URBAN INNOVATION AND SMART CITY EXPO 2024*

By 2050, the global population will reach 10 billion, with nearly 70% living in urban areas. Cities, therefore, will need to become ever more sustainable, resilient, interconnected, and secure. To confront urbanisation's challenges and demands and explore its future course, the Smart City Expo World Congress 2024 took place in Barcelona from November 5th to 7th [1].

The Smart City Expo World Congress (SCEWC) is known as the world's largest smart city trade fair dedicated to the future of cities and urban innovation. This event brings together leaders from global companies, governments, and organizations to move cities toward a better future.

The event showcased smart innovations that contribute to the creation of sustainable and efficient solutions for the urban environment in the form of smart technologies. With the development of technologies such as artificial intelligence, virtual reality, BIM (Building Information Modeling) solutions, and digital twin in particular, urban planning is becoming more dynamic and interactive. Modern tools make it possible to simulate the impact of urban change in real-time, leading to a more accurate assessment of the impact on local microclimate, transport, environment, and social factors. This approach facilitates collaboration between experts and the public, promotes participatory planning, and increases the availability of information, thus improving the quality of decision-making processes. Through data analytics and algorithms, more holistic solutions can be developed to improve urban quality of life.

Introduction

Current developments in urban planning and urbanisation face new challenges that require innovative approaches and solutions. Rapidly growing urbanisation, increasing demands for sustainability, and the need for efficient use of resources create the need for smart technologies that mediate better management of the urban environment. In this context, tools such as artificial intelligence, virtual reality, digital twins, and BIM-based solutions are becoming key to model and simulating urban change with high fidelity and in real-time. These technologies are bringing about a fundamental change in the way we plan, use, and manage cities, facilitating the development of sustainable and efficient solutions that take into account not only technical but also environmental, social, and economic factors.

As Carlo Battisti, President of Living Future Europe, says, *„In urban development, it is essential to involve diverse disciplines from the outset of each project, allowing complexities to be addressed in a coordinated manner and future challenges to be anticipated. It's not just about energy efficiency; the approach needs to be holistic and integrated, bringing together everyone from interdisciplinary designers to builders to develop practical, replicable solutions."* As in any sphere of transition, the accuracy of data is critical.

"We need concrete metrics to the effectiveness of our actions – relying on theoretical data without measuring impact is like aiming at a target that constantly shifts. Only with solid figures can we truly understand whether we're making progress." [1]

Smart City Expo 2024

The Smart City Expo World Congress, held in Barcelona since 2011, is the largest and most influential smart summit for cities. Each year, they bring together leaders from global companies, governments, and organisations to move cities toward a better future. The aim is to collectivise urban innovation around the world and enable cities to respond to the rapid challenges facing the world today.

Their mission is to catalyse a clearer urban paradigm toward green, efficient, and prosperous cities that leave no one behind [2].

More than 25,771 participants from 130+ countries attended the Gran Via event at Fira de Barcelona from November 5 to 7, 2024. Under the theme „Live Better", representatives from 850 cities came together to share the experiences of their latest projects and initiatives [2]. The program was structured around eight main themes: Enabling Technologies, Energy and Environment, Mobility, Governance, Living and Inclusion, Economy, Infrastructure and Buildings, and Safety and Security. Major partners include Saudi Aramco, Axis Communications, Dahua Technology, Dassault Systèmes, Dell/Nvidia, FCC Medio Ambiente, Hail City, KHNP, KPMG, Madinah City, MDEC, Microsoft, New Murabba, Nova Cidade, PNY, PWC, Roshn Group, Smart Ports: Piers of the Future, and Veolia [2].

On the issue of urban planning and land-use planning, the themes that resonated most at the Expo were:

Digital twin

A digital twin in the context of a city data model is a virtual model that accurately reflects the physical and functional characteristics of the urban environment in the real world. A digital replica of a city is created using various technologies

* Slovenský překlad článku je uveřejněn na webových stránkách časopisu.

such as 3D modelling, sensor data, Geographic Information Systems (GIS) data, BIM, and other data sources. This model allows one to simulate, analyse, and optimize various urban processes and scenarios in real-time.

The city's digital twin contains not only geometric information about buildings, infrastructure, public spaces, and the transport network but also dynamic data about how these elements function and interact. This data can include information on traffic, energy consumption, air quality, meteorological conditions, population movements, and other relevant factors.

Smart technology

Artificial intelligence is a powerful tool for analysing data and providing alternative solutions. It can be updated in real time based on new data from sensors or other sources, and allows for real-time assessment of changes in urban environments, such as traffic variations or new infrastructure development. Using a suitable algorithm, will offer tailor-made solutions.

Geospatial technology companies specialise in bespoke solutions for Smart Cities. Products can range from apps for enhanced road safety and traffic management to smart locations for informed land development decisions and an integrated environmental management tool that provides proactive responses to climate challenges. Such technologies enable smarter and more efficient urban life and accelerate innovation for municipalities and industries worldwide [3].

The combination of artificial intelligence and interactive technologies is leading to the development of new, holistic solutions that take into account the complexity of urban systems.

This approach makes it possible, for example, to assess the lighting conditions in a particular area. If a planner proposes a change, such as the construction of a new building, the digital city model can immediately show how this change will impact the wider surroundings. Based on real data, artificial intelligence will assess how the light regime will change in a given environment and provide suggestions for adjustments that can improve conditions, for example by optimising the orientation of the building or the design. Planners can then assess the specific impacts of this change, such as its effects on surrounding plots in terms of shading, how it will affect the regime of public spaces, people's comfort, the surrounding greenery, etc., and use an appropriate algorithm to offer an optimised solution.

The model can also be evaluated considering various constraints. For example, the intensity and type of development, the number of storeys, the orientation of buildings concerning cardinal points, geomorphological, climatological, or hydrological conditions, etc. can be optimised.

One of the key advantages of this approach is the ability to experiment with the simulation of interrelated phenomena in an urban environment. For example, changes in building height, or intensity of build environment can be immediately evaluated in relation to the length of solar radiation during the day. Population size and density can be evaluated in terms of the need for amenities, public spaces greenery etc. The model also allows for the assessment of air quality, noise or traffic pollution, and the selection of sites for public transport stops. This dynamic process is driven by real-time data and simulations, enabling collaboration among various stakeholders on a shared platform.

Technology incubators

Incubators, which initiate smart design solutions for more sustainable cities, represent a new approach in urban planning that combines research with practical application. These urban smart labs provide a space for experimentation with cutting-edge technologies to create efficient and sustainable urban environments. In practice, these technologies enable better integration of theoretical underpinnings and data models into concrete solutions that influence the way we design and plan urban structures.

The main objective of these projects is also to make smart technologies and tools available to a wider range of users and thus to make urban planning decision-making processes more efficient. Laboratories of this type such as Vienna's Urban Smart Lab [4].

Vienna's Urban Smart Lab uses interactive screens and tables that allow direct input into the design, where one can experiment with different urban designs and use technology to simulate the most effective solutions. A large database is processed in the background, using artificial intelligence to create various simulations and real models, allowing analysis of the effects of the proposed changes on the surroundings. These technological solutions make it possible to obtain rapid feedback and generate different alternatives, thus significantly improving the quality of the decision-making process and optimising the resulting proposals.

Other example is SE3 Labs develops Spatial AI that transforms spatial data into accessible 3D insights. With this innovative SpatialGPT, users can talk to their data and digital twins - from city officials to citizens - by asking natural-language questions about 3D space. SE3 Labs' AI-powered solutions enable smarter urban planning and management, making geospatial analytics easy and accessible for building the sustainable, smart cities of the future [5].

Environment

When discussing urban areas, it is important to remember the importance of integrating nature into cities. Among the exhibitors was the Italian company 3Bee, which, as Silvia Moser, Biodiversity Strategist, explains, has created a digital platform to analyse different urban contexts, collecting data on hydrogeological and climatic risks and biodiversity areas. Thanks to these parameters, it is possible to identify critical areas such as heat islands and areas at risk of flooding. In addition, the simulations consider the proximity of nature-protected areas and ecological networks to reproduce small ecosystem habitats in our cities that can increase naturalness and interconnectivity. Thus, through ar-

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Fira de Barcelona – the venue for Smart City Expo World Congress 2024

tificial intelligence, nature-based solutions can be found and integrated into cities [1].

Participation

These innovative solutions are available online, allowing a wide range of people, including laypeople, to get involved in the planning process and receive rapid feedback. Through web-based applications, residents can share their opinions, input data into preset matrices or interact directly with the city's digital twin. In this way, planning is more democratised, transparent, and accessible to all stakeholders.

Rapid feedback enables design optimization in collaboration with different stakeholders, promoting collaboration and efficiency within the creation of urban structures. The result is a better prepared, sustainable, and smart urban development that can respond to the challenges of modern cities and provide a quality of life for all its inhabitants.

Conclusion

Smart technologies such as artificial intelligence, digital twins, and virtual reality are changing the way we plan and manage urban environments. These tools make it possible to create dynamic, interactive models that not only optimize technical aspects but also take environmental, social, and economic factors into account. With the ability to react to changes in real-time and provide concrete suggestions based on data analysis, we can create more sustainable and more efficient urban solutions. Technologies such as AI not only allow for a better understanding of the impact of changes on the surrounding environment but also for rapid testing of alternative solutions and optimisation of designs in collaboration with different experts and other actors.

Technology incubators are an important step in this transformation, providing a space to experiment, research, and apply these innovations in the real world. These laboratories promote the use of state-of-the-art technologies that allow urban planning to be quickly adapted and adapted to current needs. Interactive platforms also allow the general public to participate in the process.

Integrating technology into urban planning leads to the development of smart cities that provide a quality and sustainable life for all its inhabitants. By using data and simulations, we can not only better respond to the challenges of the present, but also anticipate and plan for an urban environment that is efficient, resident-friendly, and responsive to future changes.

References:

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