A METRICS EVALUATION SYSTEM FOR DATABASE QUALITY

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Abstract:
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1. Background

Quality is defined as the achievement of the satisfaction of the requirements of the customer at an economical cost which is acceptable to both the supplier and the customer. (Swindells)

All information retrieval professionals have experienced that online searching is very expensive. For example one 5 minute search might cost $20. At this cost you might expect - according to the above definition - that you are satisfied with the results of your search. It is also well known among professional retrievers that online searches can fall down on the strangest of barriers: the connection breaks, the login procedure is changed, the password is not valid, the retrieved data is out-of-date. When using several online systems the problems will accumulate: the search languages and the commands are different, the structure of the databases varies, every service has its own login procedure, charging and invoicing follow their own rules, the user contracts show great variety and so on. One of the obvious problems concerning online databases and services is the lack of - or non-conformity to standards.

The only conclusion a database user can draw from these experiences is that the database suppliers are not aware - or even worse - do not care about the requirements of the database customers. So they have to be made aware of the customers requirements. According to quality experts, the customer's perception of service quality is acquired often through communication with the personnel and facilities of the service organisation. (Swindells)

According to the above mentioned experiences of information professionals, this way has not proved to be successful. So we, the customers ourselves, have to make the database suppliers aware of our requirements. In order to do that we have to gather the knowledge about experienced users' requirements. In order to accomplish this the evaluation of databases and adequate tools are needed. There is thus a great demand for knowledge-based assessment approach using a quantitative scoring system.

2. Previous work

2.1 International studies

During the past few years these problems have been discussed in the professional press and different studies have been made. Interestingly enough discussions and projects concerning the improvement of database quality started at the same time in various parts of the world.

At the same time, 1990, as the Finnish group published its criteria list (Juntunen et al.) also a Californian group drew up a similar list (Basch).

Since 1990, there have been several similar attempts to create database evaluation systems. High costs will prevent any thorough study also in the future. However, there are some good CD-ROM database evaluations. (Jacsó) Peter Jacsó gives a method for a quantitative database evaluation system using a customised score sheet. To each criteria is assigned a weight on a scale of 1-10. Jacsós method is suitable in comparing similar databases. It does not give accumulated data of several users’ experience of the quality of database.

Harry and Charles describe a system using a score sheet. The assessor gives two types of points for an evaluation of a database. The sum of the points measures the quality of the database. However, no information is given as to how the points reflect the quality of the database.

2.2 Finnish studies

The Finnish Society for Information Services formed a working group in February 1989 to study and evaluate the quality of Finnish databases. According to the project report, major factors weakening the database quality are insufficient information and poor user guidance, limitations in search programs as well as spelling mistakes and factual errors. The need for more sophisticated retrieval software was also generally expressed.

The business idea of the evaluation project was to improve the quality of Finnish databases by evaluating them from a searcher’s viewpoint and reporting the findings to all parties involved in the database business: users, producers, database vendors, telecommunications suppliers, etc.

The project consisted of two stages. The first part (1989) aimed at defining the concepts, generating the criteria and choosing the methods for the database evaluation, because no earlier studies could provide suitable methods for evaluating an online database quality. During the second part (1990) eight Finnish databases were evaluated by panels consisting of 2-4 professional searchers, using and com-
plementing the criteria list drawn up by the group. The project will now evolve into a system of continuous monitoring and regular reports on Finnish databases.

The quality factors were defined as validity, reliability and usability. The criteria generated cover five categories: telecommunications, retrieval software, data contents, search aids and costs. The list can be used as a tool for evaluating an existing database or as a check-list in the design of a new one.

The Ministry of Education in Finland has supported these projects through grants.

The work continues on different levels:
- continuing the manual evaluation of databases
- cooperation at international level, e.g. with the EQUIP project which is discussed in more detail in another paper by Nigel May during this conference
- creating a metrics toolkit for quantifying quality

3. QAD - a program for Quality Assessment of Databases

3.1. How QAD was developed
The Finnish project is now evolving into a system of continuous monitoring. This requires a more sophisticated way to measure database quality. For that purpose we have created a prototype for a metrics evaluation system called QAD (= Quality Assessment of Databases). The group outlined the following features for QAD:
- it should be systematic and accurate
- it should give numerical results
- it should be easy to use
- it should be useful in the quality improvement process of database hosts and producers
- it should create added value for database users.

QAD is a rule-based expert system which utilises fuzzy logic. It has been developed by the Finnish evaluation group and Arsens Oy/Ltd, a Finnish software house for TQM. QAD belongs to the MBA, Malcom Baldrige Assessment product family, also developed by Arsens. MBA is a tool for computer-assisted quality improvement process. QAD can be used either separately or as an integrated Advisor Module in MBA.

A section from the Finnish database quality criteria list was selected for the knowledge base in the prototype. The category the research group found in accordance with the available resources was „Connecting to the database system and communications“. This category covers the ease or difficulty of the first access to a databank for a beginner. The group assessed the following subcategories:
- opening times in the manual
- opening times suitable/adequate for the user
- terminal requirement in manual
- alternative connections
- kiosk service
- disturbances in the lines
- crowded lines
- access gates
- access steps
- system prompts
- notice of up-coming changes
- change of password

Arsens Oy/Ltd. represented the acquired knowledge by building the prototype with its Advisor Development Tool. The prototype was tested and adjusted in two sessions with experts. Two European database hosts were selected as case material. The hosts tested were Data-Star and Profile.

Five experienced information retrieval professionals analysed all possible answers and variations to the subcategories. In our knowledge acquisition sessions we found some surprising issues and problems. All knowledge items were recorded in the minutes of the sessions. In every subcategory the participants also were asked to evaluate how important this category was, from the point of view of the user, using a scale from 0 to 100%.

The knowledge engineer interviewed the database user experts in depth in two long knowledge acquisition sessions. He found still more interesting facts and linkages. Especially the branching of subcategories and interconnections were found to be very interesting. The engineer systematically requested experts to weigh each subcategory using trade-offs to indicate how important the different items were to the searchers.

3.2. How to use QAD?
QAD software program can be used, e.g. in following ways:
a. for evaluation of databases
   - to assess and compare the quality of databases and present the results numerically
   - to evaluate what features will add most value from the user’s point of view
   - to combine expert knowledge and customers’ desires in the evaluation process
b. as a checking tool for creators of new databases
c. to create questions to ask database publishers, practising users or hardware manufacturers
d. as a tool in helpdesks.
The QAD session is a dialogue between the user and QAD. During the dialogue the user is guided by the knowledge base of QAD through all important and relevant aspects of database quality. In the evaluation process the user assesses the attributes of the database by giving a numerical score. This is supported by the expert characterisations of typical situations and knowledge captured in the system. The user's own experience and the requirements of her or his business determine how this is to be applied. The outcome of the assessment process is the total points based on the weights given by the experienced database users.

The metrics evaluation of databases at large is achieved when all individual evaluations are combined. The results of the assessments can also be collected in QAD and delivered to all parties concerned for quality improvement of databases. QAD enables in this way comparisons and benchmarks.

3.3 The future of QAD

QAD is - according to our knowledge - the first attempt to create a prototype for metrics evaluation system of databases. We are quite aware that concomitant attempts might possibly be going on. To our knowledge nothing has been published, yet. Thus we dare to say that QAD is the first prototype of its kind. However it is clearly a prototype which needs developing. We are planning to continue the work in Finland as QAD has proved to have lots of potential.

Our aim is that QAD could also be developed for a practical tool:
- in developing standards for electronic information service industry, because it is impartial, customer focused and quantitative.
- in monitoring products and services of electronic information service industry
- in analysing contracts fairness

In the future we will work to overcome the financial problems inevitably involved in this kind of development work. We also need international cooperation.

References


