Digitizing building permissions in Vienna: BRISE Journal 1

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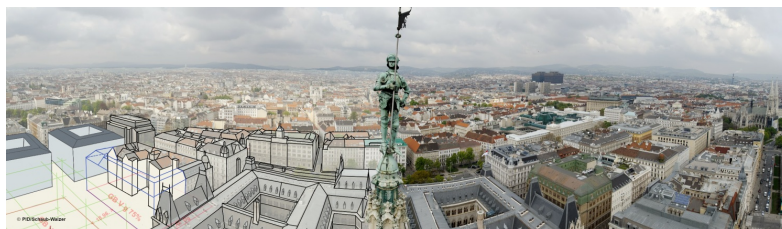
BRISE-Vienna addresses the challenge of accelerating complex verification and permission procedures in city administrations by applying the full range of digital technologies to city administration processes. It can serve as a blueprint for those cities that have to deal with a certain number of permissions and are willing to make use of the potential of digital transformation.

The BRISE-Vienna Project

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:

a) 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.

b) 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.
(Click here for an article explaining the REM Model)

c) 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.

d) 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

[Click here for a short video](#)about 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.

This alone makes it a challenging undertaking for a municipality since city administrations and their staff are involved in a fundamental change process of the organisation by using possibilities of digital innovation.

The City of Vienna uses an approach with a strong focus on excellent organisation, communication, and project management to make-up for this natural lack of experience. The last 18 months have shown that the BRISE-Vienna project can become a world class example for municipally driven service- and product innovation, since the approach chosen by the city of Vienna seems to work out. Despite a range of challenges posed mainly by the COVID-19 pandemic, but also by the high degree of technical innovation, the city has managed to reach most of the project milestones so far and has anchored the project deeply within the political narratives of Vienna as digital capital.

Overall, one can say that BRISE-Vienna is well on track and is likely to successfully demonstrate AI-based approval services for new buildings within 2 or 3 years from now.
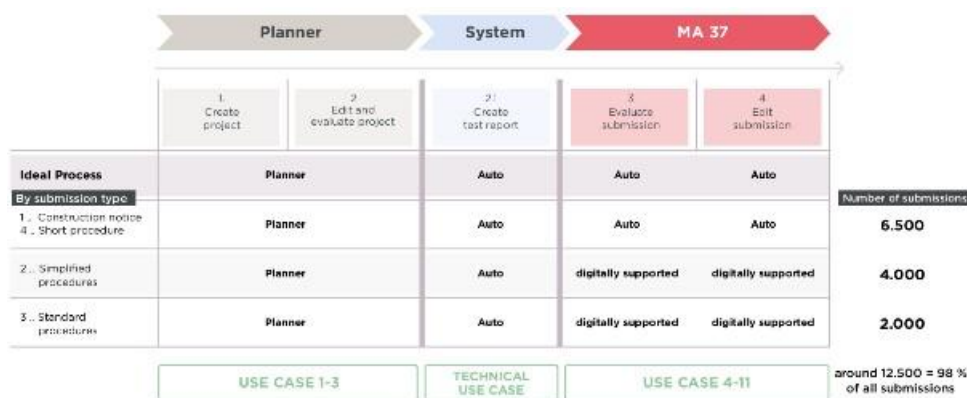
Project Update

While BRISE-Vienna aims to ultimately develop a data-driven product to support the registration and verification of new buildings, the first 12 – 18 months focus on preparatory actions to research on feasibility, prepare the overall concept and train the AI algorithms to auto-detect the required patterns.

A key deliverable at a rather early stage was the strategy document describing the "vision of the ideal process", framing a new perspective on an existing process within the city administration.

The city stated its ambition to achieve as many advantages as possible from "genuine digitisation" instead of simply transferring the existing process into the digital realm. To achieve this, Vienna did not start from the as-is process, but rather looked at the overall system from the perspective of the different stakeholders who need to interact within the process: the construction owner, the planner, the evaluator, the city staff, citizens, etc.

By framing their perspective on the process of receiving permission to build a new building in Vienna in 11 use cases, a lean and integrated process was created which now serves as a blueprint for all parties involved in the BRISE-Vienna project. It guides all actions and it binds the work packages together. At the same time, it acts as a key reference document for the development of the digital tool with individual interfaces tailored towards the stakeholders.

Figure 1: Vision of the ideal process

	Planner		System	MA 37	
	1. Create project	2. Edit and evaluate project	2.1 Create test report	3. Evaluate submission	4. Edit submission
Ideal Process	Planner		Auto	Auto	Auto
By submission type:					
1. Construction notice 4. Short procedure	Planner		Auto	Auto	Auto
2. Simplified procedures	Planner		Auto	digitally supported	digitally supported
3. Standard procedures	Planner		Auto	digitally supported	digitally supported

	Number of submissions
1. Construction notice 4. Short procedure	6.500
2. Simplified procedures	4.000
3. Standard procedures	2.000

USE CASE 1-3	TECHNICAL USE CASE	USE CASE 4-11	around 12.500 = 98 % of all submissions

A second key deliverable, which has been achieved so far was the feasibility study on AI.

In total, nine AI use cases were identified and intensively discussed with the experts. Of these, four use cases were analysed in more detail, as their realisation within the framework of the BRISE-Vienna project was considered both sensible and feasible. A further three use cases are to be classified in a broader circle of feasibility and two were completely discarded as not being goal-oriented. The four use cases to be taken further into the product development are:

- The automatic classification of the special textual provisions of the Vienna Zoning and Development Plan
- The automated search for similar legal cases
- The automatic classification of the submission documents
- The recognition and extraction of signatures from the submission documents.

Besides these key deliverables, significant progress has been made, especially when it comes to developing the classification table, which translates the different levels of detail into the 3D model.

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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 at 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 at national and EU level. One key partnership has developed around the "Digital Transition" 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:

a. **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 provide important impulses to cities across Europe and may be referred to as best practices by the Urban Agenda.

b. **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. In 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.

c. **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

Challenges in BRISE-Vienna

Like many other projects, the COVID-19 pandemic has confronted the BRISE project with a set of unexpected challenges, forcing the project management to introduce new process tools and shift to full online communication. In January 2021, the lockdown in Austria was tightened and prolonged, making it less likely that there will be a swift change back to normal work process within the months to come.

In contrast to many other less digitally prepared projects and cities, Vienna has been able to take-on the COVID-19 challenges proactively by strengthening communication and management. The lack of face-to-face interaction increases the need for frequent and continuous communication with all project stakeholders to make sure that the project stays within time and budget limits. Nonetheless the procurement of the ICT overall concept (a crucial milestone within WP6) has been delayed by months due to the pandemic. To accomplish the task, people need to collaborate who did not know each other before the pandemic and it appears that a lack of direct personal communication leads to less liability and trust and it takes longer to develop a shared mindset. The project management introduced a digital concept board as a joint management tool to facilitate collaboration and cooperation across all work packages – and apparently it has served well throughout the almost 12 months of pandemic.

A second project element suffering under the COVID-19 pandemic is the communication with external stakeholders and PR. Up until now, planned events to promote BRISE had to be cancelled or shifted to the digital realm, where less people showed up or participants engaged less.

However, overall Vienna is dealing well with the pandemic situation and the BRISE project is well on track. Due to its technical nature several tasks can be completed by highly specialized teams or individuals without need for constant interaction. This has helped to make constant progress and reach most of the project milestones as proposed.

The following section will highlight a few challenges which have arisen within the project irrespective of the COVID-19 pandemic and it will depict, how Vienna has found solutions to deal with them.

Leadership

How do I make my political leaders understand the importance of my project?

This question arises again and again when dealing with urban innovations. How do I speak truth to power? How can I break down the complexity of urban tech innovation in a way it becomes interesting, digestible, and beneficial to politicians? The BRISE-Vienna project is referred to as key project of the city of Vienna by the mayor and the councillors. At the same time, it shows-up within the coalition agreement of the newly elected coalition, where it is highlighted as a key *"digital service initiative in Vienna's housing sector"*. So how did the project management achieve this degree of visibility and political backing?

The key to enabling political leaders to step-up and promote BRISE-Vienna lies within the communication strategy of the project management team. The Magistrate Directorate - in function as the office Steering Group – required the project to formulate management summaries and easily digestible presentations, ticking boxes with key messaged of politicians and linking the project to key goals of the city. This, together with a continuous and tight management of the dedicated hierarchies (provision of information and wordings) has led to pushing BRISE-Vienna into the very focus of politicians.

BRISE-Vienna is also a good example for the importance of leadership in complex tech- and innovation projects in the public sector. One key challenge for leading the project towards the desired outcomes is the technical complexity of the solution at hand. Not only does it involve the development of a new software according to a vision of a fully digitized process different from the process which is currently operating, it also encompasses elements of Artificial Intelligence (AI), Building Information Modelling (BIM) and Augmented Reality. All of these represent highly sophisticated technologies. It requires specialized knowledge and skills to understand the potential implications of these technologies for the BRISE project and the limitations and challenges as well as shortcomings or peculiarities of these technologies may imply for the project.

A good example for this is the AI Element. In its current form AI refers to machine learning which helps to automatically detect patterns in big datasets and is facilitated through artificial neuronal networks. For BRISE-

Vienna, understanding what parts of the information chain can be subjected to AI-based automation, and which ones not, represents a key challenge. Another challenge is posed when trying to understand where AI may generate a positive impact for the project (with respect to time savings or more efficient checking routines) and where it may be useless.

The way Vienna has been dealing with this challenge is promising. On the one hand it has organized the project development process around a central project management team which carries deep technical knowledge and is able to follow the researchers and developers deep into their area of expertise. This is crucial for continuously calibrating the relationship between the technological potential and the desired project outcomes, but also for explaining the importance and limitations of AI in the BRISE-Vienna setting to all other project stakeholders. On the other hand, Vienna invested into research and communication. An important early deliverable in BRISE-Vienna was a feasibility study on AI use cases within the project. Based on the provision of a process model, the authors (a specialized AI company and the city of Vienna) identified a range of potential use cases and subjected them to a feasibility analysis on automated pattern recognition and accuracy of outputs. This document was made available to all project stakeholders, making them understand the potential and limitations of AI for the project.

A key challenge for leadership, however, will arise as soon as city officials are tasked with applying the new BRISE System, working with AI-assisted processes in their everyday tasks. Therefore, defined key-users are also involved from an early hour in this new process. It is likely that municipal workers will challenge the validity, completeness, and accurateness of the outputs of the AI system, since it will remain a black box for most stakeholders of BRISE-Vienna. It is advised that the leadership involves the city officials, which will be applying and using the system, from an early point onwards. So far this has not been done and might be a helpful step to avoid low rates of acceptance for the new technology.

Participative approach for co-implementation

Similar to the last point raised on Leadership, a participative approach is an issue for BRISE-Vienna. Several studies have shown that participation is not a goal by itself but has to be tailored to the issue at hand and to the stakeholders that are most affected (Ianiello (2019) or Willems et. al. (2017)) Also it has become evident that bureaucracy has to show a certain degree of responsiveness to the input by citizens (e.g. see Sjoberg et. al. (2017)) in order to successfully leverage citizens engagement for better outcomes and higher acceptance. For BRISE-Vienna, all these points represent a challenge.

Citizens, which will be most affected by BRISE-Vienna, are likely to be neighbours of buildings which are to be planned and constructed under the new digital process. The project, however, has not yet been able to identify reference building sites, which would allow for a simulation or dry run of the digital planning process of BRISE-Vienna. For the project, this implies that no real citizen participation is possible yet, since the process of citizen engagement can only start, once a first building site has been selected.

Nonetheless, BRISE-Vienna aims to make citizen participation easier. Neighbours of upcoming construction sites are to be invited to use digital technology – such as AR or VR - to take a virtual preview of the planned neighbouring building to gain a more realistic understanding of the impacts of the new building (sight, shading etc.), but also, if entitled in the approval process, to be able to comment and feedback to the planning authority in a digital way. Besides the technical solution (which must be browser-based), the process of engaging with potentially affected persons through the BRISE-Vienna solution has not yet been specified. It will need to involve a range of steps (informing, assisting, reviewing the input, and providing feedback) to make sure the full digital potential for citizen engagement is harnessed. 18 months into the project, this approach is not yet visible, and it might well not be accomplished within the timeframe of the project. As a compromise, the city offers neighbours of newly planned buildings to visit the office of the Vienna building administration to view and comment the 3D model within the premises of the city.

Although citizen engagement will become a key feature of BRISE-Vienna in the future, the main issues on participation in BRISE-Vienna currently evolve around the engagement of municipal staff within the project development and product design phase. It is necessary to shift our understanding of "participation" from the citizen to the municipal worker in order to not miss a key challenge for the adoption of innovation in our cities. The municipal officers of the building authority department (MA37 – which is by name called building police "Baupolizei" in Vienna) are the main and direct beneficiaries of the new BRISE system. The IT system will enable them to perform more accurate and more informed decisions, as well as accomplish their tasks quicker than it has been possible with the existing approach. So, how do you engage them in a high-tech IT product development cycle to make sure the system will be designed in a way that corresponds to their daily needs and challenges? First, there is a direct communication channel to the MA37 (building authority), informing about the goals and the progress of the project regularly. This alone will not suffice to enable full engagement. Thus, the project has engaged 20 employees of the MA37 in direct activities related to the development of the new system. They help transform legal text into machine-readable rules, training the AI and they contribute to designing the new process

which will be underlying the digital BRISE tool. Finally, the management has set-up a change management process which helps the team to gradually glide over into the new role and process.

This highlights an aspect of participation which is often underrated when it comes to urban innovation. In the end it will be the municipal workers who carry new products, processes, and services. Lasting success of urban innovation builds on their capability to adopt to new tools, new processes and to acquire and apply new knowledge. Focusing engagement activities on the municipal staff, like Vienna is doing it, is key to provide for a long-term success of an urban innovation project.

Cross-department working

An integrated management approach across all involved departments is key to deliver a project with the complexity and ambition of BRISE-Vienna. The main challenge in similar projects arises from the siloed organisation structure of city administrations which lead to unclear responsibilities and conflicts of subordinance between project goals and department goals. In the case of BRISE-Vienna, these challenges have been solved structurally from the very beginning. The overall project management lies with a cross-cutting and strategic unit - the Municipal directorate (chief executive board) (Magistratsdirektion). It is superordinate to the departments, and has strategic authority and is able to coordinate activities of the involved departments MA01 (digital transformation) and MA 37 (Construction police). This is schematically depicted in Figure 1.

**Figure 2: Departments involved in BRISE-Vienna.**
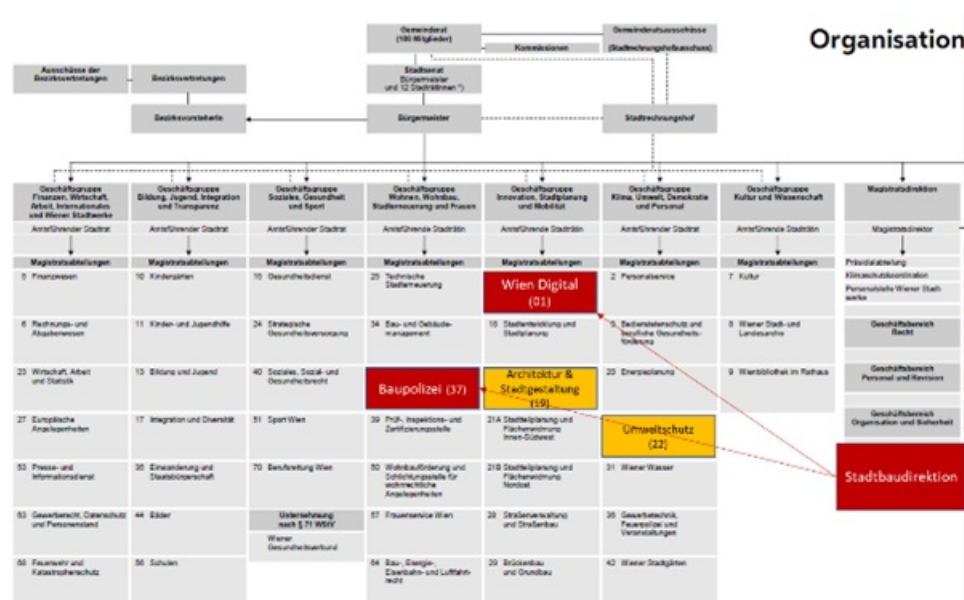
For the project delivery in a narrow sense, this setting is well-designed and very functional. Challenges may arise, however, as soon as additional departments (such as urban planning or the environmental department) need to be integrated into the process. Since Vienna is aiming to fully transform the process of building verification and permission into a digital process, all other departments which may be required to supply statements or other services in the process, need to be not only informed, but rather trained in using the new digital tool. This may add workload or at least more tools to the worker's daily tasks and thus it may produce resistance.

In the case of BRISE-Vienna a good project structure and a strong focus on internal communication solve all issues that might arise through administrative siloes and formal hierarchies. The project benefits from an interesting setting, which is rarely seen in innovation projects in the municipal context. Alongside the project management, which is tasked with the management of time, milestones, deliverables and budget, the project draws on a **steering group office** which consist of key executives from the municipal directorate and the IT department. This group manages all activities across all work packages from a content perspective and it steers the communication inward and outward. This helps deal with the high complexity of the project. However, it also enables to communicate strategically and engage political stakeholders whenever necessary.

Figure 3: Project organisation of BRISE-Vienna
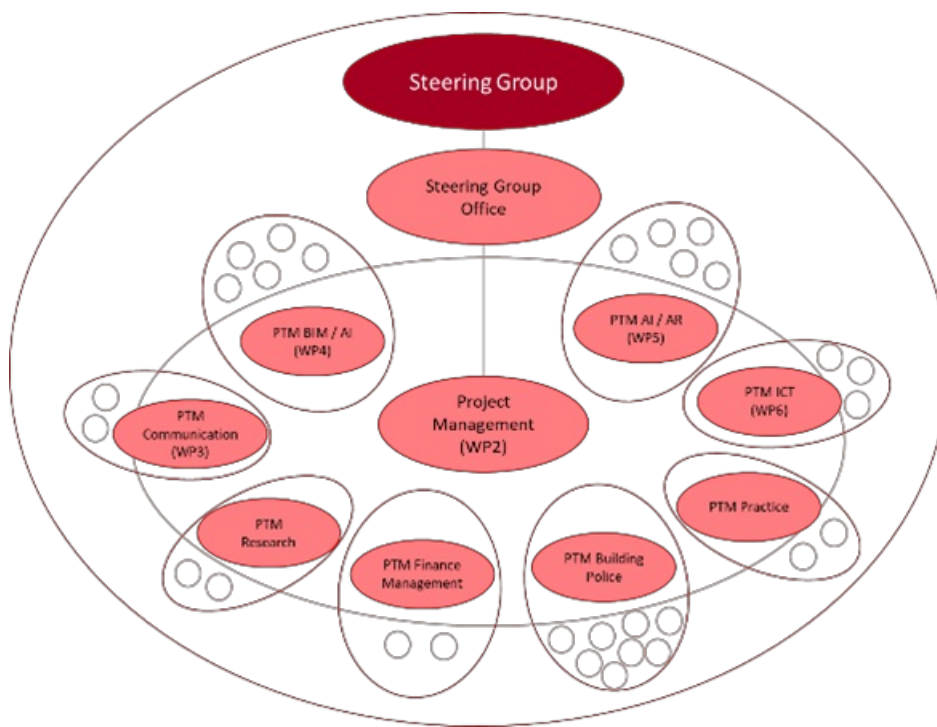
When faced with the challenge of getting the building department behind the project, the Steering Group Office offered the head of the building department to write the introduction to the vision document, which is a publicly available statement about BRISE. This helped to get full engagement of a crucial municipal unit, since no one can take a step back, once having publicly committed and praised the project.

In addition to the organisational set-up of BRISE-Vienna, the internal project communication may be regarded as exemplary. The city has released a **project handbook** as the central and joined go-to place for all stakeholders which are involved in the project. It not only states the obvious (objectives, work packages, milestones, roles and responsibilities etc.) it rather sets the project within the wider context of digital transformation and city planning in Vienna. This helps everyone to understand the bigger picture and to relate the own contribution not only to the project goals, but rather to a larger vision of the city of Vienna. It shows the links with other related projects and initiatives and it defines the rules of play for everyone who is involved in the project.

This handbook can serve as a good blueprint for any project with a similar complexity. It can be obtained via the project coordination office[5].

Other Challenges

Additional issues monitored by the UIA refer to **public procurement**, **monitoring and evaluation** and to the **communication with local partners**. In all of these areas, BRISE-Vienna at this moment does not face any significant challenges.

Scaling up

BRISE-Vienna is an ambitious project building on state-of-the-art technology and innovation. Yet, this part is maybe the least challenging when it comes to replicating a similar approach in a different city or region. Certainly, there are a few traits which make it hard for smaller cities or municipalities and for less prepared and less well-equipped cities than Vienna to undertake a similar approach: namely expertise, organization, and resources. **Expertise** is required within the municipality to manage a complex product development process linking external service providers, research, and municipal staff to deliver a tech driven innovation. The **organisation** must be responsive to the project and accompany the cross-departmental work with change management and embed it within a larger IT strategy. **Resources** are required to have dedicated staff working for a strategic project which will take several years to transform into daily business. During this time, these resources would be missing within the daily completion of municipal tasks and services.

We can thus fairly say that replicating the BRISE-Vienna project will be reserved for a range of larger, successful and innovation driven cities in Europe like Amsterdam, Stockholm, London, or Barcelona.

A full replication of the BRISE-Vienna research project should not be necessary anyhow – one may think – since the City of Vienna is undertaking this conceptual work now and once it has been set-up it can be applied by any other municipality across Europe. This, unfortunately, is a misconception – for there are a few traits to the BRISE-Vienna solution, which make it unique and tailored to the city of Vienna. This mainly resides within two elements that are hard to copy: the **local regulations** and the **checking routines**. The AI in BRISE-Vienna is currently being trained to detect building regulations with relevance to the specific sites at hand. These stem from a legal framework, which is unique to Vienna: the Vienna building code. It combines a land use plan with textual provisions that are built on geospatial information. It is a historically grown legal framework specific to Vienna and to the legal system of Austria. The AI built for BRISE-Vienna must be tailored to this system in order to automate checking routines and support planning approval for BIM-based applications in this regulatory framework.

Scaling the BRISE-Vienna solution to other cities thus poses the challenge to build new AI-based checking routines for each individual regulatory framework. Prague, Nurnberg, Berlin or Zurich, even smaller cities like Freiburg, Aarhus or Nottingham would all need an individually trained AI. It is unlikely that this process will happen on a large scale throughout Europe, not mentioning its inefficiency. Instead, scaling up of the BRISE-Vienna approach will need to happen via regional or national bodies who are able to provide their municipalities with proven and adapted digital solutions that ease and speed-up the municipal verification processes. Training an AI on the level of a federal state or national regulation is certainly possible – and it could be done in a way that would allow municipalities to add their own specificities.

It is therefore logical that the BRISE management has started to address the national level of Austria for finding the right partners to scale the Vienna solution to the rest of the country. A first step of doing so is by raising public awareness for the potential of the BRISE-Vienna project. In February 2021, BRISE is in the process of being submitted for the Austrian Administrative Award, which – if it is won – will set the project on top of the digital agenda of the country.

By focusing on the regional or national level for scaling the BRISE-Vienna solution, the work undertaken by BRISE-Vienna can be leveraged efficiently to be provided to as many municipalities as possible throughout Europe. This accounts especially for the concept for BIM-based checking routines, the overall concept for working with planners and investors via BIM 3D models, but also for the approach to training AIs or to rethink municipal service delivery along the potential of digital technologies.

Conclusions

Lessons learned

Overall, we find the BRISE-Vienna project to be well planned and executed. The COVID-19 pandemic, although impacting on the time scale, has not been able to push the project off its track.

A few lessons learned should be highlighted at this point:

a. In BRISE-Vienna, the city strives for "genuine digitization". The project serves as a good example on how to **rethink processes and services from scratch**, making full use of digital assets, instead of transferring and existing process into the digital.
b. **Leadership is key** – and it can be induced. Being smart on communication and agenda setting helps inform leadership and make politicians and decision makers adopt the project, which comes in handy when decisions or money are needed.
c. To deal with complexity you need to **organize yourself**. A complex tech-development project like BRISE-Vienna lives of a great organisation. Yes, it is costly to run a project steering team that consist of three to four people, but eventually it fully pays off, since timelines are met and knowledge is distributed across the organisation.
d. Lastly: AI is not the ultimate weapon for the digital transformation of urban Europe. Machine learning performs well in routine tasks and pattern recognition, but whenever the context changes, so need the algorithms. Thus, one has to **carefully select the elements that can be transferred** and be honest on those that cannot.

Literature and Links

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[2] https://www.wien.gv.at/regierungsabkommen2020/

[3] E.g. Ianiello et. al. (2019) or Willems et. al. (2017)

[4] See Sjoberg et. al. (2017)

[5] Please contact the BRISE-Vienna office at the E-Mail address: brise-vienna[at]post.wien.gv

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

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

Digital transition

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