"WHAT PEOPLE REALLY WANT" – USER VALIDATION OF "DIGITAL CITY" CONCEPTS

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Abstract

This Paper discusses the experience acquired from the user-compatible development of a digital city model as an aid to urban planning based on the endeavours of a large Austrian city. The method selected was a structured survey of the future users of the "Digital City". In the case in question, the addressee is initially an "internal" client, in other words the staff of the Urban Planning Department. Above all findings it seems vital to work more intensive on common terminology and concepts to facilitate the communication between all those involved in creating digital three-dimensional City Models.

1. Introduction

Digital City Models are used to model selected features of real cities in virtual format so that different future urban developments can be simulated. Models of this kind can be classified as "Digital Cities".

Urban planning is viewed here as the service area of community administration that relates to the maintenance and design of shared living space and concentrates on solving the problems that arise in urban planning.

2. Preparatory work

The preparatory work for creating a "Digital City" (based on a specific example) included the formulation of a series of concepts as examples, such as:

1) "Multi-dimensional" Digital Cities [1]: The various dimensions encompass:
   - Models with different "Levels of Detail" (LOD) depending on the viewing point and planning phase;
   - "Variants" – different possible variants of the townscape viewed at the same point in time – and
   - "Versions" – storage of the various development phases of a townscape at a certain data acquisition time;

2) Development of a "Data Pipeline" concept: intended to handle a townscape which is permanently changing due, for example, to construction, demolition and decay;

3) Integration of the above Digital City concepts in a "Space-related Content Management System" (SCMS), [2]. The work incorporated the notions of planning theory (e.g. shared development of spatial awareness with users, importance of modeling and simulation in planning).

3. Theory, METHOD

Quality testing of concepts by the users of those concepts (i.e. validation) is based on quality management standards which require product development to be based on the needs of their users. [3, 4, 5]

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Among other things the following aspects were surveyed:

- A) Profile of the work area (e.g. types of data used, data processing tools, internal and external data transfer, data formats, standards, update cycles, relevance of 3-dimensional information);
- B) Requirements for a digital city model (e.g. minimum thematic scope of digital data, level of detail, quality of the model, metadata, desired processing methods for digital data, integration of existing system components, interfaces to other systems, workflow);
- C) Future perspectives and expectations.

The next stage is to involve "external" clients (such as technical colleagues, politicians, citizens).

4. Results

In addition to other results, the survey revealed the following:

4.1. Profile of the work area

- Respondents viewed the core tasks of the facility as: processing the instruments of urban planning, and in particular: creating spatial development concepts, zoning plans and building regulation plans; also: traffic planning,

green area planning; generating different models; producing expert opinions, processing subsidies and grants; etc. The scope of the work therefore encompasses the entire range of traditional urban planning including state-of-the-art management tasks.

- These urban planning tasks use a whole range of different data, such as aerial photographs, evaluations of survey flights; urban atlas, land registry and land cadastre; various thematic maps such as land utilization, age of buildings, technical infrastructure cadastre, traffic, noise maps, green areas etc.; data relating to buildings such as heights, façade finish, photos; also historical maps, such as artistic topography etc. The required datasets therefore originate from different sources, relate to different subject matter and time states, encompass different scales and levels of detail and represent different geometric dimensions (2D, 2.5D, 3D).
- The types of data include grid data (photos, scans), geometric data (vector data), video data, statistical data and descriptive data (text). The file formats are many and varied, and include for example: jpg, dwg, dgn, doc, pdf, xls, analogue data (obtained from censuses and surveys). The data is processed with different "tools" such as CAD, GIS (Geographic Information System), digital image editing, and digital word processing.
- Within the Urban Planning Department, data exchange takes place with many other departments. Data is exchanged "externally" mainly with civil engineering offices (architects, spatial planners, landscape planners etc.) and municipal organizations. The data is subject to various access permissions and roles which define the "read" and/or "write" access.
- The intention is to implement dataset update cycles of three years. The different time states of the datasets and also within a thematic dataset were felt to be a drawback. Response times (from request to processing) are measured differently and it is not possible to make any general comment on them. The aim is to achieve quick response times.

4.2. Requirements for a digital city model

The questions regarding requirements were divided into two areas: data requirements and system requirements. The question of the three-dimensionality of the City Model was of particular interest.

- The datasets named by respondents from their own area of activity which could enrich a virtual, three-dimensional City Model, included: contents of the building regulation plans, building volume model, façades, roof shapes, color schemes, planting;
- The task areas cited where three-dimensional City Models could be particularly important were: building regulation plans, design of urban space, expert opinions on townscapes;
- A digital City Model should contain at least the following datasets: buildings, vegetation, roads, bodies of water, green areas, walls, urban structures, boundaries, civil engineering structures; also: age of buildings, façades, roofs and the surface structure of roads.
- The scale and resolution should based on the scale range from 1:250 to 1:500. Different levels of detail should be available: block model, volume model, architecture model.
- The geometrically measurable attribute should include: main fronts (building heights, building widths), building storeys, roof shapes, eave height, building height, true size of trees, groups of trees.
- The metadata relating to geometric data selected included: zoning, three-dimensional development capability (contents of building regulation plan), characteristic urban planning values.
- The "multimedia" data that should be linked to a three-dimensional City Model included: video, pictures, graphics, maps.
- The processing methods desired included: archiving of information, looking up current and historical information, modifying and updating, supplementing, measuring (geometry), generating simulations (e.g. visualizations and noise, energy and wind simulations), presentation of models and simulations.
- The important interfaces are those between CAD, GIS and the database.
- Questions relating to special processing environments for a 3D City Model (such as CAVE, 3D-Mouse, stereo projections), to special visual qualities (photo realism, symbolic and schematic representations) and advantages to be gained from the shared use of 3D City Models, were not answered in detail.

4.3. Future perspectives and expectations

The entire complex of questions relating to future perspectives and expectations, was only articulated by way of examples. The topics mentioned were:

- Better communication within the "planning fraternity",
- Better comprehensibility,
- Illustrations of urban planning goals and actions,
- More possibilities for consultancy from external clients (planners, building owners, citizens, politicians).

Respondents expressed worries about such things as the additional time, effort and cost associated with the creation and use of a digital, three-dimensional City Model.

5. Conclusion

Some of the responses were as expected, whilst others addressed surprisingly new aspects. Some questions received only unclear answers. It would make sense to carry out a detailed analysis of the data types, data exchange relationships and systems involved, as well as the structure of the data access permissions. Some users work intensively with certain system components and datasets. Integrative solutions that in addition promote interdepartmental synergies are therefore desirable. Different levels of detail have to be taken into account as an important requirement in the system specification, as well as the possibility of being able to create and call up different variants and versions. Questions relating to special simulation environments and data quality, improved work and communication processes, clearly require a greater level of awareness and illustration of the possibilities for potential internal and external users. The advantages to be gained from using digital City Models need to be clearly defined and using them must guarantee an added value to the user.

Above all it is vital to work on common terminology and concepts to facilitate the communication between all those involved in creating digital three-dimensional City Models.

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