https://doi.org/10.48009/2_iis_2009_138-147

APPLYING AN ENHANCED UNIFIED DATABASE-MANAGEMENT QUALITY EVALUATION TOOL

Paul J. Kovacs, Robert Morris University, kovacs@rmu.edu
John Scarpino, Robert Morris University, scarpino@rmu.edu
Gary A. Davis, Robert Morris University, davis@rmu.edu
Jeanne M. Baugh, Robert Morris University, baugh@rmu.edu

ABSTRACT

The objective of this study is to enhance and apply a uniform database quality evaluation measuring tool that is based on the Southern California Online Users Group (SCOUG) model. The SCOUG model was originally developed to evaluate the quality of on-line research databases. This study, however, adds to the SCOUG model and applies SCOUG to internal company databases from a systems application (front end) or from a database/developer (backend) perspective. The results can aid in the understanding of database configuration, setup, integration, and pre-analysis for evaluation purposes.

Keywords: Database Quality, Database Quality Control, Database Quality Criteria, Measuring Database Quality

INTRODUCTION

The ability to develop and implement a unified database management quality evaluation tool is the basis of this study. The Southern California Online Users Group (SCOUG) model used as the measuring tool. The SCOUG model was originally developed to evaluate the quality of on-line research databases. Applying an enhanced version of this model for modern day internal company databases will hope to find information that can help aid the understanding of how the quality of internal database systems are. Too often management and technical experts hold the need to assess configurations, database setups, systems integration and pre-analysis for a simple evaluation purpose. This research anticipates facilitating those who need this information as a tool for there own analysis and study. Within this research our quality evaluation tool will be accessing modern day database systems and will validate if this enhanced SCOUG model tool is a benefit for collecting information.

A database is a cornerstone of most business projects. The design of the database is the foundation upon which a successful database implementation is based. The design must be right, and understood properly, before it can be built upon in any way. All design rules must be followed correctly leading to an extremely well done logical and physical schema. Various areas may provide problems during the design phase. These include, but are not limited to; poor or limited planning, poor normalization, lack of documentation and lack of testing.

Within the planning process, a good database is built with much thought, not only to what will be stored, but also what may be the final purpose of the database. Who is going to use it and for what purpose? Time must be taken to map out the needs of the database project and how it will meet those needs. Often the demands of the organization will instill an attitude of "just getting it done" in favor of a well though out planning process. The project may initially start in a certain direction and problems may arise that are due to a lack of proper planning, leaving no time to go back and correct them properly.

Ignoring the Normalization process can result in a great deal of problems. Normalization is the process of breaking down all tables so that each table only defines one thing and the columns describe that one thing. Normalization has been around for 30 years and it continues to play an essential role in the database creation process. The level of Normalization a well designed database must attain is in some dispute. It is commonly held that 3rd Normal Form is essential, but often 4th and 5th Normal Forms are useful and once mastered worth the time to implement in a database project. However, often even first Normal Form is not implemented correctly. Sometimes the Normalization process can require more time on task in the early design process, but it will be worth it down the road.

Documentation of any business project is essential, this includes a database project. There are many methods of documentation, including a data store, a separate metadata database, as well as the storage of information within the modeling tool itself. Often the naming constraints within the physical database

design can be a clear indication to everyone as to how the data is intended to be used. Where the documentation is stored is largely a matter of corporate policy, but the information access needs of the developers and end users must be considered in the documentation process. Enough information must be provided to allow programmers to support the database in the future.

Testing often is the first thing to go in a project's plan when time is limited. A programmer may be blamed for poor database performance when the actual problem may be that the data was not sufficiently tested within the final database design. Sometimes the database is tested by just having the user or users poke around to check functionality. This is not acceptable and will most certainly lead to problems with a full implementation of processes and users. One must try to anticipate as many problems as possible, including incorrect data entry by the user. It is much harder to detect and correct problems once the database is live and employees are using it as part of their daily work routine. Good testing will not eliminate all of the problems, but it should get you to the point where most of the issues connected with the initial design have been addressed.

There are fundamental reasons why companies need to measure the quality of their databases from a user's perspective. Database management is a critical success factor in all IT organizations and plays an integral part in how successfully an application will perform. However, a survey [1] regarding the current state of data management within IT organizations indicated that most organizations undergo data quality problems; yet these organizations do not have feasible strategies to address existing problems nor even to avoid new ones. The results found that the area of greatest concern was the inadequate level of database testing: 96 percent of organizations considered data to be a corporate asset and 64 percent implemented mission-critical functionality within the database. However, only 40 percent of organizations perform tests to validate the data and only 46 percent validate the functionality. Additionally, the survey revealed a lack of recognition that database testing is necessary at all—only 32 percent of organizations not testing for data quality, and 39 percent of organizations not testing database functionality realized that they needed to do so.

This study reports on survey data collected from individuals working in Information Systems and Information Technology departments who are directly or indirectly interfacing with databases. The impact of these different user perspectives must be evaluated to ensure that all elements of the system are receiving the correct information to support the user's job, and that the business is receiving the correct information needed to make informed business decisions. Specifically, the research question for this study is: What is the current level of quality of internal company databases as measured by the enhanced SCOUG model?

RESEARCH APPROACH

A questionnaire was developed based on a literature review and input from a rating scheme developed by the Southern California Online Users Group (SCOUG), which is a non-profit organization devoted to helping people take better advantage of information available through the Internet, online databases, and other electronic formats. SCOUG sponsors professional workshops as well as an Annual Summer Retreat where database vendors, information producers and users identify and discuss industry trends. During the fourth annual retreat, a group of SCOUG members developed database rating guidelines in which databases should be judged [2]. The SCOUG eleven guidelines are listed as follows:

1. Consistency – Internal uniformity of data elements and record structures in the database.
2. Coverage/Scope – How well does the database cover its subject area?
3. Timeliness – How frequently is the database updated as well as the time lags that exist before data is entered into the database?
4. Value in terms of cost – Do general system characteristics such as performance and speed, pricing structures and display options support efficient, cost-effective searching?
5. Accuracy/Error rate – Covers area such as the currency and completeness of the data sources used and the prevalence of typographical errors. Additionally, what quality control procedures do the designer use to identify and/or removed inaccurate data?
6. Accessibility – This category includes such things as physical accessibility to equipment and accessibility to information content.

7. System performance/Ease of use –This category includes both access to online services and, at the database level, access to the information itself.
8. Integration – The ability of a database to assimilate with other databases on the system.
9. Output – Can the user define custom formats? Can pages or portions of a document be printed selectively? Is downloading possible with the correct formatting
10. Documentation – Is both print and online documentation timely, accurate and readable? At the source level, does database documentation outline editorial policies with regard to coverage dates, currency, inclusions, and exclusions?
11. Customer support and training – The training that and customer support that is available, both basic and advanced. Additionally, are changes made to database without warning/documentation for users?

The questionnaire, accompanied with specific instructions, was administered to Information Technology (IT) and Information Systems (IS) professionals via the Internet using SurveyMonkey.com. The survey was available for three weeks within February of 2009.

The design of the questionnaire included the following three main parts:

Part I Background Demographics – This section was used to collect data about the department and position of the respondent as well as the type, design, and vendor of the database.

Part II Database Quality – This section was used to collect data concerning the quality of the database in terms of consistency, coverage/scope, timeliness, cost, accuracy/error rate, performance, integration, and documentation.

Part III Extra Information – This section was developed to elicit additional information concerning the development of competencies associated with a specific database.

DATA ANALYSIS

A total of 23 people responded to the questionnaire. Surveys conducted by Computer Economics [3] provide data in regard to staffing levels required to maintain a database infrastructure. Participants in this survey included 275 CIOs and senior Managers from companies in The United States and Canada. The research classified organizational size as follows:

- Small Organizations – Annual Revenues less than $250 million
- Medium Organizations - Annual Revenues between $250 million and $750 Million
- Large Organizations - Annual Revenues in excess of $750 million

Database personnel in this Computer Economics study found that more than half of the *Small* organizations reported only one support person and none of the organizations had more than seven persons. The average staff size of *Medium* organizations was 3.6 persons, and general database support rarely required more than eight personnel. Finally, concerning *Large* organizations, the average staff size was 11.7 persons, with most companies reporting a staff of less than 20 people.

In relation to the current study, only one large organization was represented in which responses were collected from 11 database professionals. The majority of organizations fell within the *Medium* classification.

Part I – Background Demographics

The respondents of the study included IT/IS professionals in banking, government, healthcare, consulting, and software development. In terms of database design, respondents included users and developers of relational, dimensional, multidimensional, non-relational, and object-oriented databases.

Examining the demographics of the sample in more detail, a total of 23 people responded to the survey. Out of the 23, 48 percent of the respondents were from a database technology group in a large, Fortune 500 financial corporation.; 17 percent of the respondents were from United States Government agencies; and 13 percent of the respondents were from a database systems department. The remaining

22 percent of the respondents were comprised of healthcare, consulting, software development, electronic document management systems, and operations.

In terms of database development, 57 percent of the respondents reported that they build databases. 43 percent of the respondents reported that they work with databases, but do not build databases.
In regard to database interfaces, 47 percent of the respondents indicated that they used a web interface. 49 percent of the respondents reported that they use a non-web interface. The remaining four percent of the respondents were unsure of the type of interface used at their organization.

Table 1 describes the breakdown of the responses to the database design. Since most modern organization support multiple database schemas, the respondents were permitted to select multiple responses to the *Database Design* question. All of the organizations represented in the study reported that they supported a *Relational (non-dimensional) Database Design.* About a third (34.8 percent) of the organizations represented in the study indicated that they supported a *Dimensional (Star) Database Design.* Less than one-third (30.4 percent) of the organizations supported a *Non-relational Database design.* Other Database Designs supported by the associated organizations were as follows: *Multi-dimensional* (13 percent), *Object-Oriented* (13 percent), and *Other* (8.7 percent). 4.3 percent of the organizations in the study were unsure of the Database Design(s) supported.

Table 1
Database Design

Answer Options	Response Frequency	Response Count
Relational (non-dimensional)	100.0%	23
Dimensional (Star Schema)	34.8%	8
Non-relational database	30.4%	7
Multi-dimensional (Cube)	13.0%	3
Object-Oriented	13.0%	3
Other	8.7%	2
Not sure	4.3%	1

Note: The *Other* category is comprised of OLAP hierarchical cubes, and Berkeley Databases.

Table 2 represents the breakdown of responses in relation to the database *Systems Design*. As in the *Database Design* question, respondents were permitted to select multiple responses (since most modern organizations support multiple database platforms). As shown in Table 2, the overwhelming majority (73.9 percent) of organizations support *Oracle* as a *Systems Design* platform. IBM's *DB2* and *Microsoft's SQL Server* were supported by 43.5 percent and 39.1 percent of the organizations in the study, respectively. *Sybase* (8.7 percent) and *Caché* (4.3 percent) were only supported by a small percentage of the organizations in the study. *Internal* databases (17.4 percent) and *Other* (13.0 percent) included U-Form, Berkeley, IBM's Basic Direct Access Method (BDAM), and Integrated Database Management System (IDMS).

Table 2
Systems Design

Answer Options	Response Frequency	Response Count
Oracle	73.9%	17
DB2	43.5%	10

MS-SQL	39.1%	9
Internal	17.4%	4
Other	13.0%	3
Sybase	8.7%	2
Cache	4.3%	1
Mumps	0.0%	0
Not sure	0.0%	0

Note: The *Other* category is comprised of Berkeley Databases, Home-grown databases (BDAM), and an Assembler-written database system called MADAM (Master Data Access Method).

Part II – Database Quality Using SCOUG

The SCOUG Analysis table is shown in Appendix A. The eleven questions were rated as follows: strongly disagree, somewhat disagree, somewhat agree, strongly agree, and not applicable. Percentages were given to each question based the amount of responses to each category. Below is a summary of the main responses for each question.

Question one, *the database maintains consistency with its internal record structure and other data-related elements.* 60.9 percent (14 respondents) answered strongly agree.

Question two, *the producers (Project Managers, Business Analysts, Developers) keep me informed of the coverage / scope of the database by publishing a clear editorial policy, and regularly enforce it throughout the department.* 30.4 percent (8 respondents) answered somewhat agree, while 26.1 percent (6 respondents) indicated strongly agree and both strongly disagree and somewhat disagree indicated a 21.7 percent response (5 respondents each).

Question three, timeliness - *The database is frequently updated and new data is input into the system quickly and efficiently with little lag time.* 63.6 percent (14 respondents) indicated strongly agree.

Question four, *The database contains value in terms of cost. (i.e.-- Is there an understandable and fair pricing policy on the online system? Are there any up-front or subscription fees? Are there free output formats for this database that facilitate browsing or relevance judging?).* 45.5% (10 respondents) indicated not applicable, while 31.8% (7 respondents) indicated strongly agree.

Question five, *The database contains accuracy / error rate so that an individual can accurately estimate the number of harmful typographical errors or judge its accuracy level.* 30.4% (7 respondents) indicated somewhat agree, while 26.1% (6 respondents) indicated not applicable, and while another 21.7% (5 respondents) indicated strongly agree.

Question 6, *The database is easily accessible in terms of the equipment being used, any special software required for its use, how easy it is to retrieve information based on the fields given within the database.* 60.9% (14 respondents) indicated strongly agree.

Question 7, *The database performance in terms of its response time, bandwidths supported, and its hours of availability.* 69.6% (16 respondents) indicated strongly agree..

Question 8, *The database integration capability with other databases.* 45.5% (10 respondents) indicated strongly agree.

Question 9, *The database contains a variety of output operations that are flexible enough to change as projects evolve. (Consider output format, overall style, look and feel of the database).* 31.8% (7 respondents) indicated somewhat agree, while 27.3% (6 respondents) indicated strongly agree.

Question 10, *Does your database contain timely, accurate, and documentation (instruction manual, editorial policies, other records, etc.) that is easy to read and understand in English?* 40.9% (9 respondents) indicated strongly agree.

Question 11, *Does the database come with customer service? (Can be any form of customer service -- toll-free numbers, online information, e-mail or another kind of interactive help with a knowledgeable person to answer questions.).* 63.6% (14 respondents) indicated strongly agree.

Part III – Extra Information

Part III includes six questions designed to gather additional information of the database environments from each of the respondents. The first five were yes/no questions and the sixth was an open comments section.

The first question asked, *Overall, do you feel that the database system is developed adequately enough and embodies most of the aspects it needs to effectively handle the projects it is used for?* Of the 23 respondents, 82.6% indicated yes while 17.4% indicated no.

The second question, *Do you feel that your database environment is set up properly for its intended use?* Of the 23 respondents, 91.3% indicated yes and 8.7% indicated no.

The third question, *Do you feel that your database system should be modified / new software added in order to keep up with industry trends?* Of the 23 respondents, 60.9% indicated yes and 39.1% indicated no.

The forth question, *Do you believe that your system is equipped with proper security measures to ward-off any possible threats?* Of the 21 individuals who responded to the question, 95.2% indicated yes, while 4.8% indicated no.

The fifth question, *Do you have any integration- or database-optimization issues?* Of the 23 respondents, 65.2% indicated yes, while 34.8% indicated no.

The sixth question, *Do you have any suggestions for your department that could help increase the effectiveness of training on the current system? (Please provide comments in the box below.)* Out of the ten individuals who responded to this question, one person said the department should hire a consultant, and another indicated that the database schema must first be designed according to the customer requirements – not just hastily put together. A third person suggested that the department encourage more training, three individuals recommended more training on the database by their vendor, two others indicated that they need more documentation on the database, and lastly, two people said they could not think of anything that should be changed.

ANALYSIS OF FINDINGS

As discussed previously, a modified SCOUG questionnaire was administered to 23 employees across various organizations and industries. The respondents' results were then tabulated into a mean score for each of the 11 SCOUG questionnaire topics. The results of the modified SCOUG questionnaire are presented in Appendix A: SCOUG Data Analysis.

Although the SCOUG is a proven instrument for determining database quality, no benchmarks or industry best practices have been established for SCOUG results. Therefore, the researchers of this study have established an acceptance-threshold for results obtained from the modified SCOUG questionnaire. Since the SCOUG questionnaire uses a Likert-like scale from 1 (Strongly Disagree) to 4 (Strongly Agree), the acceptance-threshold of 3 (Somewhat Agree) was established for the analysis of the modified SCOUG results. More specifically, for purposes of this study, a mean score of 3.0 or above indicates that the organizations in the study have an acceptable level of database quality for the associated SCOUG topic. A mean score of 2.90 or lower, however, indicates that the organizations in this study do not currently have an acceptable level of database quality for the specific SCOUG topic in question.

In analyzing the mean scores across the 11 SCOUG topics, the summarized results from six of the 11 topics met the 3.00 threshold. The six SCOUG topics (and their respective mean scores) are presented in *Table 3: SCOUG Topics within Acceptable Quality Threshold*. For each SCOUG topic, an abbreviated version of the question is presented in the table. All questionnaire questions, in their entirety, are presented in *Appendix A: SCOUG Data Analysis.*

Table 3
SCOUG Topics within Acceptable Quality Threshold

SCOUG Question Topic	Strongly Disagree (value = 1)	Somewhat Disagree (value = 2)	Somewhat Agree (value = 3)	Strongly Agree (value = 4)	Not Applicable	Mean Score (out of 4.00)
Consistency	1	0	8	14	0	3.52
System performance	0	1	5	16	1	3.52
Value in terms of cost	1	0	4	7	11	3.42
Accessibility	0	2	6	14	1	3.39
Timeliness	2	2	4	14	1	3.36
Customer support	0	1	5	14	3	3.32
Overall Mean	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*3.42*

As noted in Table 3, respondents to the modified SCOUG questionnaire either *Somewhat Agreed* or *Strongly Agreed* with the following SCOUG question topics: *Consistency*, *System performance*, *Value in terms of cost*, *Accessibility*, *Timeliness*, and *Customer support*. The mean score of 3.00 or above for these topics indicates that, on average, the organizations in the current study are adequately addressing these database quality issues.

The mean scores in Table 3 are sorted in descending order from highest to lowest mean score. This range of mean scores indicates that the organizations in the current study rate *Consistency* and *Customer Support* highest and lowest, respectively, out of these six SCOUG topics. The overall mean score for these six topics was 3.42. It should be noted, however, that individual organization's scores to these six topics are not presented in Table 3.

In contrast to the topics listed in Table 3, the means from five of the 11 SCOUG topics did not meet the 3.00 threshold. The five SCOUG topics (and their respective mean scores) are presented in *Table 4: SCOUG Topics Outside of Acceptable Quality Threshold*. Once again, an abbreviated version of each SCOUG question is presented in the table. All questionnaire questions, in their entirety, are presented in *Appendix A: SCOUG Data Analysis.*

Table 4
SCOUG Topics Outside of Acceptable Quality Threshold

SCOUG Question Topic	Strongly Disagree (value = 1)	Somewhat Disagree (value = 2)	Somewhat Agree (value = 3)	Strongly Agree (value = 4)	Not Applicable	Mean Score (out of 4.00)
Integration	1	3	4	10	5	2.68
Documentation	2	4	4	9	4	2.64
Coverage/scope	5	5	7	6	0	2.61
Output	1	4	7	6	5	2.45
Accuracy/error rate	2	3	7	5	6	2.13
Overall Mean	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*2.50*

As noted in Table 4, respondents to the modified SCOUG questionnaire either *Somewhat Disagreed* or *Strongly Disagreed* with the following SCOUG question topics: *Integration*, *Documentation*, *Coverage/scope*, *Output*, and *Accuracy/error rate*. The mean score of 2.99 or below for these topics indicates that, on average, the organizations in the current study are not adequately addressing these database quality issues.

The mean scores in Table 4 are sorted in descending order from highest to lowest mean score. This range of mean scores indicates that the organizations in the current study rate *Integration* and *Accuracy/error rate* highest and lowest, respectively, out of these five SCOUG topics. More precisely, out of 11 SCOUG topics on database quality, *Accuracy/error rate* was associated with the lowest overall mean

score (χ = 2.13) and *Output* was revealed the next lowest score (χ = 2.45). Although the SCOUG rating system does not assign relative weights to individual topics, the mean scores for *Accuracy/error rate* and *Output* are of paramount concern to the researchers involved in the present study.

The overall mean score for these five SCOUG topics was 2.50. Again, it should be noted that individual organization's scores to these five topics are not presented in Table 4.

CONCLUSION

The SCOUG model was originally developed to evaluate the quality of online research databases. However, when applying it to modern-day Web- and non Web-based database environments, it still serves as a valid tool to evaluate the quality of the database, based on the respondents' feedback.

Based on the data found in this study, *Integration, Documentation, Coverage/scope, Output,* and *Accuracy/error rate* were on the "Outside of Acceptable Quality Threshold" for SCOUG. There must be further analysis in order to find exactly what individual quality issues are present in each organization. The SCOUG model has been modified as a way to find issues in quality assurance database systems, for both front- and back-end users. This modification may not be enough, however. It is now the responsibility of whoever takes the statistical quantitative results to do what they believe is right for any change, cause or effect.

It is recommended, however, that the organizations in the present study focus their attention on the six SCOUG areas that had mean scores below the acceptance threshold. In particular, the organizations in the study should pay particular attention to the two SCOUG areas with the lowest mean scores (i.e., *Integration* and *Accuracy/error rate*). Although the current study cannot be generalized to all organizations, the six areas in question may serve as a starting point to organizations that seek to assess and address database quality issues.

Likewise, the organizations in the current study should also examine the five SCOUG areas that had mean scores above the acceptance threshold. It may be worth noting, for example, how these organizations were able to adequately address these SCOUG database quality areas.

This revised SCOUG evaluation tool will create a platform for use in the IT industry to evaluate database systems from both an MIS perspective and the "back-end" database specialist's perspective. Database management is an integral part in how successfully an application will perform. The impact of these different user perspectives must be evaluated to ensure that all elements of the system are receiving the accurate information to perform their job, and that the business is receiving the correct amount of output needed.

As shown in this study, the responses are evenly divided in regard to Web vs. non-Web applications and all of the 23 respondents indicated that they have a relational database. The majority of systems represented in industry by study are Oracle-based environments, with some DB2 and MS SQL. Experience shows that many schools are no longer teaching DB2, even as companies that actively maintain these systems still need graduates to maintain them. This presents a problem similar to the one shown with COBOL, as schools teach it less but the industry still uses this technology to run mainframes. Just because DB2 is considered "old" technology does not mean that should be done away with in school curriculum. Most respondents believe that their system is consistent and holds good timing. Many individuals also strongly agreed that their database system is easily accessible.

This research helps "bridge the gap" between how non-technical / management individuals understand the issues or fine points of their database system. Too often, management makes decisions without understanding the full capability of the database to ensure quality. Sometimes big decisions are made during a large integration or retirement of systems. This research tool provides a significant amount of data for a company to retain knowledge and make wise, practical decisions about its database.

REFERENCES

1. Ambler, S. *Underlying Database Quality: A New Vision For Database Management.* <http://www.ddj.com/development-tools/193402922, accessed 1/2009
2. Basch, R. (1990). Measuring the Quality of the Data: Report on the Fourth Annual SCOUG Retreat. *Database Searcher*. October 1990. pp. 18 – 23.

3. Computer Economics. (2006). IT Personnel Management: Database Staffing and Economic Benchmarks. *Computer Economics Report, 28 (1).* Retrieved March 3, 2009, from ProQuest database.

4. Halvorson, T.R. (2002, April 30). Casecrawler: SCOUG Rating Scale Review. *Law and Technology Resources.* Retrieved March 3, 2009, from <http://www.llrx.com/features/casecrawler.htm >

5. Storey, V. and R. Wang, "Modeling quality requirements in conceptual database design", *Total Data Quality Management*, Working Paper Series, TDQM-94-02, 1994, http://web.mit.edu/tdqm/www/wp94.html (accessed 7/97).

6. Tenopir, C. Database Quality Revisited. Library Journal. 1 October, 1990. pp. 64-67.

Appendix A - SCOUG Data Analysis

SCOUG Question Topic	Strongly Disagree (value = 1)	Somewhat Disagree (value = 2)	Somewhat Agree (value = 3)	Strongly Agree (value = 4)	N/A	Mean Score (out of 4.00)	Response Count
The database maintains consistency with its internal record structure and other data-related elements	1	0	8	14	0	3.52	23
The producers (Proj. Mgrs., Bus. Analysts, Developers) keep me informed of the coverage/scope of the database by publishing a clear editorial policy, and regularly enforce it throughout	5	5	7	6	0	2.61	23
Timeliness – The database if frequently updated and new data is input into the system quickly and efficiently with little lag time	2	2	4	14	1	3.36	22
The database contains value in terms of cost (i.e., Is there an understandable and fair pricing policy on the online system? Are there any upfront or subscription fees? Are there free output formats for this database that facilitate browsing or relevance judging?	1	0	4	7	11	3.42	22
The database contains accuracy/error rate so that an individual can estimate the number of typographical errors or judge its accuracy level	2	3	7	5	6	2.13	23
The database is easily accessible in terms of the equipment being used, any software required for its use, how easy it is to retrieve information based on the fields given within the database	0	2	6	14	1	3.39	23
The database performance is acceptable in terms of its response time, bandwidths supported, and its hours of availability	0	1	5	16	1	3.52	23
The database has the ability to integrate with other databases	1	3	4	10	4	2.68	22
The database contains a variety of output operations that are flexible enough to change as projects evolve. (Consider output format, overall style, look and feel of the database).	1	4	7	6	4	2.45	22
The database contains timely and accurate documentation (instruction manuals, editorial policies, other records, etc.) that is easy to read and understand in English?	2	4	4	9	3	2.64	22
The database comes with customer service (e.g., can be any form of customer service – toll-free numbers, online information, e-mail, or other kind of interactive help with knowledgeable person to answer questions).	0	1	5	14	3	3.32	22