

**buildingSMART International (2022)**

437-TECHNOLOGY Technology Solution using openBIM

# BEXEL Manager - Smart integrated openBIM approach



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## Entrant details

Role or Job Title on the Project | Senior BIM Manager

Employer

| BEXEL Consulting, Ljubljana, Slovenia

Employer Role

| Technology or Software Development Company

Are you or your employer a member  
of buildingSMART?

| Yes - Sponsor Member (Standard, Multinational or Strategic)

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## Entry details

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### Entry Details

By checking this box I understand and acknowledge that this awards program is to assess information about openBIM, and that openBIM is not only about the use of solutions. openBIM is about setting up an environment where every party in a team can work in the optimal way ("how they prefer") without putting limitations on others.

It is about freedom to take control over your data and workflows, while keeping that freedom for others as well. Full use of open standards is not mandatory for this mission.

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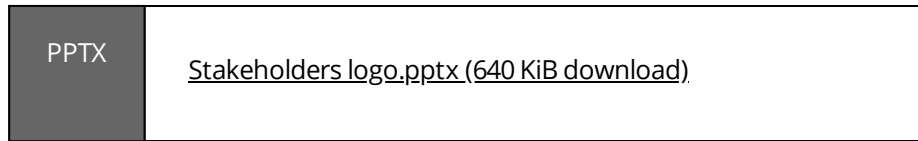
Website

<https://www.bexelmanager.com>

Location

Slovenčeva 93, 1000 Ljubljana, Slovenia

Submitting Party and Stakeholder Logos (compiled into one .ppt/pptx file for upload)



Entry Description

Our entry and presented technology address the issues of fragmented and limited BIM implementation and workflows on construction projects. Even though we have seen advancements in BIM technologies and digital construction technologies in general, we still see significant challenges in BIM implementation. It is implemented partially, within a certain project phase, by a specific stakeholder, for a specific BIM domain without a comprehensive approach, that acknowledges the need for incremental project development, and such BIM implementation indeed enables just limited benefits.

BIM must not be locked in a siloed working environment of a particular BIM domain, similar to the limitations one experienced in traditional construction management when separate trades tended to be isolated regardless of the fact that the construction project is one whole, both in terms of design disciplines and BIM domains. The need to successfully transfer data forward and to be aware that achieved progress could be truly beneficial for the project only if it could serve as the basis for the following phase needs to be emphasized more. In this regard, the importance of utilizing existing, and further development, of openBIM standards to enable smooth exchange of data and BIM analyses between various BIM tools, is especially highlighted.

BEXEL Manager's approach is comprehensive. We tend to see BIM as an integrated process where every domain is a piece of a puzzle that forms a big clear picture of the entire project. Where data integrated into one module is visible and could serve as the basis for further project development in the next module. Where a change in one place is reflected throughout the whole project.

All of this is achieved through the integrated software ecosystem that encompasses all BIM domains but is also open for the exchange of information with other openBIM platforms in every one of its modules so project teams can flawlessly collaborate toward the project's success. Our BEXEL Manager technology supports a complete integrated BIM workflow presented in our submission as follows:

- The workflow starts from BIM model federation process using multiple IFC files,
- Goes through automated Data Validation process using open Excel and JSON templates,
- Continues with Automated Data Enrichment workflow based on IFC data templates as well as through the bSDD integration,
- Besides quality control of model data layer, integrated BEXEL Manager BIM platform allows for quality control of model geometry through the use of robust clash detection module within a fully automated process based on predefined Clash Detection Matrix templates, stored within the Knowledge base that can be easily customized according to project needs,
- Automated creation of Cost Classification that is based on data previously integrated in the model through the Data Enrichment process as well as naming and Rules of Measurements templates that rely on IFC properties, and
- Finally, after the BIM model has been successfully enriched with well-structured data and cost information layer, it goes through the Planning module, where with the use of the Intelligent Scheduling approach, the user is able to automatically generate a construction schedule using methodologies based on previously created or imported Cost Classification system and spatial zones defined through the utilization of spatial data layer. The schedule is then fine-tuned and optimized through a series of optimization tools based on the fact that all information integrated throughout previous project phases is available and interconnected with schedule information (cost, resources, daily output, normatives, etc.)

In this way, the BIM model has been upgraded from a basic 3D to a fully integrated 4D/5D model that is used for progress tracking, close monitoring of KPIs and even operation and maintenance once the project is completed, and the model is further enriched with as-built information, documentation and long-term maintenance plans.

Besides extensive workflow integration, another significant characteristic of this approach is maximum automation and knowledge transfer. This is mainly achieved through the use of Knowledge Base templates that are developed and prepared

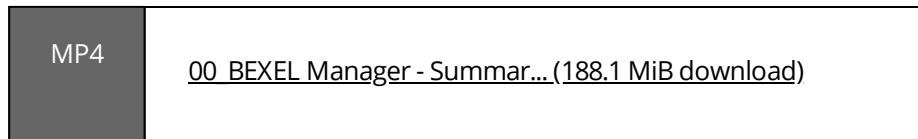
with the intention to capture expert logic, reuse it on multiple projects and enrich it through collaboration and exchange with other participants. Of course, the core of such an approach is standardized openBIM data formats (IFC, BCF) upon which all relevant templates are based.

What stage of completion is the entry content representing? | Maintenance

#### Stakeholder Statements

Stakeholder statements are provided as a single pdf file, in the attachment.

Upload a 2 minute video to show the scope of the entry.



#### Technology Solution Description

BEXEL Manager is the innovative BIM analysis platform that integrates the most important 3D/4D/5D/6D BIM analyses into a single openBIM solution. It supports the integration of hundreds of separate IFC models into the federated BIM model, as well as separate updates of each of them. It is certified by buildingSMART International for import of IFC2x3 and supports the import and export of BIM models into IFC2x3 and IFC4. It is successfully used on complex projects and BIM models with up to 2.000.000 BIM model elements.

BEXEL Manager powerful data layer interconnects multiple BIM data domains enabling various cross-domain analyses and BIM queries. At the same time, it is very flexible and allows data integration and exchange with external databases and third-party solutions using different open formats or BEXEL Manager's open API.

The vision of BEXEL Manager technology is to automate repetitive project planning and management tasks in order to free the time and resources for creative and value-adding project management activities. The platform offers advanced engines for data verification, data enrichment, clash detection, quantity takeoff, cost estimation, smart 4D/5D schedule planning, progress input and monitoring, and reporting that are integrated into innovative and efficient openBIM workflows that enable timely quality control, precise estimates and detailed planning and full control over the project execution.

Facilitate automation using templates:

Advanced workflows allow the import of various spreadsheet-based templates to facilitate automation enable engineers to set up their BIM processes while using well-known spreadsheet tools. Additionally, BEXEL Manager-based templates are used to capture and reuse experts' knowledge and implement it in future projects. All user templates are stored in BEXEL Manager knowledge database.

One group of templates that handles BIM elements, normally contains various attribute-related rules or BIM queries used to identify applicable model, which are then processed according to the specific template: to check whether elements contain requested attributes, check compliance to naming conventions, check if attribute values correspond to predefined lists (ex. rooms schedule, classification coding,...), as well as to enrich element metadata with additional properties and values, to create new rule-based smart selection sets, or generate clash detection jobs.

Another group of templates handles 5D classification and cost items. They are used to enable automated import of an entire existing cost and resource database: classification items with element queries, cost items containing unit price or required resources, element queries and quantity formulas based on model attributes, and resource database with defined unit prices. BEXEL Manager also allows model-derived development of a cost database that uses the most of BIM data to intelligently generate cost items with automatically defined element queries, which then can be adjusted according to applicable rules of measurement by importing corresponding template defining cost items units and quantification formulas.

BEXEL Manager-based templates are used to define and reuse rules for generating custom breakdown structures, quantity takeoffs, as well as construction methodologies, project zones, and schedule creation templates that are used to automatically generate construction schedules.

Smart BEXEL Manager model-derived location-based planning technology enables generation of integrated 4D/5D construction schedules:

1. Based on BIM element attributes and defined rules, quantity takeoff is generated and transferred into 5D cost database with automatically defined element queries that remain the links to BIM model elements throughout any model changes during project execution.
2. Rules of measurement template is applied to automatically fine-tune cost items by implementing relevant quantification formulas and units to respective cost items. Such cost database is then exported into the spreadsheet where unit prices are populated and imported back, and is automatically assigned to BIM model, generating Bill of Quantities.
3. Cost items are used for creating construction methodology defining work sequencing. Methodologies could be reused for projects of similar types and contain all usual planning relations between tasks. Project-specific zoning is separately defined. A detailed construction schedule may have multiple levels of both zonings (buildings, levels, wings, zones) and methodologies, whose outline levels are defined within the creation template used to generate thousands of tasks in a matter of seconds.
4. Each task of generated 4D/5D construction schedule has a link to corresponding model elements, quantities, costs and resources if they were defined in cost database, and extensive schedule analytics is available. Also, the schedule flowline could be analysed and fine-tuned.

Following location-based scheduling principles project zones are created and resources planned in such a way to ensure that activities are executed within a similar duration - "tact", which imitates assembly line principles for the construction projects and have significant benefits in terms of operative planning, imposing expected productivity, risk mitigation, and construction management.

The main desktop BEXEL Manager platform is further extended with cloud-based solutions, BEXEL Viewer, BEXEL Portfolio Manager, BEXEL Common Data Environment, and BEXEL Facility Maintenance.

Progress monitoring workflow starts with generating look-ahead plans separated per zones, cost items, subcontractors, etc. and their BCF exchange. Utilizing BEXEL Viewer, on-site team can alter the planned for execution elements set to match actual progress and send it back via BCF to the office team that will create progress entry, automatically update the construction schedule and get advanced interactive planned vs actual progress reports, and KPI dashboards using MS Power BI, or BEXEL Portfolio Manager that provides various cross-project and multi version analyses.

BEXEL Manager platform fully supports BIM implementation during the entire project lifecycle including creation of a cloud-based database of information and documentation about the as-built project (user manuals, maintenance manuals, technical and photo documentation, guarantees, etc.). Additionally, cloud-based FM plans and cost estimations can be generated. All documents and plans can be linked to respective BIM elements (and assets).

As mentioned before, we believe that our main advantage is an integrated approach and interconnection of multiple BIM data domains and their interdependence enabling various types of BIM analyses, from the very beginning of the project throughout all project stages including FM and operation. Through its API capability, BEXEL Manager allows users to develop a specific procedure that will utilize any subset of the BIM model information database and integrate it with other platforms.

What underlying technology are you using for your solution?

The core component of the entire solution is the Bexel Manager desktop application. It is developed using .NET technologies (primarily C#). Following the best software architecture principles, it is divided into separate layers for data storage, business logic, and user interface. Also, it is composed of a lot of independent modules/components that communicate with each other using their public interfaces. Some of the modules are cloud-based, developed in .NET Core technologies and appropriate service-oriented architecture. Almost all cloud-based modules have available REST API.

Regarding the data storage, all data and analysis are stored on file system by default. Besides the file system, they can be stored on the cloud which enables the environment for working in a team.

The main part of our business logic layer, besides logic for project management, are several powerful engines. They are in charge of model checking, clash detection, budgeting, scheduling, and progress tracking. The business logic and data layer are totally independent of the user interface and the entire application can be executed in the background, without the user interface.

The user interface is done using Win Forms and Telerik components.

The main workflow implemented in this app is to use some externally developed BIM models, do some checks or analyses, and then export results or performed analyzes. Directly supported formats for reading models are IFC2x3 and IFC4. Using our proprietary format BX3, all other formats created in or loaded into Revit or Navisworks can be loaded into the application. Once the analyses are done, they can be exported to the cloud services in order to use data at an expert level. Also, the entire model can be exported to IFC for further use in other BIM softwares.

In addition, Bexel Manager functionalities can be easily enriched or automatized by using an open C# API and add-in system.

openBIM methods used

- ✓ IFC 2x3
- ✓ IFC 4
- ✓ ifcXML
- ✓ bsDD
- ✓ BCF
- ✓ IDM
- ✓ IDS
- ✓ mvdXML
- ✓ COBie

Were there other open data standards used other than those listed above?

Besides commonly used and standardized openBIM methods such as IFC, bsDD, BCF, IDM, etc, one of our primary intentions and goals was to further extend our possibilities and enable common users without any programming/coding background to easily use, edit and exchange information.

Also, the current industry issue is that the openBIM exchange could often be poorly executed because of either poor implementation of the schema by vendors or poor implementation by non-experienced users. For these reasons our platform also allows bi-directional information exchange of any standardized classification system such as OmniClass, Uniclass, Unifomat, etc using the .xlsx file format. Of course, direct information exchange between various open data standards and 3rd party applications or platforms is possible using BEXEL Manager Open API.

Giving a possibility to all users to freely explore, edit and exchange any valuable project information using .xlsx files and utilize any open data standard via known excel file formats gives additional value to the entire process and ensures that all stakeholders can understand and monitor information exchange process and validate their accuracy no matter what software each participant in the project is using.

Another open standard we're implementing in our workflows especially related to automated BIM checks and validation is JSON (JavaScript Object Notation). Due to its relatively simple and understandable syntax, very light size and higher parsing efficiency than XML – we found it a perfect fit for IDS exchange.

Even though it wasn't instrumental in the successful use of openBIM – this approach gave our users additional confidence and understanding that all information exchange requirements can be easily reached. On top of that entire project

knowledge: IDS, Clash detection matrixes, data classifications, rules of measurement, data enrichment templates, etc can be shared via easily understandable and editable commonly used file formats.

## Similar or Comparable Solutions on the market today

Compared with other similar solutions BEXEL Manager is the most comprehensive software solution for the management of construction projects by integrating all of the most important 3D/4D/5D/6D uses of BIM technology. While other softwares are mostly concentrated on specific BIM uses and their capabilities are developed mostly for implementation within specific BIM domain like Clash Detection, 4D Scheduling, BIM checks, Cost estimation, progress tracking or Operation & maintenance.

Our solution utilizes multiple inter-connected BIM data domains in a single software platform. Users can create multiple federated BIM projects and multiple project revisions from an unlimited number of IFC files. The history is saved locally or in a cloud-based environment. All BIM analysis results can be exchanged through openBIM formats.

**Automation:** The software allows data management, automated BIM data checks and BIM data enrichment. A user can generate QTOs based on predefined rules, fully automate schedule creation, or generate automated cost estimation based on any classification systems and rules of measurement. Open formats such as IFC, BCF, JSON are used for data exchange.

**Change management:** BEXEL Manager enables propagation of project changes into BIM models with an automated update of all conducted analyses. Most of other software solutions cannot automatically update previously conducted analyses based on project changes. Bexel automatically identifies BIM model changes and each project version is archived before updates.

**Customization:** BEXEL Manager enables integration of any classification system within BIM model, including Uniformat, MasterFormat, Uniclass, DIN 276 or any non-standard specific Classification System. Additionally, our reporting engine can produce customized reports.

**Integrated 4D/5D:** It is possible to automatically generate schedules with thousands of tasks containing task relations. Task dependencies and links to 3D elements are stored. This allows seamless interoperability with traditional scheduling applications. Fully BIM-based cost classifications can be automatically created. Using custom-defined resources, cost data, and productivity rates it is possible to implement a fully integrated 5D process. Using its intelligent planning workflow a user can develop detailed, Level 5 construction schedules, following location-based planning principles. It allows schedule analyses using a Flowline diagram (Line of Balance) and enables planners to impose high productivity rates by ensuring uniform distribution of resources. This can be automated by using resource leveling and update task duration tools. Utilizing multiple BIM domains BEXEL Manager allows users 20x faster construction schedule generation and 10x faster project budgeting and cost analyses compared to traditional tools. Since multiple data domains are related –model updates and change in each BIM domain has implications and updates all other data domains. Eg. Model or schedule update triggers automated QTO and cost estimation updates. Cash flow and tendering packages are also updated. This approach allows easy generation of look-ahead plans for any period (daily, weekly, monthly...) broken down by various criteria such as: per schedule activity, per subcontractor, per resource, etc. A clear definition of planned tasks, with respective quantities can be easily sent to any project stakeholder, that can report back altering the look-ahead plan with actually performed activities. Data exchange is performed using openBIM formats.

## What added value does your solution give?

Even though BIM workflows significantly improve overall project management processes, due to BIM software limitations and issues with consistent data integration which requires significant time, resources, and discipline, implementation of such workflows could be significantly limited in numerous projects.

The main issues in BIM workflows are:

- inconsistent, non-standardized data that limit the level of BIM implementation
- labor-intensive repetitive tasks that limit the development of detailed quality control analyses, detailed, optimized schedules, and cost classifications
- limited or non-existent knowledge transfer between different stakeholders.

These problems are major obstacles to the successful implementation of BIM on many projects mainly due to the required resources and discipline to implement well structured, consistent data that has to be agreed on the project level before it starts and substantial time in order to control the process and quality of delivered models and data. Even when these processes are well implemented, the creation of the BIM cost database and construction schedules require yet additional effort, a significant amount of working hours due to numerous repetitive tasks, and a very limited amount of knowledge transfer from project to project and between different teams and stakeholders.

Our solution addresses all these issues through integrated knowledge-based automation that is available throughout the whole project life-cycle. From the early stages of the project, the user is able to use predefined, standardized knowledge templates in order to organize and control the quality of BIM data. Using advanced Data Enrichment process and integration with bSDD, custom project data could be easily integrated into the model relying on well-structured standardized IFC parameters which serve as the universal "BIM language" through which different custom databases could be assigned to every BIM model. Through the process of Data validation and predefined Clash analyses, the quality control process is highly automated and based on predefined knowledge templates. Cost Data integration and Scheduling process are also highly automated and allow quick creation of multiple what-if scenarios, extensive optimization, and ensure high precision in project management and control process.

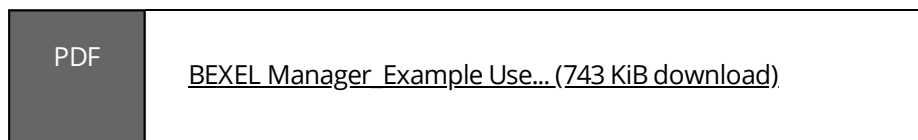
Throughout all phases and processes, the user is able to use predefined knowledge templates, to change it, customize it, save and exchange with other participants in the project. As a result, knowledge is easily exchanged between different teams, and between different projects and enables synergy of various experts and saving time previously lost in repetitive, non-efficient tasks and workflows and leaving it for creative thinking and problem-solving.

The new integrated BIM approach can significantly reduce labor hours lost in inefficient project management and planning, reduce risks related to unrealistic schedules, imprecise analytics of project KPIs, and improve coordination, collaboration, and knowledge transfer between experts. All of this would result in an improvement in the efficiency and productivity of the whole industry.

## Results In Practice

Stakeholder statements are provided as a single pdf file, in the attachment.

## Example Use



## What is the accessibility of your solution?

BEXEL Manager's fully integrated openBIM approach and advanced 4D/5D planning engines affect more than project BIM workflows since it changes the perspective of data-driven construction management by putting an integrated 3D/4D/5D BIM model in the core of it. With its wide span of features, BEXEL Manager involves all stakeholders of a construction project, enabling each project role to benefit from centralized and trustworthy information:

Design teams can utilize BEXEL Manager to federate hundreds of IFC models, and automate data enrichment to improve model datasets, while BIM coordinators can check compliancy and consistency of model data and naming with Information Delivery Specification and naming conventions, both within standardized template-based workflows;

- Quantity surveyors and estimators can implement local rules of measurement and develop a work breakdown structure, and cost database, generating a Bill of quantities automatically linked to BIM model elements;
- Using BEXEL Manager, planners can define construction zoning and methodologies to crate very detailed 4D/5D construction schedules with thousands of tasks and multi-domain information available within each task;
- Procurement and financial departments can utilize an integrated 3D/4D/5D BIM model to check cash flows and material needs, creating their own plans;
- Having precise information about quantities, location, and complexity for each task or cost item, Project managers can negotiate better as well as benefit from improved communication in terms of assigning tasks and operative plans to

specific contractors using look-ahead plans;

- On-site team also benefits from look-ahead plans using them to better prepare and organize work activities and easily report progress and generated trustworthy payment certificates that are approved more efficiently;
- BEXEL Manager advanced progress reporting and analytics help project manager to navigate the project towards success within time, budget, and quality constraints, while top management gets clear insight into project key performance indicators;
- Integrated 4D/5D BEXEL Manager BIM model represents a valuable database for any delay analysis or claim resolution;
- Finally, the project team can utilize the BEXEL Manager model as a central database for the project handover, by linking all relevant as-built documentation and information to corresponding BIM model elements;
- Facility operators can further utilize the BEXEL Manager platform to develop and track long-term facility maintenance plans.

Offering so many potential BIM uses throughout the entire project lifecycle, BEXEL Manager is a commercial platform offered within various subscription formats, including broad company packages that enable every team member to benefit from integrated openBIM technology and project management workflows in the way applicable to their scope of activities. In that way, BEXEL Manager indeed transforms the industry towards the implementation of smart digital openBIM workflows.

What are next steps and future developments of your solution?

Thanks to its robust and flexible data layer BEXEL Manager is being actively developed in many different areas such as following openBIM standards updates and initiatives, enabling even more automation and smart workflows, implementation of machine learning and artificial intelligence algorithms, development of cloud-based solutions, integration with various external databases and tools, and more. We are involved in multiple research projects in the fields of sustainability, sensor data integration and digital twins analysing and showcasing various BIM implementations and developing open APIs.

Currently, BEXEL Manager supports IFC4, however, due to standard updates and our dedication to support all project types including infrastructure, we are actively participating in the buildingSMART working groups and will be releasing implementations of new IFC standards and candidates. We are planning to update our solution to supporting an IFC4.3 and continue to follow guidelines for 5.0 implementation progressively. Also, we are implementing bSDD integration and developing tools for further BEXEL Manager integrations and connections with other cloud-based databases and standards. Further, we are leading the buildingSMART Construction Room project for development of 4D/5D IDM/MVD that should enable exchanging true BIM-based information that will persist important semantic data such as connection of the schedule and the BoQ estimate and connection of BoQ items to the BIM model. Additionally, we are following various buildingSMART projects such as openCDE API whose results we are planning to integrate with our solutions.

The initial version of our new cloud-based BEXEL Viewer is recently released connecting our client-based BEXEL Manager platform and bridging the gap between office and on-site collaboration enabling real-time data exchange between all stakeholders. The system supports IFC and BCF standards. It facilitates various BIM project management workflows and will supplement our reporting systems with interactive BIM model visualizations, and will be integrated with our cloud-based document management and facility management systems.

We are releasing another cloud-based solution, BEXEL Portfolio Manager, that will enable a truly BIM-based project and portfolio management since it collects all the BIM data from multiple projects and multiple revisions of any project, offering an overview of the most important insights and KPIs. All published information can be stored in a cloud-based database which could be hosted on the client premises as well. Further, all published data can be accessed using BEXEL REST API, so the possibilities for customizations or integration with other applications are limitless so users can create their information exchange ecosystem.

This gives you an idea of almost infinite possibilities of BIM integration using our integrated BIM platform and connection with cloud-based reporting systems. We strongly believe this could greatly improve information exchange and information analysis processes and contribute to industry digital transformation and evolution of smart efficient collaboration and workflows. We are devoted to sharing knowledge and providing additional value to all our customers, partners and users. We will keep improving our solutions answering the ever-changing market requests and growing customers' needs, and providing and updating our knowledge, templates, tools and resources database.



What is potentially possible in the future?

We believe that standardization and automation drive efficiency. That is why we stand that integrated BIM environment shall be the core of construction planning and management processes, offering a single reliable source of project information to all project stakeholders throughout the entire project lifecycle. BEXEL Manager vision is to enable project teams to benefit from engaging massive computing power, smart engines and algorithms, and flawless integration between various openBIM tools within well-designed digital workflows that utilize easily customizable knowledge templates, and deliver various project analyses and results that enable successful project management.

We are on the right path to enabling a fully automated BIM-based construction planning and management process on the back of IFC schema and open BIM standards. From IFC file(s) to fully developed, detailed and feasible construction schedule and construction simulation in a matter of minutes by going through a simple wizard providing basic project information and selecting applicable rules of measurement knowledge templates, etc. By ensuring automated model data consistency checks based on defined Information Delivery Specification, as well as automated model data enrichment based on bSDD service we can get a standardized input for smart automated planning. The workflow further utilizes the classification defined within IFC standard as the basis for the rule-based generation of work breakdown structure using additional available properties and selected rules of measurement. The developed structure of the project budget is used to automatically generate the construction schedule by creating project zones based on the user inputs and implementing the selected predefined construction methodologies applicable for specific project type, and tact duration. Weeks and months of repetitive work are therefore automated and results are delivered in a matter of minutes so it can be further optimized or another scenario could be run. Construction plan presented in the form of flowline (line of balance), Gantt chart and 4D/5D construction simulation, together with charts of quantities, costs and resource needs on a monthly or a weekly basis, enables a full understanding of generated results.

Separately from described innovative workflow, our cloud-based portfolio management tool will offer more than important project and portfolio management KPIs and reporting dashboards. The cloud-based multi-project and multi-version BIM database with so many data domains and available through BEXEL REST API will enable a vast variety of potential innovative uses. Valuable cross-project analytics and benchmarking, cross-domain big data processing with the implementation of machine learning and artificial intelligence algorithms will enable various forecasting or anomaly detection or multi-objective programming algorithms to be established providing various predictions, automated warnings and notifications, or offering optimizations.

Make the case for why your solution should win.

BEXEL Manager focuses on the high utilization of available BIM data and releasing the full potential of the BIM model. The pillars of the solution are ensuring BIM data consistency, flawless interoperability based on open standards, capturing and reusing expert knowledge as well as growing the knowledge database, the innovative technology offering smart automated workflows, and delivery of trustworthy and usable results and analyses that enable data-driven construction management.

BEXEL Manager robust and flexible data layer provides an integrated environment of multiple data domains which allows a multitude of cross-domain analyses as well as offers open API. These allow users to improve management of project activities, mitigate project risks, and ensure well-directed top management engagement in order to increase productivity, lower waste and achieve overall better project results.

Further, the platform offers smart innovative engines, and advanced and integrated BIM workflows of information management, project planning, monitoring, and reporting that are second to none. Its location-based planning approach makes the most of the BIM model and generates information-rich construction schedules, at the level of detail and information that would require huge effort with the use of common tools.

Thanks to its wide span of functionalities, BEXEL Manager offers BIM benefits to the vast variety of project stakeholders, as well as the project roles. While innovative, BEXEL Manager template-based automated workflows can import rules and expert knowledge in a form of simple spreadsheets. This way it enables a wide range of engineering staff to contribute to the BIM project management process. At the same time, the platform supports JSON scripts or C# API scripts and Add-Ins development as well.

BEXEL Manager platform puts the integrated 3D/4D/5D BIM model at the core of the construction execution phase through advanced progress monitoring and reporting workflows. Based on detailed construction schedules, the platform enables generation of BIM look-ahead plans and implementation of advanced work packaging approach, allowing project managers to make short-term operative plans and assign tasks to project stakeholders, therefore, getting full control over the project execution.

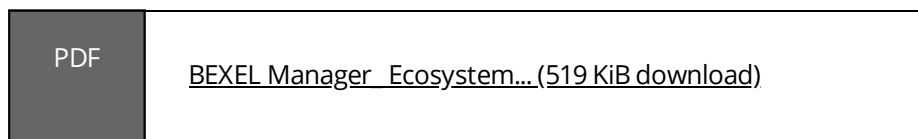
Well-tailored cloud-based solutions further build on the functionalities of the platform. Online viewer, perfectly fits into the look-ahead-based BIM progress monitoring workflow that utilizes BCF exchange to connect a client-based platform with an online solution easily accessible on-site using mobile devices. Based on actual element-based progress inputs, monthly payment certificates are exported and a variety of reports and KPI dashboards, including up-to-date earned value analysis, SPI and CPI are available. Portfolio manager provides the multi-project, multi-version, multi-domain BIM database in the cloud-based environment with available REST API, offering limitless integration and analysis possibilities.

BEXEL Manager platform stays on top of openBIM standards and supports their further development. It delivers real tangible project benefits of BIM implementation, and offers a variety of optimization and productivity improvements throughout the entire project lifecycle, therefore engaging the entire project management community into the BIM process and accelerating the digital transformation of the construction sector.

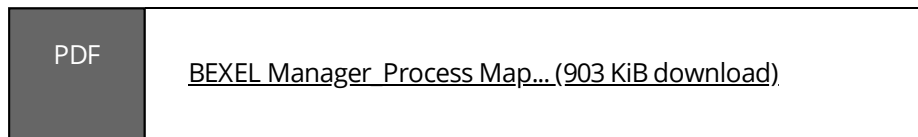
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## openBIM Evidence

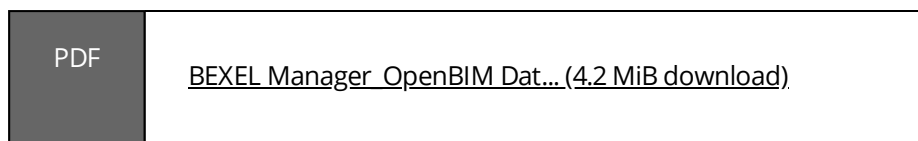
### Software Ecosystem Map



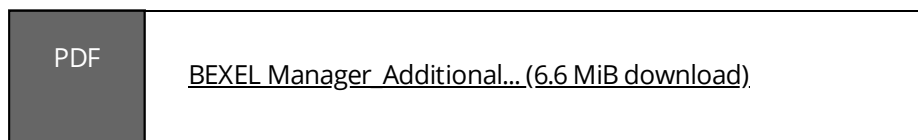
### Process Maps



### openBIM Data Metrics Summary



### Additional openBIM Supporting Evidence



### Lessons Learned

The use and implementation of our technology solution in very different types of projects (high-rise buildings, hotels, highways, railways, tunnels, sports venues, etc.) where various construction standards, principles, classifications and information were used and successfully exchanged gave us confidence and proved the quality of our solution. Positive feedback from our clients gives us confirmation of the potential of our platform and boosts our dedication to its further development and improvements related to openBIM.

We know that technologies and processes will be only improved in the future, but we also understand that currently IFC is the only available solution for successful data exchange.

The main lesson learned during the implementation of our tool was to understand the needs and doubts of our clients related to digital transformation and implementation, especially related to all possible uses of data and more specifically various ways to save, preserve and exchange data using openBIM.

Another issue we faced was a variety of solutions and schemes used in the project. Infrastructure projects struggle with vendors and their attempts to implement the IFC4.3 schema, on the other hand, common construction projects are utilizing a mixture of IFC2x3 and IFC4 schemas, which also makes additional issues in the creating a unique workflow and guidelines to properly check and validate all information in one federated project when different trades are using different schemas.

As a software developer, we hope that the official openBIM standard releases will be updated more frequently to engage more software vendors to join, test and release respective solutions supporting the latest standards.

Upload .ifc file(s) or other technical files to support validation of the research results.

<https://service.usbim.com/link/62b2fb4c17de4e5512f89fe9>

## Use Cases

BIM Uses were defined on the project | ✓

BIM Uses formed an integral part to how the project was delivered | ✓

I agree to be contacted for more information about the project BIM uses outside of this awards program. | ✓

Log in to [awards.buildingsmart.org](https://awards.buildingsmart.org) to see complete entry attachments.

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<a href="#">buildingSMART I...</a> 886 KiB

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Image
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<a href="#">01 IFC Import.png</a> 497 KiB

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<a href="#">02 IFC.propertie...</a> 1.2 MiB

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[07 QTO.png](#) 1.0 MiB



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[08 Cost wizard.p...](#) 1.1 MiB



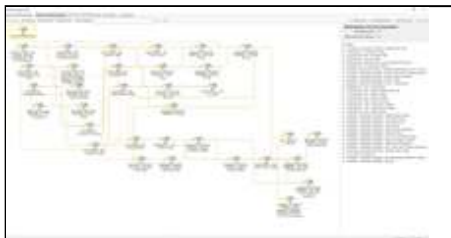
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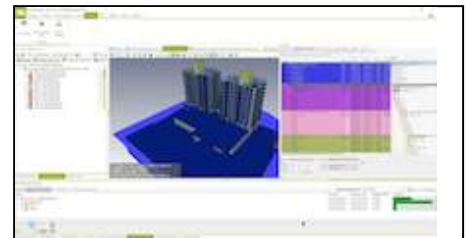
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[12 LOB.png](#) 1,013 KiB



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[14 Construction...](#) 778 KiB



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[15 Progress trac...](#) 1.7 MiB



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[16 Progress trac...](#) 1.5 MiB



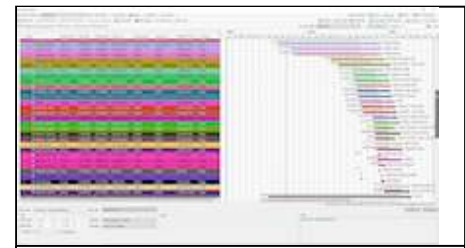
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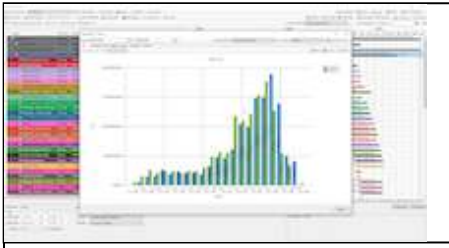
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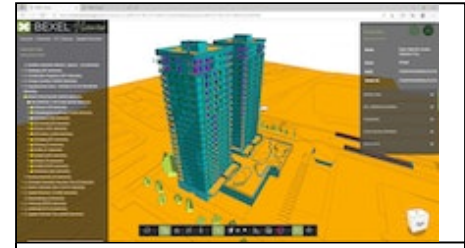
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[20 Reporting.png](#) 1.3 MiB



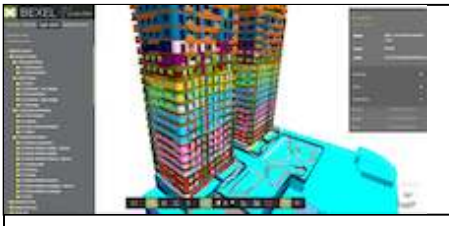
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[21 Reporting.png](#) 1.0 MiB



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[22 BEXEL Viewer...](#) 1.1 MiB



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[23 BEXEL Viewer...](#) 750 KiB



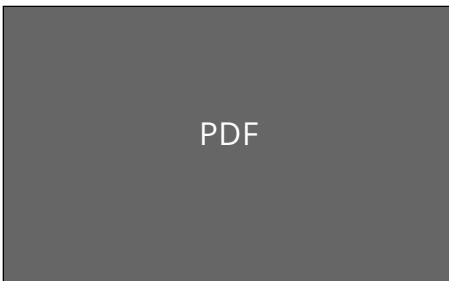
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Type of attachment  
Technical Documentation

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