



DATABASE QUALITY ANALYSIS

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ABSTRACT

In this article, the data itself, its storage, and processing are prioritized in database systems. In database information requirements, at certain levels, practically all properties and attributes of the ISO 9126 "Software Quality" standard can be used. In accordance with this standard, the characteristics of information quality are divided into 1) functional and 2) constructive, and the requirements for its content are formulated, which are covered in detail based on sources.

KEYWORDS

Functional, constructive, similarity, relevance, completeness of the accumulated characteristics of objects.

INTRODUCTION

Although these components are closely related in the process of implementing a particular database, they are initially created independently of each other and can be considered as two objects that differ from each other in their life cycle in the following ways:

- the nomenclature and content of quality indicators that determine their purpose, functions, and consumer characteristics;
- in the technology and means of automation and support for the development of the entire life cycle of the object;
- categories of specialists who ensure the creation, operation, or application of the database;
- sets of operational and technological documentation supporting the life cycle of the object.

In database systems, the data itself, its storage and processing are of paramount importance. In database information requirements, at certain levels, practically all properties and attributes of the ISO 9126 "Software Quality" standard can be used. According to this standard, information quality characteristics are divided into 1) functional and 2) constructive. Let's consider them in more detail.

1. The functional suitability of database information can represent a complex system for measuring and evaluating compliance with the requirements of actual values of quality attributes. At the functional level, the quality of many databases reflects:

- 1) completeness of the accumulated characteristics of objects - the relative number of objects or documents available in the database to the total number of objects on a given topic, or to the number of objects in similar (analogous) databases;
- 2) similarity - the relative number of object descriptions without defects or errors to the total number of documents about objects in the database;

3) relevance - the relative number of outdated data on objects in the database to the total number of collected and processed data.

Measures and scales for assessing the quality of functional suitability of databases are as diverse as the specifics of the purpose and functions of the information stored in them. Therefore, it is impossible to standardize database requirements, expressed only in the general rules for their organization, compilation, and documentation. Therefore, assessing the quality of designed databases based on their functional characteristics is a complex issue and often requires a creative approach.

2. The constructive properties of the information contained in the database, and consequently, the quality of databases themselves, unlike functional properties, can be standardized. The constructive properties of information quality include practically all standardized quality indicators used in the analysis of software quality and listed in the standard. Let's consider the main ones.

1) Data reliability - the degree of correspondence of information about objects in the database to real objects at the current moment of time. Three types of discrepancies between the actual content of the database and its actual state are distinguished:

- the database stores a record that should not actually exist - an "excess" error occurs;
- the database lacks the entry that should be in the original database - the "insufficiency" error occurs;
- there is a record in the database that corresponds to the original record by key, but differs in the value of an element that is not a specific key - an "rearrangement" error occurs.

Errors in the information transmitted to the end users of the system are the result of errors in stored information, errors in processing algorithms, equipment failures, and malfunctions.

2) Information security is ensured through database management systems and their supporting data protection tools. The goals, objectives, and functions of protection are closely related to the functionality of each database. The quality of protection can be characterized by the amount of damage prevented as a result of the emergence of destabilizing factors and the implementation of certain security threats, as well as the average time between the manifestation of possible threats that overcome the data protection system.

3) The reliability of the database is characterized by the possibility of loss of operability. A reliable database should, first of all, provide a quick response to data loss or corruption, their reliability and restoration of operability in a shorter time than the boundary between rejection and failure, high reliability.

4) Resource utilization in standards is reflected in the occupancy of resources in the central processor, RAM, external and virtual memory, input/output channels, and communication channels.

5) practicality - a property that determines the functionality and usefulness of a database for certain users. This includes: functional comprehensibility, ease of assimilation, systematic efficiency, and ease of data use. Evaluation of practicality depends not only on the specifics of the database, but also on the organization and adequacy of documenting its operational processes.

6) The possibility of information support is reflected in the convenience and effectiveness of adjusting, improving, or adapting the content structure of descriptions depending on changes in the external application environment.

7) Database mobility is characterized by the duration and complexity of its installation, adaptation, and transfer to other platforms (hardware or operating). The specifics and complexity of transfer depend on the compatibility characteristics and content of the information transmitted between the platforms. The complexity of the transfer process, the laboriousness and duration of this procedure

require serious work in planning and organizing this work; at the same time, it is necessary to ensure the maintenance or improvement of the database functioning on the new platform.

Depending on the area of application, when assessing the quality of the database, priority can be given to various design features: reliability and security of use (financial sector), ease of use by low-skilled users (social sector), efficiency of resource use (material and technical support sector). In almost all cases, a certain role of other quality indicators is retained - for each of them, its priority for a specific area of application, as well as measurements and scales of required and acceptable quality characteristics, should be assessed.

As can be seen from the above review, assessing the quality of database design is not a trivial task. Moreover, due to the specifics of functional properties, it is difficult or even impossible to formalize their assessment, which depends on the direction of the field of science and various types of subjective factors.

The field of science is defined as a part of the real world that must be studied for the purpose of management and, ultimately, automation.

Assessment of the database quality by constructive parameters can be formalized and expressed in digital characteristics, as reflected in the standard. However, due to the high labor intensity and high cost, in practice such a procedure is used for evaluating large and very expensive projects, often with multi-planned evaluation of alternative software product options.

Since the subject of our research reflects the educational design of databases in academic lyceums, the assessment of its quality is significantly simplified and is mainly aimed at developing the student's professional skills and abilities. The main indicators here are often the following skills of the student: 1) correct task setting; 2) creation of an adequate structure for the designed database; 3) implementation of an effective database and user-friendly interface; 4) ensuring support for software products - the ability to test the product, correct errors, and create new versions. Experience in teaching database design shows that with the availability of the above-mentioned skills and abilities, students can design databases that adequately meet the quality indicators assigned to both the data management system and the data itself, both at the functional and constructive levels.

However, for a student to successfully master the training course and learn to properly design databases, they must possess certain personal qualities.

A survey conducted among lyceum students and teachers, as well as the experience of teaching information-oriented subjects, shows that the success of different students in mastering the basics of database design often does not correspond to their overall performance indicators and varies significantly. Also, the main difficulties encountered by students studying in the information specialty in designing databases are the lack of skills to: 1) correctly formulate the task from the existing initial conditions (field of science); 2) representation of the data included in the designed database as a system with all its characteristics: the presence of a goal, integrity, individuality, the presence of a structure of connections between elements, etc. (model of the field of science); 3) representation of a standardized data scheme in the form of a relational model (logical and conceptual model), reflecting only the essential connections between the system elements, i.e., the characteristics of the system necessary to achieve the set goal.

The indicated abilities (or inabilities) are mainly characterized by the designer's systemic thinking, where "the actual object (set of objects) is considered as a multidimensional whole, taking into account many determining factors: specific and non-specific, direct and indirect, stable and variable." Issues

of improving the quality of database design through the formation of systemic thinking by students studying in the field of information technologies will be discussed in the following paragraphs. In the context of the continuously increasing volume of information in the process of informatization of all spheres of social relations, the creation of a database, that is, "systems designed for organizing, storing, supporting, and presenting interconnected information based on computer technologies," is of great importance [104].

Database design is a complex, creative process and has a number of aspects: a methodology of a general approach, multi-level presentation of information from the presentation of a non-skilled user to the presentation of a system developer, analytical design tools and analysis of database structures, methods and tools of documentation used both in the design process and during the operation of the database. Therefore, assessing the quality of database design is also a multifaceted task requiring separate consideration.

When analyzing the quality of a database, it is advisable to consider two components: a data management system and a set of data organized according to certain rules.

We emphasized that database design is a complex, multifaceted creative process. It is based on the reflection of information about real-world objects as a holistic data model with attributive, functional, and communication properties. At the same time, the database creator must have the ability to synthetically perceive objects of the real world and consciously understand the diversity of information inherent in the holistic picture of the world, which determines the systematic thinking of the designer. In this approach to system design, information about the object (data) is considered as a specific attribute (parametric description), functional (target functions), and communicative properties (connections and relationships in the system) [8]. This means that it is necessary to develop systemic thinking (STM) in future specialists in the learning process, as it determines new features of acquired knowledge and skills, a new level of development of intellectual abilities, as well as skills and abilities for quickly and effectively solving complex tasks, including quantitative and qualitative elements.

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