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objektINFO Project

Analysis of the information requirements of selected actor groups regarding property information during building lifecycles as a prerequisite for developing a Building Information System (BIS)

Summary Report

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Introduction

There are various actors who operate within the real estate industry, each with specific tasks, goals and roles. Each actor requires specific information in order to prepare, support and justify the decisions they make. These decisions must be made by actors who are either directly or indirectly involved at various times and for various occasions over the course of real estate lifecycles. Here often constellations of actors occur, in which one party must provide information while another party relies on correct, complete information. In addition, the real estate market is not very transparent. To some extent, information is not available, or is not available in the proper form required, or even is not always exchanged as required. This fosters the emergence of information asymmetries between the parties involved. Information asymmetries in the real estate industry may be based on a lack of expert knowledge or an insufficient information basis. Asymmetries may also occur due to miscalculating the abilities, intentions and knowledge of respective partners (e.g. a contractual partner).

Until now on one hand, there has been a lack systematic structure towards the collection, analysis, assessment and communication of key information over the course of lifecycles. On the other hand, there has also been a lack of systematic structure towards the development and application of suitable instruments in supporting information management. An already decades-long discussion regarding the introduction and use of building rating certificates as an instrument to improve the provision and updating of building-related information has failed to move in permanently overcoming the above-described problems.

In the past, instruments for the provision and updating of building-related information were frequently offered to actors without first having analyzed the actors' concrete and situation-related information requirements. As a result, it would be useful to clarify the demand side prior to further developing any approaches, in order to adapt the contents and possibilities of appropriate instruments to demand.

In the objektINFO research project, funded as part of the "Future Building" ('Zukunft Bau') research initiative, the goal is to systematically determine and analyze the specific, existing demand among various actors for information during the real estate lifecycle. A classification system for property attributes that is developed should be capable of establishing a future basis for effective information procurement, management and analysis.

The project objective is to develop a property information system which integrates both unweighted information and results of evaluation. Assessments or valuation results could be managed as both information (for further processing) and as documents. However, the classification system is explicitly not intended to serve as a ratings system, but is rather for further developing the basis and structures of providing information for management and administration, for example, or for evaluation processes, as well as for managing assessment-related documents and results.

Theoretical Basis

The subject of discussion on a theoretical basis includes the actors, instances, terms, definitions and approaches for a systematization regarding the collection and documentation of information for building lifecycles.

The starting point of theoretical considerations is the so-called principal agent theory. This theory includes approaches for describing the information asymmetries described in the problem and approaches for overcoming them. When the principal agency theory is applied to the real estate industry, we can determine that information asymmetries exist in various forms contingent on the specific characteristics of the branch and commodity. The real estate branch is marked by trade between many different actors with a variety of motivations. Between some of the actors it is possible to identify classical principal and agent constellations Typical, for example, is a seller-buyer or landlord-tenant constellation.

Besides the principal agent theory, there is also a discussion of terms such as information demand, information supply and information needs. The objective related to these information system related considerations is that – as comparable to principal agent theory - there should be a balance created between information demand and information supply.

While considering the actors, it becomes clear that there is neither a standard definition of actors in the real estate sector, nor an established approach in classifying them within a system concerning the requirements of information exchange. Rather, there are approaches which serve to identify actors within the context of the real estate market and commodity, e.g. grouping actors into consumers, providers and transactors or assigning them to various lifecycle phases.

The emergence of information in the building and real estate industry can be understood the same way as the processes during each lifecycle phase of a building. A large share of information normally originates already during the first phase of lifecycle: conception, planning and construction. In relation to information gathering, for example, we have in this phase the land use plan or the implementation plan. Very little information arises during the marketing and procurement phases. The focus of gathering here is the information used to serve in marketing a building, i.e. providing the potential user with information on the building's layout and facilities. During the phase of use, a great deal of data is created regarding energy consumption, contract agreements, cash flow etc. During remodelling and redevelopment activities a need for updating and follow-up of property information arises.

Basics of systematic information collection and preparation

The starting point of identifying suitable instruments, tools and procedures is formed by determining the information requirements for each respective actor. Over the course of this research project, the most common instruments and tools towards consolidating building information were collected and discussed on one hand, while at the same time systematization approaches from literature, practice and standardization were analyzed. A suggestion was subsequently developed for a systemization based on these findings.

The procedure in identifying information requirements must be adapted to the specific characteristics of the actors. Generally, it was attempted to supply the information needs of each actor group through the records and documents that were produced or used. In addition, interviews with actor group representatives were held and a survey was conducted. Using this approach, 37 different documents were evaluated and over 900 attributes in describing real estate were collected. Particularly during the conversations with various actors it could be determined that almost all of them were aware of the present problem of information deficit.

In addition to identifying the actual information needs, various instruments and tools towards the systematization of building information was investigated. The terms for residential real estate included building documentation, energy certificate or the comprehensive building / house document file ('Hausakte'). For office and administrative buildings the terms included Building Information Model (BIM), building file, building data store, building book and due diligence.

In addition to instruments and tools, the area of systematic preparation of building information also includes approaches found in literature, practice and standardization. One example from literature divides information into static and dynamic categories. Static information is subject to no change or change only over very long intervals, e.g. due to remodelling, conversion or renovation activities. In contrast, dynamic information is subject to constant temporal change, e.g. consumption data and status data that provides information on energy consumption or the present situation within a certain period.

On the standardization side there are a host of approaches, such as from DIN 32835, which unify technical aspects, economic aspects, organizational aspects and locational aspects under the umbrella term "building and usage documentation". Related approaches used in practice can be found, for instance, at the German Facility Management Association (GEFMA). One example is

the GEFMA 400 guideline, which divides information at an initial level into master data, process data and other data.

Observing various approaches applied in practice toward systematizing building information demonstrates that no standardized approach has existed until now. In observing this, we also see the complexity of the task of structuring building information. A distinctive feature of all approaches is that it is not possible to eliminate an overlapping or duplication of information.

In our examples, the type of systematization must be observed respectively within the context of the specific type of building use.

Developing a Building Information System

Within this project's target of developing a classification system to describe and manage real estate data, the first step was to aim for a practical application for all actors and types of use. In addition, the systematization should also provide a basis to modularize the information. Through a modularized structure, it would also be possible to provide partial information that is oriented to the needs in practice and that can be communicated in a target-oriented manner.

Based on the information requirements analyzed for each actor and based on examples drawn from standardization, the literature and practice, the following diagram shows a development and suggestion for systematization. It is based on a classification that is used as the starting basis of systematizing the actors' information needs. Over the further course of the project, this structure proved itself as suitable and is recommended for use, also with the agreement of the project advisory board.

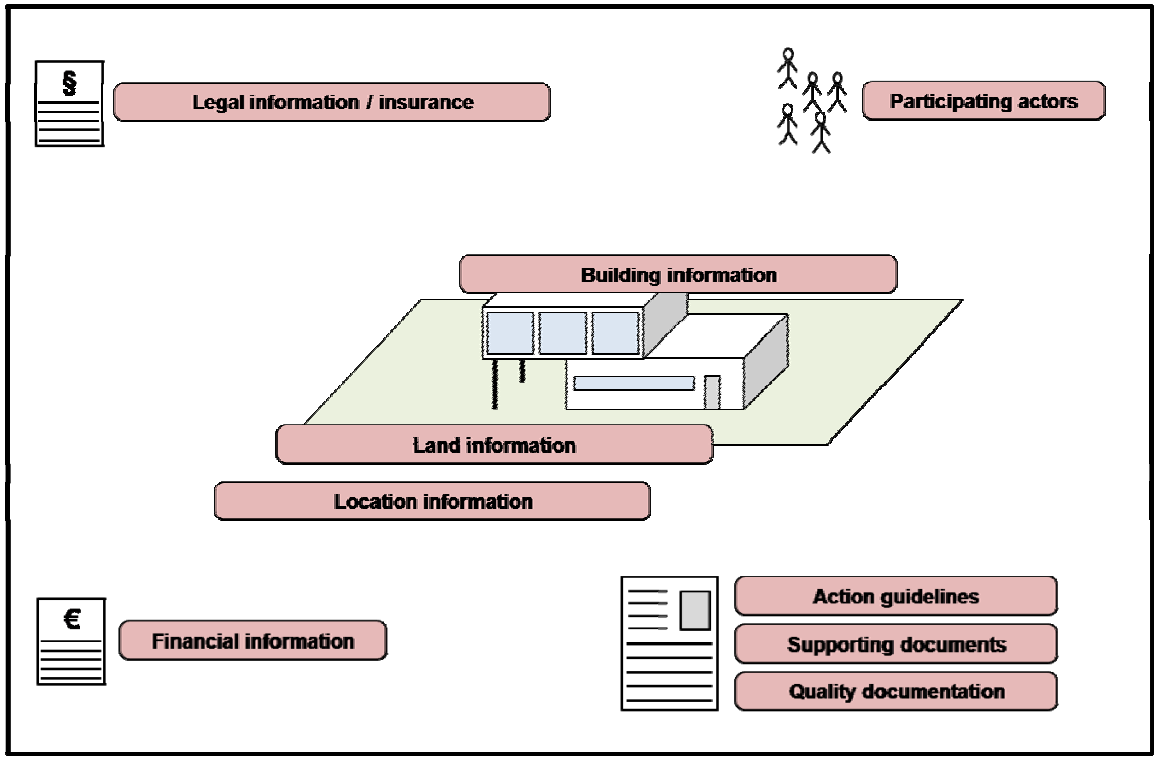

Figure 1: Overview – An approach towards systematizing information

The diagram shows the first level of an initially hierarchical model for the systematic representation of information. In contrast to the examples cited, which are mainly arranged according to functional, technical, lifecycle or document-related factors, here a hybrid form is suggested that is

oriented to the requirements found in practice. The respective information package in the first level can also be described as information modules for the overall system.

The evaluation of information and discussions with actors demonstrated that there is a need to typify information beyond systematization. This means that information should be assigned with additional data (signatures) to designate its validity. In this context, the term *signature* is understood as an identifying marker for a piece of information. An example of this is the difference between information which can be deleted or overwritten and information which must be kept available for an unlimited time. In addition to typification, an additional signature can be added to information: a reference indicating the information source. Maintaining and updating information in this form assumes a systematic approach in collecting information, particularly regarding actors during early lifecycle phases.

During the analysis of actors' information requirements during real estate cycles it became clear that these requirements were far more comprehensive and complex than first assumed and represented. At the same time, the importance of a proper and special-purpose provision of information continues to grow. In this way, for example, a building's sustainability rating and the integration of sustainability aspects as part of value appraisal lead to an additional information demand for new (e.g. auditors) and existing (e.g. appraisers) actor groups.

In this connection, it is also required to define the often-used term of building rating certificate more precisely. For example, through the introduction of assessment and certification systems, the building rating certificate has been relieved of its role as a quality assurance system and seal of quality. In this way it allows for a concentration on the representing and updating of selected real estate criteria found over the course of lifecycle. This criteria mainly covers descriptive information, and only partially involves information that is additionally assessed. The descriptive information initially should mainly contain information on real estate attributes that arise during the planning process and should form a set of "master data".

This "master data" can be understood as a compilation of a building's basic features and qualities. The following Table 1 presents a suggested list of master data.

Description of building	**Examples**
Cubage / Area	Gross capacity, gross floor space, net floor space…
Construction method and primary materials	Information on construction method and primary materials used
References to special features and eco-friendly components	Information on green roof, rain water usage, solar panels etc.
Mechanical stability and structural integrity	Load-bearing capacity
Energy saving and heat loss protection	Primary energy requirements, energy-efficient quality of building shell
Sound insulation	Information on airborne sound insulation and footfall sound insulation of components
Fire protection	Information on level of fire protection
Barrier-free access	Verification of barrier-free access
Retrofitting / convertibility	References to convertibility and retrofitting
Electrical amenities / quality	Information on the type, quality and quantity of electrical installations
Plumbing amenities / quality	Information on the type, quality and quantity of plumbing installations
HVAC amenities / quality	Information on the type, quality and quantity of heating, ventilation, AC systems
Environmental and health safety	Declaration of component compliance with environmental

	and health safety standards
Thermal comfort	Information on thermal comfort in winter and summer
Visual comfort	Information on quality of supply of natural and artificial light

Description of land (selection)	**Example**
Degree of building and land use	Floor space / floor space per storey allowed per square footage of land
Land survey information	References to contamination
Encumbrances	Right of way

Table 1: Suggested list of master data [Autoren]

This master data could in the future represent the core of the building rating certificate or building condition report.

An approach for managing property and land information over the course of lifecycle is necessary in the form of master data or a building rating certificate, for example. However, this approach cannot fully cover the variety of informational needs of actors and situations as identified during the project. Generally introduced documents (e.g. full documentation about the property) cannot be ignored or replaced, either.

The authors therefore suggest an open concept for a Building Information System (BIS). This is conceptionally based upon a comprehensive building document file (‘Hausakte’). This file is less a closed document in itself, but rather a type of “information container” to be filled over the course of lifecycle. The building file integrates documents such as the energy rating certificate, a simplified building rating certificate and verifications of repair and maintenance.

A collaborative system of information sources and documents is suggested, which supports the provision of information as required by respective actors and situations. The following diagram serves to describe the theoretical structure of a Building Information System (BIS).

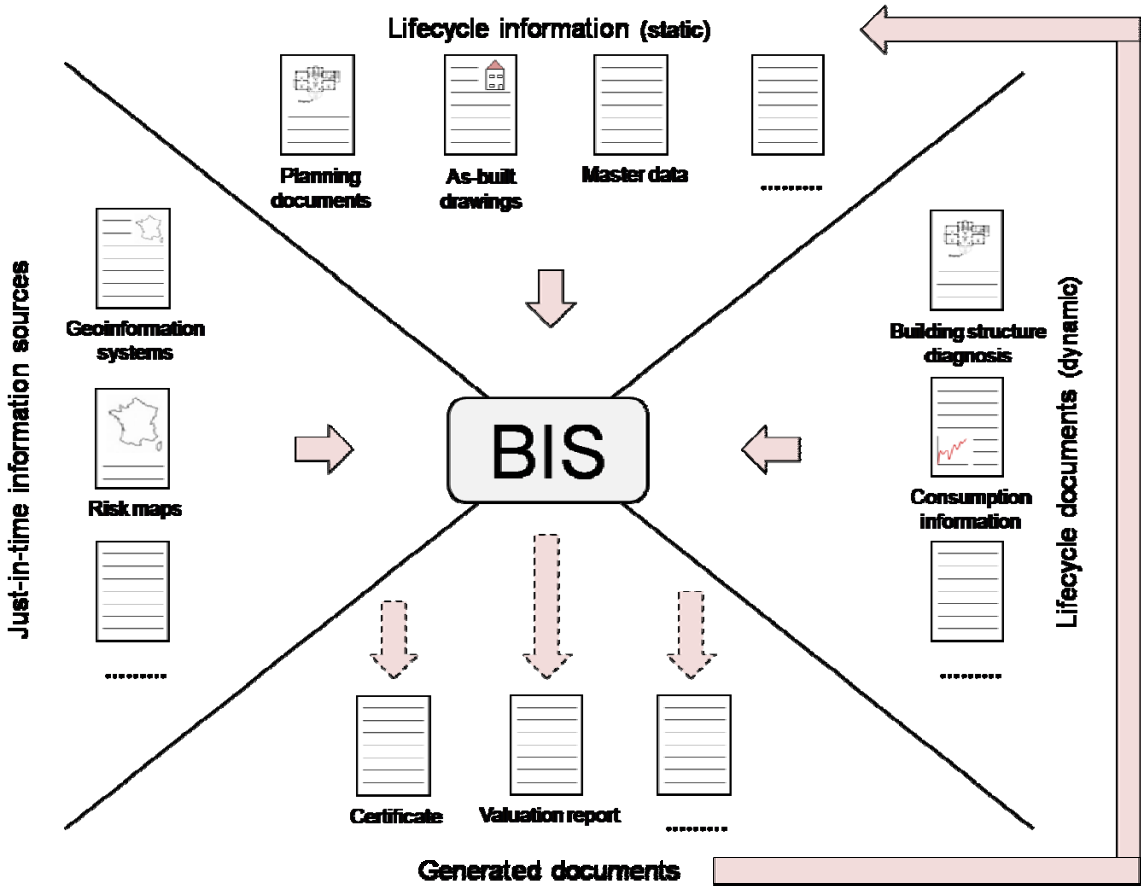

Figure 2: Structure of a Building Information System

The diagram shows a centrally placed system of classification that can be developed into a system of information on buildings. The Building Information System (BIS) includes the modules that correspond to the system of classification introduced in Figure 1. Shown at the top are documents primarily covering static information which generally comes about during a building's planning phase. Also a part of this are the building rating certificate and building condition report in terms of serving as "master data". To the left is information which can be accessed just-in-time. This information is generally subject to constant change and generally is produced and made available through publicly-accessible sources (GIS, noise mapping, risk mapping). To the right is dynamic information and documents which come about over the course of building lifecycle. This information must be collected on an ongoing basis or requested from facility management or owners.

The three blocks described are components of the building information system in terms of acting as a collaborative system. Simultaneously, new data and documents (e.g. appraisal report, sustainability certificate) can be generated from the information consolidated as part of the BIS. This new information can serve to supplement the available data and documents for a property, and be integrated into the system classification. As long as this information can be kept available, it serves as an extended information basis for third parties.

Summary and Outlook

Both the lack of a systematic structure for collecting and communicating key information during real estate lifecycles combined with deficits in developing and applying suitable instruments formed the starting point for the objektINFO research project. As a result, our goal was to develop a structure for property information over the course of lifecycles on the basis of the information requirements of relevant actor groups, and thus for the first time approach the topic from the information demand side.

Overall, the discussion of information requirements of various actors within the building and real estate sector has shown that the systematic collection and updating of information often does not fail at the gathering stage, but rather during the management, updating and follow-up stages over the course of lifecycles. The reason for this in turn is often the lack of a system of classification when initially collecting the information. The approach taken when initially collecting the information is thus key in deciding how much effort will be given to maintaining a current supply of information.

In addition to the demonstrated necessity of preparing and, where applicable, updating information in a systematic manner right from the onset, new information requirements and information sources -- as they emerge as part of sustainability debates -- must be integrated into existing processes and instruments. In relation to this, there are indications that first developments are on the horizon -- for example, as seen in the amendments to the German Real Estate Valuation Regulation. This regulation for the first time explicitly refers to a building's energy efficiency quality and its environmental impact. In addition, an increasing number of German cities (e.g. Darmstadt, Weimar) are taking a building's energy efficiency quality into consideration when setting their rent indexes.

It can be expected that new service offerings will be developed surrounding the topic of provision, management and evaluation of information. Actors such as planners will be able to improve their competitive position through improved and expanded treatment of property data. The minimum target is to allocate "master data" to each property and then systematically update and expand the respective information basis over the lifecycle. This argues in favor of supporting the concept of a comprehensive building document file for residential properties as well as establishing information systems for large-scale properties – as internal or external services where applicable (information management as a part of facility management)

A "sustainable" management of information supports sustainable planning, building and operation.