The Urban Lab of Europe!

JOURNAL

PROJECT

BRISE-Vienna - Building Regulations Information for Submission Envolvement

Vienna, Austria

TOPIC

Digital transition

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The BRISE-Vienna Project - Journal N°2

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BRISE-Vienna addresses the challenge of accelerating complex verification and permission procedures in city administrations by applying the full range of digital technologies to city administration processes. It can serve as a blueprint for those cities that have to deal with a certain number of permissions and are willing to make use of the potential of digital transformation. This Journal examines the progress of the BRISE project in its second year and highlights challenges and innovative solutions found by the City of Vienna and the project partners.

The **BRISE-Vienna** Project

BRISE-Vienna addresses the challenge of accelerating complex verification and permission procedures in city administrations. It can serve as a blueprint for those cities that experience growth and must deal with a high number of building permissions.

Vienna has been experiencing continued growth and demand for new housing over the course of the last 20 years. Between 2004 and 2019 the city has been issuing more than 13.000 new building permits per year. Behind many of them are complex verification procedures and sophisticated analyses on legal, physical, and other requirements. Like in other growing cities, today it takes well in average up to 12 months for a planner or an investor to receive a building permission in Vienna.

The BRISE-Vienna Project is now making full use of the potential of digital technologies to at least double the speed of the building verification and permission process. It aims to achieve a strong acceleration and simplification of the entire process by subjecting it to a radical digitization. In short, the following features are brought together to achieve a fast, lean and efficient process:

1. Planners and investors will no longer have to submit their building plans on paper, but rather upload their 3D Building Information Model (BIM) in a digital format via the servers of the city of Vienna.
2. Based on the application documents the city produces a digital 3D reference model (REM) of a generic building which is in congruence with all existing regulations and specifications of the site.[1]
3. In an automated process the municipal auditor then compares the 3D BIM Model of the planner with the digital reference model of the city. By this, he can easily identify deviations from existing regulations and requirements and give direct and quick feedback to the planner.

4. Additional features – like AI-based verification routines or AR-based visualizations for citizen engagement – help to make sure that all actors in the process receive the maximum support.

With BRISE-Vienna, the city of Vienna will demonstrate how a municipal administration can make full use of what digital technologies can offer – but even more so, it shows the way towards a new thinking in integrated, seamless processes and efficient services for running a smart and liveable city.

Partnership:

- City of Vienna
- TU Wien – Bauingenieurwesen und Informatik - University
- WH – Media – Municipal company
- tbw-ODE – The better Way - Office for Digital Engineering - Private Company
- ZT-Kammer – Kammer der ZiviltechnikerInnen – Association of Architects and planners

There is a short video about BRISE-Vienna, which gives a good introduction and overview[2]

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[1] Von Radecki, 2020: „The automated reference models as municipal verification tool"

[2] https://www.wien.gv.at/video/2946/BRISE-Vienna

Executive Summary

BRISE-Vienna stands out from a range of other urban innovation projects in a sense that it is not only about a process innovation or strategy which eventually leads to technological innovation, BRISE-Vienna is about developing new digital solutions which will be (partially) owned by the city of Vienna.

During the second year of BRISE Vienna the main focus was put on building the integrated digital bulding verification and permission process out of several modules. While each module for itself is an ambitious undertaking, the main challenge in year 2 was to bring all pieces of the puzzle together in an integrated digital (web-based) tool and test its functionalities.

Froma joint vision, BRISE Vienna has made the step towards a joint product. As in virtually all complex IT development projects, project partners had to learn that the devil is in the detail; that joint language and joint definitions matter and that good management and governance is key. Also, in year 2 the COVID pandemic challenged project staff to work remotely and limit physical encounters to an absolute minimum.

Despite ca. 6 months of COVID induced delay, one can say that BRISE-Vienna is on track and is likely to successfully demonstrate the AI-based approval services for first pilot buildings in 2022.

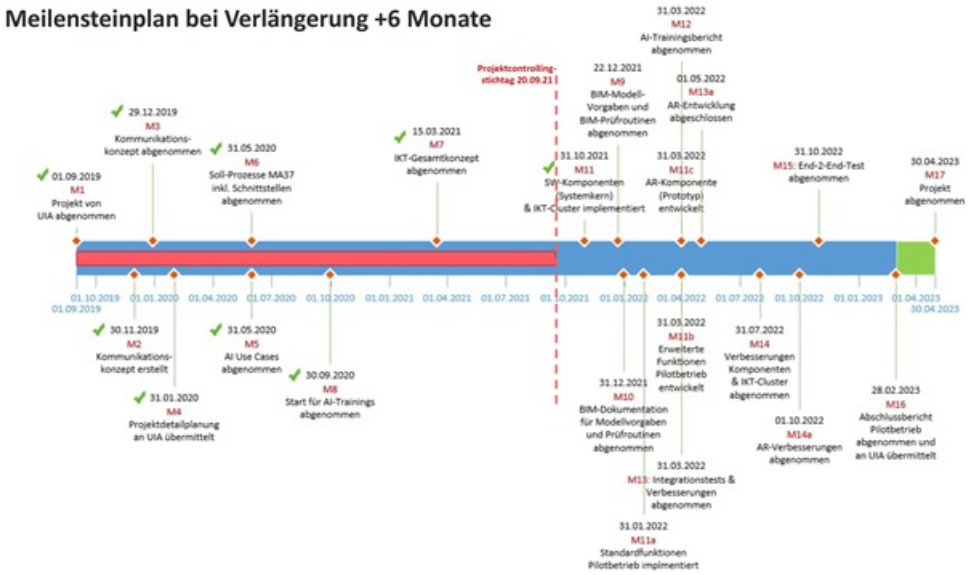
Section 1: Project Update - BRISE Vienna 2021

In 2021 BRISE Vienna made significant progress in key components which together will build the future digital building permission and verification system of Vienna. To understand the project, it is helpful to imagine it as a modular set of components, which need to be integrated in a seamless digital process and workflow. While in the year to come, BRISE will integrate all components with each other and prepare for a pilot and testing, in 2021 the main focus of BRISE was on the development and refinement of key components. These were mainly:

1. The AI modules for the automated analysis of textual provisions and semantic search
2. The mapping table that provides the rules of modelling for the automated 3D Reference Model in Solibri
3. The approach for integrating key components into one digital tool with a coherent frontend

While a range of milestones could be achieved, the ongoing COVID-19 pandemic has provided challenges to the BRISE-Vienna Team, which lead to a 6 Month project delay in 2021. Figure 1 provides an overview over the adjusted project plan of BRISE Vienna and highlights the remaining milestones of the project.

Figure 1: Milestone plan of BRISE Vienna (as of Oct. 2021)



Policy Context

BRISE-Vienna fits well into the strong focus, which EU policies have put on local governments and digitization. The Urban Agenda for the EU currently is the strongest joint policy initiative on EU level driving the sustainable transformation of cities and urban societies throughout Europe. It is structured into 14 Partnerships, driving change, innovation and policies at the local level, but also on national and EU level. One key partnership has developed around the "Digital Transition"[1] of cities and regions and it has put forth a set of goals and actions within an action plan, also formulating expected results from the partnership.

BRISE-Vienna is set to contribute to key results of the Digital Transition Partnership within the Urban Agenda for the EU. Especially to the following three:

1. Better, more accessible and personally customized public services to citizens, incl. accessibility of digital public services to disabled and elderly citizens:

BRISE-Vienna demonstrates how bureaucratic process can become user-friendly, easy and quick by means of digitization. The expected results, but also the process, how Vienna and its partners are aiming to achieve their results, can provided important impulses to cities across Europe and may be referred to as best practices by the Urban Agenda.

2. Better competences to develop public services based on new technologies:

BRISE-Vienna has brought together an interesting consortium of city officials, university researchers, experts and highly specialized companies collaborating to develop a new digital product for the city. A key component is the integration of municipal staff into the development process. At the end, a range of departments with hundreds of municipal workers will have contributed to the BRISE-Vienna tool and digital process – and many of them will apply AI-based solutions in their daily work, knowing they have contributed to training it. This approach is exemplary and should be promoted among the Digital Transition Partnership.

3. More efficient and inclusive urban planning processes

BRISE-Vienna solves a real-world issue. Because of the project many families will be able to receive housing earlier and more conveniently. Streamlining and digitizing the process of granting building permissions will double the speed of issuing building permits. This is an impressive demonstration of how technology can serve to plan and build cities more efficiently.

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[1] https://futurium.ec.europa.eu/en/urban-agenda/digital-transition/action-plan/digital-transition-action-plan

Section 2: Mapping BRISE Vienna against the established UIA Challenges:

The following section will highlight challenges which have arisen within the project irrespective of the COVID pandemic and it will depict, how Vienna has found solutions to deal with them.

1. Leadership for implementation

Leadership in BRISE Vienna is confronted with a range of challenges stemming from the complex nature of the project. As a matter of fact, BRISE is aiming at delivering a fully integrated digital solution to a lengthy and bureaucratic process which requires highly specialized knowledge. This implies that not only staff involved in the project, but more importantly, political leaders and decision makers, citizens and remotely involved stakeholders from adjacent processes and systems need to fully grasp the meaning of the project, the potential of involved technologies and the implication it has on the wider organisation and service delivery. In short: project stakeholders need to develop an understanding of the digital transformation as such and of the project activities in BRISE in particular. This presents itself as a challenge since most stakeholders do not bring specialized knowledge to the table. Leadership in BRISE thus needs to put high emphasis on communication and training. Whereas a range of high-quality project documents, explanation videos, simulations and other multimedia content have been developed, focus must remain on activating support and leadership by highlighting the specific relevance of BRISE for policy makers, planners, investors and – ultimately – citizens. Defining, initiating and communication the pilot applications of BRISE will become paramount to this end in 2022.

Less universal, but equally important, leadership has to give orientation to the staff involved. Joint language, a joint terminology and a clear communication of expectations are the key to achieve this goal and should be continuously improved. BRISE partners have acknowledged that the project team is functioning well. It was installed to track progress and govern the complex interactions between the tech work packages. Yet, the need for orientation (e.g. how does BRISE relate to the overall digital transformation of the city of Vienna?) continues to require ongoing efforts by the leadership of Vienna.

2. Public Procurement

Procurement is not a particular challenge within BRISE, since most of the deliverables are being produced by the involved project partners. Only one important component has been tendered out to be delivered by an external organisation: the overall Integration of software components based on the WP6 specifications of the overall IT concept. It may be stated that it does not present a particular surprise that the tender process as such could have been somewhat swifter and the approvals by the awarding office could have arranged a bit quicker. Overall, these challenges, however, are of a generic nature and they present themselves in virtually all awarding public organisations. BRISE staff agreed to lobby for a higher priority of the project at the Vienna procurement office. The issue as such is of rather low impact and relevance.

3. Integrated cross-departmental working

BRISE Vienna has adopted a well-functioning approach for integrated, cross-departmental working. The project organization has been described in detail in the BRISE Journal N° 1 and it has proven useful and resilient throughout the year 2021, although several unforeseen challenges presented themselves. In particular, the remote work and the lack of personal and direct collaboration posed a challenge to the cross-departmental working, but it could be tackled by frequent communication, clear organisational rules, and a maximum use of digital collaboration tools such as Microsoft Teams or Mural.

As the project progressed in 2021 two challenges for the integrated, cross-departmental working stood out: a) The joint understanding of the technological details and b) the direct and quick coordination of action.

It is a common sign of complex tech development projects, that misunderstandings about details present themselves only after a while. In 2021 BRISE made good progress on some of its key technological components: on the 3D reference model, on the definition of the BIM-based verification routine, or on the training of AI models. Challenges presented themselves, when trying to integrate all components into a coherent IT concept. It is only at this step, that misconceptions or different levels of knowledge become apparent. Thus, defining terms and arriving at a joint language across all project stakeholders has become ever more important in 2021. A solution to this is stronger guidance (see Leadership), but also making documentations of supposed project details available

for everyone, can help to reduce knowledge barriers and to arrive at a joint understanding!

Best practices from BRISE in this section include:

- A broad definition of the project goal and an ongoing open discussion about the tension between project goal and work package activities.
- Allocating the ultimate responsibility over the project direction at one steering group office which consist of key executives from the municipal directorate and the IT department.
- An ongoing process for quality management which facilitates structure review cycles of components and project documents.

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4. Participative approach for co-implementation

The solutions developed throughout the BRISE-Vienna project, will have an interface with a variety of internal and external stakeholders: planners and architects will upload their BIM Models in a new online interface (instead of sending paper plans to the building authority), staff of the building authority (MA37) will interact with the subjects under verification via a new, digital interface, and neighbours and other interested citizens, will be able to visualize the future scape of a new building via augmented reality in an app or via a browser on their tablet. These new interfaces require great UI/UX design and a significant amount of user testing and participation. Yet, in 2021, none of these interfaces exist. First designs will be developed in 2022 and testing will likely not happen before 2023. Thus, in 2021 challenges for participation and co-implementation evolved around a more generic question of the digital transformation. Should a new digital process fully replace the old, analogue way of doing things? Can a city expect a divers range of stakeholders to switch from analogue to digital? What does this do to older people or people who may be less literate when it comes to digital tools and products?

In essence, the dialogue about this question was held between the representative of the most important external group of stakeholders to BRISE – the Chamber of Civil engineers, representing planners and architects – and diverse representatives of the project. Consequently, Vienna took a clear decision to provide the new and innovative digital solution as an option, but not as an obligation. Analogue and digital interfaces and processes will have to be provided in parallel at least for a longer period of transition.

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5. Monitoring and Evaluation

Monitoring and evaluation of project success presents a few challenges to the BRISE project. The core of the promise, BRISE makes, is to accelerate the building verification and permission process by 100%. This figure is quantitative, rather easily verifiable and will prove that the new combination of digital tools is saving resources and time. However, in order to arrive at scientifically backed statements about the degree of achievement of this goal, a statistically significant number of cases (250+) will have to have used the new digital process and tools. This will not happen within the period of the project. Thus, a full verification of the project goals can only happen ca. 2 – 3 years after the project has ended.

Project partners have acknowledged that important monitoring results and conclusions about the project success, can also be achieved with a few sample cases which represent archetypic buildings and ground situations. To this end, it is vital for BRISE-Vienna, to identify and use a sufficiently large number of pilot cases within the timeframe of the project. Yet, by the end of 2021 only a vague idea about potential pilot cases existed. Due to the lack of a fully operational prototype of BRISE, external planners and architects are not able to assess their own risk (w.r.t time-lag or tech invest) related to participating in a BRISE pilot and are therefore unable to commit themselves. Fortunately, the City of Vienna itself is a major developer and can time the piloting process with own building projects that are currently in the pipeline. The project steering committee has identified this opportunity and taken steps to coordinate the piloting and evaluation of the BRISE solution with development projects of Vienna in 2022. An approach that seems realistic and promising!

A second challenge to be aware of. lies within the complexity of the BRISE solution. While individual components like the AI algorithms or the BIM reference model may be ready for piloting, the integration in a fully digital process may take more time than expected. A fully functional pilot of BRISE therefore runs the risk of other complex systems: after full integration, individual components may show deficits in interaction with each other and not function as expected within the overall process – e.g. due to interface issues or lack of interoperability. The BRISE team is aware of this issue and has proposed two approaches for minimizing risk and allowing for an early evaluation:

1. Individual components that are ready for testing will be evaluated and tested on the component level, making sure full functionality is given and the defined interfaces are working.
2. Those steps who lack programming within the overall process, will be simulated or replaced by manual processes during

evaluation and testing. These “process mock-ups” allow for piloting and evaluating the integrated BRISE solution even before a fully functional system can be provided. At the same time, they can provide valuable insights and hints for the final system.

6. Communication with local partners

The main challenges in communicating about BRISE with local partners lie within the complex and challenging technical nature of the project. While project participants are excited about the possibilities of the project, it is difficult for outsiders to understand the benefit and the implications of BRISE. In light of machine learning, data usage and AI, concerns and often irrational fears drown out the benefits and advantages of the system.

To counter this pattern in communication, project communications will break down BRISE best practices according to different user groups and facilitate an easy and very practical communication. At the same time, project communication suggested to collaborate with influencers from different communities and have them report about BRISE and its potential.

7. Upscaling

Project progress in 2021 revealed, that a simple transfer of BRISE to other cities and regions in Europe is highly unlikely. Instead, the project team will need to find a bundle of strategies and approaches to upscale BRISE.

Why would a simple transfer not work? The main argument for this is embedded within the individual building regulation of Vienna: legal text and textual provisions follow a specific approach in Vienna and the AI system has been trained on the basis of these input documents. Using the same algorithms to detect patterns in textual provisions of building regulations of say Northrine Westphalia (NRW) in Germany, is highly likely to produce invalid results, since a range of provisions will be undetected and some code-parts will search for patterns that do not exist in these documents.

At the same time, BRISE Vienna is being built in absence of a nation wide standard for data transfer in the planning- and building administration. While Germany, for example, has introduced XPlanGML[1] as binding data exchange format in planning and building on national level in 2017, Austria does not refer to any standard alike. This gives BRISE developers a higher degree of freedom to build the system based on the latest technologies and standards, but also runs the risk of lacking interoperability with other digital planning and verification systems in Europe. From the project standpoint, it is reasonable to build BRISE in reference to FME and BIM by using DWG and IFC files, yet it poses a challenge to upscaling BRISE to different countries, since an adaptation of the technical system must happen based on the national standard.

The large potential for upscaling of BRISE becomes evident, when redirecting the focus. Away from a 1:1 transfer of the fully functional BRISE system and towards a modular approach of reusing the innovations by BRISE for rebuilding similar systems in different national or regional settings, or even for improving administrative processes which are not related to building verification and permission.

In essence, the project has identified five replicable and scalable innovations which can be used in a modular way beyond the full deployment of the BRISE System:

1. The automated transfer of 2D plans into a 3D reference model.
2. The criteria matrix behind the 2D – 3D transfer (structure, compatibility) as IFC standard
3. The AI-based semantic search for similar or related legal cases
4. The AI-based recognition and extraction of signatures from submission documents
5. The process to train the AI to identify and classify textual provisions in legal documents

Each of these tools holds in itself the potential to simplify and accelerate a range of administrative procedures in city administrations or building authorities. To reap its potential, a good documentation and a high-quality open-source code repository will be imperative. Providing this in German and English before the end of the project should be taken-up as a key result of BRISE.

When posed with the question on how to scale-up the results of BRISE-Vienna, the project team realised yet another challenge. Although focusing on the development of a new digital product, the stakeholders involved in BRISE Vienna do not have an intrinsic own interest of putting the scalability of the system at the center of the focus. This is – in principal – due to the nature of the project. Whereas product development in the private sector usually is intrinsically linked to business innovation (i.e. no product comes without a business model), BRISE Vienna is developing a new product out of the perspective of one city, targeted at solving this citie’s challenges. The lack of a business model perspective for BRISE Vienna has been discussed at a workshop in September, leading to no

final result. Yet, it is the author's recommendation to include the perspective of a sound business model into the further development and exploitation plan of BRISE. Only if one or several organisations perceive BRISE as a chance for growing a business (i.e. by facilitating the development and uptake of similar systems in other regions of Europe), a clear perspective for scaling-up will become apparent. Until today, project coordination assumes that it will be enough to publish the results of BRISE and to engage in dialogue with other cities and nation-wide actors for scaling-up to happen. This, unfortunately, is unrealistic and should be reconsidered.

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[1] XPlanGML uses a standardized object oriented data model and GML based standard data transfer format. For more information please see https://xleitstelle.de/downloads/XPlanung_Leitfaden_1.pdf

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SECTION 3: KEY LEARNING POINTS

Summing up, in 2021 BRISE-Vienna made good progress and provided a rich basis for learning and development. The following points are the key take-aways:

1. Where technological complexity is high, strong focus needs to be put on communication and training. BRISE continues to be a highly complex and challenging project, driven by a dedicated team and managed and delivered by highly specialized experts. From the standpoint of January 2022 the technical goals of the projects will be achieved, but wider project success will only happen, if the practical relevance can be broken down in easily understandable pieces of communication.

2. Where specialization is high, a common language is needed: although well into the project, discussions about definitions, goals and challenges keep popping up. A joint terminology and a clear picture how BRISE relates to overarching strategies of digital transformation are required.

3. The different work packages of BRISE have delivered individual technical components, which taken for themselves, are already innovative and replicable. They should be promoted and made available as stand-alone innovations with a good documentation.

4. In 2022 focus has to be shifted to the integration of the components. Leadership and organisation will become even more important in 2022, since all modules need to come together for building an integrated, digital process for building verification and permission.

5. In absence of a full system, mock-ups and simulations can help test and evaluate the full BRISE model. Not all components of a fully functioning system will be in place by the end of 2022, but project members have identified the potential of a hybrid simulation process.

6. Pilots are key! Whereas planners and developers working to achieve permission for new buildings in 2022 may be less willing to act as "Guineapigs" for a new digital process, the City of Vienna can make use of its predominant position as a developer and align the planning process of own buildings and the verification process of BRISE.

7. For scaling-up BRISE Vienna, a business model perspective should be embraced.
