Werner Kuhn
Andrew U. Frank
Technical University Vienna, Dept. of Geoinformation
Gusshausstrasse 27-29/127, A-1040 Wien, Austria

Invited Paper (Extended Abstract)

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ABSTRACT

Spatial data are being collected at an increasing pace, with photogrammetry and remote sensing serving as the most productive data collecting disciplines. At the same time, markets for spatial information are emerging world-wide. Still too often, however, there is a mismatch between the demand and supply of spatial information: data being collected and offered sometimes do not meet the expectations of potential buyers.

The malfunctioning of spatial data markets has many reasons, ranging from the fact that users are often unaware of existing data to the difficulties in interpreting and processing spatial data once they have been bought, to institutional and legal obstacles. A major technical reason is the lacking usability of data collections.

The presentation addresses the issue of usability and discusses the widely proposed remedy of metadata. It concludes that the most effective step toward usable spatial data is not to document data collections, but to modularise them into small manageable units and packaging them with suitable operations. This vision of future spatial information services is currently being pursued under the heading of "Open GIS".

I. MARKET CONCERNS FOR SPATIAL DATA

A spatial data market needs to provide answers to questions of potential data suppliers and customers. Typical customer questions about data *supply* are:

- where and from whom can they get data?
- in what form?
- in what resolution?
- how precise?
- how complete?
- how current?
- how quickly?
- how expensive?

Typical customer questions about data *use* are:
- can the data be combined with others?
- what operations do they support?
- what conversions are required?
- how can updates be integrated?

On the other hand, data *suppliers* might ask:
- what can I sell ?
- how can I reach potential customers ?
- how can I keep customers ?
- who is my competition ?
- what about copyrights ?
- what about liability ?
- what can I charge ?

Reflecting on the possibilities for market settings to answer such questions reveals several *problems* with the current situation:
- a lack of available and *usable* data
- monopolies distorting supply and demand
- unclear copyright and liability situations.

For businesses operating in the market, these problems can be understood as *opportunities* if they are
- adopting a product and service orientation
- exploiting niches for value adding
- advancing flexible standards.

II. METADATA AS PANACEA?

Using data for decision making requires an interpretation of their contents. Metadata have been proposed as a means to support users in this interpretation task. They are defined as data about spatial data: "Data that describes the content, representation, extent (both geographic and temporal), spatial reference, quality and administration of a geographic data set" [CEN 1995].

Typically, metadata standards involve categories like

- Dataset Identification
- Dataset Overview
- Dataset Quality Parameters
- Spatial Reference System
- Geographic and Temporal Extent
- Data Definition
- Classification
- Administrative Metadata
- Metadata Reference

There is very little theory on metadata - and even less practice. Everybody talks about metadata, but who produces and who uses them?

A recent case study in Austria applied the proposed CEN metadata standard to eleven digital spatial data sources [Timpf et al. in press]. It found that the standard is comprehensible and applicable. Producing metadata was feasible for practitioners and the results understandable to them. The major issues were, however, whether the metadata themselves are usable and relevant to potential users. Do they provide answers to the questions of a potential user who needs to decide if a dataset should be acquired for a specific task?

Current thinking about metadata emphasises *completeness* instead of *usability*. It promotes a tendency for data cataloguing, leading to voluminous and difficult to use *meta*data collections in turn. At the end of the case study, there was a general feeling among the metadata producers that potential data users would still be confused, but on a higher level. There seems to be a complete lack of considerations for the use and the user of metadata.

III. FUTURE DEVELOPMENTS

If metadata are not yet the answer to the usability problems that slow down the development of data markets, where should we look for future answers?

The general recognition of some facts about data and information products provides some guidelines. Firstly, it has become obvious that nobody wants to buy data as an end in itself. Rather, customers want information, providing answers to specific questions, which are important to them. Secondly, information system research has found that the traditional emphasis on data, neglecting operations, is detrimental to the usability of the data. The

separation of data from the operations that they support induces a loss of semantics [Kuhn 1994]. Thirdly, current metadata activities show that data do not become usable through documentation alone.

These observations suggest a new approach to the production of usable spatial information: To define and standardise interfaces for spatial information *services*, rather than interfaces for data exchange. Following the paradigm of object-orientation and targeting modern client-server architectures of GIS, data and operations are recognised as belonging together and forming packages that provide services to users. These service interfaces act as contracts between the suppliers and consumers of spatial information. Instead of trying to transfer spatial data among monolithic GIS, modular GIS functionality then becomes distributed over a global network. This idea is currently being developed and implemented by the Open GIS Consortium [Buehler and McKee 1996]. It is based on the philosophy of Occam's razor: simplifying as much as possible (but not more). A simpler interface reduces the documentation needed to explain complexity.

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Address of Authors

Doz. Dr. Werner Kuhn
Prof. Dr. Andrew U. Frank
Dept. of Geoinformation, Technical University Vienna, Gusshausstrasse 27-29/127, A-1040 Wien, Telephone: (++43 1) 58801 3787, Fax: (++431) 504 3535, email: kuhn@geoinfo.tuwien.ac.at