly care facilities.

However, navigating this evolving landscape comes with challenges. Efficient and innovative solutions are required to manage limited resources while meeting rising demand for such infrastructure.

The **Methodology for Digitalization over BIM (KER #6)** directly addresses these challenges by enabling the **efficient management of data for community infrastructure projects**, such as nursing homes and childcare facilities. By streamlining workflows and integrating comprehensive lifecycle data, the methodology supports the planning and execution of projects that cater to

demographic shifts, ensuring they are both sustainable and resource efficient. This makes it an essential tool for stakeholders aiming to leverage demographic changes while overcoming associated challenges, reinforcing its relevance in this evolving market landscape.

Valuation Challenges in Real Estate

Accurately valuing real estate assets is becoming increasingly difficult due to macroeconomic headwinds and low transaction volumes. Many real estate professionals are concerned that current valuations do not fully reflect the realities of the market. A lack of transactions has created a cycle of uncertainty, with many investors reluctant to adjust valuations downward. This has led to a growing disparity between listed valuations and real market conditions. The disconnect between valuations and real market conditions may take time to correct, particularly in regions where economic recovery is slower [4].

In conclusion, the European real estate market in 2024 faces a mix of challenges and opportunities, with industry leaders expressing cautious optimism despite ongoing economic uncertainties. The rise of ESG, AI, and shifting demographics are reshaping the sector, while macroeconomic pressures, such as inflation and interest rates, continue to weigh on the minds of investors.

2.1.4. Key players

The European real estate market is shaped by a variety of key players, each significantly influencing the sector within their respective countries. Very important are the real estate investment funds, which we list below based on their assets under management (AUM) and performance:

- **AXA Investment Managers** - Known for its extensive portfolio and significant AUM.
- **PIMCO** - A major player in the real estate investment sector.
- **CBRE Investment Management** - Offers a diverse range of real estate investment options.
- **UBS Asset Management** - Provides robust real estate investment opportunities.
- **Credit Suisse Asset Management** - Well-regarded for its real estate investments.

- **Brookfield Asset Management** - A global leader in real estate investments.
- **PATRIZIA** - Specializes in European real estate investments.
- **AEW** - Known for its strong performance in real estate investments.
- **DWS** - Offers a variety of real estate investment funds.
- **M&G Real Estate** - A prominent name in the real estate investment market.

These funds are recognized for their strong performance and significant presence in the European real estate market. Below is an overview of the major players across several European countries, emphasizing their market influence, financial performance, and strategic direction.

Italy

In Italy, the real estate sector is dominated by companies that manage and develop residential, commercial, and office properties. Among them, it's worth mentioning **GP Offices Apartments S.R.L.** As Italy's leading real estate company, GP Offices Apartments S.R.L. generated over 285 million euros in domestic sales revenue. The company's focus lies on high-end office and residential developments, which positions it at the forefront of Italy's property sector. This leadership in the Italian market demonstrates the country's reliance on residential and office developments, especially in major cities like Rome and Milan. As property values rise and urbanization continues, GP Offices Apartments S.R.L. is expected to maintain its dominance [6].

Leonardo Global Solutions S.p.A. is the second-largest real estate entity in Italy, with over 210 million euros in domestic revenue, Leonardo Global Solutions S.p.A. specializes in property management and development. The company is known for its comprehensive real estate services, from facility management to large-scale construction projects. These firms are not only shaping the Italian landscape but also addressing challenges related to sustainability, retrofitting, and real estate valuation. With rising construction costs and ESG considerations, their roles are crucial in ensuring the long-term viability of Italian real estate [6].

Poland

Poland's real estate market has undergone rapid transformation in recent years, especially in residential and mixed-use developments. The major players in this sector include **Echo Investment Group**. In 2023, Echo Investment experienced a

strong recovery in Poland's residential sector. The demand for housing and mixed-use destinations in major cities such as Warsaw and Krakow boosted the group's financial performance, with a net profit of over € 15,5 million and assets worth nearly €1.4 billion [7]. The company's focus on sustainable, mixed-use developments reflects broader global trends, as real estate shifts toward creating living environments that combine residential, retail, and commercial spaces. Echo Investment is poised to continue benefiting from Poland's growing urban population and increasing demand for modern living spaces.

The other main actor is **Skanska Group**. Although primarily known for its construction division, Skanska Group also has a significant presence in Poland's property market. In 2023, the group's revenues from real estate decreased slightly due to weak property market conditions. However, Skanska continued to perform strongly in the construction segment, emphasizing infrastructure and commercial developments. With total revenues of €14,14 billion [8], Skanska remains a major player in Europe's real estate and construction sectors.

Romania

Romania's real estate market is centered around high-quality office spaces, which have become increasingly sought after as companies return to physical workspaces. One of the key players here is **Globalworth**. As the leading investor in Romania's office sector, Globalworth specializes in Class A office buildings. The company focuses on attracting international tenants, particularly in cities like Bucharest, where demand for high-quality office spaces has grown steadily. Globalworth's emphasis on sustainability and modern work environments positions it well in the post-pandemic real estate landscape. Additionally, Globalworth's investments in Romania are not limited to office spaces. The company is diversifying into other sectors, including logistics and industrial properties, adapting to the evolving needs of tenants and investors alike.

Spain

The Spanish real estate market is dominated by large-scale residential developers and construction companies, which have benefitted from a steadily recovering economy and growing demand for housing. As one of Spain's largest construction and real estate companies, **ACS** holds a significant share of the market. The company has been instrumental in both residential and commercial developments across

Spain, contributing to the country's robust construction sector. ACS's influence extends beyond Spain, as the firm has expanded into international markets, diversifying its portfolio. ACS's strength lies in its ability to manage complex projects, from high-rise residential towers to infrastructure developments. The company is a key player not just in Spain but also in the broader European real estate scene.

Another player that is worth mentioning is **Neinor Homes**. A major force in Spain's residential market, Neinor focuses on large-scale housing developments, particularly in urban areas like Madrid and Barcelona. As housing demand continues to grow in Spain's major cities, Neinor Homes has capitalized on this by delivering thousands of new homes annually. The company's strategic focus on the residential sector positions it well to meet the ongoing demand for housing in Spain's growing urban population centers.

Germany

Germany's real estate market is one of the largest and most stable in Europe, driven primarily by residential and commercial property investments. Germany's largest residential real estate company, **Vonovia SE**, manages a vast portfolio of apartments across Europe, particularly in Germany, Austria, and Sweden. The company focuses on affordable housing solutions, aiming to provide high-quality living spaces while maintaining cost-efficiency. Vonovia's strategy includes acquisitions, such as its merger with Deutsche Wohnen, making it one of Europe's largest real estate companies. The merger has allowed Vonovia to expand its reach and resources, helping it address challenges such as housing shortages in major German cities. With a strong emphasis on sustainability and tenant satisfaction, Vonovia continues to play a vital role in the German housing market.

Focused primarily on property management, **Deutsche Wohnen SE** has a vast portfolio of residential properties. After merging with Vonovia, Deutsche Wohnen expanded its influence in the German real estate market, especially in key cities like Berlin, where demand for affordable housing continues to rise.

Greece

The real estate sector is shaped by investment firms that manage both commercial and residential properties, catering to local and international markets. The largest real estate investment company in Greece, **Prodea Investments** specializes in

commercial properties, including office buildings, retail spaces, and logistics centers. With a focus on both Greek and international markets, Prodea plays a significant role in the development of sustainable commercial real estate. As Greece's economy continues to recover, Prodea is well-positioned to benefit from increased demand for modern, sustainable office and retail spaces in cities like Athens and Thessaloniki.

Another major player in Greece's real estate market, **Grivalia Properties** is known for its high-quality commercial developments. The company has a strong focus on sustainability and ESG principles, ensuring that its properties meet modern environmental and social standards. Grivalia's emphasis on premium office and retail developments has made it a leader in Greece's real estate sector.

2.1.5. Entry barriers and Opportunities

The European real estate market presents several entry barriers for technology solutions like those developed under the OpenDBL project. While the solutions are not intended to manage real estate assets directly, they aim to empower key market players, such as investors, developers, and property managers, by enhancing their services through improved digitalization, sustainability, and operational efficiency.

The **fragmented regulatory environment** in Europe is one of the most challenging barriers. Regulations vary across countries and regions, from energy performance standards to property management requirements, necessitating adaptable and localized solutions. Tools like CDE #KER1 and Methodology for Digitalization over BIM #KER6 help overcome this by ensuring compliance with both national and EU-wide frameworks, such as the **EPBD**.

Another challenge is the **slow technology adoption** in the real estate sector. Many stakeholders, particularly smaller firms, rely on traditional workflows and are cautious about integrating new tools. OpenDBL addresses this with user-friendly and interoperable solutions, such as the AI-Based Mapping Service, which integrates seamlessly with existing systems and enhances efficiency.

The market is also **highly competitive and saturated**, with numerous providers offering solutions for property management, energy audits, and data analytics. Differentiation is key, and OpenDBL leverages unique features like **openAPI capabilities, AI automation**, and support for **sustainability reporting** to stand out.

Additional barriers include:

- **Data Fragmentation:** Real estate firms operate with disparate data systems, complicating integration. OpenDBL centralizes and standardizes data to streamline operations.
- **Cost of Implementation:** High upfront costs for digital tools and infrastructure can deter adoption. OpenDBL mitigates this by offering scalable, modular solutions that allow incremental deployment.
- **Cultural Resistance:** Many stakeholders resist change, particularly those unfamiliar with digital tools. Pilot projects and targeted training programs can help overcome this barrier.

On the other hand, while the barriers are substantial, the European real estate market also offers several opportunities, particularly for solutions that align with sustainability initiatives and support ESG compliance.

Sustainability Trends as Catalysts for Growth

Rising energy costs, stricter environmental regulations, and the demand for sustainable urban environments make this an ideal time for digital tools that prioritize ESG principles. OpenDBL solutions address these needs directly:

- The Methodology for Digitalization over BIM KER #6 ensures compliance with green building standards, such as **BREEAM** and **LEED**, enhancing firms' market competitiveness.
- The VR Viewer KER #3 enables detailed visualization of energy-efficient building designs, supporting architects and developers in achieving green certifications.
- The Mobile App KER #5 facilitates data verification for sustainability audits, ensuring operational efficiency and regulatory alignment.

Economic Benefits of Sustainability

Sustainable buildings are more attractive to tenants and investors due to lower operational costs and higher valuations. The AI-Based Interoperability Mapping Service KER #4 enhances workflows for retrofitting projects and energy monitoring, making ESG compliance accessible and efficient. These solutions not only help firms reduce costs but also secure long-term value by appealing to environmentally conscious stakeholders.

Enhanced Market Access

ESG-compliant buildings are increasingly favored by financial institutions and investors, providing firms with greater access to capital. OpenDBL enables smoother workflows and more accurate data integration, helping firms secure financing for sustainable projects.

Digital Transformation and Operational Efficiency

As the market gradually adopts advanced technologies, OpenDBL KERs address the growing need for efficiency and innovation. These solutions reduce manual processes, improve data management, and accelerate decision-making, positioning firms to thrive in a competitive landscape.

2.2. Building design, construction and renovation, and Energy efficiency

This section explores the Building Design, Construction, and Renovation market, emphasizing two interconnected sub-niches: **construction and renovation and building energy management**. While construction and renovation focus on the physical development and modernization of buildings, energy management ensures their operational efficiency and sustainability over time. Together, these markets are driving a new era of innovation and sustainability in the building sector.

2.2.1. Current market size and growth in next years and market structure

The European construction market reached a size of approximately €3.11 billion in 2023 and is projected to grow to €4.99 billion by 2032 at a CAGR of 5.10% [9]. This growth is fueled by urbanization, infrastructure modernization, and green building initiatives. Southern European countries such as Greece, Spain, and Italy play a significant role, with investments in residential and tourism-related projects contributing to regional growth. Figure 8 reflects the projected growth of European Construction market.

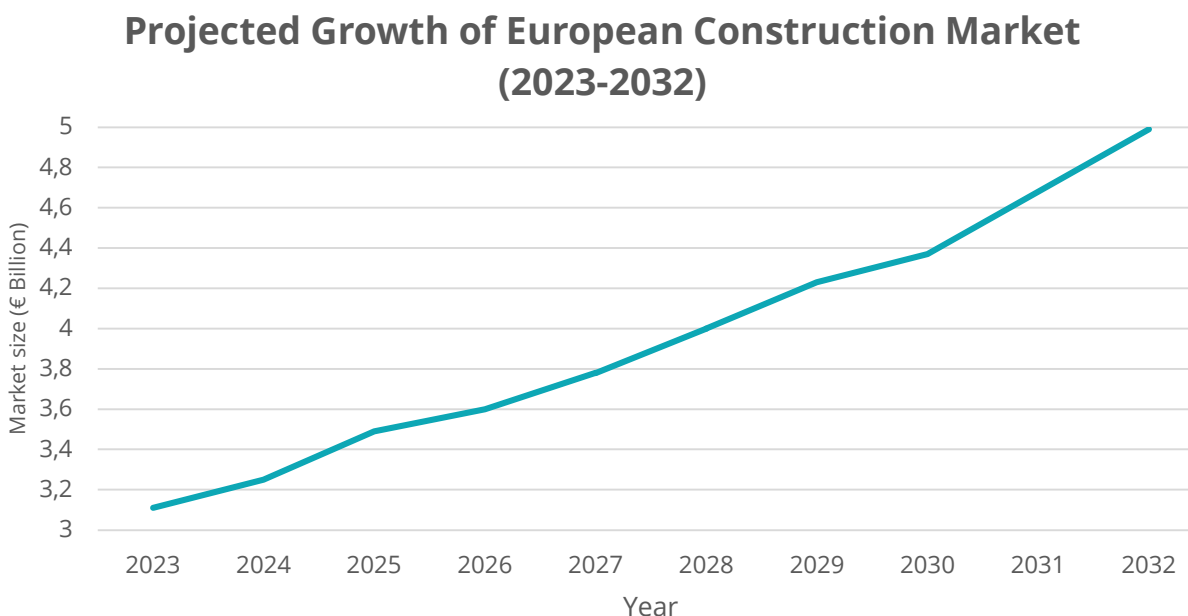


Figure 8 Growth of European Construction Market

On the other hand, the global BEMS market is undergoing rapid growth as energy efficiency becomes a critical priority in both new and existing buildings. According to recent research, the market size is projected to reach \$13.4 billion (€12.33 billion) by 2030, growing at a CAGR of 11.1% during the forecast period [10].

This growth is fueled by several factors, including rising demand in the residential and commercial sectors, particularly in Germany, France, and the United Kingdom. However, Southern Europe is emerging as a key region of interest, offering additional opportunities for development and investment, either in construction or renovation as well as energy efficiency for buildings.

Greece is seeing a surge in construction driven by infrastructure improvements and a growing focus on sustainable tourism. Urban regeneration projects and green building initiatives are increasingly prioritized, supported by EU funds such as the Recovery and Resilience Facility.

The **Spanish** construction market is rebounding strongly, particularly in residential and commercial developments in cities like Madrid, Barcelona and Malaga. There is also a significant push toward green building practices, aligning with the country's climate goals and EU directives.

Italy's construction sector is benefiting from a combination of historic building renovations and new infrastructure projects. Investments in energy-efficient residential housing and retrofitting programs, supported by government incentives, are driving growth.

2.2.2. Market structure

The European construction market is a cornerstone of the broader building sector, providing the physical foundation for urban and infrastructure development. It is primarily driven by **narrow construction**, which includes residential, commercial, and industrial projects. This segment is highly fragmented, with **small and medium-sized enterprises (SMEs)** leading in localized residential projects, while larger corporations dominate high-value commercial and infrastructure developments.

Key markets such as Spain, Italy, and Greece are focusing on integrating **green building technologies** and adopting **digital construction tools** like prefabrication and modular construction to meet evolving regulatory and environmental standards.

Building design forms the creative and technical backbone of the construction process. Similar to Real Estate market players, architectural firms and engineering consultancies are increasingly prioritizing **sustainable and innovative design practices**, driven by the need to comply with environmental certifications like **LEED** and **BREEAM**. The adoption of **BIM** is revolutionizing this space, enabling highly detailed and collaborative design processes that reduce waste and improve efficiency. Countries like Italy and Greece, known for their architectural heritage, are blending modern sustainability practices with traditional aesthetics, particularly in urban regeneration projects.

Renovation is a rapidly growing sub-sector, especially in countries with aging building stocks like Greece and Italy. This segment focuses on retrofitting older structures to improve energy efficiency, align with modern safety standards, and extend building lifespans. Renovation projects often involve comprehensive energy audits and the integration of **BEMS** to optimize operational efficiency. In Spain, urban renewal initiatives in major cities are not only modernizing buildings but also improving their compliance with **EU sustainability targets** [11], making renovation an essential driver of market growth.

The **BEMS** market complements construction and renovation by enabling smarter, more efficient use of energy in both new and existing buildings. The market structure

is composed of three primary segments, each fulfilling a critical role in delivering comprehensive energy solutions:

- **Hardware Providers:**

These companies supply the physical components required for energy management systems, such as **sensors, meters**, and **control devices**. These devices form the backbone of BEMS, collecting real-time data on energy usage and enabling automation of energy-saving measures. The hardware segment is experiencing growth due to the increasing integration of **Internet of Things (IoT)** devices, which enhance monitoring capabilities.

- **Software Developers:**

This segment focuses on creating platforms that enable energy monitoring, analytics, and optimization. Advanced software solutions use **artificial intelligence (AI)** and **predictive analytics** to identify inefficiencies and recommend actions to reduce energy consumption. These platforms also provide detailed reporting, helping organizations comply with regulatory standards and achieve sustainability targets. Software developers are central to the push for smart buildings and smart city initiatives.

- **Service Providers:**

Service providers offer a range of solutions, including **energy audits, maintenance of systems**, and **retrofitting of older buildings** with modern energy-saving technologies. These firms bridge the gap between hardware and software providers by ensuring seamless implementation and ongoing operation of BEMS. Retrofitting services are particularly crucial in Europe, where aging building stock requires significant upgrades to meet modern energy efficiency standards.

The synergy between the construction and renovation market and the energy management market is becoming increasingly evident. As the focus on sustainable building practices grows, energy management systems are being integrated into the construction process from the outset. For instance:

- New buildings often include pre-installed energy management hardware and software to meet energy efficiency standards.

- Renovation projects, particularly in older European cities, prioritize retrofitting with BEMS to optimize energy usage and reduce operating costs.

This interdependence highlights the need for a cohesive approach, where construction firms collaborate with energy management providers to deliver buildings that are both functional and environmentally sustainable. As a result, both markets are evolving together, driven by shared goals of innovation, efficiency, and sustainability.

2.2.3. Market trends

The Building Design, Construction, and Renovation market, along with the Energy Efficiency segment, presents distinct trends while also sharing several common drivers shaped by sustainability goals, technological advancements, and regulatory frameworks. Below is an analysis of the common and sector-specific trends that are influencing these markets.

There are common trends across both markets:

- Focus on Sustainability and Green Initiatives. Both markets are significantly driven by sustainability mandates such as the **EU Green Deal** and the revised EPBD. Furthermore, the growing emphasis on reducing carbon footprints has led to the integration of energy-efficient designs, renewable energy systems, and sustainable materials in both construction and renovation projects.
- Government Regulations and Incentives. Subsidies and regulatory pressures are encouraging the adoption of energy-efficient technologies and sustainable construction practices. Examples include incentives for solar panels, heat pumps, and insulation upgrades in residential renovations. Also, the EPBD introduces comprehensive environmental certifications, focusing on the entire life cycle of buildings, including materials production, construction, operation, and renovation.
- Technological Advancements. Digital tools like **Building Information Modeling (BIM)**, IoT devices, and AI are reshaping both markets by enabling better planning, real-time monitoring, and predictive analytics. Moreover, the **integration of BEMS** in construction and retrofitting projects highlights the convergence of these markets around smart energy management.

- **Energy Costs as a Key Driver.** Rising energy prices continue to be a catalyst for renovation projects and the adoption of energy-saving technologies, such as improved insulation and smart energy management systems.

Regarding the specific trends in the Building Design, Construction, and Renovation Market, we can identify the following:

- **Shift Toward Renovation Over New Construction.** The renovation and maintenance (R&M) market constitutes more than **54% of total construction production** in Europe and is growing steadily due to sustainability goals and aging building stock [12]. Also, Western European countries, with older infrastructure, have a higher share of renovation activities compared to Eastern Europe, where new construction is more prevalent. In Figure 9 the share of renovation market is shown.
- **Increased Focus on Urban Renewal.** Cities like Madrid, Milan, and Athens are investing in large-scale urban renewal projects to modernize aging infrastructure while maintaining their architectural heritage. On top of that, mixed-use developments and public infrastructure upgrades are prioritized to enhance urban living standards.
- **Rising Renovation Costs.** Renovation costs have surpassed inflation rates in Europe, partly due to increased demand for energy-efficient upgrades and rising prices for building materials. Despite the cost increases, government subsidies and reduced payback periods for energy-efficient solutions are driving demand.
- **Resilience to Economic Cycles.** Unlike new construction, renovation projects are less vulnerable to economic downturns. Essential repairs and energy efficiency upgrades maintain demand even during financial crises.

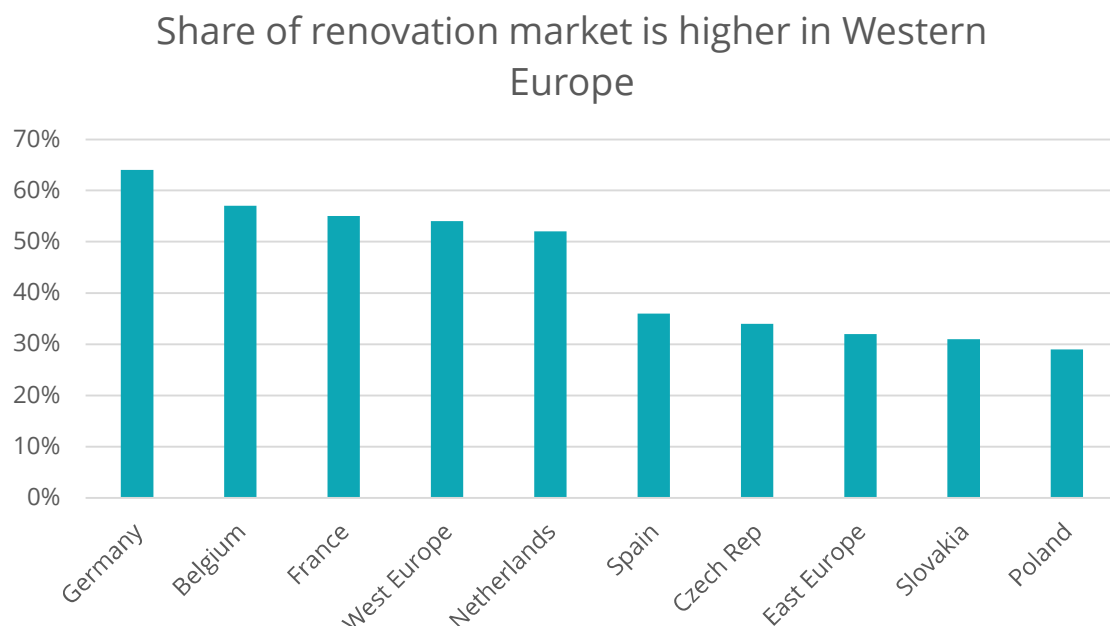


Figure 9 Share of renovation market in Europe

If the focus is on the specific trends in the energy efficiency industry, the following have been identified:

- **Adoption of Advanced Energy Management Systems.** BEMS adoption is driven by IoT-enabled sensors, smart meters, and AI-based platforms, allowing real-time energy monitoring and optimization.
- **Growing Popularity of Retrofitting.** Energy efficiency retrofits, such as improved insulation, heat pumps, and solar panels, are increasingly incorporated into renovation projects. The focus on retrofitting is particularly strong in Europe, where aging buildings need upgrades to comply with stringent energy efficiency standards.
- **Integration with Smart Cities.** Energy efficiency measures are a core component of smart city initiatives in Europe, such as in Amsterdam, Barcelona, and Copenhagen, where energy management systems are integrated into urban planning.
- **Consumer Awareness and Demand.** High energy prices and government awareness campaigns have encouraged consumers to adopt energy-efficient technologies. For example, searches for solar panels surged during 2022, indicating increased interest in renewable energy solutions.

The trends in these two interconnected markets illustrate how they are evolving to meet the demands of a sustainable and energy-efficient future. While building design, construction, and renovation focus on modernizing and creating physical structures, the energy efficiency market ensures that these buildings operate at peak efficiency throughout their life cycles.

By aligning construction and renovation practices with energy management solutions, stakeholders in these markets can collectively address global sustainability challenges while capitalizing on growing opportunities driven by technological and regulatory developments.

2.2.4. Key players

The building design, construction, and renovation markets, along with the energy efficiency segment, are driven by leading companies that provide innovative solutions, sustainable technologies, and integrated services. Below is a detailed overview of the key players shaping these industries, highlighting their expertise and contributions.

Some of the main players of the building design, construction, and renovation market are the following:

- **Vinci Construction (France)** is a leader in construction and infrastructure development, focusing on public-private partnerships, urban renewal projects, and sustainable solutions. With a portfolio that includes several carbon-neutral building initiatives, Vinci demonstrates a commitment to sustainability and large-scale project execution.
- **ACS Group (Spain)**. ACS is a global construction giant specializing in infrastructure, renewable energy, and high-tech building projects. Through its subsidiary Hochtief, ACS is involved in digital construction methods such as 3D printing and prefabrication, driving efficiency and innovation.
- **Bouygues Construction (France)** is known for its strategic acquisitions and digital transformation efforts. The company focuses on green construction methods and smart buildings, catering to public and private sectors across Europe.

- A pioneer in sustainable construction, **Skanska AB (Sweden)** delivers low-carbon infrastructure projects. The company's focus on modular construction and digital tools like **BIM** has positioned it as a leader in eco-friendly building practices.
- **Eiffage (France)** is a prominent player in public works and renewable energy infrastructure. The company is heavily invested in solar and wind energy projects, reflecting its dedication to green construction.
- Known for its innovative insulation solutions, **RockWool International A/S (Denmark)** supports energy efficiency in building design and renovation. Its products are central to achieving energy savings in residential and commercial properties.
- A global leader in sustainable building materials, **Saint-Gobain (France)** develops energy-efficient solutions, including advanced glass technologies and eco-friendly construction materials. The company is well positioned to benefit from Europe's Green Deal initiatives.

If we focus on the Building Energy Management market, some of the main actors of the play are the following:

- A global leader in energy management and automation, **Schneider Electric (France)** offers advanced solutions such as the **EcoStruxure platform**, enabling real-time energy analytics, optimization, and control. Its portfolio spans building management systems, energy-efficient lighting, and renewable energy integration.
- **Siemens AG (Germany)** specializes in electrification and IoT-enabled energy solutions. In 2023, Siemens introduced the **Connect Box**, an IoT solution for small to medium-sized buildings, enhancing energy efficiency through real-time monitoring and optimization.
- Through its **OpenBlue platform**, **Johnson Controls (Ireland)** provides comprehensive energy-efficient products tailored for schools, campuses, and healthcare facilities. The company's focus on net-zero solutions underscores its leadership in sustainable building technologies.
- **ENGIE SA (France)** is a multinational utility company specializing in energy transition, renewable energy, and energy services. Its focus on decarbonization aligns with Europe's ambitious climate targets.

- **ABB (Switzerland)** provides cutting-edge automation and energy management systems, focusing on smart buildings and industrial energy efficiency. The company's technologies help optimize energy consumption and reduce carbon emissions.

Several companies operate across both markets, leveraging their expertise to offer integrated solutions:

- **Schneider Electric** and **Siemens** provide automation and energy management systems that are increasingly integrated into construction and renovation projects.
- **Johnson Controls** bridges the gap with its comprehensive **building-as-a-service** model, combining construction, renovation, and energy efficiency solutions.

2.2.5. Entry barriers

Both the **Building Design, Construction, and Renovation** market and the **Energy Efficiency** market face various entry barriers. While these markets share some common challenges, each also has specific barriers influenced by market dynamics, technological requirements, and regulatory frameworks.

There are some common barriers that apply to both niches:

- **Financial barriers** in the market stem from high initial costs associated with energy-efficient designs, advanced materials, and technologies like IoT-enabled systems and BEMS. Limited access to capital, particularly for SMEs and independent contractors, further restricts market entry, especially in high-cost regions. Additionally, economic uncertainty and fluctuations in energy and material costs increase financial risks, discouraging new entrants.
- These financial barriers are compounded by **regulatory and compliance challenges**, as adhering to EU regulations like the EPBD demands extensive documentation, certifications, and strict compliance with sustainability standards, often requiring significant time and resources. Furthermore, the complexity of region-specific building codes and energy efficiency mandates creates additional hurdles, increasing the burden on businesses, particularly

smaller players, to navigate diverse requirements while managing limited resources.

- To be considered are **the workforce and expertise shortages**, as the lack of trained professionals in sustainable construction and energy management limits market scalability and slows project execution. Shortages of skilled labor hinder the adoption of innovative solutions and affect project timelines, while gaps in knowledge about circular economy principles and advanced energy-efficient technologies exacerbate the challenges. This expertise deficit not only impedes the implementation of cutting-edge practices but also places additional strain on businesses striving to meet regulatory and market demands.
- **Informational barriers** are worth mentioning, as limited awareness among potential clients about the benefits of energy-efficient solutions and sustainable building practices slows market adoption. Furthermore, the lack of reliable data and tools to evaluate and verify performance claims creates uncertainty, making it difficult for businesses to build trust and demonstrate the value of their offerings. Together, these financial, regulatory, workforce, and informational barriers form a complex web of obstacles that hinder the widespread adoption of sustainable and energy-efficient practices in the market.

The building design, construction, and renovation market faces several specific entry barriers that complicate the widespread adoption of sustainable practices. **Fragmentation and a lack of standardization**, driven by the dominance of SMEs, create a highly disjointed ecosystem where coordination among stakeholders is difficult. This issue is exacerbated by the **absence of standardized solutions** for incorporating sustainability into projects, particularly retrofits. **Retrofitting older buildings adds further complexity**, with unexpected structural challenges, administrative hurdles, and the need to balance modernization with preserving architectural and cultural heritage.

Supply chain and material availability present additional challenges, as access to sustainable construction materials, such as recycled or second-hand products, varies greatly by region. Rising material costs and supply chain disruptions disproportionately impact smaller firms. Lastly, **behavioral and sociological factors** often drag progress, especially in multi-owner or co-ownership buildings where conflicting priorities and misunderstandings about the benefits of renovations create

delays. Resistance to change and mistrust in the process further discourage owners and residents from pursuing necessary upgrades, compounding the industry's existing barriers.

On the other hand, the energy efficiency market faces distinct entry barriers that complicate the adoption of advanced solutions. **Technological integration challenges** are prominent, particularly in retrofitting older buildings where implementing systems like BEMS requires costly customization and poses interoperability issues with IoT devices and legacy infrastructure. Additionally, **market saturation** in certain segments, such as LED lighting in specific regions, limits opportunities for new entrants.

Behavioral barriers also play a significant role, as a lack of understanding among end-users and building managers often leads to the underutilization of installed energy-efficient systems. Resistance to changing energy consumption habits further reduces the impact of these measures. **Split incentives** exacerbate these challenges, with conflicting interests between landlords and tenants; property owners may avoid costly investments when tenants are the primary beneficiaries of energy savings. These combined factors create a complex environment that stifles innovation and market growth in energy efficiency [13].

2.2.6. Opportunities

The combined **Building Design, Construction, and Renovation** and **Energy Efficiency** markets offer immense opportunities driven by global sustainability goals, technological advancements, and growing regulatory support. These interconnected markets are critical to addressing climate change, enhancing urban infrastructure, and reducing operational costs for building owners and operators. Below are the key opportunities emerging in these markets.

Growing Demand for Sustainable Solutions

- **Green Building Initiatives:** The rising emphasis on sustainability, supported by policies like the **EU Green Deal** and the **EPBD**, has created a robust demand for energy-efficient and environmentally friendly buildings. The **Methodology for Digitalization over BIM (KER #6)** directly supports green building initiatives by enabling streamlined workflows and ensuring compliance with certifications like LEED and BREEAM. It provides a robust framework for

integrating sustainability data, helping stakeholders align projects with EU Green Deal objectives and market demands.

- **Retrofitting Existing Buildings:** With the majority of European building stock predating modern efficiency standards, retrofitting for energy efficiency and compliance is a vast, untapped market. The **Tool for Identifying Construction Elements (KER #2)** facilitates efficient planning and execution of retrofitting projects, particularly for buildings prior to modern energy standards.

Technological Advancements Driving Innovation

- **Smart Buildings and IoT Integration:** The adoption of IoT devices and **AI-driven platforms** enables real-time energy optimization, predictive maintenance, and improved operational efficiency. Companies offering **smart technologies** for energy monitoring and management are well-positioned to capitalize on this trend. The **OpenDBL (KER #1)** serves as a centralized system for integrating IoT devices and monitoring building performance in real-time.
- **Data-Driven Energy Optimization:** The ability to leverage big data for energy usage insights and optimization is becoming a critical differentiator. Service providers with robust analytics platforms have a unique opportunity to dominate the market. The **Mobile App (KER #5)** contributes to this trend by digitalizing onsite data collection for energy and sustainability audits. It ensures accurate and efficient verification processes, crucial for optimizing energy performance in both new and existing buildings.

Regulatory Support and Financial Incentives

- **EU Recovery Funds:** Significant funding is being allocated to support sustainable construction, renovation, and energy efficiency initiatives across Europe. These funds reduce financial barriers for both building owners and market players, accelerating the adoption of advanced solutions.
- **Tax Incentives and Subsidies:** Governments are incentivizing energy-efficient upgrades through tax breaks and subsidies, such as grants for solar energy systems and efficient heating and cooling installations. These incentives create favorable conditions for market expansion.

Increasing Urbanization and Infrastructure Development

- **Urban Renewal Projects:** Urban centers across Europe, particularly in **Southern Europe**, are undergoing significant transformation to modernize infrastructure and improve energy performance. Key cities like **Madrid, Milan**, and **Athens** are focusing on integrating mixed-use developments and sustainable public infrastructure.
- **Tourism-Driven Growth:** Countries like **Italy, Spain**, and **Greece** are leveraging opportunities in the tourism sector to renovate and modernize buildings, particularly hotels and commercial spaces. Sustainable tourism initiatives are creating additional demand for green construction and energy-efficient retrofits.

Rising Energy Costs Driving Efficiency Investments

- With energy prices at historically high levels, building owners and tenants are increasingly prioritizing energy efficiency measures to reduce operating costs. This presents significant opportunities for companies offering solutions like **advanced insulation, smart HVAC systems**, and **renewable energy technologies**. **The Methodology for Digitalization (KER #6)** ensures the integration of energy-efficient designs into projects, helping firms address rising operational costs by meeting stricter energy standards.

Collaboration Opportunities Across Stakeholders

- **Public-Private Partnerships (PPPs):** Collaboration between governments and private companies is enabling large-scale sustainable building projects. These partnerships can help overcome financing challenges while ensuring compliance with strict regulatory requirements. **The OpenDBL (KER #7)** facilitates collaboration among stakeholders by providing an interoperable and centralized data environment. This capability is crucial for large-scale projects requiring coordination between governments and private companies.
- **Integrated Services:** Companies offering end-to-end solutions—from design and construction to energy audits and management—are particularly well-positioned to capture market share.

Market Gaps and Emerging Niches

- **Residential Sector:** The demand for energy-efficient homes is growing, particularly in light of evolving consumer preferences for sustainable living. Companies focusing on affordable, yet energy-efficient residential construction and retrofitting can tap into this expanding market.

- **Smart City Initiatives:** Smart city projects in European hubs are driving investments in both sustainable construction and energy efficiency, offering a promising niche for tech-enabled service providers. The **CDE (KER #1)** and **AI-Based Interoperability Mapping Service (KER #4)** align with smart city goals by enabling seamless integration of data from multiple systems and stakeholders, fostering efficient urban development and management.
- **Circular Economy Practices:** Growing interest in the circular economy, including the reuse of construction materials and sustainable deconstruction practices, opens new revenue streams for innovative companies.

The convergence of **building design, construction, and renovation** with **energy efficiency solutions** creates a multi-faceted market ripe with opportunities. Companies that leverage technological innovation, align with sustainability goals, and capitalize on government support are well-positioned to succeed in these high-growth markets.

2.3. Facility Management

2.3.1. Current market size and growth in next 5 years

The European Facility Management (FM) Market demonstrates steady growth, driven by the outsourcing of non-core functions, increasing demand for integrated services, and the growing sophistication of service delivery models. As of 2024, the market size is estimated at €312.91 billion and is projected to reach €362.87 billion in year 2029, reflecting a CAGR of 2.95% during the forecast period [14].

Europe is considered one of the most sophisticated FM markets globally, combining both **single-service and integrated contracts**. This creates opportunities for multinational companies to partner with service providers offering cross-border capabilities, enhancing operational efficiency and consistency across multiple regions.

A significant trend reshaping the market is the integration of facility management with corporate real estate services. This approach provides companies with seamless solutions to manage complex property portfolios, reducing redundancy and

enhancing value. By aligning FM services with real estate operations, businesses can better harmonize workplace strategies and infrastructure management.

Technology is a key driver of innovation in the FM market. Providers are increasingly leveraging:

- IoT-enabled sensors for real-time monitoring and energy management.
- Automated systems to streamline operations.
- Data analytics tools to optimize workplace performance and ensure compliance with sustainability standards.

Additionally, the outsourcing of non-core functions, particularly in critical sectors like healthcare and education, underscores the importance of FM services. This evolution highlights the FM market's dynamic nature, combining technological innovation with strategic partnerships to meet growing demands.

2.3.2. Market structure

The FM market is a multi-faceted industry, organized across various service categories and applications that cater to the operational, safety, and infrastructure needs of diverse sectors. The market's structure highlights the segmentation by service type and application, reflecting its complexity and the specialized roles played by different segments in ensuring the functionality and sustainability of buildings and facilities.

Service segmentation:

- **Hard services** account for a significant portion of the FM market, representing **52% of market share in 2023**. These services are critical to the infrastructure and technical functioning of facilities, encompassing areas such as HVAC systems, electrical installations, plumbing, and structural repairs. The role of hard services extends beyond maintenance; they are pivotal in ensuring the operational safety and smooth functioning of buildings. The growth of hard services is driven by the increasing emphasis on preventive maintenance and regulatory compliance. Organizations prioritize these services to reduce the risks of costly failures and to adhere to stringent safety standards. Additionally, the demand for skilled professionals and specialized providers capable of tailoring solutions to specific needs continues to rise.

- **Soft services** focus on non-technical, operational tasks that contribute to the comfort and usability of facilities. These include cleaning, laundry, landscaping, and security services. Unlike hard services, which are infrastructure-centric, soft services enhance the overall environment, ensuring it is clean, secure, and aesthetically appealing. These services are essential for supporting daily operations and maintaining health and safety standards. For instance, in sectors like healthcare and education, soft services such as sanitation and security play a pivotal role in ensuring well-being. While they are less technical in nature, they are indispensable for fostering positive occupant experiences and maintaining the functionality of spaces.
- **Management services** focus on the strategic and operational oversight of facilities, aligning their functionality with organizational goals. These services include contract management, energy and utilities optimization, and maintenance planning. They are instrumental in ensuring cost-effective and sustainable operations, leveraging data-driven tools and frameworks to enhance efficiency.

By addressing long-term planning and operational control, management services ensure that facilities not only meet current demands but are also equipped to adapt to future challenges. The integration of energy management systems and advanced analytics is a growing trend in this segment, as organizations strive to align their operations with sustainability targets and cost optimization goals.

The market can be segmented as well **by application**. The FM market serves a diverse array of sectors, each with unique requirements and operational goals. Figure 9 offers an overview of the segmentation by application in FM market. These applications range from government and public sector facilities to commercial and industrial spaces, showcasing the versatility and critical nature of FM services:

- The government and public sector represent a significant portion of the FM market, accounting for **23% of market share in 2023** [15]. These services cater to various public institutions such as schools, hospitals, and transportation systems, ensuring their functionality, safety, and sustainability. FM providers play a crucial role in addressing the distinct challenges faced by this sector, including stringent regulatory compliance, budget constraints, and high expectations for service quality. Governments are increasingly prioritizing

the modernization of public infrastructure, driving demand for comprehensive and tailored FM solutions that align with these goals.

- The **commercial application** of FM services focuses on office spaces, retail facilities, and other business-oriented properties. In these environments, FM is essential for optimizing operational efficiency and enhancing occupant experiences. Services such as energy management, cleaning, and security are critical in maintaining a professional and productive atmosphere. The growing emphasis on sustainability and employee well-being further amplifies the importance of FM in this sector, with organizations seeking innovative ways to balance cost efficiency with high-quality service delivery.
- In **healthcare facilities** such as hospitals and clinics, FM services ensure strict adherence to hygiene standards, operational continuity, and patient safety. These settings require highly specialized FM solutions, including critical maintenance of medical equipment, HVAC systems, and sanitation protocols. Similarly, in the **education sector**, schools and universities rely on FM providers for maintaining a safe and conducive learning environment. Services like routine maintenance, security, and waste management are particularly significant in these applications, where health and safety are paramount.
- Factories, warehouses, and manufacturing plants depend on FM services to enhance operational efficiency and comply with stringent safety regulations. The **industrial sector** often requires customized solutions, such as equipment maintenance, energy management, and site security. These services are crucial for minimizing downtime, optimizing resource usage, and ensuring compliance with industry standards.
- **Transportation** hubs, including airports, train stations, and seaports, present unique challenges for FM providers due to their scale and complexity. These facilities require extensive maintenance, coordination, and real-time management to handle large volumes of passengers and goods effectively. FM services in this sector are vital for ensuring smooth operations, enhancing user experience, and maintaining compliance with safety and security protocols.

Facility Management Market share by application 2023

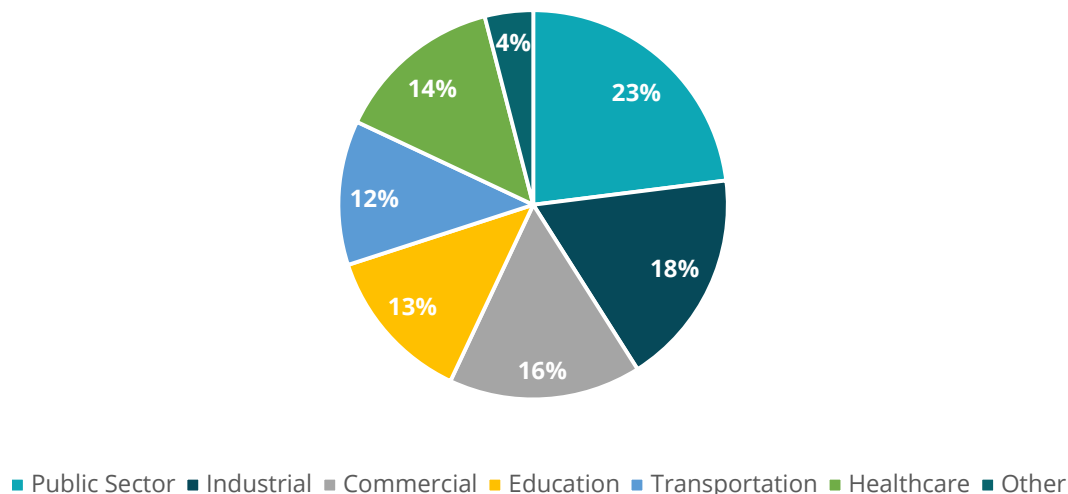


Figure 10 FM Market share by application

2.3.3. Market trends

The FM market in Europe is undergoing a significant transformation, driven by advancements in technology, changing workplace dynamics, and increasing emphasis on sustainability. These trends are reshaping the way facilities are managed, creating opportunities for efficiency, innovation, and enhanced service delivery.

Enhanced Employee Experience and Workplace Design

The shift toward hybrid and flexible work models has placed a renewed focus on **employee well-being and productivity**. FM providers are prioritizing ergonomic designs, wellness programs, and workplace technologies to foster collaboration and innovation. This trend highlights the importance of FM strategies that adapt to changing organizational needs, making spaces more efficient and employee friendly. The **VR Viewer (KER #3)** enables immersive visualization of workplace designs and layouts, helping FM providers create ergonomic and collaborative spaces.

Urbanization and Infrastructure Development

The rapid urbanization of European cities and the expansion of key sectors like healthcare, retail, and hospitality are driving demand for FM services. Urban renewal

projects and infrastructure modernization, particularly in Southern Europe, are expanding FM applications in government and public sector facilities. These trends align with the growing need for energy-efficient and sustainable buildings in dense urban centers. As urban centers undergo renewal projects, the Methodology for Digitalization over BIM provides a standardized framework for managing lifecycle data of facilities

Commercial Buildings as a Key Market Segment

Commercial buildings remain a dominant segment in the FM market due to their higher cash flow potential and better ROI. Several partnerships in the sector highlight the trend:

- In April 2023, BT Group extended its FM partnership with **CBRE** to cover over 7,500 properties, emphasizing service delivery enhancements.
- **ISS UK** expanded its contract with Virgin Media O2 in January 2023 to provide integrated FM services, demonstrating the growing appeal of bundled solutions.

The digitalization of commercial buildings into **smart buildings** is another significant trend, with technologies like IoT transforming both new and existing properties. For instance, the collaboration between **Planon** and **SAP** in May 2023 showcased how integrated real estate and FM solutions can improve sustainability and operational efficiency [14]. **The AI tool (KER #4)** enables data standardization and interoperability, helping FM providers leverage Big Data for predictive maintenance

The Role of Big Data and Technology

Big Data is revolutionizing the FM sector, enabling organizations to focus on **efficiency and cost savings** through data-driven decision-making. Advanced analytics tools allow FM providers to optimize operations, reduce waste, and tailor services to client needs. The shift from in-house delivery of services to integrated FM contracts is also gaining momentum, offering economies of scale and better service quality.

Future investments in technologies such as IoT, **AI, augmented reality (AR)**, and **advanced data analytics** are expected to enhance FM services. Germany, with its 522 data centers and a 93.1% internet literacy rate (2023) [14], exemplifies the growing importance of data processing capabilities in FM. Facility managers are

increasingly tasked with ensuring the accessibility, security, and optimal operation of data centers, reflecting the critical role of Big Data in modern FM.

Sustainability in FM

The increasing focus on **sustainability and energy efficiency** is driving innovation in FM. The demand for energy-efficient systems and sustainable practices is reshaping the market, encouraging providers to adopt green technologies and processes. Initiatives like energy optimization in commercial buildings and compliance with environmental standards are creating opportunities for FM companies to enhance their service offerings and reduce environmental impact.

Integrated and Specialized FM Services

As organizations prioritize outsourcing, the FM market is shifting toward **integrated services** and longer-term contracts. These bundled solutions, combining multiple FM services under a single provider, add value by delivering comprehensive and scalable management solutions. This trend benefits both small and large organizations by providing specialist expertise and operational efficiency. The **CDE (KER #1)** supports bundled service offerings by providing a single platform for managing multiple FM services, enhancing operational efficiency and collaboration.

2.3.4. Key players

The European FM market is characterized by its **highly fragmented nature**, with numerous regional and international players catering to diverse client needs. While a few multinational companies dominate specific segments, the market remains competitive, with small to medium-sized enterprises (SMEs) holding significant shares, particularly in local markets. This fragmentation creates both opportunities and challenges, as providers compete to deliver tailored and innovative solutions.

Major Players and Their Contributions

1. **CBRE Group**

A global leader in real estate and FM services, CBRE provides integrated solutions, including property management, maintenance, and strategic workplace planning. CBRE's strong presence across Europe allows it to cater to multinational clients seeking comprehensive facility management services under unified contracts.

2. **Mitie Group**

Mitie is a UK-based FM provider specializing in integrated and energy-efficient services. The company focuses on delivering sustainable solutions, including waste management, energy optimization, and workplace design, emphasizing innovation and environmental responsibility.

3. **EMCOR Group**

EMCOR specializes in mechanical and electrical construction services, alongside facilities operations. Known for its technical expertise, the company plays a key role in maintaining critical infrastructure across sectors such as healthcare, industrial, and education.

4. **G4S**

G4S, a global security company, extends its expertise to FM by offering security-integrated facility services. These include access control, surveillance, and emergency response, catering to high-security environments such as government buildings and financial institutions.

5. **ISS World Services**

ISS is a major player in providing workplace experience and FM solutions, including cleaning, catering, and support services. With a strong focus on client-centric innovation, ISS leads in delivering tailored solutions across commercial and public sector facilities.

The European FM market is noted for its **high level of fragmentation**, where no single entity dominates the market entirely. This creates a competitive landscape, as companies ranging from global firms like CBRE and ISS to local SMEs meet the diverse needs of clients. While larger players focus on integrated and cross-border solutions, smaller firms often specialize in niche services or single contracts, addressing localized requirements effectively.

Multinational companies are increasingly seeking FM providers with the capacity to offer integrated services across multiple locations, giving larger players like CBRE and ISS a competitive edge. Also, SMEs remain critical to the market, offering specialized and highly tailored services to meet region-specific needs. This adaptability keeps competition robust and dynamic. On top of that, key players are aligning their service offerings with sustainability goals, integrating energy-efficient solutions and green certifications into their portfolios.

FM software Providers

Below are some of the top facility management software and platform providers operating in Europe, which leverage BIM to provide more accurate and efficient facility management, improving overall building performance and lifecycle management. These are among the strictest competitors of openDBL:

- **IBM Tririga** - Offers integrated workplace management solutions to optimize real estate and facility operations.
- **Planon** - Offers integrated solutions that combine BIM data with facility management processes to enhance building performance and maintenance
- **Archibus** - Provides BIM integration to streamline facility management, space planning, and asset management.
- **FM:Systems** - Specializes in BIM-enabled facility management software to improve space utilization and maintenance efficiency.
- **Spacewell** - Delivers smart building solutions with BIM integration for better facility management and operational insights.
- **Accruent** - Offers BIM-ready solutions to manage real estate and facilities more effectively.
- **MCS Solutions** - Provides BIM-integrated IWMS for comprehensive facility and workplace management.
- **pitBIM4FM** - Integrates FM-relevant data from BIM models into their CAFM solution, enhancing data management and operational efficiency.
- **Dalux** is a leading provider of BIM-based and mobile Computerized Maintenance Management Systems (CMMS). Offers a user-friendly interface that supports both 2D and 3D BIM on web and mobile devices and allows users to navigate through buildings in 3D, providing a comprehensive overview of all buildings, assets, and documents.
- **ACCA** offers a range of software solutions for facility management, including BIM integration and provides tools for various aspects of facility management, including maintenance, asset management, and space planning.

2.3.5. Entry barriers

The FM market faces significant entry barriers, stemming from the industry's complexity, the increasing demand for specialized services, and evolving technological and sustainability standards. These challenges affect both new

entrants and established players, particularly in adapting to modern operational expectations [16]:

- **Rising Costs and Resource Constraints**

One of the primary barriers in the FM market is the **increasing cost of resources**, including raw materials like steel, copper, and electrical components. These rising costs have a direct impact on maintenance and repair budgets, making it difficult for smaller companies to remain competitive. Similarly, **energy costs**, which can account for up to 30% of operational expenses for some facilities, create significant challenges for FM providers striving to meet budgetary constraints.

Additionally, the demand for **energy-efficient equipment and technologies** adds to the financial burden, as companies must invest in costly upgrades to comply with sustainability goals. Smaller firms, lacking the capital to invest in these technologies, often find it challenging to compete with larger players who can leverage economies of scale.

- **Skilled Labor Shortages**

The FM market faces an acute shortage of skilled labor across both hard and soft services:

- **Hard Services:** Roles in electrical, plumbing, and HVAC maintenance require highly specialized skills and long training periods. However, the talent pipeline for these roles has stagnated, with younger workers retiring earlier and fewer professionals entering these trades.
- **Soft Services:** Sectors like security, janitorial, and landscaping face high turnover rates and competition from other industries, making it difficult for FM companies to maintain reliable staffing.

This labor shortage directly impacts service quality, efficiency, and the ability to scale operations, creating a significant barrier for new entrants and smaller firms.

- **Regulatory Compliance and Sustainability Standards**

FM companies operate in a heavily regulated environment, particularly in sectors like healthcare, education, and government. Meeting stringent compliance standards related to safety, energy efficiency, and operational continuity requires:

- Extensive knowledge of local, regional, and EU-wide regulations.
- Investment in tracking systems to monitor compliance and report performance.
- Significant initial and ongoing costs to adhere to sustainability directives.

Sustainability, while offering long-term benefits, adds another layer of complexity. Clients increasingly demand energy-efficient and environmentally responsible operations, which require investments in smart technologies, renewable energy systems, and waste reduction strategies. Smaller firms may struggle to meet these expectations without compromising profitability.

- **Technological Integration**

The increasing reliance on **advanced technologies** like IoT-enabled systems, AI-driven analytics, and cloud-based management platforms poses a barrier for companies that lack the resources or expertise to adopt and implement these tools. Larger firms have the advantage of being able to invest in:

- Predictive maintenance technologies that optimize resource allocation.
- Intelligent data systems for decision-making.
- Automation tools that enhance operational efficiency and reduce costs.

For smaller companies, the cost of entry into these technologies and the skills required to manage them can be prohibitive, limiting their ability to compete in a rapidly digitizing market.

2.3.6. Opportunities

The FM market is set for significant growth, with opportunities arising from technological advancements, evolving workplace trends, and the increasing global emphasis on sustainability. These factors, coupled with expanding urbanization and government investments, provide FM providers with avenues to innovate and expand their offerings:

- **Technological Integration for Advanced Services**

The adoption of advanced technologies like IoT, AI, and PropTech is revolutionizing the FM market. These tools enable real-time monitoring, predictive maintenance, and data-driven decision-making, enhancing

operational efficiency and reducing costs. The integration of these technologies offers FM providers opportunities to:

- Offer **smart building management** solutions that optimize energy consumption and improve tenant satisfaction.
- Leverage **Augmented Reality (AR)** for efficient navigation of facilities, simplifying maintenance tasks, and enhancing spatial understanding.
- Capitalize on **PropTech innovations**, which integrate multiple facility functions like lighting, HVAC, and security into centralized management platforms.

AI-Based interoperability Mapping Service (KER #4) leverages AI for data-driven decision-making and ensures interoperability between various facility management systems.

- **Sustainability and Green Initiatives**

Sustainability is becoming a cornerstone of FM services as companies and governments prioritize eco-friendly practices. The increasing demand for green building certifications such as LEED and BREEAM underscores the importance of FM providers offering tailored solutions for sustainable building management. Opportunities include:

- Expanding services to focus on **energy efficiency**, such as implementing carbon footprint reduction strategies and installing renewable energy systems.
- Supporting government-led green infrastructure projects, such as Germany's €63 billion allocation for green infrastructure in 2024, aimed at achieving carbon neutrality by 2045.

The **KER#1 CDE** provides centralized tracking of sustainability metrics, facilitating carbon footprint reduction and renewable energy integration in FM projects.

- **Changing Workplace Dynamics**

The shift towards **hybrid working models** has created opportunities for FM providers to rethink workplace management. With traditional office spaces evolving into hubs for collaboration and flexibility, FM providers can:

- Develop customized workplace solutions, including dynamic space allocation and remote office support.

- Introduce technologies like **Meeting-Rooms-as-a-Service** (MRaaS), enabling hybrid teams to collaborate seamlessly through digitally connected spaces.

- **Urbanization and Infrastructure Development**

Rapid urbanization and the resulting surge in infrastructure projects are driving demand for FM services. Governments and private entities are investing heavily in modernizing public facilities, transportation systems, and healthcare infrastructure. Opportunities arise from:

- Providing **specialized FM services** for urban infrastructure, such as airports, hospitals, and public transit systems.
- Partnering with governments in **Public-Private Partnerships (PPPs)** to manage and maintain large-scale public facilities.
- Expanding services to emerging markets experiencing significant infrastructure growth.

As urban centers expand, the **Methodology for digitalization (KER #6)** facilitates the efficient management of data for large-scale infrastructure projects, such as airports and hospitals. This makes it a valuable tool for FM providers involved in urban renewal and PPPs.

3. KERs potential opportunities

The market assessment has provided a comprehensive overview of the conditions and dynamics within the AECO industry. It highlights how technology, sustainability goals, and shifting client demands are driving the evolution of real estate, construction, and facility management markets. The findings demonstrate significant opportunities for innovation, partnerships, and integration across these sectors.

As the next step, the focus shifts to analyzing the **KERs** developed within the project. This section will explore how the KERs align with the market conditions outlined, identifying potential opportunities for leveraging these results to address industry needs and capitalize on emerging trends. By bridging the insights from the market assessment with the strategic application of the KERs, we aim to pinpoint actionable pathways to success in the digitalized construction ecosystem.

3.1. Common Data Environment

Table 3 Opportunities for KER #1

Business strategy of the KER #1	
Market for the KER	The target market for the Common Data Environment (CDE) lies within the building design, construction, and maintenance sectors. With the rapid digital transformation of the construction industry, the demand for centralized data management and collaboration tools is increasing. This market is driven by construction companies, architects, engineers, and facility managers seeking to improve communication, streamline workflows, and enhance transparency across all stages of a project's lifecycle.
Synergy between KER and the Business strategy	This KER aligns well with EM's business strategy of developing IT solutions for the building environment. While EM primarily focuses on maintenance solutions, they also have experience in supporting the design and construction phases . This existing expertise provides a strong foundation for the commercialization of the CDE, as it complements their current product offerings and enhances their value proposition.

Winning new markets / Securing existing markets	EM's strategy focuses on securing its existing market by strengthening its position through innovative functionalities embedded in the CDE. By offering advanced features that competitors lack, EM can potentially create a competitive edge, making it harder for rivals to penetrate the market. This approach not only ensures customer retention but also opens opportunities to expand into new segments by leveraging the CDE's unique capabilities.
Market characteristics	
Market name	AECO Market (Building Design, Construction, and Maintenance)
Types of products / services within the market	• Data management tools • Collaboration platforms for design, construction, and maintenance workflows
Location of the market	Primarily within the European Union, with potential for global expansion.
Market size and growth	The European construction sector, encompassing design, construction, and maintenance, represents a significant share of the global market. However, this market is reaching maturity with incremental growth due to regulatory pressures and technological innovations.
Drivers or trends	• Rising demand for interoperability and cloud-based technologies. • Adoption of innovations like BIM, new collaboration platforms, and AI-driven tools. • Increased focus on cultural exchange, migration, and green building initiatives supported by EU directives like the Green Deal and EPBD.
Players / competition	• Teamsystem. Teamsystem offers a comprehensive suite of cloud-based solutions for construction and project management, including tools for collaboration, document management, and workflow automation • BuildingInCloud. A cloud-based platform designed to manage and share project information in real time. BuildingInCloud focuses on collaboration, ensuring interoperability between stakeholders during the design and construction phases, with support for BIM workflows. • ACCA Software is specialized in BIM-focused solutions, including tools for project management, cost estimation, and CDE integration. Their PriMus and usBIM platforms are tailored for the construction industry, offering ISO-compliant workflows and seamless data sharing. • Archicad. A leading BIM software developed by Graphisoft, Archicad offers robust tools for architectural design, enabling seamless collaboration and integration with other BIM tools

	• MaintainX. A mobile-first platform focused on simplifying maintenance management, including work order creation, asset tracking, and team communication. • UpKeep is a cloud-based maintenance management solution that enables organizations to track assets, monitor maintenance schedules, and optimize resource usage. • FiiX offers a powerful CMMS (Computerized Maintenance Management System) that integrates AI capabilities for predictive maintenance. It provides tools for scheduling, asset management, and analytics, making it ideal for facility and maintenance managers seeking data-driven insights.
Customers / end-users	• Large construction companies and project managers. • Facility managers responsible for building upkeep. • End-users such as tenants, government entities, and infrastructure operators
Entry barriers	• Dominance of established players like Autodesk and Archicad. • Resistance to adopting new technologies and workflows. • High costs associated with ISO-compliant workflows and robust data platforms.
Opportunities to enter the market	• Addressing the lack of interoperability between existing systems. • Providing a single, user-friendly platform for design, construction, and maintenance phases. • Offering specialized solutions like real-time data integration and compliance tools tailored to EU regulations.
Other products & services 1	• A360 (Autodesk) and ACCA Software for design collaboration. • Maintenance platforms with similar functionalities but lacking integrated workflows across the building lifecycle.

3.2. Tool for identifying construction elements

Table 4 Opportunities for KER #2

Business strategy of the KER #2	
Market for the KER	The market for this KER is the Construction, Renovation and Facility Management market, with a focus on door hardware specifications. The tool is particularly relevant for digitizing and identifying building elements in existing buildings, where there is a significant lack of 3D models. It addresses the growing demand for efficient digitalization

	of old structures using AI to process 2D floor plans, enabling streamlined workflows in construction, renovation, and maintenance.
Synergy between KER and the Business strategy	DORMAKABA would use the KER as an enhancement for door planning tools in the next few years
Winning new markets / Securing existing markets	The tool supports growth in existing markets, particularly by: • Streamlining renovation planning for older buildings. • Providing cost-efficient solutions compared to labor-intensive manual identification processes. • Enhancing integration with OpenDBL, enabling broader adoption across stakeholders like planners, engineers, and facility managers.
Market characteristics	
Market name	Construction, Renovation and Facility Management market
Types of products / services within the market	Services for digitizing building plans and creating digital twins for operational efficiency.
Location of the market	The tool has a global reach , with primary markets in Europe and North America due to their advanced focus on building digitalization and sustainable practices. Nevertheless, the scope for the tool shall be Italy, Greece and Spain, as the early adopters are based on these countries.
Market size and growth	• The Spain Facility Management Market is expected to register a CAGR of 5.29% over the forecast period (2022 - 2027). • The Italy Facility Management Market size is estimated at €38 billion in 2024, and is expected to reach €43 billion by 2029, growing at a CAGR of 2.14% during the forecast period (2024-2029). • The Greece Facility Management Market size is estimated at €1.79 billion in 2024, and is expected to reach €1.98 billion by 2029, growing at a CAGR of 1.97% during the forecast period (2024-2029).
Drivers or trends	The market for the Tool for Identifying Construction Elements benefits from a variety of trends and drivers that reflect broader transformations in the construction and facility management sectors across Europe. Key trends shaping the landscape in countries like Spain, Italy, and Greece include: Real Estate and Construction Expansion • Spain: Investments in real estate have surged post-pandemic, with foreign buyers returning and residential sales increasing. Large-scale acquisitions, like Round Hill Capital's €30 million investment in Madrid's serviced apartments, underscore the

	growing demand for construction and renovation services. This growth drives the need for tools that streamline the planning and execution of projects. • Italy: The expansion of logistics operations and the restructuring of supply chains are increasing the construction of new facilities. Real estate expansion for logistics hubs creates demand for advanced tools to identify and manage construction elements efficiently. Shift Toward Outsourced Facility Management The rise in installation costs for in-house facility management and the complexity of managing diverse services has driven organizations to outsource FM tasks. Certified third-party vendors offering single, bundled, or integrated services are increasingly popular in Greece, where SMEs dominate the market. Tools that simplify facility data digitization and enable interoperability to provide third-party vendors with competitive advantages. Tourism and Residential Construction Growth In Spain, increasing economic activity and tourism have led to a surge in occupancy rates for hotels, residential developments, and commercial spaces. Similarly, Greece is witnessing growth in residential construction, boosted by increasing real estate activity. This growth generates demand for innovative tools that aid in managing and renovating older buildings, aligning with market trends in energy-efficient renovations and modernized infrastructure. Sustainability and Green Initiatives Across Europe, governments and businesses are focusing on green certifications, energy efficiency, and sustainable construction. Tools that integrate AI to digitize 2D floor plans and identify construction elements align perfectly with this shift, reducing resource use and improving renovation planning accuracy. Technological Transformation The adoption of AI, IoT, and other PropTech solutions is reshaping how construction and facility management operate. AI-powered tools that digitize and classify building elements allow for precise planning and efficient operations, directly addressing the growing demand for smarter, more efficient building practices.
Players	• CBRE Group • ATLAS IFM SRL • Sodexo Group • Cowa Hellas Facility Management AE • Manifest Services SA

Customers / end-users	Primary customers include: • Construction companies for new building projects. • Specifiers in the construction industry, particularly those focusing on door elements. • Facility managers digitizing existing buildings for renovation or operational needs.
Entry barriers	• Customer acquisition challenges: Building trust relationships is critical for market entry and growth. • Knowledge gaps: Expertise in building components and digital workflows is essential.
Opportunities to enter the market	• The Renovation Wave in the EU creates a significant demand for digitization tools. • The lack of skilled personnel in the market positions this tool as a cost-effective alternative to manual labor. • Integration with OpenDBL enhances its utility, providing a comprehensive ecosystem for building digitalization.
Other products & services 1	This KER differentiates itself by targeting specific use cases, such as door hardware identification, with a competitive or budget pricing model. Sensors are the main tool for the identification of elements in this sector.
Any other remarks / information	The service is ideal for competitive pricing models and can be scaled for standalone use or integration with broader applications like OpenDBL. Its success depends on addressing gaps in the digitization of old buildings and providing seamless integration with existing platforms.

3.3. VR Viewer

Table 5 Opportunities for KER #3

Business strategy of the KER #3	
Market for the KER	The global Virtual Reality (VR) market is on a remarkable growth trajectory. In 2021, the industry recorded a significant increase of 92.1% year-on-year in VR headset shipments, reaching 11.2 million units globally. The European market, a critical component of the construction sector's digital transformation, is expected to expand at a compound annual growth rate (CAGR) of 41.4% through 2025. This growth is driven by:

	• Technological Advancements: Enhanced VR devices with higher resolutions, improved tracking systems, and better user interfaces. • Cost Decline: Reduction in hardware and software costs, making VR solutions accessible to a broader audience. • Wider Adoption in Professional Applications: Sectors such as Architecture, Engineering, Construction, and Operation (AECO) are increasingly integrating VR tools to improve project outcomes. The VR Viewer is a web-based 3D visualization tool enabling the management and exploration of Building Information Modeling (BIM) projects. It provides immersive capabilities for virtual inspection, detailed multi-layer visualization, and real-time data integration. Its SaaS-based model allows users to access this tool flexibly, supporting the digital transformation in the Architecture, Engineering, Construction, and Operation (AECO) industry. Additionally, the market for the VR Viewer encompasses both the Building Design and Renovation sector and the Facility Management sector. The global market for VR in construction is also expanding, driven by the need to reduce project errors, enhance design workflows, and improve stakeholder collaboration. The AECO industry, which lags in digitalization, offers fertile ground for VR Viewer. Aligning with EU Green Deal objectives and circular economy goals, the product collaboration, and sustainable practices.
Synergy between KER and the Business strategy	The VR Viewer complements OpenDBL's objective of creating an integrated platform for building lifecycle data management by: • Enhancing Data Utilization: The VR Viewer enables immersive access to BIM data, improving decision-making and project planning. • Supporting Scalability: The SaaS model allows for modular and scalable implementation, aligning with OpenDBL's goal to offer cost-effective and versatile solutions. • Driving Adoption: Its immersive features directly address the AECO industry's demand for improved visualization and collaboration tools, thus catalyzing platform-wide adoption. The integration of VR Viewer into the openDBL platform adds a unique selling proposition (USP), aligning with market demands for innovative and collaborative solutions in building lifecycle management.
Winning new markets / Securing existing markets	To successfully penetrate new markets, the VR Viewer must: Leverage Partnerships: Collaborate with hardware and software providers such as Meta and Unity to ensure compatibility and co-market the product, and form alliances with industry leaders in BIM and facility management software to embed VR capabilities into existing workflows.

	Adopt a Regional Focus/Market-specific Customization: Adapt and tailor features to align with regional regulations and market dynamics, especially in emerging economies. Include, also, features addressing local sustainability and green building certifications, particularly in EU. Invest in Awareness Campaigns: Engage stakeholders with educational workshops and demonstrations to reduce resistance to technological change. Demonstrate ROI through pilot projects and case studies and white papers.
Market characteristics	
Market name	The primary market is the "Construction Technology Solutions" sector, particularly focusing on digital tools for BIM visualization and data exploration. Other one is BIM Digital Transformation Market
Types of products / services within the market	The VR Viewer is a software product delivered as a SaaS solution, offering advanced capabilities such as multi-model loading, dimensional verification, and real-time collaboration.
Location of the market	The market has an international scope, with significant activity in Europe, particularly in Greece, Spain, and Italy, where BIM adoption and digital transformation initiatives are gaining traction.
Market size	The market for VR and BIM tools is emerging and rapidly growing. The European Virtual Reality (VR) market is experiencing significant growth, driven by technological advancements fueled by advancements in 3D visualization, digital twin technology, and increasing adoption of immersive tools for construction and facility management. Key drivers include the global push for sustainable building practices and the integration of advanced technologies like IoT and AI into construction processes.
Drivers or trends	Key Drivers include: • Policy Push: Regulatory incentives in the EU to adopt sustainable and digital solutions in construction. • Cost Efficiency: Reduced errors and improved decision-making facilitated by immersive technology. • Technological Maturity: The advancement of VR hardware and software enabling scalable, high-quality solutions. • Integration of Advanced Technologies: Adoption of 3D printing, digital twins, and IoT is driving efficient construction and management processes. • Enhanced Collaboration: Immersive visualization fosters collaboration among stakeholders, improving decision-making. • Demand for Sustainability: Tools that streamline project planning and energy-efficient designs are aligned with EU green initiatives.

Players / competition	• ACCA Software (Italy): Specialized in BIM software solutions. • Meta (Quest 2): a dominant player in consumer and enterprise VR markets. • HTC (Vive XR Elite): A provider of premium VR solutions tailored for professional use. • Autodesk and Unity: Leaders in BIM-compatible VR Tools, offering integration capabilities. • Vrex (USA): Known for immersive VR tools for construction projects. • Varjo (Finland): A leader in VR simulation and visualization technologies.
Customers / end-users	The primary customers include: • Professionals across the AECO (Architecture, Engineering, Construction company, and Operations) supply chain. • Facility managers and digitalization consultants. • Public contracting Authorities; • Odr and University; • BIM Managers, BIM specialist, BIM coordinators, BIM CE • Stakeholders involved in planning, design, and maintenance phases of construction project
Entry barriers	• High Entry Costs: initial investment in VR Hardware and software; • Infrastructure Dependence: The availability of 5G and cloud-based platforms can limit market penetration in regions with less developed technology infrastructure. • Competition: A growing number of established players in BIM-related visualization tools. • Resistance to Change: Traditional workflows in construction may limit initial adoption rates.
Opportunities to enter the market	Opportunities for the VR Viewer include: • Leveraging EU policies and incentives for digital construction. • Expanding into untapped segments like facility management and smart city planning. • Offering tailored, modular solutions to accommodate varying project scales and budgets.
Any other remarks / information	The VR Viewer developed under the OpenDBL project offers several unique value propositions that distinguish it from existing products in the market. Its core added value lies in the following aspects: • Integration with the OpenDBL Ecosystem: The VR Viewer is not a standalone tool; it is a component of the broader OpenDBL platform, designed to seamlessly integrate with the digital building logbook ecosystem. This ensures comprehensive data management across the building lifecycle,

	from design to operation, providing a unified environment for accessing, updating, and visualizing information. Its alignment with international standards and sustainability goals positions it as a key enabler of efficient, collaborative, and immersive project management. • API and Interoperability: The VR Viewer leverages an openAPI-based framework, promoting interoperability with existing BIM software and tools. This capability addresses a common pain point in the industry: integrating diverse data sources and software ecosystems into a cohesive workflow. • Compliance with European Standards: The VR Viewer is developed in alignment with European regulatory frameworks and standards, particularly those supporting sustainability and digitalization in the construction sector. This ensures that the tool is not only innovative but also compliant with evolving legal and environmental requirements. The VR Viewer's true added value lies in its ability to combine advanced visualization capabilities with seamless integration into a broader digital ecosystem, all while adhering to industry-specific standards and sustainability objectives. These features make it not only a tool for immersive exploration but also a strategic asset for digital transformation in the AECO sector.
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3.4. Tool for AI-Based Interoperability Mapping Service

Table 6 Opportunities for KER #4

Business strategy of the KER #4	
Market for the KER	The target market is the Building design, construction and renovation sector. This market is experiencing rapid expansion due to the growing trend of digitalization in the construction industry. The main users of this AI-based mapping service are construction companies, building operators, and project management firms looking to streamline workflows, improve documentation, and enhance collaboration between stakeholders.
Synergy between KER and the Business strategy	labi e.V. is primarily dedicated to research endeavors, guiding its activities through a strategic framework centered on advancing knowledge and innovation within its field. Thus, the aim regarding the KER is to continue the researching on this sector.
Winning new markets / Securing existing markets	Although primarily dedicated to research, labi e.V. will explore potential commercialization by collaborating with industry stakeholders such as construction firms and project management companies. The goal is to explore new market opportunities while staying engaged in ongoing

	research to keep the KER at the forefront of technological advancements.
Market characteristics	
Market name	Building design, construction and renovation
Types of products / services within the market	• Construction Management Software • Building Information Modeling (BIM) Software • CAD-Software • CAFM-Software • Augmented Reality (AR) und Virtual Reality (VR) • Building Process Management Software • Prefabrication and Modular Construction Services • Remote Monitoring and IoT Sensors Software
Location of the market	The primary location of the market for the Interoperability via AI-based Mapping Service is Europe, where digitalization and sustainability trends in the construction industry are rapidly advancing. The recent implementation of stricter European Union regulations on energy efficiency, environmental sustainability, and digital construction standards opens significant opportunities for this KER. The new legislation encourages the adoption of innovative tools like AI-based mapping to ensure regulatory compliance, making Europe an ideal and expanding market for this solution.
Market size and growth	The European construction technology market is undergoing rapid growth, fueled by industry digitalization, increasing regulatory demands, and advancements in AI and automation. In 2023, the global construction tech market was valued at approximately €5 billion, with projections to reach €24 billion by 2033 at a 16.9% CAGR. Within Europe, key markets such as Germany, the UK, and France are driving this expansion, as infrastructure projects increasingly adopt cutting-edge technologies to enhance efficiency, reduce costs, and meet sustainability goals. The growth phase of the construction technology market remains far from maturity, as continuous innovations and a steady influx of new entrants shape its trajectory. Europe's construction sector is especially influenced by stringent regulatory frameworks focused on sustainability and efficiency, alongside rapid urbanization and smart infrastructure investments. This environment creates fertile ground for AI-driven solutions like the "Interoperability via AI-based Mapping Service," which can enhance data management, regulatory compliance, and decision-making in construction projects. With growing demand for digital transformation across the sector, the market presents

	substantial growth opportunities for tech providers innovating in AI, automation, and data analytics.
Drivers or trends	Digital Transformation: The construction industry is rapidly adopting Building Information Modeling (BIM) and mobile applications to enhance project management, collaboration, and efficiency. These technologies are transforming how construction projects are designed, built, and maintained. Sustainability and Smart Cities: With increasing environmental regulations and the global push for sustainable development, there is a growing demand for technologies that support energy-efficient buildings, sustainability audits, and smart city projects. These trends are reshaping how construction integrates with urban development. Automation and AI: Labor shortages and the need for safety improvements are driving the adoption of automation technologies, such as AI for planning and risk management, and wearable tech to monitor worker safety. These innovations optimize operations and reduce project risks.
Players / competition	Standardization Organizations: buildingSMART develops standards and solutions for information sharing across the built environment industry. They are pivotal in promoting interoperability and open BIM standards, which are crucial for the effective implementation of technology in construction projects. Software Giants: Companies like Autodesk and Nemetschek are long-standing leaders in construction software, offering comprehensive suites for design, engineering, and construction management. Equipment Manufacturers: Heavy- or light equipment manufacturers such as Caterpillar, Liebherr or Komatsu are integration technology into their machinery, offering data analytics and remote monitoring services. Modular Construction Providers (Pre-fabricated parts): Companies like FDU or Modscape are specializing in prefabricated and modular construction, which is becoming increasingly tech-driven. IoT and Sensor Providers: Companies that produce IoT devices and sensors for monitoring construction sites and equipment health are also significant players. Sustainability Consultants: As green building becomes more prevalent, firms that specialize in sustainable design and construction practices are becoming key players in this field. Engineering and Architectural Firms: These professionals are essential drivers of technology adoption in the construction industry. They utilize advanced software for design and simulation and are often at the forefront of integrating new technologies like BIM, VR and sustainable design practices into their projects. Firms like AECOM are

	examples of industry leaders that are heavily invested in construction technology
Customers / end-users	Given that the KER is focused on improving data management and integration in construction projects, the key customers should be those who directly benefit from such solutions: General Contractors: They are responsible for overseeing construction projects from start to finish, managing multiple stakeholders, and ensuring compliance with regulations. The AI-based mapping service will streamline their workflows, improve communication between teams, and enhance overall project management. Government Agencies: For public sector projects, government agencies require meticulous documentation, transparency, and compliance with sustainability and safety regulations. This KER can help them efficiently manage large-scale infrastructure projects by providing real-time insights and accurate data management. Project Owners and Developers: These stakeholders are primarily concerned with keeping construction projects on time and within budget. The AI-based service will provide them with a transparent, data-driven tool that helps monitor project progress, reduce risks, and make informed decisions throughout the project lifecycle.
Entry barriers	Given that labi e.V. is a research organization with limited commercialization expertise, here are four key entry barriers that are most relevant: Industry Expertise: labi lacks the deep commercial experience and industry knowledge needed to understand the complexities of construction workflows, processes, and client needs. This expertise is crucial to effectively market and tailor technology solutions to real-world challenges in the construction sector. Established Relationships: The construction industry is known for its reliance on long-standing relationships between contractors, suppliers, and clients. Breaking into these established networks can be challenging for a research organization that has not previously engaged in commercial partnerships or business development in this space. Integration with Existing Systems: Construction companies often use legacy systems, and any new technology must be compatible. labi's solution must be adaptable enough to integrate with these systems, which can require additional resources and time, especially for an organization without a strong background in commercial software solutions.

Opportunities to enter the market	Digitalization Demand: The increasing demand for digitalization within the construction industry provides a significant opportunity for tech companies. As the industry moves away from traditional methods, there is a growing need for digital solutions. Government Initiatives: In many regions (e.g. Germany) governments demand new techs (BIM) that have to be implemented by law (in the infrastructure field) Modular and Prefabricated Construction: The growing interest in modular and prefabricated construction methods creates opportunities for software and systems that can support these approaches. Data-Driven Decision Making: The construction industry is increasingly recognizing the value of data-driven decision making, which requires sophisticated data collection and analysis tools.
Other products & services 1	Construction Management Software: Platforms like Procore or Autodesk's BIM 360 offer project management tools that track progress and document the history of a construction project, similar to a digital logbook. Asset Management Systems: These systems track the usage and maintenance of construction equipment and can be integrated with a digital logbook for comprehensive oversight. Traditional Paper Logbooks: In some markets, especially where digital adoption is low, traditional paper-based logbooks and manual mapping services are still used.

3.5. Mobile APP

Table 7 Opportunities for KER #5

Business strategy of the KER #5	
Market for the KER	The Mobile App targets the Facility Management market, leveraging its three main applications: Test pits, Damage surveys, and Data verification. These functionalities address the growing need for component-oriented quality control and data accuracy in construction and operational workflows. While initially developed for internal use at CEMOSA, the app positions itself as a pivotal tool to enhance digital twin services, aligning with the company's strategic focus on infrastructure and sustainable operations.

Synergy between KER and the Business strategy	The app integrates seamlessly with CEMOSA's expertise in Digital Twins , acting as a catalyst for process efficiency and service quality. By incorporating the app into internal workflows, CEMOSA enhances its operational excellence and positions itself to explore new markets while securing its presence in existing sectors. This synergy supports CEMOSA's broader mission of delivering innovative and sustainable infrastructure solutions .
Winning new markets / Securing existing markets	The Mobile App is designed to: • Secure CEMOSA's position in Spain by streamlining workflows and improving the quality of its facility management services. • Explore new markets, particularly in regions like India, where infrastructure development and digital transformation initiatives are expanding.
Market characteristics	
Market name	The app operates within the Energy Audits Market and the Facility Management Market.
Types of products / services within the market	Hard Services (Technical Maintenance and Infrastructure) • HVAC Systems Maintenance: Heating, ventilation, and air conditioning systems for temperature control and air quality. • Electrical Systems: Maintenance of electrical wiring, lighting systems, and power distribution. • Plumbing Services: Installation, repair, and maintenance of water supply and drainage systems. • Structural Repairs: Maintenance of building exteriors, roofs, and foundations. • Fire Safety Systems: Maintenance of fire alarms, sprinklers, and emergency lighting. Management Services (Strategic and Operational Oversight) • Contract Management: Overseeing third-party vendors and service agreements. • Energy and Utilities Management: Monitoring and optimizing energy use to reduce costs and emissions. • Space and Workplace Management: Optimizing space utilization for employee productivity and efficiency. • Asset Management: Lifecycle management of building systems and equipment. • Sustainability Consulting: Advising on green certifications and energy efficiency initiatives.

	Digital and Technology-Driven Services • IoT Integration: Smart sensors for real-time monitoring of building systems (e.g., temperature, occupancy, energy usage). • Building Information Modeling (BIM): Digital twin solutions for enhanced operational planning. • AI-Based Predictive Maintenance: Using analytics to anticipate and address equipment failures. • Cloud-Based FM Platforms: Centralized software for managing facilities, assets, and workforce operations.
Location of the market	The app is initially focused to help CEMOSA on the Spanish market , with plans to expand into international markets, particularly in Asia , starting with India .
Market size and growth	The Spain Facility Management Market is expected to register a CAGR of 5.29% over the forecast period (2022 - 2027). The market is majorly driven by increasing private investments in real estate, growing facilities in the pharmaceutical industry, and hygiene factors in educational, government, and commercial properties.
Drivers or trends	Sustainability Initiatives: Compliance with EU energy efficiency standards and green building certifications. Digital Transformation: Growing reliance on AI, IoT, and digital twins to optimize building performance. Public Sector Investments: Infrastructure modernization projects driving demand for energy audits and facility management solutions. Automation and Quality Control: Increasing need for component-level inspections and real-time data verification to ensure operational excellence.
Players / competition	The market is highly fragmented , with numerous SMEs providing energy audit and facility management services. While larger players offer integrated solutions, smaller firms dominate local markets, offering niche services tailored to client needs. CEMOSA stands out by integrating the app into its broader service portfolio, offering enhanced digital tools for quality control.
Customers / end-users	Project Demonstrators: Key stakeholders from the OpenDBL project, such as Mislata, Kiffisia, and Ruvo, serve as primary users of the app during its initial deployment. Public Sector Organizations: Companies like ADIF, currently implementing digital twins for infrastructure such as the Train Station in Málaga, represent ideal end-users.
Entry barriers	Training Requirements: Ensuring that CEMOSA employees are proficient in using the app to deliver high-quality services.

	Workflow Adaptation: Integrating the app into existing processes without disrupting operational efficiency. Technical Challenges: Addressing potential bugs and ensuring the app performs reliably across diverse scenarios.
Opportunities to enter the market	Public Infrastructure Contracts: The Spanish public sector's emphasis on infrastructure modernization offers significant opportunities for deploying the app in large-scale projects. International Expansion: India's infrastructure boom and digital transformation initiatives present a promising market for the app. Value-Added Services: The app's ability to enhance digital twin offerings and streamline energy audits positions it as a differentiator in a competitive market.
Any other remarks / information	The Mobile App's role in enhancing internal workflows and supporting CEMOSA's broader business strategy makes it a critical enabler of innovation and efficiency. Its expansion into public and international markets aligns with the growing demand for digitalization in infrastructure and energy management. By addressing key market drivers and leveraging public sector opportunities, the app positions CEMOSA as a leader in integrating advanced tools into its service offerings.

3.6. Methodology for digitalization over BIM

Table 8 Opportunities for KER #6

Business strategy of the KER #6	
Market for the KER	The market for the Methodology for Digitalization over BIM lies within the Architecture, Engineering, Construction, and Operations (AECO) industry. It specifically addresses the needs for efficient digitalization processes in construction projects, facility management, and infrastructure lifecycle management.
Synergy between KER and the Business strategy	This KER aligns strongly with the business strategy of promoting sustainable digitalization and addressing the fragmentation within the AECO market. By offering a comprehensive digitalization methodology, the KER complements existing workflows and tools, ensuring smoother transitions to digital practices.
Winning new markets / Securing existing markets	The methodology is crucial for securing market share in regions with established BIM practices. By addressing regulatory demands, such as mandatory BIM use in public tenders, the methodology positions itself as a solution for both compliance and operational efficiency.

Market characteristics	
Market name	BIM Digitalization Market
Types of products / services within the market	BIM Tools and Platforms: Tools like SCAN2BIM for data capture and BIM2FM for facility management integration. Consultancy and Training Services: Guiding stakeholders through BIM implementation and enhancing their capacity to leverage digital tools
Location of the market	The primary market focus is on Southern Europe , particularly Italy , Spain , and Greece , where public and private sectors are increasingly adopting BIM practices.
Market size for KER and growth	The global AECO market, including BIM tools and services, was valued at €6 billion in 2020 and is projected to grow at a CAGR of 10.7% until 2028. In Europe, the adoption of BIM methodologies is expected to accelerate, driven by public sector mandates and private sector investments.
Drivers or trends	Regulatory Push: Government mandates, such as reducing thresholds for BIM requirements in public contracts, are driving adoption. Sustainability Goals: The alignment of BIM tools with green building initiatives supports energy efficiency and carbon reduction. Fragmented Market Needs: A diverse range of stakeholders in the AECO sector requires tailored solutions for BIM implementation. Emerging Technologies: Integration of AI, IoT, and blockchain into BIM workflows enhances automation and interoperability.
Players / competition	• Acca Software (Italy): A leader in BIM tools tailored to European markets. • Autodesk (US): Global provider of comprehensive BIM platforms. • Trimble (US): Known for construction-focused digital tools. • eFM (Italy): A service provider with a focus on facility management and BIM integration.
Customers / end-users	The primary customers and end-users of this methodology include: • Architectural and Engineering Firms: Transitioning to BIM for design and planning. • Construction Companies: Managing on-site workflows and digital documentation. • Public and Private Sector Clients: Adopting BIM for procurement, asset management, and facility operations.
Entry barriers	Technological Expertise: Stakeholders require significant training to adopt BIM workflows effectively.

	Cost of Implementation: Transitioning to BIM involves initial investments in tools, training, and workflow adaptation. Market Education: Overcoming resistance to change among traditional operators and educating them about BIM's benefits.
Opportunities to enter the market	Public Tenders: Increasing opportunities as governments mandate BIM in infrastructure projects. Private Sector Partnerships: Collaborations with construction companies and facility managers for tailored digitalization solutions. Consultancy Expansion: Offering training and consultancy to SMEs and emerging markets with limited BIM expertise.
Any other remarks / information	This KER's focus on providing a modular, cost-effective digitalization methodology aligns with market needs for interoperability, scalability, and sustainability. Its ability to cater to both advanced and emerging markets positions it as a versatile solution within the evolving AECO sector.

3.7. OpenDBL

Table 9 Opportunities for KER #7

Business strategy of the KER #7	
Market for the KER	The OpenDBL platform targets the AECO industry, providing a comprehensive, standardized digital solution for building lifecycle data management. It addresses current gaps in interoperability, accessibility, and reliability of building-related data, aligning with the increasing need for sustainability, energy efficiency, and digital transformation.
Synergy between KER and the Business strategy	OpenDBL aligns with its consortium partners' strategies by leveraging cutting-edge technologies (e.g., AI, IoT, Blockchain, VR) to simplify workflows, enhance sustainability, and improve decision-making. It consolidates the expertise of its partners into a scalable, interoperable platform to support both private and public-sector clients, ensuring compliance with EU sustainability targets and expanding the reach into emerging markets.
Winning new markets / Securing existing markets	The platform has the potential to: • Secure market presence in Europe by addressing critical needs in construction and facility management. • Expand into emerging markets, including Asia and Latin America, where digital transformation in construction and asset management is accelerating.

Market characteristics	
Market name	Building Lifecycle Data Management Market and PropTech Market
Types of products / services within the market	Building Lifecycle Data Management: Tools for data capture, analysis, and reporting throughout the lifecycle of buildings. Energy and Sustainability Management: Solutions for monitoring energy consumption, carbon footprint, and sustainability metrics. Digital Twin Integration: Virtual models for operational optimization and predictive maintenance.
Location of the market	Primary Focus: European Union countries, particularly Italy, Spain, and Greece, where public contracts and sustainability initiatives are driving demand. Expansion Potential: India, Latin America, and other regions embracing digital and sustainable construction practices.
Market size and growth	The building lifecycle data management market is valued at approximately €1.4 billion, with a projected annual growth rate of 9%. The growing emphasis on digital twins, green building certifications, and EU directives creates a robust foundation for market growth. The Building Information Modeling (BIM) market in Europe is experiencing significant growth, driven by increased construction activities and the adoption of BIM solutions. According to a report by Mordor Intelligence, the European BIM market registered a Compound Annual Growth Rate (CAGR) of 11.7% during the forecast period of 2022-2027. Globally, the BIM market is also expanding rapidly. MarketsandMarkets projects that the global BIM market size will grow from €8.0 billion in 2024 to €14.8 billion by 2029, at a CAGR of 13.1% between 2024 and 2029 [17]. These figures highlight the robust growth trajectory of the BIM market, both in Europe and worldwide, underscoring the increasing adoption of digital solutions in the Architecture, Engineering, Construction, and Operations (AECO) industry.
Drivers or trends	Sustainability Mandates: EU directives such as the Green Deal and EPBD drive demand for solutions like OpenDBL. Digitalization of the AECO Industry: Increasing use of AI, IoT, and blockchain for data-driven decision-making and enhanced interoperability. Green Building Certifications: Tools that streamline compliance with energy efficiency standards are in high demand. Global Urbanization: Rising infrastructure projects and real estate development worldwide fuel demand for integrated lifecycle data management solutions.

Players / competition	PropTech Companies: Competitors like Bluebeam, PlanGrid, and Buildr Pro dominate the market with robust solutions. BIM Tool Providers: Established players like Autodesk and Trimble offer specialized platforms for design and construction. Facility Management Firms: Providers integrating data management and operational tools into their services.
Customers / end-users	• Architects and Engineers: Using OpenDBL for design optimization and data standardization. • Facility Managers: Leveraging the platform for maintenance planning and operational efficiency. • Public Administrations: Utilizing OpenDBL for compliance with sustainability mandates in infrastructure projects. • Investors and Property Managers: Benefiting from real-time, transparent data for decision-making
Entry barriers	Technological Complexity: High upfront development and integration costs may deter adoption. Market Education: Clients require awareness and training to understand the platform's value. Established Competition: Market incumbents have significant brand equity and established client bases.
Opportunities to enter the market	Public Contracts: Increasing government investments in digitizing infrastructure create opportunities for market entry. Partnerships: Collaborating with facility management firms and construction companies to integrate OpenDBL as part of their offerings. Emerging Markets: Expansion into regions undergoing rapid urbanization and digital transformation. EU Sustainability Goals: Positioning OpenDBL as a critical tool for achieving energy efficiency and green building targets.
Any other remarks / information	The OpenDBL platform is a cornerstone of digital transformation in the AECO industry. Its emphasis on interoperability, sustainability, and data transparency aligns with global trends and regulatory needs, positioning it as a market leader in building lifecycle data management. By addressing critical pain points and leveraging cutting-edge technology, OpenDBL can redefine how buildings are designed, constructed, and managed.

4. Strategic recommendations from stakeholders

The stakeholder interviews conducted within the framework of the OpenDBL project, specifically regarding the KPI 1.1, where more than 50 interviews were carried on providing valuable insights into the challenges and opportunities across the construction and building management ecosystem. These interviews covered a diverse range of profiles, including **owners, architects, engineers, facility managers, legal advisors, IT professionals**, and more. The findings highlight both common needs and specific expectations, offering a clear direction for the development of the main KER, the OpenDBL.

Stakeholders such as **owners and facility managers** emphasized the critical need for **centralized access to data**. They noted that such access would streamline operations, enhance maintenance planning, and ensure compliance with increasingly stringent regulatory requirements. Specific functionalities, such as **energy management tools** and predictive maintenance capabilities supported by IoT, were highlighted as essential to improving building efficiency and sustainability. Furthermore, concerns about **data security** and controlled access, especially in sensitive facilities, pointed to the need for robust data management frameworks within the DBL.

For **architects and engineers**, the integration of **Building Information Modeling (BIM)** technologies with the Digital Building Logbook (DBL) emerged as a top priority. These stakeholders stressed the importance of **dynamic, updatable data** that could support ongoing design, construction, and renovation projects. Additionally, they called for features that would enable **structural monitoring** and enhance workflows, particularly in retrofitting and large-scale renovation efforts.

Legal and compliance experts focused on the role of the DBL in ensuring **regulatory alignment and legal auditability**. These stakeholders emphasized the need for clear frameworks addressing **data privacy, intellectual property, and cybersecurity**. Such capabilities would not only aid in meeting compliance requirements, particularly under GDPR, but also serve as valuable tools in **contract management and litigation support**. This perspective highlights the critical need for a DBL to offer transparency and reliability in data management.

IT and digitalization experts advocated for open-source and **cloud-based solutions** that could scale across various types of projects. Their insights pointed to the importance of **API integration** and compatibility with existing platforms like

Revit, SAP, and other Common Data Environments (CDEs). By ensuring seamless interoperability, the DBL would enhance its usability and relevance across diverse operational frameworks. These experts also stressed the importance of building error management systems to improve reliability and user trust.

Finally, **tenants and general users** expressed interest in simplified access to building information, particularly for understanding **health, safety, and energy efficiency metrics**. Tools that provide actionable insights into energy usage patterns and operational costs were identified as highly valuable, particularly in residential and commercial applications.

Main Conclusions

The stakeholder interviews underscore the potential of the OpenDBL platform to address market gaps and foster innovation in the building industry. The following main conclusions emerged:

- **Interoperability:** DBLs must integrate seamlessly with existing platforms and tools to maximize usability and adoption while minimizing redundancy.
- **User-Centric Features:** Stakeholders require intuitive interfaces, advanced search functionalities, and role-specific access to simplify workflows and enhance productivity.
- **Regulatory Alignment:** Addressing data security, privacy, and compliance is crucial to building stakeholder trust and ensuring the platform's long-term viability.
- **Scalability:** The platform should cater to a wide range of stakeholders, from small residential projects to large-scale public infrastructure developments.

These insights provide a comprehensive understanding of the key market needs and stakeholder priorities, offering a roadmap for the direction that the OpenDBL platform should take. The next step involves translating these findings into actionable strategies by exploring **Preliminary Business Models**. This section will evaluate how the OpenDBL's KERs can structure its offerings, revenue streams, and value propositions to effectively address the identified challenges and opportunities, ensuring a robust alignment with stakeholder expectations and market conditions.

5. Preliminary Business Models

The **Preliminary Business Models** section provides an initial framework for the commercialization strategies of the KERs developed within the OpenDBL project. Feedback from the owners of the KERs has been collected and summarized in this first version, offering insights into target markets, value propositions, revenue streams, and go-to-market strategies. This document serves as a foundation, showcasing how these innovative solutions address critical challenges in the AECO sector and align with market demands.

Looking ahead, the next deliverable will focus on refining and expanding the business models for the most significant KERs, providing a detailed and updated version to leverage their successful deployment and market adoption.

5.1. Common Data Environment

Table 10 Preliminary BM of KER#1

Description of the KER, Current TRL and desired TRL
The Common Data Environment (CDE) is a collaborative digital platform designed to facilitate efficient data management and project collaboration in the construction sector. It simplifies workflows across all project phases, from design and construction to maintenance. Key Features: - Centralized data storage for real-time collaboration. - Granular control over user permissions, ensuring secure access to project data. - Interoperability with multiple BIM tools and standards (e.g., IFC files). - Simplification of standards to lower the expertise barrier for users.
Target Market
Primary Users: Large Construction Companies: Streamlining workflows for complex projects.

• Facility Managers: Enhancing operational efficiency and data management. • Clients and Building Owners: Accessing project data for informed decision-making.
Value Proposition How the CDE Creates Value: • Improved Collaboration: Real-time sharing and updating of project data reduces communication errors and delays. • Enhanced Security: Role-based access ensures strict control over sensitive data. • Cost Savings: Simplifies workflows, reducing redundancy and administrative overhead. • Interoperability: Supports integration with various BIM tools and systems, addressing the lack of unified solutions in the market. Key Benefits: • Accelerates project delivery by streamlining data workflows. • Enhances transparency and accountability across all stakeholders. • Reduces costs associated with managing disparate systems
Revenue model Potential Revenue Streams: • Subscription-based model for ongoing access. • Licensing agreements with construction firms and facility managers. • Customization fees for tailored solutions to meet specific client needs. • Consultancy services to facilitate onboarding and training.
Exploitation and Go-to-Market Strategy Commercialization Strategy: • Direct Sales: Targeting large construction firms and facility management companies with tailored solutions.

- **Partnerships:** Collaborating with software providers and BIM tool developers to integrate CDE functionalities.
- **Government Contracts:** Positioning CDE as a solution for public infrastructure projects requiring compliance with EU directives.
- **Industry Outreach:** Promoting the platform at construction industry events and forums to build awareness.

Risk and Challenges

Key Risks:

- **Market Resistance:** Hesitancy among stakeholders to switch from familiar tools.
- **Competition:** Strong presence of established players like Autodesk and Archicad.
- **Technical Barriers:** Ensuring seamless integration with existing systems.

Mitigation Strategies:

- Offering training programs and demonstrations to ease adoption.
- Highlighting cost and efficiency advantages over competitors.
- Building partnerships with influential stakeholders to drive acceptance.

5.2. Tool for identifying construction elements

Table 11 Preliminary BM of KER#2

Description of the KER, Current TRL and desired TRL

The **Tool for Identifying Construction Elements** is an AI-based service designed to analyze and interpret 2D floor plans. The tool automates the identification of building elements, such as doors and windows, from traditional 2D floor plans, transforming these into digital data usable for BIM and digital twin applications.

Key Features:

- AI-powered identification of 1-leaf and 2-leaf doors and other elements in 2D plans.

- REST API-based service for seamless integration with other software platforms.
- Modular design allows flexibility for embedding the tool into client applications.
- Supports streamlined workflows for digitizing existing buildings

Target Market

Primary Users:

- **Building Operators and Facility Managers:** For digitizing building plans and managing assets.
- **Building Planners and Engineers:** Supporting renovation and retrofitting workflows by simplifying the creation of digital twins.
- **Software Developers in the Construction Sector:** Embedding the tool into their applications for enhanced functionality.
- **Manufacturers and Specifiers:** Streamlining door hardware specification and product consulting processes.

Market Segments:

- **Software Companies:** Developing construction tools that benefit from AI-driven data.
- **Manufacturers:** Focused on integrating advanced specification tools.
- **Building Owners:** Seeking efficient digitization solutions for asset management.

Value Proposition

How the KER Creates Value:

- **Efficiency Gains:** Automates a traditionally manual and time-consuming process, significantly reducing the time and effort required for digitizing 2D plans.
- **Cost Savings:** Offers a budget-friendly alternative to costly technologies like laser scanning or drone surveys.
- **Flexibility:** Modular design and API integration enable seamless adaptation to various client needs.

Key Benefits:

- Provides ready-to-use AI capabilities without requiring investment in data collection, model training, or API development.
- Enables precise and efficient workflows for creating digital twins and improving building performance.
- Bridges the gap between traditional 2D plans and modern BIM environments.

Revenue model

Potential Revenue Streams:

- **Licensing Fees:** For standalone use by external clients, with variable pricing based on usage.
- **API Subscription:** Monthly or annual subscriptions for accessing the tool via API.
- **Embedded Use in OpenDBL:** Offered as a cost-effective, budget-friendly option for OpenDBL users.
- **Consultancy Services:** Training and customization fees for integrating the tool into client workflows.

Exploitation and Go-to-Market Strategy

Commercialization Strategy:

- **Direct Integration:** Embedding the tool into the OpenDBL platform for enhanced adoption.
- **Partnerships:** Collaborating with software companies and manufacturers to integrate the tool into existing solutions.
- **Demonstration Projects:** Showcasing the tool's capabilities in real-world scenarios through pilot projects.
- **Digital Marketing Campaigns:** Targeting facility managers, engineers, and construction software companies through focused online campaigns.

Risk and Challenges

Key Risks:

- **Market Resistance:** Clients may hesitate to adopt new technologies due to existing workflows.
- **Technological Competition:** Competing AI tools may enter the market with similar functionalities.
- **Integration Complexity:** Ensuring seamless integration into client systems may require additional customization.

Mitigation Strategies:

- Providing extensive training and support to clients.
- Demonstrating the tool's value through pilot projects and case studies.
- Offering competitive pricing to reduce adoption barriers.
- Maintaining flexibility in development to adapt to client-specific needs.

5.3. VR Viewer

Table 12 Preliminary BM of KER#3

Description of the KER, Current TRL and desired TRL

The **VR Viewer** is an immersive digital tool designed to facilitate the visualization and management of BIM projects within a web-based 3D environment. It enables collaborative exploration of 3D building models (IFC format) and enhances user engagement through virtual reality capabilities.

The current TRL level is 5, and the estimated TRL level will be 7.

Key Features:

- Immersive **Web-based 3D** visualization of BIM models via web browsers.
- Query elements and switch between **different viewing modes**.
- Integrates with VR headsets for **experiential project exploration**.
- **IFC Model Compatibility:** Supports industry-standard formats for seamless integration.
- **SaaS Architecture:** Cloud-based deployment ensures scalability, accessibility, and ease of use. SaaS-based accessibility with openAPI

framework allows integration with existing BIM Tools and databases, for customization and third-party integration.

Target Market

Primary Users:

- AECO professionals, including architects, engineers, and construction managers.
- Facility managers and maintenance overseeing digital twin implementations.
- Public and private institutions require advanced visualization for infrastructure projects.
- BIM Managers, BIM Specialist, BIM Coordinators, BIM CE.

Market Segments:

- BIM Digital Transformation Market: Covering AI and VR applications in design and construction;
- Construction Management Solutions;
- Sustainability and Energy Efficiency Solutions;
- Facility Management Market: Focused on operational and maintenance insights through digital twins;
- Digital Twin and Smart Building Platforms;

Value Proposition

The VR Viewer revolutionizes how users interact with BIM models by providing:

- **Enhanced Collaboration:** Enables stakeholders to explore and review projects in an immersive, interactive environment.
- **Ease of Use:** No third-party software required; accessible directly through a web interface.
- **Customizability:** Free API allows seamless integration with existing workflows.
- **Cost Savings:** Reduces the need for physical prototypes and on-site visits through virtual simulations.

Key Benefits:

- Greater project transparency and stakeholder involvement.
- Improved decision-making with real-time immersive insights.
- Simplified processes for managing complex BIM data.

Revenue model

Potential Revenue Streams:

- **SaaS Subscription:** Monthly or annual licensing for the VR Viewer platform.
- **API Integration:** Paid licensing for third-party software developers using the API.
- **Customization of API Integrations:** Fees for tailored API solutions and consulting services implementations for specific industry needs.
- **Training and Support:** Revenue from user training, workshops, and technical support packages.

Exploitation and Go-to-Market Strategy

The exploitation strategy for the VR Viewer involves:

- **Direct Sales:** Target AECO firms, facility managers, and public institutions.
- **Strategic Partnerships:** Collaborate with major BIM and VR software providers to bundle services.
- **Demonstration Projects:** Showcase success stories through pilot projects in cities like Mislata, Kifissia, and Ruvo.
- **International Expansion:** Initially focus on European markets, followed by penetration into emerging regions such as Asia and Latin America.

Risk and Challenges

Key Risks:

- **Infrastructure Dependence:** Relies on high-speed internet and 5G for optimal performance.
- **Market Resistance:** Potential hesitation from traditional users unfamiliar with immersive tools.

- **Competition:** Established players like Autodesk, Unity Reflect, and HTC Vive XR Elite already dominate parts of the market, making differentiation essential.

Mitigation Strategies:

- Offer training sessions and free trials to ease adoption.
- Leverage partnerships with influential stakeholders to enhance credibility.
- Focus on unique selling points, such as free API access and web-based simplicity.

5.4. Tool for AI-Based interoperability Mapping service

Table 13 Preliminary BM of KER#4

Description of the KER, Current TRL and desired TRL
The AI-Based Interoperability Mapping Service is an advanced tool designed to address the challenges of data interoperability in the Architecture, Engineering, and Construction (AEC) industry. The tool leverages AI to map attributes from IFC models and other data formats to various ontologies, enabling seamless integration across different Building Information Modeling (BIM) systems. Key Features: • AI-driven automated attribute mapping to multiple ontologies. • Supports diverse BIM systems and standards for seamless data integration. • Scalable solution for handling large datasets and complex projects. • Reduces manual effort and increases accuracy in interoperability processes. Target Market Primary Users: • Large Construction Companies: Managing interoperability in complex projects.

- **BIM Managers:** Overseeing data coordination and quality assurance.
- **Engineering and Architectural Firms:** Streamlining design and planning workflows.
- **Public Sector Organizations:** Ensuring compliance in government infrastructure projects.
- **BIM Standardization Organizations:** Supporting data integration for global standards.

Value Proposition

How the KER Creates Value:

- **Efficiency:** Automates data mapping, significantly reducing time and resources required for interoperability tasks.
- **Accuracy:** Minimizes errors in attribute mapping, ensuring higher-quality outcomes.
- **Scalability:** Handles large-scale datasets, making it suitable for complex infrastructure projects.

Key Benefits:

- Cost savings through automation and error reduction.
- Enhanced collaboration across stakeholders due to standardized data formats.
- Future-proofing projects by ensuring compliance with evolving BIM standards.

Revenue model

Potential Revenue Streams:

- Licensing fees for access to the platform.
- Subscription-based models for continuous usage and updates.
- Customization fees for tailored implementations for specific client needs.
- Consulting and training services for onboarding and integration.

Exploitation and Go-to-Market Strategy

Commercialization Strategy:

- **Direct Sales:** Targeting large firms and public sector projects requiring advanced interoperability solutions.
- **Partnerships:** Collaborating with BIM software providers to enhance integration and reach.
- **Industry Events:** Showcasing the tool's capabilities at BIM and construction technology trade fairs.
- **Digital Marketing:** Promoting the tool through targeted campaigns aimed at AECO professionals and decision-makers.

Risk and Challenges

Key Risks:

- **Technological Competition:** Emerging AI-based solutions from competitors could challenge market share.
- **Integration Complexity:** Organizations may face difficulties in implementing the tool due to legacy systems.
- **Market Adoption:** Hesitation from smaller firms with limited resources to invest in new technologies.
- **Regulatory Changes:** Evolution of BIM standards may necessitate frequent updates to the tool.

Mitigation Strategies:

- Offering pilot programs and free trials to demonstrate value and ease of use.
- Providing extensive training and support to clients during the onboarding process.
- Maintaining a flexible development roadmap to adapt to regulatory and technological changes.
- Establishing partnerships with influential industry stakeholders to build trust and credibility.

5.5. Mobile App

Table 14 Preliminary BM of KER#5

Description of the KER, Current TRL and desired TRL

A **web-accessible** mobile app that digitalizes and automates onsite data collection and data verification for quality control, integrated with the Digital Building Logbook (DBL).

Use cases:

- **Test Pits/Trial Pits:** Testing building elements (pillars, roofs, floors, walls) for composition and condition.
- **Damage Surveys:** Inventorying damages like cracks, landslides, and humidity issues.
- **Data verification:** for energy and sustainability audits

Current development stage: First prototype ready to be integrated with openDBL to be later tested and optimized according to pilot sites experience. With a initial TRIL 5, the aim for the end of the project is reaching a TRL 7

Target Market

Primary Users: Construction professionals (e.g., engineers, quality control inspectors).

Value Proposition

How the KER Creates Value:

- Provides a streamlined digital solution for onsite quality control and data verification.
- Integrates seamlessly with the DBL to ensure comprehensive, accurate, and up-to-date building information.
- Enhances regulatory compliance while reducing manual errors and inefficiencies.
- Standardize data collection process & onsite activities related to quality control & data verification.
- Allow data accessibility in real-time and from any location.

Revenue model

The revenue model for the **Mobile App** is focused on **strengthening CEMOSA's market position** by enhancing the value of its existing services. The app is not intended for direct monetization but is designed to **optimize and streamline internal workflows**, resulting in improved service delivery and client satisfaction.

By leveraging the app, CEMOSA aims to:

- **Increase Service Efficiency:** Faster and more accurate quality control processes (test pits, damage surveys, and data verification) reduce operational time and costs, allowing for more competitive pricing or better margins.

- **Enhance Client Value:** Offering improved and reliable data-driven insights, the app ensures higher quality and precision in the services provided, strengthening client relationships and loyalty.
- **Attract New Clients:** By showcasing technological innovation and efficiency, the app positions CEMOSA as a forward-thinking leader in Digital Twins and Energy Audits, appealing to potential new clients in the infrastructure and facility management markets.
- **Support Market Differentiation:** The integration of the app into CEMOSA's services demonstrates a commitment to digital transformation and sustainability, differentiating it from competitors in a fragmented market.

This approach leverages the app as a strategic tool to **drive growth and secure long-term value** for CEMOSA's services rather than generating direct revenue from the app itself.

Exploitation and Go-to-Market Strategy

Commercialization Strategy:

- **Testing Phase:** Pilot the app with partners and stakeholders to refine functionality and gather user feedback.
- **Launch Phase:** Market the app to AECO industry by including its use in live contracts with public & private clients

Risk and Challenges

Key Risks:

- **Training Requirements:** Ensuring all CEMOSA employees can use the app effectively.
- **Workflow Integration:** Addressing potential disruptions when incorporating the app into existing processes.
- **Technical Bugs:** Identifying and resolving issues that arise during implementation.
- **Market Resistance:** Hesitancy from external users unfamiliar with app-based workflows.

Mitigation Strategies:

- Comprehensive training programs for internal users.
- Piloting app functionality in smaller projects before full-scale deployment.

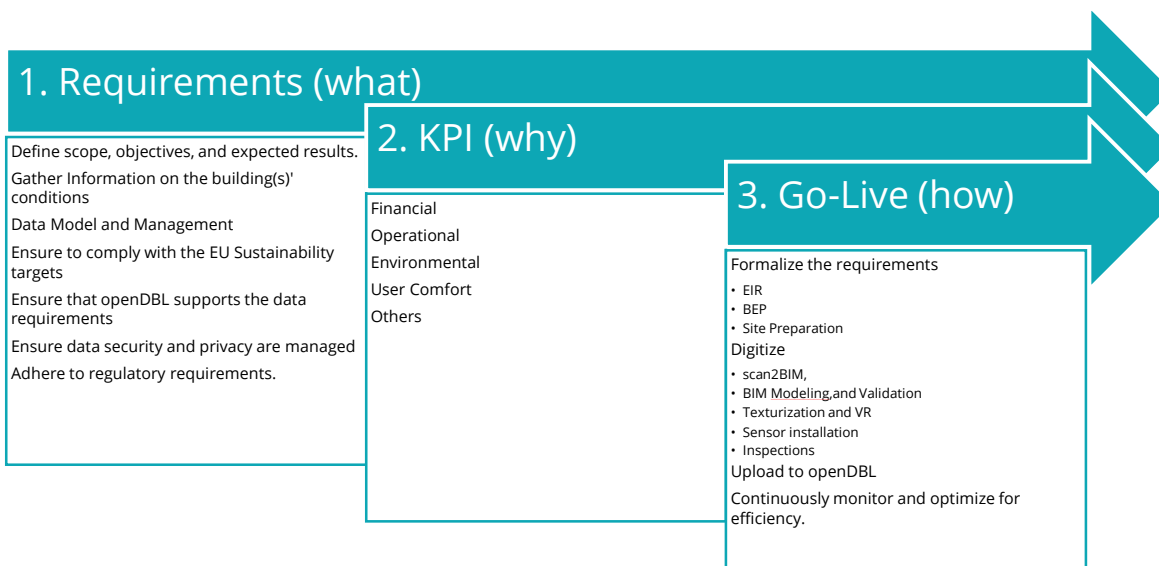
- Continuous technical support and updates to address operational bugs.
- Demonstrating value through successful case studies in public projects

5.6. Methodology for digitalization over BIM

Table 15 Preliminary BM of KER#6

Description of the KER, Current TRL and desired TRL
The Methodology for Digitalization over BIM is a standardized framework for implementing the BIM “revolution” across the AECO (Architecture, Engineering, Construction, and Operations) industry. It supports the efficient management of building information throughout the lifecycle, enabling streamlined decision-making and compliance with EU sustainability directives. Key Features and Functionalities: • BIM Tools and Platforms: platforms like SCAN2BIM for data capture, BIM2FM for facility management integration and tools for automated updates, historical data comparisons, and real-time data integration • Consultancy and Training Services: Guiding stakeholders through BIM implementation and enhancing their capacity to leverage digital toolsComprehensive data model integrating design, project, construction, and operational details. • Compliance support for EU regulations like the EPBD.
Target Market
Primary Users: • Building owners and managers. • AECO professionals (architects, engineers, consultants). • Public authorities and regulatory bodies involved in building energy efficiency.
Value Proposition
The methodology provides a structured approach to BIM implementation and can be summarized as a real User Guide that describes the methodology on how to best adopt BIM for the management of buildings. As such it

- takes into high consideration the most recent sustainability targets defined by the EU in terms of Energy Performance of building(s)
- is based on the decisions taken and the know-how acquired by in2it in multiple projects across many players.
- The methodology follows a three-steps approach.



Revenue model

Primary Revenue Streams:

- Professional fees for consultancy services for custom adaptation of the methodology
- Subscription-based model for access to associated digital tools and training materials.

Exploitation and Go-to-Market Strategy

Commercialization Approach:

- Direct sales to companies and public authorities managing extensive building portfolios.
- Partnerships with software developers to embed the methodology in digital platforms.
- Collaboration with training institutions to promote widespread adoption.

Market Introduction:

- Demonstration of the methodology's efficacy through pilot projects in Spain, Greece, and Italy.

- Initial focus on public infrastructure projects aligned with EU directives.

Risk and Challenges

Key Risks:

- Resistance to change among traditional stakeholders in the AECO industry.
- Integration challenges with legacy systems and non-standardized data formats.
- Potential gaps in expertise for implementing and managing the methodology.

Mitigation Strategies:

- Conduct targeted training programs to build capacity and familiarity with BIM processes.
- Develop APIs and modular tools for seamless integration with existing systems.
- Regular feedback loops and iterative improvements based on pilot project outcomes.

5.7. OpenDBL

The business model of openDBL will be based on the interviews, the results that produced the deliverable 3.1 and the single KER's of the OpenDBL partners. This section illustrates the preliminary results.

5.7.1 Goals and objectives

OpenDBL will significantly enhance various business use cases by integrating multidisciplinary know-how and state-of-the-art technologies also providing and ensuring the adoption of unique standardized structure for data collection, management, and interoperability.

Ultimate goal of openDBL is to address the use cases of our clients, all of which relate to the need of obtaining and maintaining updated key information related to their assets.

5.7.2 OpenDBL Use cases

The table below summarizes the business use cases addressed by openDBL.

Table 16 OpenDBL Use Cases

1. Scan to BIM
1.1. Point cloud and BIM Modeling
1.2. Availability of Building Program, Project Meta Data, Physical Properties of BIM Objects & Elements
1.3. Availability of GeoSpatial and Spatial Location of Objects & Elements
1.4. Renovation planning and potential improvements in terms of security, accessibility, health, energy efficiency, wellbeing, comfort.
2. Product Comparison and Choice
2.1. Availability of manufacturer information
2.2. Availability of sustainability specific information
2.3. Possibility to select and use of appropriate materials
3. Construction and BIM to Field
3.1. Specifications Estimating
3.2. Construction Logistics
3.3. Time Sequencing
3.4. Total Cost of Ownership of Assets
3.5. Value Engineering (cost analysis of elements allowing financial decisions - financial comparison with the possibility of using alternative scenario)
3.6. Technical and technological analysis
3.7. Building Commissioning
4. Energy Management
4.1. Consumption Analysis and Monitoring (electricity, water, etc)
4.2. Usage of sustainable materials and equipment (ie. LEED, etc)
4.3. Environmental & Site Conditions
4.4. Energy efficiency certification
4.5. Audits (LCA, Energy...)
4.6. Deconstruction, Waste Management & Circularity
4.7. Recommendations for energy efficiency operation
5. Compliance
5.1. Program, Space
5.2. Validation and Code
6. Health & Safety
6.1. Users Safety
6.2. Users Comfort (air quality, physical, thermal, acoustic...)
7. Structural Monitoring

7.1. Obsolete structures – components for replacement
7.2. Monitoring of structures and buildings in real time
7.3. Preventive conservation of heritage buildings
7.4. Non-destructive testing of structural damage
8. Facilities/Asset Operation & Management
8.1. Building & facilities features & conservation status
8.2. Instructions and registration on building use & maintenance (conservation measures, etc)
8.3. Maintenance Plan
8.4. Extraordinary Maintenance
8.5. Inspections and Incidence registration and management (ticketing)
8.6. Repairs
8.7. Reduction of operating costs
8.8. Reporting
8.9. Smart contracts

Scan to BIM: openDBL can facilitate the creation of digital as-built models by integrating laser scanning technologies to produce point clouds, which can then be converted into accurate BIM models or digital twins

Product Comparison and Choice: By leveraging our users' database with ontologies and advanced data matching capabilities, openDBL can help users compare and select the best products based on various criteria such as cost, performance, and sustainability. This can streamline the decision-making process and ensure optimal product choices within the AECO chain.

Construction and BIM to Field: openDBL can provide digital support for work management and construction site activities, ensuring that BIM models are accurately translated into field operations. This includes model validation solutions and real-time updates to ensure that construction activities align with the digital plans.

Energy Management: openDBL can monitor building consumption and provide insights into energy usage patterns. By integrating with external databases and using advanced analytics, it can help identify opportunities for energy savings and support the EU's circular economy and green policies.

Compliance: openDBL can ensure that all data and processes conform to the latest regulatory requirements and standards. This includes automatic classification systems and data standards that simplify compliance with environmental and safety regulations.

Health & Safety: By providing real-time data and analytics (with data provided by sensors, APIs and eventually manual inputs), openDBL can enhance health and safety measures on buildings. It can track occupancy, comfort levels, compliance with safety protocols, and provide insights to prevent future incidents.

Structural Monitoring: openDBL can support the continuous monitoring of building structures using mobile tools, sensors and other technologies to collect relevant information. This enables early detection of potential issues and ensures the long-term integrity of the building structures.

Facilities/Asset Operation & Management: openDBL can facilitate the operation and maintenance activities of buildings by providing a centralized repository of all relevant data. This includes maintenance schedules, asset information, and performance metrics, ensuring efficient and effective management and updates.

Sustainability and Environmental Impact: The platform can support sustainability initiatives by providing tools for lifecycle assessment and carbon footprint analysis. It can help users understand the environmental impact of their projects and identify opportunities for improvement.

Social Impact: By promoting transparency and collaboration, openDBL can enhance the social impact of construction projects and building lifecycles. It can ensure that all stakeholders are informed and engaged, and that projects are aligned with community needs and values.

5.7.3 Value Propositions

Benefits and value offered to users by openDBL.

In a nutshell, openDBL aims to leverage digital technology to improve the way buildings are designed, constructed, and managed. Their main value resides in three simple components:

- Useful content and functionalities.
- User-friendly interface to a secure and scalable data lake to support various analytics operations and reduce the time spent on processing information.
- Attractive economics through convenient pricing.

We can provide such benefits through our technologies, consisting of a proprietary platform, a mobile app, an AI-tool and the open standards approach (openAPIs) that will enable our clients to link and automatically match various source of data and databases, independently from their structure and formats.

Figure 11 Figure 11 OpenDBL Value propositions shows the value propositions aiming at transforming the AECO industry and making it more efficient, collaborative, and sustainable.

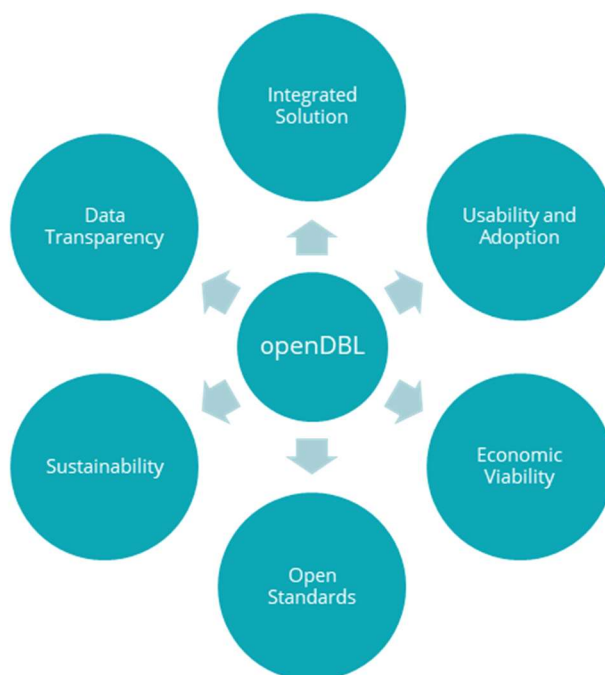


Figure 11 OpenDBL Value propositions

The elements of the figure are described below:

Integrated Solution: to simplify the workload of the AECO supply chain. This integration is intended to streamline processes and reduce complexity for stakeholders.

Usability and Adoption: to facilitate their usage and gain wide adoption across the industry. By focusing on user-friendly interfaces and practical applications, openDBL aims to encourage more professionals to adopt digital logbooks.

Economic Viability: through value propositions and market-relevant pricing. This approach is meant to make the adoption of digital building logbooks financially attractive to potential users.

Open Standards: to ensure seamless data integration and transparency throughout a building's lifecycle, from design to operation. This openness is expected to foster collaboration and efficiency within the industry.

Sustainability: openDBL supports the idea that improving buildings can contribute to improving the European Union's overall environmental footprint.

Data Transparency: together with increased data availability to its broad range of target clients such as property owners, tenants, investors, financial institutions, and public administrations. This transparency is intended to build trust and enable better decision-making.

Table 17 Preliminary BM of KER#7

Description of the KER, Current TRL and desired TRL
OpenDBL is a standardized, openAPI-based digital platform designed for managing building lifecycle data. It solves key challenges in the AECO (Architecture, Engineering, Construction, and Operations) industry by enabling interoperability, transparency, and efficiency. Key Features: • A centralized repository for real-time building lifecycle data. • Integration of advanced technologies such as AI, Blockchain, IoT, and VR. • Tools for energy management, compliance, health & safety, and facility operations. • OpenAPI and open standards to ensure seamless data integration. Development Stage: Currently in the advanced development stage, OpenDBL is designed for market readiness, building upon its application in a pilot project with an Italian Public Contracting Authority.
Target Market
Primary Users: • AECO Professionals: Architects, engineers, and construction firms. • Facility Managers: Managing building operations and maintenance. • Public Administrations: Meeting regulatory compliance for sustainability and energy efficiency. • Investors: Real estate professionals seeking transparent data for decision-making.
Value Proposition
How OpenDBL Creates Value: • Efficiency Gains: Reduces time spent on data collection, search, and processing.

• Sustainability Support: Aligns with EU green policies and circular economy targets. • Enhanced Decision-Making: Provides accurate, real-time data for sound investment and operational decisions. Key Benefits: • Cost savings through streamlined workflows and reduced redundancies. • Improved building performance and compliance with energy efficiency standards. • Transparency and trust through data availability and accuracy.
Revenue model Potential Revenue Streams: • Subscription-based access for AECO professionals and facility managers. • Licensing fees for public administrations and large enterprises. • Freemium model with basic functionalities free and premium services paid. • Customization and consultancy fees for tailored solutions.
Exploitation and Go-to-Market Strategy Direct Sales: Targeting large firms and public entities through tailored presentations. Partnerships: Collaborating with facility management and construction software providers. Licensing Deals: Providing scalable access to organizations with extensive portfolios. Industry Events: Participating in trade fairs to showcase the platform's capabilities. Geographic Focus: Initial rollout in Europe, with future expansions planned for Asia and Latin America.
Risk and Challenges Key Risks: • Market Education: Low awareness about OpenDBL's benefits in a fragmented market. • Technological Barriers: Resistance to adopting new technologies in a traditionally conservative industry. • Competition: Established players with significant market share. Mitigation Strategies: • Offering free trials and demonstrations to build trust and showcase value. • Investing in targeted marketing campaigns to increase awareness. • Leveraging partnerships with influential stakeholders to penetrate the market.

Additionally, below in Table 18 OpenDBL competitors's comparison is an overview of some of the software that are available on the market and are considered competitors of OpenDBL.

Table 18 OpenDBL competitors's comparison

Features	OpenDBL	Procore	Autodesk Construction Cloud	PlanRadar
Task Management	Includes tasks for design, construction, operation, and demolition phases.	Advanced task management with issue tracking.	Yes, with integration into BIM models.	Task creation with custom forms and interactive maps.
Data Storage	Lifecycle data storage, Digital Building Logbook.	Centralized cloud-based document storage.	Document management with version control.	Interactive document and blueprint management.
BIM and 3D Integration	Includes BIM models, Virtual Reality, and Point Clouds.	BIM model visualization and clash detection.	Compatible with Autodesk Revit and other BIM tools.	Pins on 3D blueprints for task management.
Team Collaboration	Workspaces, roles, and marketplace for team interactions.	Advanced collaboration tools and RFIs (Requests for Information).	Team coordination and permissions management.	Real-time communication and collaboration.
Quality Control and Verification	Quality control tools and IoT integration for verification.	Checklists for quality and safety control.	Inspections and audits built-in.	Digital inspection lists for quality and safety.
Cost and Budget Management	Focused on building data; cost management is not a primary feature.	Advanced budgeting and real-time cost tracking.	Detailed financial management tools.	Basic functionality via customizable templates.
API and Interoperability	OpenAPI for integrating with key technologies.	Integrates with external applications and platforms.	Open API for customization and new module development.	API for interoperability with other software.

OpenDBL stands out for its focus on digitalizing the entire building lifecycle with advanced technologies like AI, IoT, VR, and an openAPI for seamless integration.

Procore is ideal for large, complex construction projects, offering robust financial tools, advanced task management, and BIM integration.

Autodesk Construction Cloud shines with its comprehensive BIM compatibility, strong integration with other Autodesk tools, and sophisticated document management features.

PlanRadar is more suited for small to medium-sized projects, offering practical tools for real-time collaboration, task tracking, and customizable forms.

6. Conclusions

This market analysis highlights the dynamic evolution of the European **Real Estate, Building Design, Construction, and Renovation, Energy Efficiency**, and **Facility Management** markets, driven by sustainability goals, technological advancements, and regulatory shifts. These transformations present both challenges and opportunities for stakeholders, emphasizing the importance of innovative tools like those developed within the OpenDBL project.

The **AECO market** is undergoing significant changes shaped by initiatives such as the **EU Green Deal, EPBD**, and the **REPowerEU plan**, aiming to modernize building management, reduce energy consumption, and achieve climate neutrality by 2050. By 2030, all new buildings must meet zero-emission standards, with public buildings required to comply by 2028. Additionally, existing residential and non-residential properties face stringent refurbishment requirements to reduce primary energy demand for heating, cooling, and ventilation. Energy reduction targets mandate significant improvements, alongside the introduction of **EPCs**, which will standardize energy classes and directly influence real estate valuations.

Beyond energy efficiency, the increasing focus on **circularity** and **Life Cycle Assessment (LCA)** requires detailed traceability of building materials and operational data. The OpenDBL solutions, particularly its **traceability capabilities**, enable stakeholders to efficiently manage and access lifecycle data across design, construction, operation, and renovation phases. These tools simplify compliance with sustainability goals while also improving maintenance workflows, supporting circular economy practices, and streamlining LCA processes.

The European construction and real estate markets also present vast opportunities, driven by the growing demand for **green buildings**, retrofitting projects, and smart building management. Government initiatives and regulatory support, such as funding for energy efficiency and infrastructure modernization, provide a robust environment for sustainable innovation. However, challenges remain, including fragmented regulations, slow technology adoption, and high implementation costs. These barriers highlight the need for solutions that enhance **data management**, **transparency**, and **collaboration** across stakeholders.

By integrating digitalization with ESG compliance and advanced analytics, OpenDBL addresses these market needs and offers a competitive edge. Its tools enable better traceability of building data, supporting operational efficiency, regulatory compliance, and long-term value creation across multiple dimensions, including energy performance, maintenance, circularity, and LCA.

After analyzing the market conditions and potential opportunities for the KERs, this document serves as a foundation for the **OpenDBL Business Models**, guiding consortium partners to align their tools with market needs. Each KER, whether deployed individually or as part of the OpenDBL ecosystem, has the potential to create significant value across these evolving markets.

In conclusion, the European construction and real estate markets are at a transformative moment. The convergence of **sustainability**, **digitalization**, and **regulatory frameworks** creates immense opportunities for innovation. OpenDBL's solutions, with their emphasis on traceability, lifecycle data management, and user accessibility, are uniquely positioned to meet these challenges, driving meaningful change while ensuring operational excellence, sustainability, and long-term growth in the built environment.

7. Annexes

7.1. Partners contribution to KER identification sheet CETMA

Partner: CETMA															
Date: 16/10/2023															
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator.	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result address?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
2	Algorithm for identifying construction elements	Object detection system that uses artificial intelligence algorithms to identify and classify objects (doors) in floor planetary images.	Algorithm	DORMAKABA-CETMA	WP4, Task 2-3 System integration, other participants CEM, IABED, DOR, EM. The goal is to develop openDBL in terms of front-end and back-end production environments and relevant sprint tests. This encompasses:	AECO Industry	DORMAKABA	Yes because simplifies the process of planning a building.	DORMAKABA: main owner (direct commercialisation, licensing)	TRL 4-5	An AI system for detecting doors in the floor plan automates an otherwise manual process, improving scalability and facilitating integration with other systems.	Automation increases efficiency and accuracy in door identification, allowing for better data analysis and potential facility optimization.	The use of advanced deep learning techniques and the potential for customization and integration with other systems make the system more effective and adaptable compared to traditional methods.	Copyright protection on the code	
3	OpenDBL VR Viewer	The VR module provides the opportunity to collaboratively and interactively explore BIM models in a detailed and immersive manner via web. Within the OpenDBL platform module, a 3D Viewer will be accessible for visualizing 3D point clouds, IFC format models, and virtual reality models of digitized buildings. By wearing VR headsets and using the Virtual Reality module, it will be possible to investigate	software- 3D web model in SaaS	CETMA	E-metodi; in2it	AECO Industry	KIFISSA, MISLATA, RUVO, DORMAKABA	Yes. Because it would allow more efficient management of the BIM process, in an immersive 3D environment and in the cloud, giving the user the opportunity to completely immerse themselves in a digital project	mass production in SaaS - monthly license activation	TRL 5	Advanced web visualization tools for 3DBIM Virtual Reality database	Immersive visualization and investigation of the 3D BIM (IFC) model via web or via 3D viewers	The integration of VR into BIM processes represents an innovation as it combines two advanced technologies to offer a more complete and engaging experience of exploring and managing construction projects.	Copyright protection on the code	
4	Consortium management report	This report aims to present the key achievements and the fulfilled works. This report is highly suited to ensure a successful monitoring of activities, operation and completion of the openDBL Project in terms of project management, high quality deliverables and dissemination material, IPR management, innovation management	Know-how	CETMA	all partners	AECO Industry		The successful implementation of the openDBL project relies greatly on the timely fulfillment of the reporting obligations of all partners, efficient collaboration facilitated by the project management structures, risks mitigation and efficient information			Validation of the information in the catalogue; Provide recommendations to result proponents on Intellectual Properties (IPs) protection best practices; Validation of individual result's dissemination and exploitation activities; Handle escalations from T6.4 Innovation Management Task Leader in case of insufficient information	Exploitation management is covered in the openDBL Results Catalogue within each Result Identification template and allows the consortium to identify each result's exploitation opportunities for foreground IP, and developing an appropriate strategy for its exploitation and protection, maintain and		Copyright protection on the code	

DORMAKABA

Expected results															
Name: Kai Oberste-Ufer															
Partner: dormakaba															
Date: 09.10.2023															
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator.	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result address?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
1	Smart Door Identification in Floor Plans	An online service that identifies doors in a floor plan automatically. Users can upload floor plans and get back a list of coordinates pointing to the door locations. The data can be used in openDBL or other special applications to collect data and create a as-built models of the building.	demonstrator, software, service	DOR	DOR: Use case definition, example data, Software integration CETMA: Software Service development	Building Owners, Industry Companies for door hardware	RUVO, DORMAKABA	No	Direct commercialization by dormakaba, licensing to other partners possible		Today, it's a manual time consuming process to identify the doors in a floor plan. This service will speed up the whole task a lot	For existing building, very often just floor plans exist. The data is normally not accessible by IT systems. The provided service makes the data available for further use.	Digitizing the manual work of collecting data of existing building. It's an advantage if this process can be speed up.	Access to API (software service) is blocked and needs authorization of named users	

EDI

Expected results																
Name:		Janis Judvaitis														
Partner:		EDI														
Date:		12/10/2023														
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks	
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions	
1	A Comprehensive Study of Sensor-based Smart Building Monitoring and Data Gathering Techniques	In this paper, we study and analyze building monitoring solutions and sensor data acquisition methods to identify what design choices best fit an efficient smart building application as per IoT user's needs.	Publication	EDI	EDI	Academic	-	No	EDI, scientific publications	-	Advancing building monitoring sector	Knowledge	-	-		
2	IoT network for building monitoring	A plug-and-play set of IoT devices for monitoring of building status throughout the lifetime of the building	Prototype	EDI	EDI	Building managers?	All	Yes, it is crucial to have live data from the buildings into the OpenDBL system	EDI, direct commercialisation, licensing to third parties	TRL7	Building monitoring	An OpenDBL compatible vertically integrated solution	A complete set of building relevant sensors already integrated into the OpenDBL environment	-		
3	Sensor fusion solution for advanced parameter monitoring	Measuring the things no one else can measure	Methodology	EDI	EDI	Industry	All	Yes, it provides more comprehensive understanding about the processes within buildings	EDI, direct commercialisation, licensing to third parties	TRL7	Building monitoring	Increased knowledge of process within buildings	A novel measurement approaches	-		

e-Metodi

Expected results																
Name:		Michele Allori														
Partner:		e-Metodi														
Date:		12/10/2023														
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks	
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions	
1	oDBL Common Data Environment	This result would bring to completion a common data environment on the openDBL platform, while many alternatives exist, the interaction with the many services of the platform and the openAPIs planned for the project would make this a truly flexible and competitive service. The whole system could be separated from the platform and offered at a competitive pricing	Product (final)	e-Metodi	e-Metodi (full development), CETMA (3D viewer integration)	BIM specialists, Building Managers, Construction Companies, Large asset owners	All demos	yes, as all alternatives for CDEs online are paid subscriptions, such a service is already exploitable without even considering its synergy with our many other services	Direct commercialization with the platform as a core functionality of openDBL. If sold outside of the platform licensing or direct commercialization are viable		It eliminates the hurdles in communication and collaboration in the building process, bringing a common environment for every party involved	faster working times, clearer communication	by having a competitive pricing, an easy to modify code and most importantly, synergy with other services through openAPIs	There are systems to hide the code of web applications, exposing only the APIs for interoperability with other systems		
2	oDBL Building Data Editor	a system that tracks, shows, and allows editing of non geometric building data	Product (final)	e-Metodi	e-Metodi (full development), IAB (AI Mapping integration)	Building Managers, Facility Managers, Large asset owners	All demos	there are no real known alternatives for this kind of product, such a system is the core of openDBL's	Direct commercialization with the platform as a core functionality of openDBL. If sold outside of the platform licensing or direct commercialization are viable		It manages relevant data regarding the assets of a building	Interoperability with other systems, such as Maintenance	by having a competitive pricing, an easy to modify code and most importantly, synergy with other services through openAPIs	There are systems to hide the code of web applications, exposing only the APIs for interoperability with other systems		
3	oDBL Maintenance tool	A tool that links tickets for maintenance of physical assets to their digital counterpart, allowing tracking of operations, expenses, and savings.	Product (final)	e-Metodi	e-Metodi (full development) EDI (if IoT is included)	Facility Managers, Large Asset owners, Service companies	All demos	A tool that allows to program standard maintenance and quickly react for extraordinary	Direct commercialization with the platform as a core functionality of openDBL. If sold outside of the platform licensing or direct commercialization are viable		It eliminates the slow process of fault signaling, and guarantees consistency for	Faster reactions, expense planning	It is innovative because it is automatically linked to digital counterparts allowing all involved personnel to familiarize with the asset and	There are systems to hide the code of web applications, exposing only the APIs for		

IABI

Expected results															
Name:		Jakob Martin													
Partner:		Iabi e.V.													
Date:		12.10.2023													
Nr.	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator, procedures, component, guidelines, ICT system, software, algorithms, services, etc. (please specify)	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
1	Presentation at Linked Building Data Group W3C	A presentation within the Linked Building Data Group discussing the openDBL project, focusing on ontology-driven data models, IFCSTEP 2 IFCOWL, and more. Aims to engage experts in IoT, building automation, and related fields.	Discussion/Presentation	IABI	IABI/E-Metodi	Experts in semantic web technologies, IoT, building automation		Yes, for dissemination and networking	IABI, scientific dissemination		Lack of interoperable solutions in building data	Presenting openDBL's unique approach	Ontology-driven data model and advancements in IFC		On 16th October
2	Journal Publication on openDBL	An academic publication detailing the methodologies and findings of the openDBL project. Exact topics and focus TBD.	Journal Publication	IABI	IABI	Academic, Industry Experts		Yes, for spreading knowledge	IABI, scientific publications		Need for comprehensive research on openDBL's domain	Detailed exploration of openDBL's methodologies	Peer-reviewed endorsement of openDBL's approach		TBD
3	Interoperability via AI-based Mapping Service	Implementation of AI-based mapping service based on WPI results, with a focus on transforming openDBL information specification IDM into a semantically enriched Logbook ontology. Includes neural network training, UI development, and more.	Methodology, Software, Service	IABI	IABI	Industry, Academics		Yes, for direct application and extension of openDBL	IABI, direct commercialisation, licensing to third parties		Lack of interoperable AI-based mapping services in building data	Seamless integration and mapping capabilities	AI-enhanced mapping, integration with bSDD, UI development		

IN2IT

Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator, procedures	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need have characteristics to be protected)	Space to leave any remarks or questions
Traceability of building information (KER# 5 of our proposal document)	We will deploy new or improved tools for collection and update of relevant building data at the three pilot sites. Goal is to demonstrate the major benefits of using digital building logbooks (e.g. safety and health, people counting, access control, structural	Intermediate product (since it will be expanded through the deployment of further BIM models, information requirements and sensors). Process, methodology	DOR, EDI, IABI, KIF, MIS, RUV	ALL	Building owners, Property and facility Managers, Tenants, Users	KIF, MIS, RUV	Yes, we will formalize and make it simple to use the methodology and the procedures for normal users (and our target clients) to become	CEIMA, DOR and EDI (direct commercialisation and licensing to third parties) KIF, MIS and RUV (marketing and communication, potential new purchases) CEM and EM (licensing to third parties) AMPT, IABI, in2it (consulting	TRL 7-8 (to be evaluated and decided)	Real time information about the operation of buildings. Better decisions making. Users	Lack of real time information about the operation of buildings. Basis for operative decisions	Many competitors are "running" towards this frontier. However, within the openDBL solution, our KER will be easy to adopt and deploy, cheaper and based on state of the art solutions	To be jointly evaluated	

KIF

Expected results																
Name:		Yorgos Vrachnos														
Partner:		KIF														
Date:		12.10.2023														
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks	
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example: products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator, procedures, component, guidelines, ICT system, software, algorithms, services, etc. (please specify)	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions	
1	Building Technical Information All in One	Benefits of using the digital logbook on public administration and gathering all information regarding the building (building technical information folder) in one place.	methodology, know-how, tester, demonstrator	KIF	KIF: Case study, Testing, Demonstrating results	Employees of Public Sector (Municipalities etc) in all departments	KIFISSIA	Yes, because with a positive result in public assets management and regarding that Public Sector has a big number of buildings to manage, there are many commercial possibilities for the project	KIF, consultancy services	TRL 6	It gathers all the technical information of the building in one place and its digital format provides flexibility in the exchange of information between stakeholders	For Public Sector buildings there are usually no floor plans or if there are they will be in printed form. The provided service makes building's technical information folder digital and easy to access, work with and share.	-	-	-	

MIS

Expected results															
Name:		Mislata													
Partner:		Mislata													
Date:		24/10/2023													
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example: products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator, procedures, component, guidelines, ICT system, software, algorithms, services, etc. (please specify)	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
1	WHAT IF...?	It will be possible to simulate the savings or increase, transformed into 'euros', depending on the hours of operation of each piece of equipment in the building. It will allow to know what is consumed at each moment and to estimate the consumption in a period of time according to the daily parameters of operation that are assigned to transform the saving or increase of energy in the euros that will imply saving or increase in invoicing. It will recommend optimization based on users and time of operation of the building.	Final prototype - Software - ICT system	KIFFISSIA - MISLATA - RUVO	Italian partner (IT) German partner (Sensors): Implementation and app elaboration. German Professor: Data collection and transformation.	The owner of the building, in which it is implemented, will benefit from the results. The building may be publicly owned (as in the case of the project) or privately owned (companies or individuals).	Kiffissia - Mislata - Ruvo	Yes, it gives us real information about our building and allows us to act on it according to its energy needs and possible savings.	Consultancy services or direct commercialisations because it can be operated in any home or industry and of course in any public building.	At least TRL7	The lack of consumption control, especially at times of no or minimal occupancy. It will optimize consumption, making the building more sustainable and efficient.	Knowing the simulation according to the time parameters to be set by the user, it will be possible to estimate the energy savings transformed into 'euros', thus giving the owner the tools to determine a reduction of time schedules according to the capacity or only economic criteria to reduce energy consumption.	This product is not known to exist in the market. It is achieved in a visual and practical way to know the estimated savings in a given period of time (e.g. 12-24-36 months) and to be able to act on each equipment independently seeing the results and the impact on the whole.		
2	AFORO	It will be possible to know the capacity per room and in the building as a whole. There will be an access control by user level depending on the type of room. We know which rooms are most used and when they are most used. It will complement the WHAT IF in decision making.	Final prototype - Software - ICT system	KIFFISSIA - MISLATA - RUVO	DORMAKABA	The owner of the building, in which it is implemented, will benefit from the results. The building may be publicly owned (as in the case of the project) or privately owned (companies or individuals).	Kiffissia - Mislata - Ruvo	Yes, it gives us real information about our building and allows us to act on it according to the excess or shortage of space demand and of the consequent need for expansion or reduction/reconversion of spaces; all this with the consequent alteration of energy consumption.	Direct commercialisation	At least TRL7	Energy consumption in unused rooms and the best time to perform maintenance. Allows to know the status of a room in order to hold a meeting/training or similar.	It is possible to know the occupancy in real time as well as to have a history of occupancy over a period of time to know the use of the spaces and determine new needs as well as maintenance operations at times of lower utilization.	It will be able to complement the WHAT IF, providing data that will help the building manager to make decisions.		Restricted access by user levels shall be implemented by the staff assigned to the building.
3	SENSÓRICA	The consumption of each element or system in the building, both energy and water or gas, will be known. Each outlet, air conditioning machine or faucet will have its own sensor.	Final prototype - Software - ICT system	KIFFISSIA - MISLATA - RUVO	Alemanes sensórica	The owner of the building, in which it is implemented, will benefit from the results. The building may be publicly owned (as in the case of the project) or privately owned (companies or individuals).	Kiffissia - Mislata - Ruvo	Yes, it allows to know each consumption of each element of the building, being able to dump the data in the WHAT IF and allowing to know what each element means for the overall building.	Consultancy services or direct commercialisations because it can be operated in any home or industry and of course in any public building.	At least TRL7	The use of unnecessary elements, control of leaks or couplings as well as optimization of resources.	Total control of energy resources and water supply.	It will be able to complement the WHAT IF, providing data that will help the building manager to make decisions.		It can also be implemented for the generation or supply in existstr (PV).

AMTP

Expected results															
Name:		Marcin Konopczyński													
Partner:		AMTP													
Date:		25.10.2023													
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example: products (final or intermediate), prototypes, processes, methodology, know-how, tester, demonstrator, procedures, component, guidelines, ICT system, software, algorithms, services, etc. (please specify)	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
1	Standards_openDBL_LCA	List of standards, that should be considered in LCA and sustainability aspects.	Methodology	All partners	AMTP - list preparation, ASRO - list consultation	All Project Partners	KIF, MIS, RUV, DOR	Sustainable / LCA aspects are built based on existing European Norms and standards	Consultancy services and Scientific publications			Sustainable / LCA aspects are built based on existing European Norms and standards	Sustainable / LCA aspects are built based on existing European Norms and standards	Not need	
2	Sustainability Aspects	Task 1.2 refers to Sustainability requirements, which we have analysed and identified for various environments, taking into account the following issues: 1) Clean and climate neutral industrial value chains, 2) Raw material management based on a circular system, 3) Identification and management of waste in terms of its further recovery and reuse, 4) Decarbonization of buildings in terms of energy efficiency and optimal use of available energy carriers, 5) Promotion of sustainable solutions appearing in dynamically changing conditions related to the available raw materials and	methodology, guidelines	AMTP	AMTP - sustainable requirements	All Project Partners	KIF, MIS, RUV, DOR	Sustainability requirements, which we have analysed and identified for various environments	Consultancy services and Scientific publications			Sustainability requirements, which we have analysed and identified for various environments	Sustainability requirements, which we have analysed and identified for various environments	Not need	
3	Sensors in pilot actions	List of sensors and potential arrangement	Methodology	AMTP/EDI	AMTP - list preparation EDI - consultation	All Project Partners	KIF, MIS, RUV, DOR	For existing buildings, actual data that can be obtained from properly placed sensors and meters is more suitable and even necessary for LCA analysis of existing building sustainability. The proposed "check	Consultancy services and Scientific publications			The proposed "check points" were listed.	The proposed "check points" were listed.	For AMTP not need	
4	Potential result - plan Publication relates to the sustainability aspects	Publication could describe the Sustainability aspects analysis in the project area	Other - publication	AMTP, other Project Partners	AMTP Preparation, other PP partners according to the interest in the topic	All Project Partners	KIF, MIS, RUV, DOR	Publication could describe the Sustainability aspects analysis in the project area	Consultancy services and Scientific publications			Publication could be developed	Sustainability requirements, which we have analysed and identified for various environments	According to the publish law	

ASRO

Expected results															
Name:		Cristina Chirea													
Partner:		ASRO													
Date:		10/09/2023													
Nr	Title	Description	Type	Owner(s)	Partners contribution	Target users	Demos	Key Exploitable Result?	Preliminary exploitation strategy	TRL development	Problem addressed	Value Proposition	USP (Unique Selling Point)	Potential IPR strategy	Remarks
	Please provide a title of your result (try to create a short, nice title)	Provide a short description of the result	For example, products (final or intermediate), prototypes, processes, methodology, know-how, testbed	Which partner(s) are the owner(s) of the result?	List all partners involved in this result and specify their contribution	Sector(s) or type of user that are being addressed by the result	In which demos will this result be tested / demonstrated?	Would you consider the result a Key Exploitable Result of the project? If yes, why?	Main owner(s) & means of exploitation (e.g. direct commercialisation, licensing to third parties, consultancy services, scientific publications, etc.). E.g. Partner X (direct commercialisation), Partner Z (licensing agreement)	What is the expected TRL development of the result during the project?	What problem does the result addresses?	What added value or direct benefits does the result create?	Why is the result innovative and how does it outbid the competition?	What is the protection strategy for the result? (Not all results need/have characteristics to be protected)	Space to leave any remarks or questions
1	DBL Standardization Roadmap/Whitepaper	The conclusions of the standard analysis (gaps of existing standards) will be used to develop a Roadmap for standardization in the area the project, for proposing improvements to existing standards and for proposing new standardization topics	Publication	ASRO	all technical partners	all stakeholders CEN-CENELEC EU policy makers	N/A	Yes, from this roadmap a EN standard/TS/CWA could be developed it will include recommendations for improving EN existing standards on DBL	Public document, no case for commercialisation	TRL 7-9	Gaps, lack of information in existing EU standards in the field of DBL	The roadmap will support creating new EN standards more applicable at EU level	there is not any analysis of existing EU standards in the field of DBL	Public document	free of charge

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