buildingSMART International (2022)
367-TECHNOLOGY Technology Solution using openBIM

usBIM.extender

Entrant details

Role or Job Title on the Project	Project Manager

Employer

ACCA Software S.p.A.

Contrada Rosole 13,
83043 BAGNOLI IRPINO (AV) - Italy

Employer Role	Technology or Software Development Company
Are you or your employer a member of buildingSMART?	Yes - Sponsor Member (Standard, Multinational or Strategic)

Entry details

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.
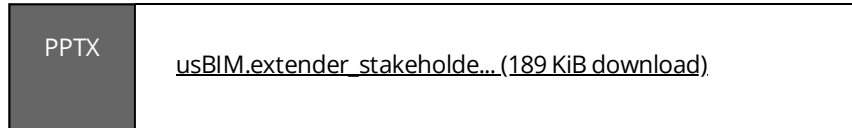openBIM is about setting up an environment where every party in a team can work in the optimal way ("how they prefer") without putting limitations on others.
It is about freedom to take control over your data and workflows, while keeping that freedom for others as well. Full use of open standards is not mandatory for this mission.

✓

Website	↗ https://www.accasoftware.com/en/bim-management-system

Location

Contrada Rosole 13 - 83043 BAGNOLI IRPINO (AV)
Italy

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

| PPTX | usBIM.extender_stakeholde... (189 KiB download) |

Entry Description

usBIM.extender is a collection of BIM Tools that operates on the IFC and BCF file format, and uses other standard open formats and services, such as IDS, bSDD and openCDE, allowing the collaboration and contribution of all the actors involved in open data exchanges and workflows with their expertise, hence being faithful to openBIM principles of interoperability, opennes, reliability, collaboration, flexibility and long term sustainability. The IFC models are hence considered not anymore a static snapshot in time of the built asset, but something dynamic, that evolves over time thanks to the contribution of all the actors involved in any phase of the project. usBIM.extender allows to operate on such digital representation of the Digital Twin of the built asset and update it in real-time, in order to keep it updated to always reflect the actual state of the asset it represents.

usBIM.extender is a collection of Tools, and new Tools are added to the usBIM family when new use-cases arises from customers, as well as when new open standards are deployed by the buildingSMART community. Such Tools hence solve real problems based on real use-cases, and represent the cutting edge technology regarding openBIM.

usBIM.extender is a collection of 12 tools working with standard open formats:

1. usBIM.editor: Tool for editing BIM models directly in IFC format, edit names, properties, geometries, etc. of the entities of an IFC model and generate a new IFC model with the updates.
2. usBIM.classification: Tool for editing classifications of an IFC model entities and to generate a new IFC model with the updates.
3. usBIM.refactor: Tool for refactoring and/or merge of IFC models. Allows to reuse the geometry of one or more IFC files to create a new IFC file (also in a different version: 2x3; 4; 4.3), reorganizing spatial structure, redefining IFC classes and entities properties.
4. usBIM.ids: Tool to verify the properties of the entities of a BIM model in IFC format, manually with filtering and advanced functions or automatically with the use of IDS standard (Information Delivery Specification) files.
5. usBIM.bSDD: Tool to create new data dictionary for the buildingSMART Data Dictionary (bSDD) online service and to enrich IFC models with classifications and properties using bSDD with a standardized workflow that ensures data quality and information consistency.
6. usBIM.openCDE: Tool for connection to and from other Common Data Environments (CDE) for seamless documents exchanges and data workflow.
7. usBIM.clash: Tool for clash detection that highlights geometries conflicts between federations of BIM models in IFC format with the generation of check reports and BCF files (BIM Collaboration Format).
8. usBIM.compare: Tool for comparing different versions of a BIM model to catch immediatly differences in IFC files in terms of geometries and/or data.
9. usBIM.reality: Tool to navigate BIM models with virtual reality or with real-time rendering. The Tool is available on any 3D model in IFC format. For virtual reality a proper VR headset is required.
10. usBIM.render: Tool to create professional photorealistic and real-time renderings of BIM models in IFC format directly online in your browser.
11. usBIM.bcf: Tool to manage project communication with the use of BIM Collaboration Format (BCF) to discuss and solve issues in BIM models in IFC format.
12. usBIM.reclass: Tool to change IFC entities classes in order to add semantic meaning to BIM models in IFC format.

BIM (Building Information Modeling) is a process that is based on cooperation, collaboration and communication using digital technologies.
Everyone involved in the construction information model creation process must be able to record, modify, verify and access data and information.
It is clear that one of the greatest advantages of openBIM is precisely the greater accessibility to the data. usBIM.extender marries this philosophy because the BIM process is not blocked by the need to use specific software for information management.

The use of usBIM.extender achieves many benefits and openBIM is at their foundation:

Every actor involved in the process of digitalization of a new and existing asset, can use one or more Tool that allows to operate on the models in IFC format, so that the users are not obliged to use the same software that creates the model in the first hand, in order to

edit it along the way.

Even more importantly, the users, and hence the client/stakeholder of the digitalized assets, are the real propertietary of the data, because there is no need to have software license to access them: they are in an open format.

In case the users find other, better tools for their specific activities, they can replace them without any issue.

Each Tool is specialized in some kind of activities, hence trying to solve it at its best. There is no software that does it all, but specialized software for every need.

Collaboration is with everyone, and not only with people who use the same software.

Analisys, verification, data analysis and aggregation is always possible on open data, in order to improve work quality.

Ultimately, more software means more competition and hence less costs, software is never obsolete, and innovative software can be developed that make the best out of openBIM standards.

These and many more are the achievements possible with the use of an ecosystem of Tools that operates on open data formats such as usBIM.extender.

What stage of completion is the entry content representing?	usBIM.extender is part of the usBIM family, ACCA's commercial CDE IFC certified from buildingSMART. Most of the Tools presented are already commercially available, some others are under development and, of course, many others will be added in order to satisfy growing customers needs regarding open standards workflows. They are all part of the usBIM cloud solution.

Stakeholder Statements

"usBIM.extender allows to realize, in practice, the open digital strategy envisioned by Stakeholders, Clients, BIM Managers and all actors involved during all the life-cycle of any built asset. It is possible to combine the use of one or more of such Tools that operates on open formats in order to bring your openBIM workflows to life." Michelangelo Cianciulli, openBIM & IFC expert at ACCA.

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

MP4	usBIMextender_intro.mp4 (4.4 MiB download)
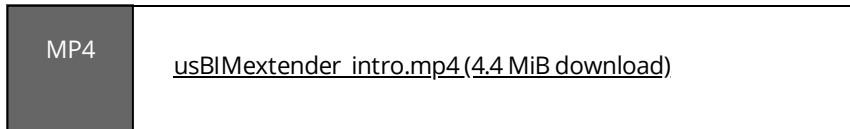
Technology Solution Description

The usBIM.extender solution is about the idea that openBIM standards, and in particular IFC, should be considered more and more as the dynamic representation of the built asset that should evolve over time with the day to day changes that tipically happen during all the phases of the construction project (design, construction, operation, etc.). Any participant of the project, should be able to contribute with his/her expertise to the enrichment of the models, and should be able to do so with any tool of choice and always using open data formats. Such models, which are kept up-to date individually, are then federated together with all the documentation and other models produced, such as Cloud Points, PDFs, 2D Drawings, 360 Photos, etc. representing the Digital Twin that will always reflect such updates, making it always the real-time digital representation of the asset using the most up-to date informations available. Such models can be then also connected to external systems, such as IoT and Asset/Facility Management systems, with the use of dedicated connectors developed with the use of APIs. At any point, there should be always the possibility to use any kind of tool in order to check the content of the models, elaborate them, and produce analysis and outputs that would give insights to keep the open data quality bar very high, and steer the project decisions in different possible directions, regardless of the single software that is used for creating the models on the first hand.

usBIM.extender is a collection of Tools that operates on openBIM standard to make this vision a reality. It is part of an ecosystem where the open data flows between different applications and different actors involved in any possible workflow. Such workflows, possibily decided and created at a higher level, represent in fact the digital strategy set-up by the company/stakeholder. usBIM.extender allows to realize such strategy in practice using exclusively open data formats.

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What underlying technology are you using for your solution?

In usBIM.extender, the (open) data can have different flows, as different tools may be involved. The typical scenario involves one user that operates with one or more of the Tools, usually on one or more IFC models. Such IFC models are initially uploaded on usBIM (possibly downloaded from other CDEs with the use of openCDE APIs), where can be visualized and shared with other actors involved. At any point, any of the Tools can operate directly on the models: it is opened for visualization, and a dedicated UI for each different Tool allows the users to edit the model. The UX is kept as simple as possible, and different actors may also interact at the same time on the same model. When editing is finished, a new version of the model is created, with all the updated informations, and can be for example downloaded or transfered to other CDEs (with the openCDE APIs) in order to continue with the open data workflow, or exchanged with other actors to continue in the data flow. Every Tool that updates the IFC file, in particular, uses the usIFC.server technology (buildingSMART Awards Winner in 2020), which is a dedicated IFC server for editing the model, transforming it from the static snapshot in time of the asset that the IFC model digitalizes, into a dynamic model that evolves over time. Other Tools may not require editing, but may gather data from one or different models, elaborate on such data, and possibly produce reports in the form of JPEG, PNG, PDF, CSV or BCF files. These resulting files are stored on the CDE workspace and can be downloaded/shared aswell.

openBIM methods used	
	✓ IFC 2x3
	✓ IFC 4
	✓ bSDD
	✓ BCF
	✓ IDS

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

Json for API data exchanges, XML for storing classification systems, OmniClass, UniClass, MasterFormat, etc. as part of the classification systems and part of the buildingSMART Data Dictionary. These in particular were not instrumental in the successful implementation of the Tools from a technical point of view, but are foundamental for a successful use of the openBIM for the end users, allowing to classify entity and object models accoring to national and international standards, hence raising the quality of the openBIM data in the actual projects.

Similar or Comparable Solutions on the market today

usBIM.extender is an ecosystem of applications that operates on open formats and allows to realize openBIM digital strategies in practice. At its foundation there are usBIM, the BIM management system for the digitization of constructions and infrastructures and usIFC.server, which allows for dynamic editing of IFC models. On top of that, Tools with specific functionalities allows users to think about and create any kind of workflow that involves the use of openBIM data. Everything is in the cloud, and only a web browser is required. Nothing has to be installed, and applications are kept updated automatically. usBIM.extender is an ever evolving ecosystem, where user needs are listened to, and specific new solutions are developed for their needs. Each new Tool may solve a problem on its own, and be combined with the use of other Tools aswell, in fact multiplying the possibilities (and solutions) for the end users. All the processes and workflows can then be automatized thanks to the use of dedicated APIs, and specific clients can be developed from stakeholders and end users to automatize their jobs. All of this makes usBIM.extender quite an unique solution on the market today, that covers any aspect of the BIM management process with the use of open formats.

What added value does your solution give?

usBIM.extender solves the problem of having the possibility to operate on open formats for any reason from any actor possibly involved in the construction process. Contrary to what usually happens, the Tools exclusively operates on open formats, and in particular on IFC models, allowing to create flows of open data between different actors. Most of the open data flows that we see today, are producer/consumer kind of flows, where a single producer produces data, exports it in IFC open format, and then one or more consumers operate on such data. While that data is in open format, which is already a big step forward, such data is most of the time static, in the sense that any change requires to use the same software that produced the data to change its internal, proprietary state, and then export a different version of the open data again. What is missing, in this flow, is that between the production and the use of such open data, many can be the actors involved which, with different specialization, can enrich such models and associated data to have the contribution of all the actors involved before the actual usage of the data itself. All of this can be done using different software and tools among the different actors, as the open formats are accessible and editable from anyone. This brings real collaboration and openBIM workflows to life. If we also think long term (think about years after the handover), then most if not all the built assets will have a operational life span which is much larger then the construction phases of the project. This means that operations needs to be done on the models, and updates and changes will occour frequently and from many different actors. Data needs to be updated in many ways, with different tools and with different frequency. Everyone should be able to do so indipendently, but should be aware of the changes of each others and, when necessary, such updated data needs to be used for different purposes, checking, and so on. Having tools that operates on open data is a necessity for both short and long term open data strategies, and the added value of usBIM.extender is that it does exactly that: allows to bring open data strategies and workflows to life.

Results In Practice

Poste Italiane:

Poste Italiane is one of the main owners of private real estate assets in Italy with 158 years of history, a network of over 12,800 Post Offices, approximately 130,000 employees, 536 billion euros of total financial assets and 35 million customers, Poste Italiane is integral part of the economic, social and productive fabric of the country.

With the aim of implementing BIM to support the procurement, design and management phase of its assets, the customer made use of the usBIM solution for the management, updating and consultation of information relating to the BIM process using open formats and interoperability logics.

The intent is to be able to manage the real estate assets throughout the life cycle of the assets, from the design and construction of new buildings to the maintenance and management of existing ones.

Poste Italiane, to deal with the introduction of the BIM methodology as a new modus operandi in its organization, has equipped itself with a CDE for the management, updating and consultation of its IFC models.

The implementation carried out allows to adapt the current processes in place at the company to those of the openBIM, promptly introducing functional services to support the new deliverables.

ANAS:
New Service Implementation based on IDS to grant BIM Models QA.

ANAS is a joint-stock company, part of the Ferrovie dello Stato Group, which manages approximately 30.000 kilometers of Italy's national road and motorway network.
This important customer has moved out to BIM tender phase to start digitizing its assets. ANAS did an excellent work to define and

come out with their EIR and LOIN, according to IFC schema.

We worked together to implement a new service that automates the QA & QC (Quality Assurance and Quality Control) processes and eases the operators to prompt informing a BIM model, directly using an IFC-based service and using the new buildingSMART IDS standard for Information Delivery Specification.

Example Use

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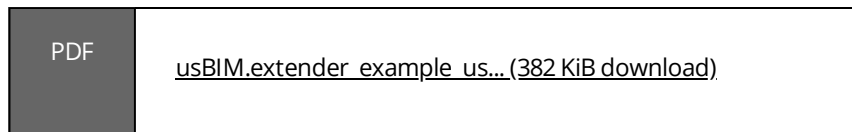
What is the accessibility of your solution?

usBIM.extender is part of the usBIM family, ACCA's CDE, IFC certified from buildingSMART, which is the foundation where all the Tools are built on. Each one of the Tool is distributed separately, some of them are available for free, while others can be purchased, after a free trial period, from the usBIM.store directly from the users of the CDE within a couple of clicks. This means that the Tools are immediately available for use and that every customer can decide which Tools are needed for their purposes. usBIM itself is available also with a free plan. Everything is online in the cloud, which means that it is not even needed to install anything on local machines, and the applications are constantly updated automatically. This allows maximum speed and spreading possibilities into the market, and, most importantly, allows customers to choose what they really need with ease.

What are next steps and future developments of your solution?

Today, we see more awareness from clients and stakeholders about their digital strategy using open data formats, and they can see the endless benefits that such strategies can bring to their businesses in the long term. There is also much more experience from users, which are more aware of the openBIM technologies and methodologies, also thanks to the buildingSMART Professional Certification program, which is raising the knowledge on such topics. BIM Managers and other managerial roles, on the other hand, can set-up strategies and standardize the way they require the data in open formats from different actors, and can be confident that the data is delivered in such way as they can semi-automatize quality controls and quality checkings, and can ultimately think about long term strategy of aggregation of such data, use of such data in the operational phases, and have the freedom of thinking out of the box on whatever they would like to do and accomplish with the use of their data. All of this is possible because the data is in open format, and this means that anyone can develop Tools that operates on such data: usBIM.extender is exactly this, a series of Tools that operates on open formats according to user needs, and new Tools will be created to solve the arising needs to come: this is an ever-evolving ecosystem. Such Tools provide solutions to practical problems for end-users, that are identified from real world use-cases and transformed into applications that help in solve their needs in a standard way, using open formats.

What is potentially possible in the future?

usBIM.extender is already delivering many solutions for common use-cases but this is just the beginning. Open data strategies are arising, and clients/stakeholders are putting this strategies into action. While the industry may still be in the phase where models are being required, more and more are being produced, according to different needs, in increasing complexity from geometrical and informational point of view. New use-cases arises daily, as, once in action, such strategies open the users mind on new possibilities and benefits for their businesses. Aggregation of the models, data analysis, predictive maintenance, use of Artificial Intelligence algorithms for insights, and many other similar uses are not so unreachable exactly because the models are in open format and structured as required, independently of the software that produced them. The existing Tools allow to enrich them and make them adhere to the data requirements, making possible the aforementioned use-cases based on a proper common data strategy decided that is independent of the single software or tool used, but that makes the open data central to every process, and not any of the software used for creating or manipulating the open data. Also, these services can certainly be used to innovate legacy systems already available within complex organizations and adapt them to standards and workflows that support openBIM without unsustainable technological replacements. On the other hand, due to their nature and conception in the form of microservices, they can equally be used by professionals, and by micro enterprises that constitutes most of the companies that make up the construction supply chain, individually or combined, enabling the possibility of applying the principles of openBIM to all stakeholders without economic constraints.

Make the case for why your solution should win.

The solution should win because it is an unicum in its kind and brings state-of-the-art tools and services to the field based on the latest discoveries in terms of standards, technologies and methodologies, while keeping intact the principles of sustainability and

interoperability promoted by buildingSMART International. It allows to create and carry out, in practice, your openBIM digital strategy.

usBIM.extender marries the philosophy of openBIM and open standards, where data is at the center, and not software.

This allows companies to step into the digitalization revolution with the certainty that this will bring so many benefits and ROIs, while being able to express clearly their company needs that then they will see solved in practice with new Tools. or Tools that operates on open standards. This is a vision that more and more companies have understood the importance of, and companies are investing time, money, and, most importantly, expertise and experience in order to set up an openBIM digital strategy that will be crucial in the near future.

Having Tools that already allow to conduct experiments and see, in practice, that many of the things envisioned are already possible, and that many more can be accomplished with new software solution is a fuel for this process that will ultimately lead to better, high quality and automated work, while also giving insights on how to improve even more.

These and others are the benefits in using such kind of solutions:

- Any software can be used to produce, read and manage data
- Client/Stakeholder is real owner of the data, because access is not dependent on any software
- Any software can be used and switched for a better one when needed
- Software is very specific for each need, but data model is common to anyone
- Data access is guaranteed over time, without software license, because data is in open format
- Workflows are independent of the software used
- Collaboration is guaranteed over data, not over software
- Data aggregation and analysis from different models is always possible, because data is in open format
- Data can be cross-checked and verified, for even more results quality
- Automatic and semi-automatic data analysis and verification is on the data, because data is structured as planned
- Software and Tools costs less, because there is more market competition, and more software to choose from for each need
- Productivity increases, because specialized tools will do every single aspects of the work
- Software and Tools will always improve, because competition stimulates developments.

usBIM.extender is a sneak peek into the future, where companies can already lead out their digital strategy in practice, directly in open standards, and users can try out new Tools for optimizing their work and their habits, in order for them to produce better quality models and data, in accordance to stakeholder needs and requirements. It allows hence to have a complete different vision on digitalization strategies, and to already bring such strategy to life.
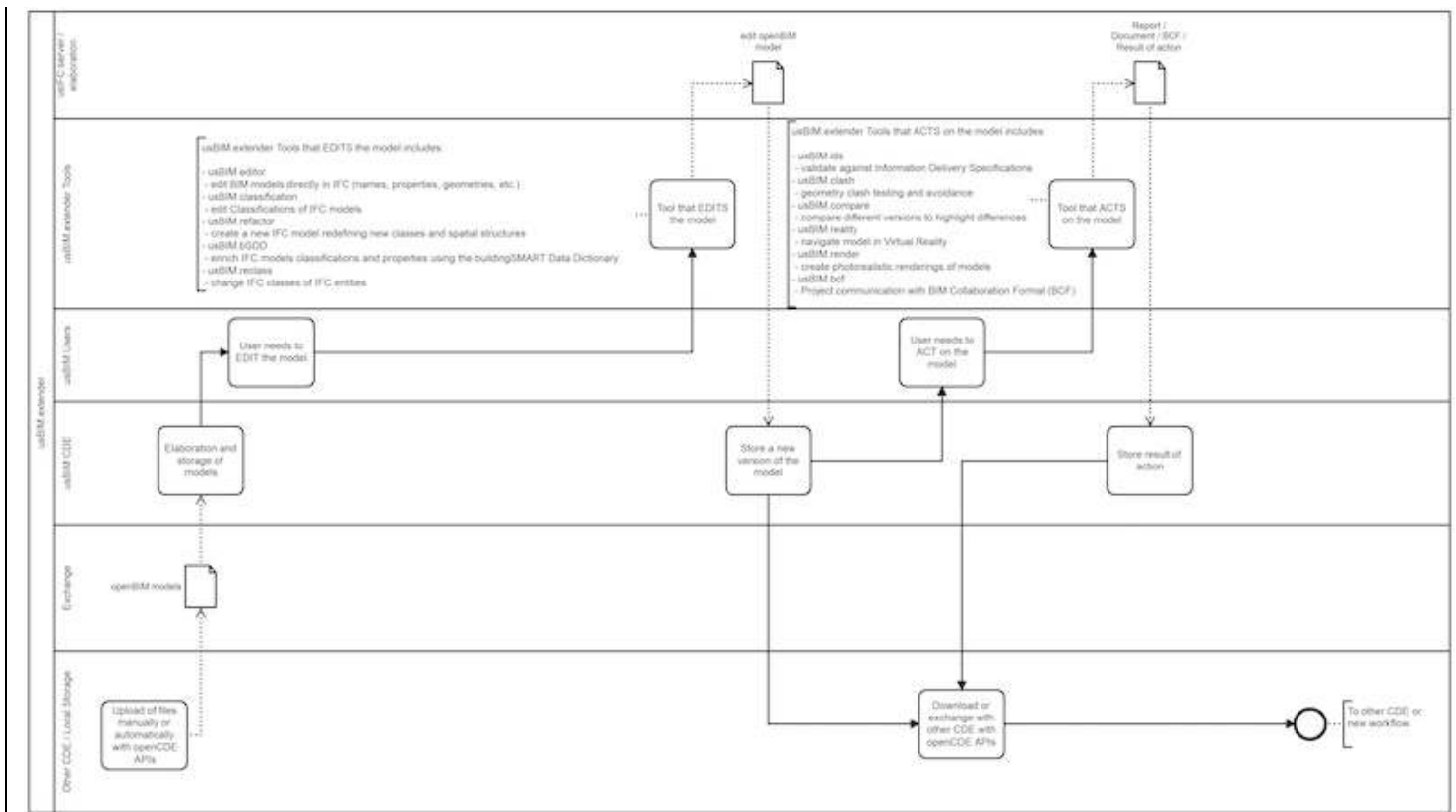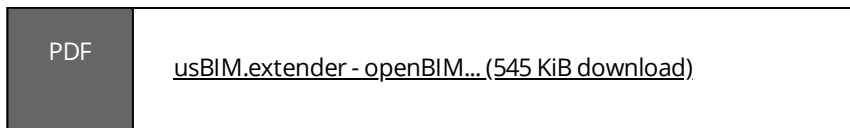
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openBIM Evidence

Software Ecosystem Map
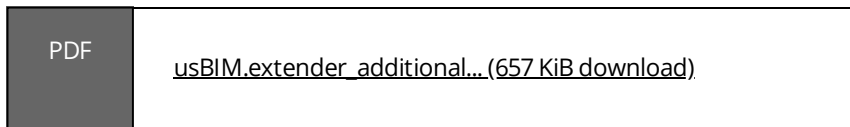
PDF	usBIM.extender_software_e... (619 KiB download)
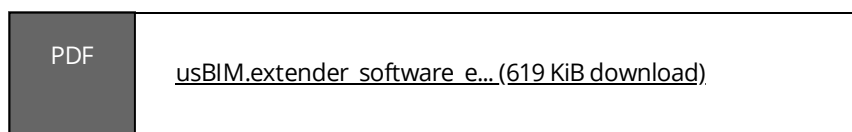
Process Maps

openBIM Data Metrics Summary

PDF	usBIM.extender - openBIM... (545 KiB download)

Additional openBIM Supporting Evidence

PDF	usBIM.extender_additional... (657 KiB download)

Lessons Learned

The usBIM.extender developments follow closely ACCA understanding and interpretation of openBIM methodologies and technologies, and how we, as software vendors, provide solutions for end users that are easy to use, but solve common problems that are arising in digitalization strategies with open standards. The openBIM community is growing not only in numbers, but also in experience and expertise. The feedback we receive from such customers is precious, as it represents the base on which we develop new solutions. This gives us the possibility to understand real world needs that we can then try to solve with our ideas and tools that we propose. The users, on the other end, find an easy to use and convenient solution to their problems and needs. This feedback loop allows both us as software vendors and them as end users to grow with respect to openBIM digitalization strategies. Much we have already learned, but we expect to learn much more in the time being. As a recommendation on what to apply to a next project from our customers, we would recommend to use the tools and strategies that worked well in the past, but also always try to integrate new tools and ideas in their digitalization processes. This is because there is no estabiished strategy that works well everytime and for every project, and so a mix of exploration, where the customers experiments with new possible ideas, and exploitation, where what has worked best in the past is kept, could be key to a better digitalization strategy over time.

This would also be the recommendation for buildingSMART, to understand the needs and feedbacks from clients and stakeholders, and propose digitalization strategies and ideas to make them better, and create new standards in order to standardize new open data flows that are arising. But this is exactly what buildingSMART is already doing, because for creating new developments, use-cases are central for the development of any solution proposed by bSI, and this seems to have worked quite well so far.

"We were able to identify where we need openBIM to develop further."

The main need identified is about the IFC schema that is still quite complex and doesn't help in managing updates and changes in the model, making it difficult (but not impossible) to make it dynamic rather then static. Further simplification of the IFC specification, in order to lower the implementation threshold for the widespread adoption of the IFC data structures in any domain, is already being addressed mainly in the undergoing IFCJSON and NextGen-IFC Projects (i.e. IFC5), and this alone is a great possibility for the future use of the IFC data schema. These projects are still in the early phases, but hopefully they will undergo the same bSI Process as any other Project, such as the Infrastructure Extension Deployment Project, the Railway Project and so on. This would mean that specific use cases will be identified from the domain experts from all over the world and then there will be a technical implementation of the details from the software vendors and the interested parties. As of today, this approach has proven to be very successful in guaranteeing an international consensus on the decisions made during the different projects and we expect this to be guaranteed aswell for these projects should they follow the same bSI Process. This would also maximize the number of interested parties and stakeholders involved and would (hopefully) guarantee that there will be a widespread adoption of these next-generation IFC data structures in the whole construction industry in any domain (IoT systems, Digital Twins, etc.).

Upload .ifc file(s) or other technical files to support validation of the research results.	↗ https://service.usbim.com/link/62a062018df9e6f834e5e32e

Share any instructions for accessing the .ifc or other technical files for review.

Access to the link is granted to anyone with a free account on usBIM. It shows an example of an IFC model classified with the use of the buildingSMART Data Dictionary thanks to the usBIM.bSDD Tool, in particular according with the ETIM 8 Domain. You can select objects (for example the photovoltaic modules) and inspect the properties and classification as found on the bSDD. The process that is used to classify such objects will be shown later on during the video, the link represents the end result (i.e. the enriched IFC model).

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.	✓

Documentation on use case(s) as a single file upload

PDF	usBIM.extender_use_cases.... (360 KiB download)

Log in to awards.buildingsmart.org to see complete entry attachments.

MP4
Type of attachment
Video
The BIM Extend...   230.5 MiB

MP4
Type of attachment
Video
usBIM.extender ...   88.7 MiB

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Image
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Type of attachment Image 01_usBIMBIMM... 1,014 KiB	Type of attachment Image 02_usBIMCoordi... 709 KiB	Type of attachment Image 03_usBIMDataM... 716 KiB
Type of attachment Image 04_usBIMeditor.... 234 KiB	Type of attachment Image 05_usBIMbSDD.... 188 KiB	Type of attachment Image 06_usBIMclash.p... 228 KiB
Type of attachment Image 07_usBIMcompa... 231 KiB	Type of attachment Image 08_usBIMreality.... 360 KiB	Type of attachment Image 09_usBIMrender... 632 KiB
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