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Common Data Environment : An Overview

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Abstract: As there has been observed a paradigm shift from the traditional practices in construction industry to the digitalization of the whole process with the implementation of Building Information Modelling (BIM), numerous data is generated throughout the project life cycle starting from the conceptual design to planning and the execution of the project. Therefore, a well-structured, automated and user-friendly centralized platform to keep the data, structure it, combining data from different sources, distributing to various stakeholder as per individual requirement is a necessity of the hour. Introduction of Common Data Environment (CDE) makes things simpler for digital collaboration in a BIM based projects.

Providing a common digital space to different stakeholders to access the workflow of different processes from designing, modelling, scheduling, cost estimation and quantity estimation, resource allocation and levelling, progress tracking, forecasting etc. enables a consistent source of generating and tracking all the necessary information of the project.

The aim of this paper is to provide an overview of the concept of CDE and highlighting its capability from its functions to the challenges in implementation by demonstrating it in a digital software, which integrates the different dimensions of BIM, called BEXEL Manager.

Keywords: *CDE, BIM, Digital Space, Centralized Platform, Designing, Modelling, Scheduling, Cost Estimation, Quantity Estimation, Resource, Forecasting.*

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I. INTRODUCTION

➢ *Overview*

The common data environment (CDE) is a centralized repository for information about construction projects. The CDE will contain documentation, federated BIM models, non-graphical assets, estimates, reports, materials specification, building element properties, and it will not be restricted to assets developed in a 'BIM environment.' Collaboration between project members should be improved by using a single source of information.

➢ *Need for Establishing CDE*

In a construction project, there are many stakeholders responsible for the successful completion of the project and delivering it on time and within budget. This can achieve only if there is a proper co-ordination and enough collaboration between them. For an efficient communication, co-ordination and transparency in between the different works carried out by different departments, a well-structured centralized digital data sharing, storing, exchanging, accessing platform is needed. A CDE is not a project management tool but it can be utilized for successfully managing a large data-driven construction project.

➢ *Contributors of CDE*

All the different inputs given by the core as well as the supporting departments of a construction project such as Architectural drawings and designs, civil work specifications, MEP works, contracts, estimator and estimates for cost and quantity. The contributors are –

- *Drawings and Models*

A federated 3D BIM model consists of a structural model, architectural model and a MEP model. All these can be combined in one digital platform for a better understanding of work flow.

- *Approvals and Contract Documents*

It includes all the necessary approvals such as planning approval, government clearance for the construction activity, building regulation approvals, environment, health and safety etc. All these approval documents along with the tendering document can be stored in a CDE so that the person responsible can access it at any particular point of time.

- *Estimates*

It contains both, the quantity as well as the cost estimates. Estimation is one crucial activity in the planning phase of any project. With the help of estimation, the total

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budget of the project is decided. Common data environment provides this flexibility of keeping the estimation in a common environment so that all the stakeholders can see the estimate and provide the changes necessary.

- *Reports*

The WIP report, clash reports, EVM reports and many other important reports can also be stored and can be exported whenever required for access outside the common environment.

II. REVIEW OF LITERATURE

Cornelius Preidel et. al. (2018) talks about the technical aspects of Common Data Environment and how due to exchange of numerous complex data in a planning phase to the execution of BIM based project creates a demand for a central platform to manage all these data. CDE acts as a single point of truth which can be accessed at any point of the project with different level of details for different individual's requirement. The different federated BIM models have its own loopholes, which necessitates the adaption of a more collaborative approach for construction. The CDE marks an important step forward in the digitization of these processes. The massive volume of data saved in models and data objects can be coordinated consistently by centralizing data storage and bundling information and data streams. Examination of data quality and data model can be done simultaneously at the same time saving a lot of time in a project.

Jan Radl et. al. (2019) highlights the ways to increase the efficiency of the construction process. The impact of the implementation of CDE and its types in different construction projects were evaluated on the basis of the overall impact on the feasibility of the project. As per the author, CDE overlaps with the BIM maturity level 2. From an eye of an investor of the project, implementation of a common environment will reduce the cost and avoid any time lags given the condition that all other parameters are maintained.

Selen Ozkan et. al. (2021) describes CDE as a centralized information system which is used to for getting an overview of any particular running task or the task which is about to happen. Successful implementation of the CDE can increase the efficiency in project management. The author suggested to place similar information such as all types of approval, or change order and contractual documents, or cost and schedule in one management domain in order to avoid the overcrowding of data and the puzzlement can be avoided between different teams involved in a project. A well-structured information will provide flexibility and better accessibility in a data-driven construction project.

Martik Stransky (2020) tried to explore the features and function of a CDE. He has emphasized on a particular function of CDE in supporting the procurement processes and management for the sub-contractors. For a selected environment, the bidders can also access the tender documents. All the different work packages can also be managed and stored in a selected CDE by defining the scope of work as per the tender. With the implementation of CDE, the tender time schedule can also be created and tracked. CDE is not only just for the document management but it is a well-defined platform which can also enables the subcontractor to do the procurement management for a project.

Davide Simeone et. al. (2020) explains not only about the effective collaboration but also how CDE can enable a qualitative check on the models and properties of the model which is being stored in a common environment as a part of building information modelling. The paper also talks about specialized data retrieval and query strategies to ensure information coherence and consistency across distinct models. enhancing CDE's standard repository function by adding the ability to undertake qualitative checking and evaluation of data stored in various models and information carriers, can be useful in faster detection of potential inconsistencies and better design integration. The enhancement can be done with a semi-automated knowledge-based system which can be an in-built function in a BIM tool.

III. STRUCTURE OF A CDE

A Common data environment has 4 phases/process. From the start to the end of the project, these 4 folders or document container are used to share information at different point of time with different levels of development. These are-

- *Work-In-Progress (WIP)*
- *Shared*
- *Published*
- *Archived*

- *Work-in-Progress (Wip)*

A WIP may be in the form of information/model/documents/design data which is only for the use of in-house design team. A lead designer or the head of design team will check certain parameters such as sustainability, technical content, standards and procedures, 2D drawings etc.

- *Shared*

Once the WIP information is approved by the lead designer or the head of the design team, the information/model/data is then shared with the other team members for the coordination with other disciplines. There are 2 types of "shared" phase in the workflow, one is sharing within the team for different discipline coordination and the other one is sharing to the client for their feedback.

- *Published*

When the shared data/model is been approved and has been given a green signal from the client as well as by the design team with all the necessary changes, this information becomes available for other stakeholders such as contractors and can be used for tendering or construction purpose.

- *Archived*

After the modification and changes made in the data/model/information after sharing it with the team and

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clients, a new folder or a new set of revised information is created and the old set of information and folders are archived for accessing if it is required at any time in the future.

A simple workflow of a CDE is shown in "Fig 1".

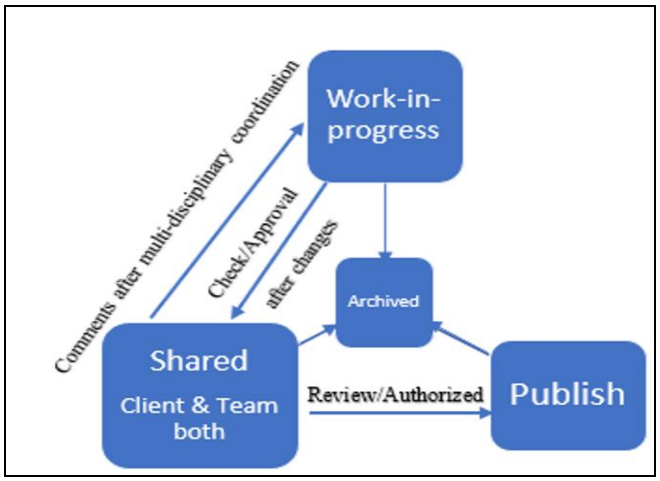

Fig 1 Workflow of a CDE

IV. WORKFLOW (STAGES)

➢ *Stage 1*

An initial draft of the model (let's say a structural model) is created and is in the work-in-progress state. This model is created in revit or any modeling tool. It is shown to the design and modeling team head for any changes and errors to be corrected and then approved.

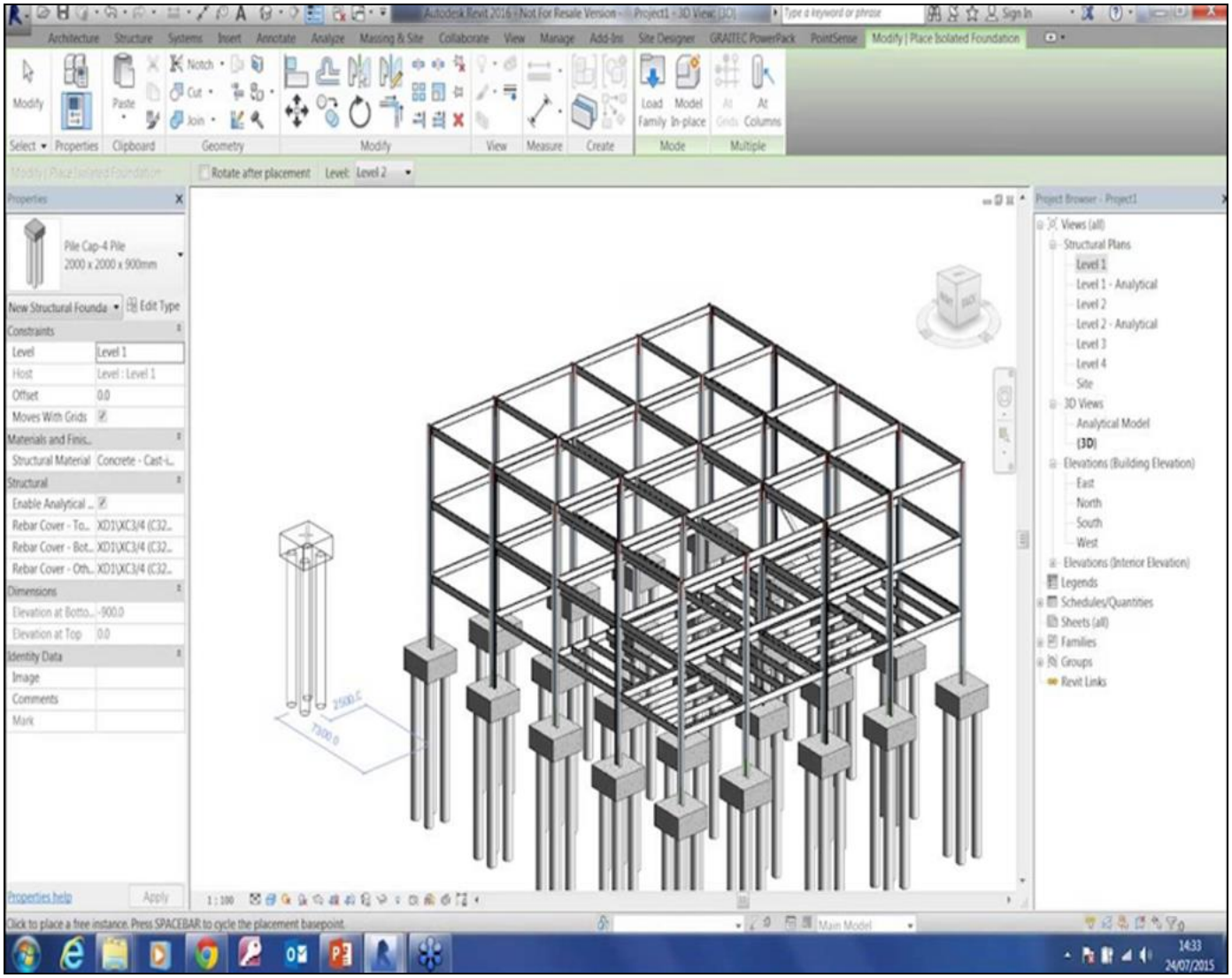

Fig 2 Interface of Revit with First Draft of Structural Model is Being Created

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➢ *Stage 2*

Once the initial WIP is approved, it is forwarded in the shared stage to the clients for any additional feedback or suggestion and also is shared to the rest of the team members for other discipline coordination such as MEP or architectural for clash detection and checking various properties of the model. The model created in Revit is then exported and opened in BEXEL Manager for further checks and sharing.

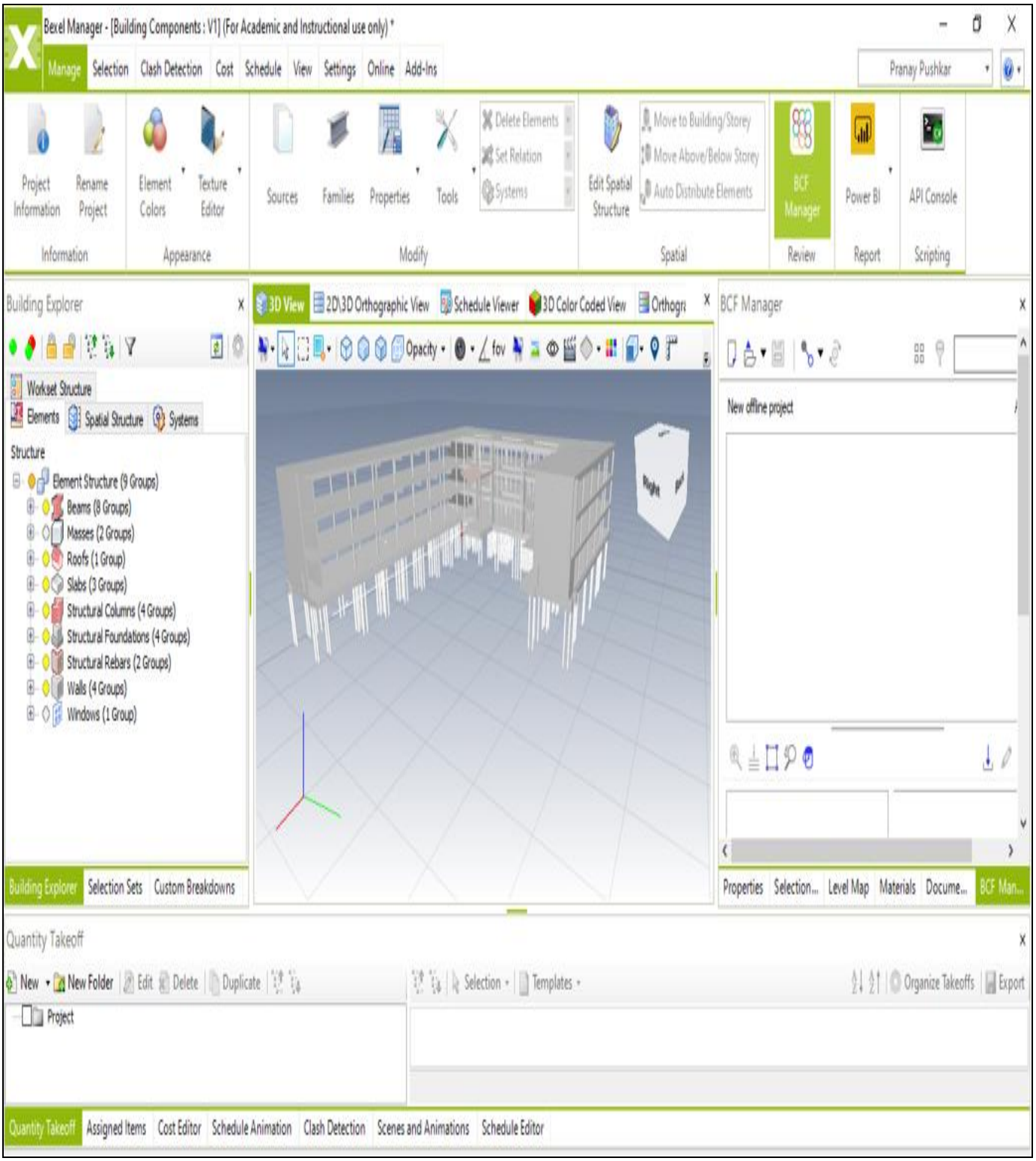

Fig 3 BEXEL Manager Interface of the Transferred Structural Model from Revit

Now, this structural model is integrated with architectural and MEP model for multi-disciplinary coordination.

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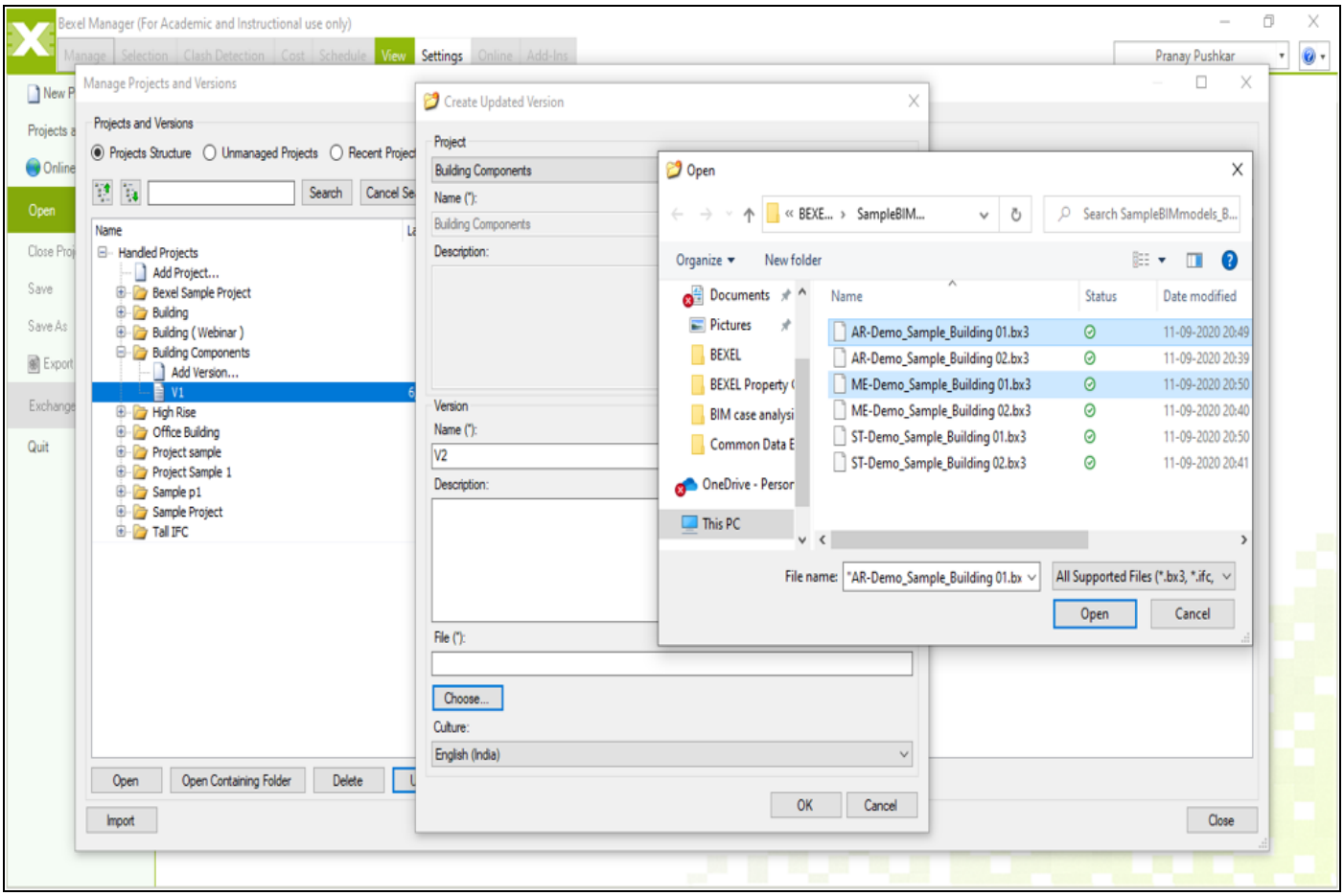

Fig 4 Integration of All the Different Model and Creating A Federated BIM Model for Checks

Once the different building components are integrated and federated into one BIM model, clash detection and checks for property is done before the model is signed off for publishing.

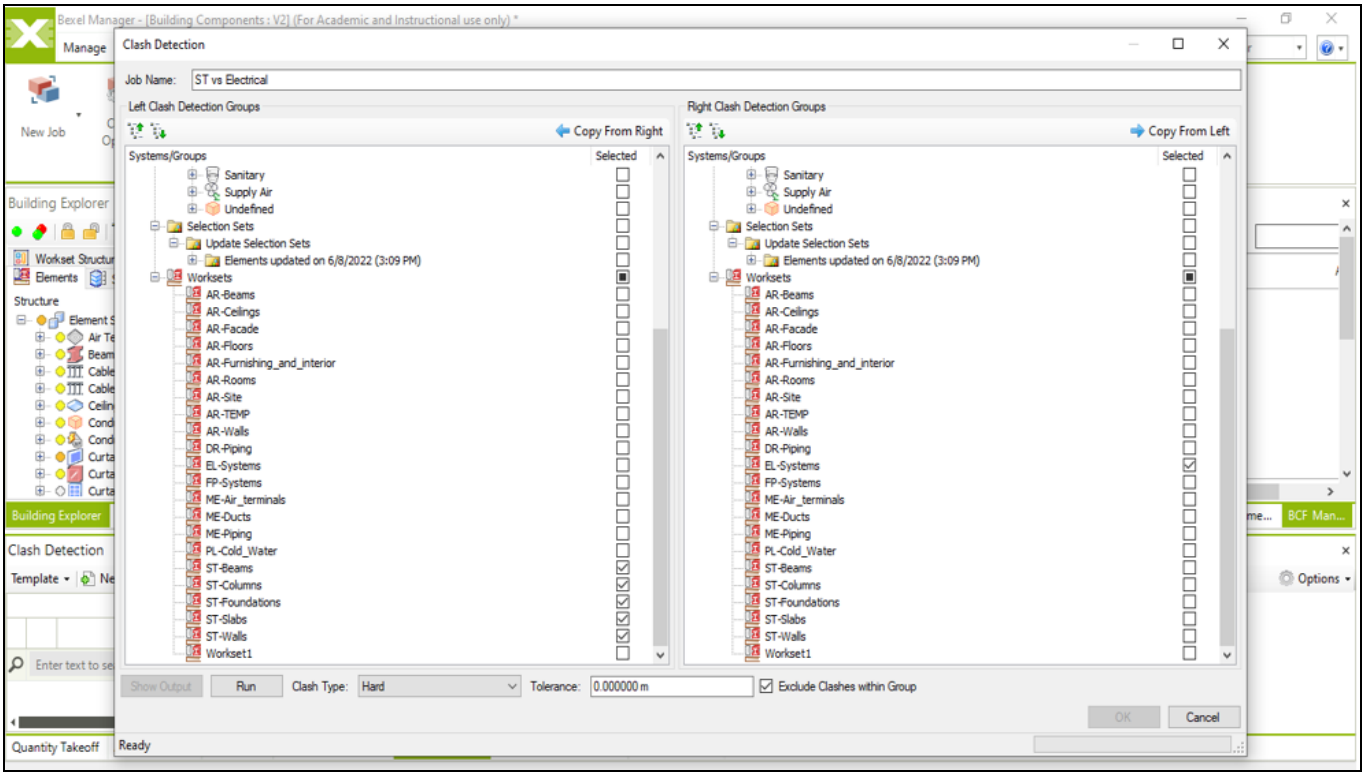

Fig 5 Clash Detection Check Window

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After running the clash detection, the clashes can be viewed and then if there are any errors in the model or clash, then with the help of BCF manager, issue is being created and sent to the designing team for the changes.

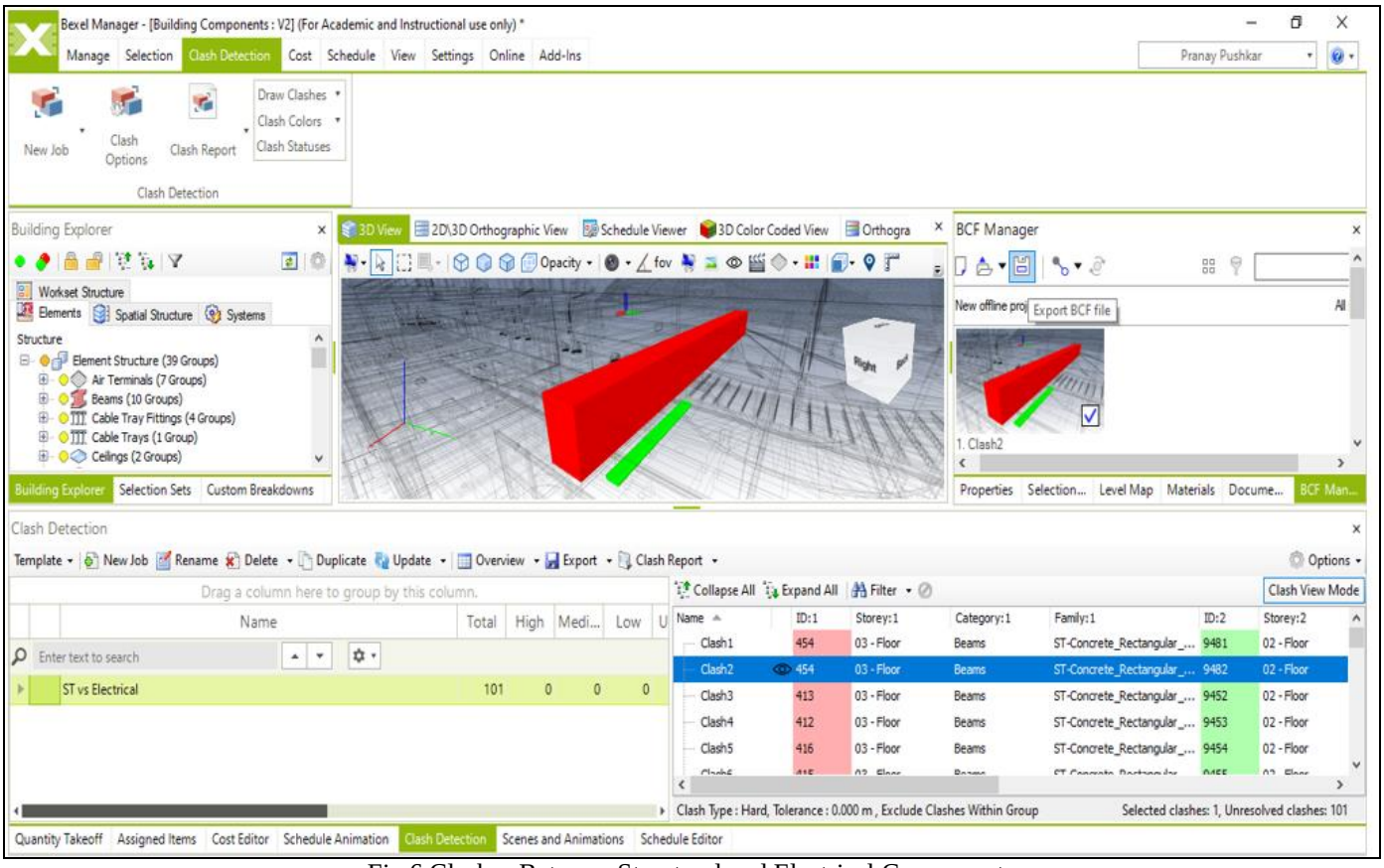

Fig 6 Clashes Between Structural and Electrical Components

In the same way the different model properties can also be checked and reviewed. Client can issue a spreadsheet with defined property and naming conventions with respect to which the property can be checked.

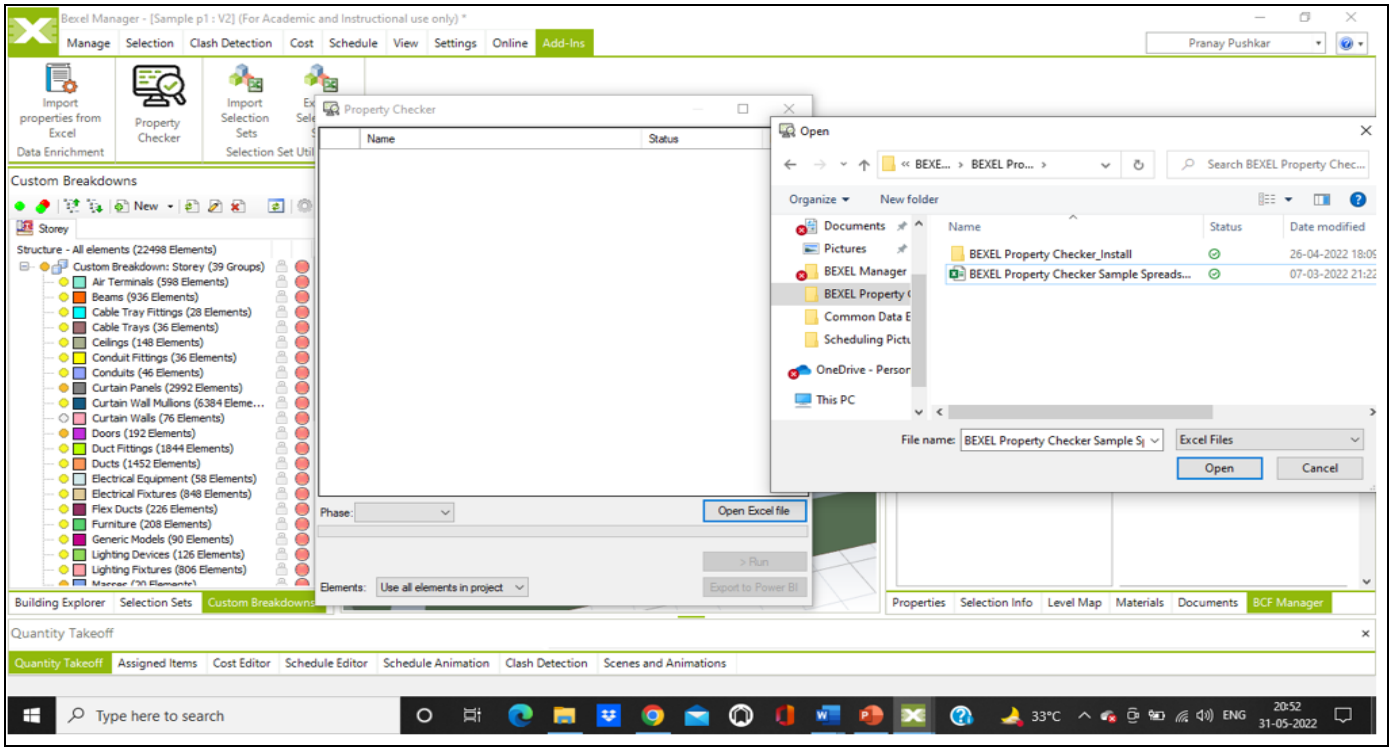

Fig 7 Property Checker Interface

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After opening and running the property checker, the result of the model property check can be exported in power BI desktop and can be viewed there.

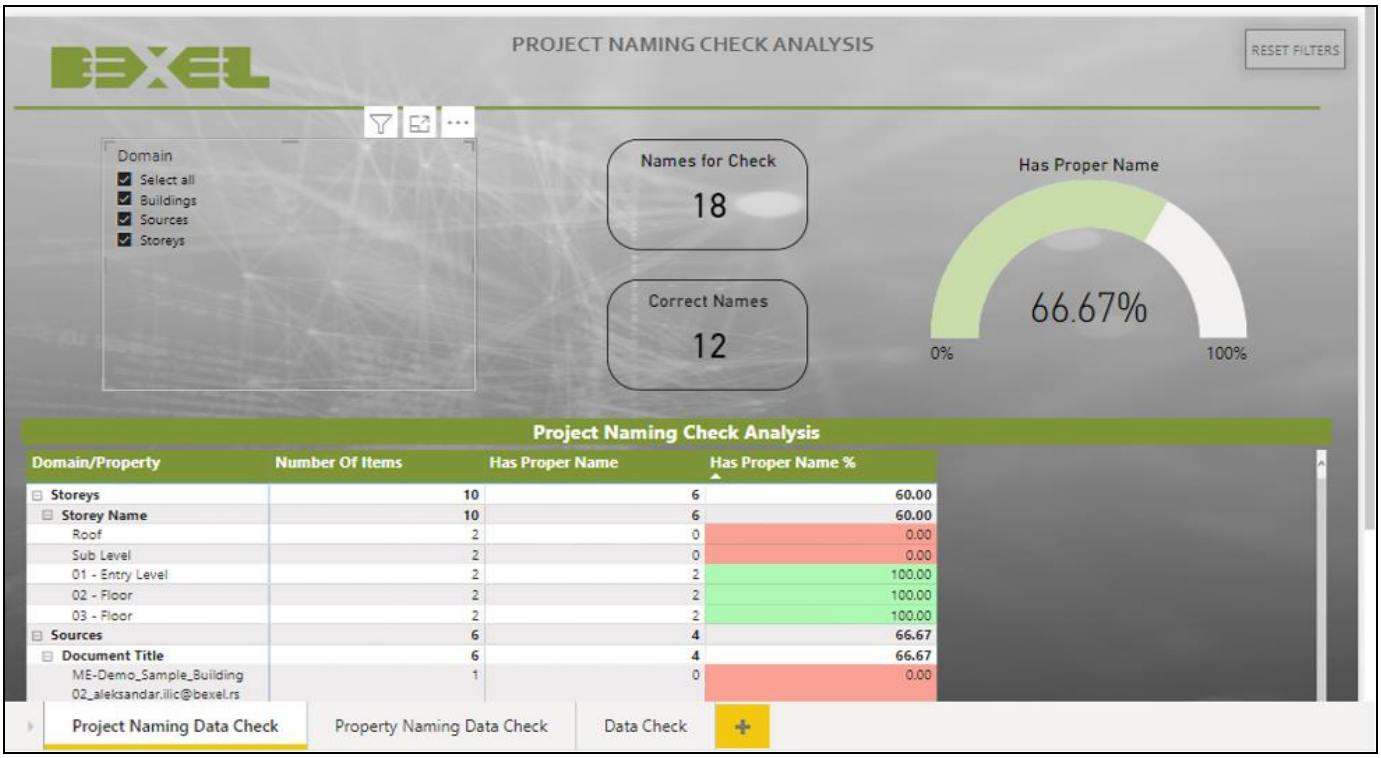

Fig 8 Power BI Interface and Result of Property Checker

➢ *Stage 3*

Once the correction and necessary changes has been done in the model/design, it is ready to go for the published stage. For doing that, the model which is opened in BEXEL manager, it can be then exported using a function in the software i.e., exchange. The model will be saved as a bx3 file extension. This file can be shared with stakeholder for construction or contract purposes such as for using in tendering process.

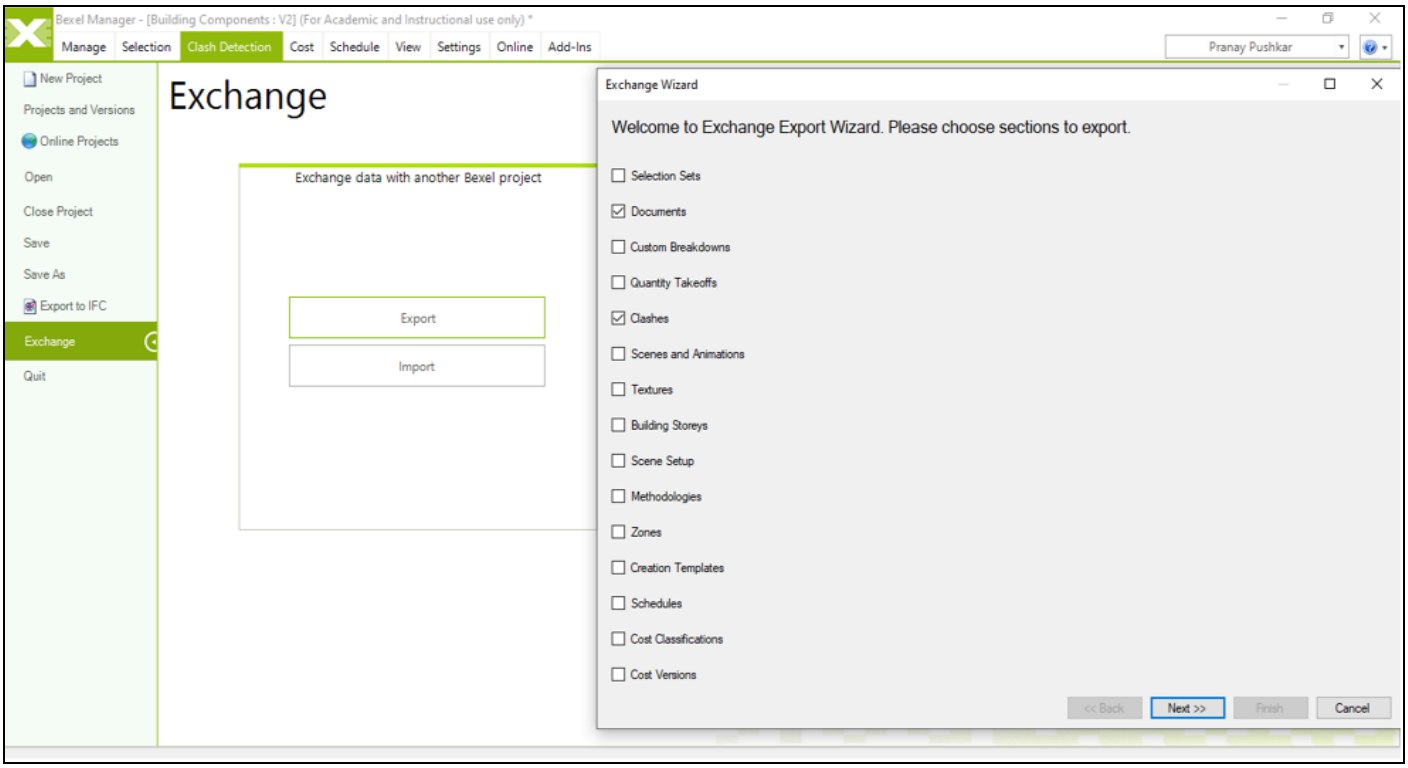

Fig 9 Exporting/Publishing the Approved Model for Authorization

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V. BENEFITS AND CHALLENGES

➢ *Benefits*

One of the main benefits of implementing a common data environment is that the shared common information, whether it is a document, change order, model, cost, quantity, tender document etc., it is accessible to all the stakeholders of the project at any point of time with any level of details as per the individual requirement. The project can be tracked internally and digitally with the help of CDE and the general problems involved in construction project such as cost overrun, or schedule delays can be avoided. It will provide better communication platform for multi-disciplinary coordination.

Apart from this, there are Other Benefits, which the CDE Provides. these are.

- *Accuracy and Consistency*

Whether it's a BIM federated model, or tendering document, or cost estimation, quantity estimates, scheduling related information etc, a CDE will provide accuracy and consistency in the data or information irrespective of the fact that it is transferred and stored multiple times during an ongoing project.

- *Efficiency*

It will provide a better and centralized platform for communication exchange, data accessibility, rectification and correction of issues which will save a lot of time and cost.

- *Economical*

One of the things that CDE does not gets implemented is that lot of people think that it requires additional cost. But actually, CDE is very efficiency and it saves the overall project cost as it restricts the number of resources being used. A centralized platform gives a flexibility to all the stakeholders to work under one umbrella utilizing their skills and efficiency.

- *Challenges*

The major challenge faced in current scenario is there is no such standard centralized common data environment which creates an inconsistency in the workflow of the CDE. Another challenge is preserving the consistency of data in model collaboration. Some models are domain-specific and some are coordinated model.

When these types of models are collaborated together, it can cause some inconsistency and errors. Another big challenge is that due to the collaborated communication process, the project stakeholders create different data sets for different topics. These data sets contain different attributes such as type, comments, description, state etc.

These have to be linked with the digital building model and in a central platform. As of now, these are done with the help of cloud based, extranet or BIM collaboration format. For a better workflow, a single central platform to store and deliver these data sets is needed.

VI. CONCLUSION

The CDE marks a significant step forward in the digitization of these processes. The huge volume of data saved in models and data objects can be coordinated consistently by centralizing storage of data and combining information and data streams. Essential aspects such as data and model quality can be examined at the same time.

The essential aspects outlined above give an overview of a CDE's structure and the functions it must perform. Because of the complexity and dynamic nature of construction projects, BIM data evolution is a highly dynamic process. It is vital to ensure that the chosen system can meet these shifting requirements when defining the content and capabilities of a project-specific CDE.

From the perspective of the project's investor, CDE's implementation improves its control functions, resulting in cost savings, improved quality (by maintaining all relevant parameters), and reduced time delays.

Construction projects should be more resilient to changes in the external environment (e.g., regulation, technological innovation, and changing opinions of landowners in the neighborhood in the case of long-term projects) if the Common Data Environment is properly specified.

REFERENCES

[1]. Preidel, C. "Building information modelling. *Common Data Environment*", 2018, 1-16. doi:10.1007/978-3-319-92862-3.
[2]. Radl, J., & Kaiser, J. "Benefits of Implementation of Common Data Environment (CDE) into Construction Projects.", 2019, *IOP Conference Series: Materials Science and Engineering*, *471*, 022021. https://doi.org/10.1088/1757-899x/471/2/022021
[3]. Ozkan, S. "Identification of Common Data Environment Functions During Construction Phase of BIM-based Projects", 2021, Conference: CIB W78 - LDAC 2021, 253-262.
[4]. Stransky, M. "Functions of common data environment supporting procurement of subcontractors", 2020 *19th International Scientific Conference Engineering for Rural Development Proceedings*, 793–799. https://doi.org/10.22616/erdev.2020.19.tf186
[5]. Simeone, D., Cursi, S., Coraglia, U. M., & Fioravanti, A. "Reasoning in common data environments - re-thinking cdes to enhance collaboration in Bim Processes", 2020, *Proceedings of the 38th International Conference on Education and Research in Computer Aided Architectural Design in Europe (ECAADe) [Volume 2]*, *2*,499–506. https://doi.org/10.52842/conf.ecaade.2020.2.499
[6]. constructionblog.autodesk.com
[7]. www.globalcad.co.uk
[8]. www.designingbuildings.co.uk