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Telling the story of someone's work using published literature is not the most difficult task. However, writing about someone's life can be quite difficult when little information is available. Apparently, no one has written on the life of Cyril Cleverdon, a British librarian whose impact on the profession of library and information science has been profound, even if unchronicaled. I did uncover the existence of an item published in Britain by Butterworths Publishing Ltd. entitled "Information Retrieval Experiments: For Cyril Cleverdon From Whom We Have Learnt Alot" written by K. Sparck Jones in 1981. Cleverdon last published in the indexed literature in 1978 when he would have been 64 years old.

For an indexer the question of "How good is an index?" can often be translated as "How well does the index serve the user?". How often does the index lead to the needed information and how quickly can this information be found? How can these parameters be measured? The man who stands as the first librarian to attempt to answer these questions is Cyril W. Cleverdon.

Cyril Cleverdon was born in Bristol, England in 1914. He received his education in Bristol and began his library career at the Bristol Public Library. He became librarian of the Engine Division of Bristol Aeroplane Company, Ltd. in 1938 and librarian of the College of Aeronautics in Cranfield, England in 1946. He joined the Association of Special Libraries and Information Bureau (hereafter Aslib) and was elected council chairman in 1957. He remained at Cranfield until his retirement.*

In 1956 the U.S. National Science Foundation awarded to Aslib (the British sister organization to SLA) a grant for the study of indexing systems and their efficiency. Work on this project was centered in Cranfield at the College of Aeronautics. The purpose of the project was to develop a body of facts to replace the unscientific assumptions held about indexing up to that time. The intent was to develop a method for testing existing indexing systems in terms of efficiency. Work on the project began in 1957. Early experiments were inconclusive and in 1960 the National Science Foundation offered the Aslib-Cranfield group the opportunity to test the Western Reserve University Index of Metallurgical Literature. From the Aslib published results:

> The objective of the test would be the evaluation of the operating efficiency of the index, this involving evaluation of the code or index language.[1]

The plan was to evaluate the index in use and not from an economic standpoint.

The evaluation proceeded as follows. Sample search questions were obtained from scholars at the university. Source documents pertaining to these questions would be generated through the use of the index. Searches were made and in cases where no information was found, the question was reformulated and resubmitted for searching. Only 24 second searches were necessary, out of the original 137 search questions.

Searches were made by the Cranfield staff using their experimental method and by the Western Reserve University staff using traditional methods. Thus the Western Reserve method served as a control with which to compare results obtained by the Cranfield group. Results of the project were mixed, but certain conclusions were apparent. The project "confirmed the practically total lack of importance of the arrangement of terms in the index language. Tests showed the insignificant difference which would have been made to the results by

*Although I could not find evidence to the contrary, this fact was not verified.

any variations within the grouping of the terms within the index language."[2-3] Uses of concepts such as recall ratio, precision ratio, and relevance ratio showed that the complex design of the Western Reserve system of indexing had little effect on the search results. Recall ratio was little different from the results obtained by the Cranfield group. Precision and relevance ratios were slightly better than Cranfield but not enough to justify the extra time and expense required by Western Reserve staff to adhere to their specific indexing language.

The final conclusion of what may be called Cranfield Experiment 1 is that in using computers to conduct searches it is important to have good search programs. This may seem like an obvious result from our vantage point in the late 1980s but thirty years ago when the Cranfield group was developing their test system, computer searching of indexes was still in its infancy. Therefore, the conclusion that good search programs were a necessity to accurate high speed searching of indexes was important. It provided a different point of emphasis on what had been a concentration on computer hardware and not software. Cleverdon wrote ". . . more work is necessary, almost certainly involving modifications in procedure, to make full use of the potential (of the system)."[4]

One fact not mentioned in the report of Cranfield 1, was the relative ease and comparatively little effort which was necessary to evaluate an operational indexing system. The experiences obtained in Cranfield 1 led Cleverdon to improve the methodology even further. The next test was to be at Cleverdon's own library at the College of Aeronautics in Cranfield, England.

For Cranfield Experiment 2 which commenced in 1962 the same basic methodology was followed as in Cranfield 1. Search questions and relevant documents were solicited from scholars. Searches were carried out and the results returned to authors for analysis as to relevance. For this test the chosen subject was high speed aerodynamics. Scholars were asked in a questionaire to formulate a search question and submit a set of documents both of which were to relate to the chosen subject. Searches were initiated using the information obtained from the scholars. 361 search questions were searched from those submitted. The scale of complexity of this project compared to Cranfield 1 is best illustrated in the following from Cleverdon's final report:

> "Over 1500 manhours of work during the 1963 summer vacation were put in. The job involved over half a million individual judgements, and was an extremely onerous task."[5]

When the search results were complete they were returned to the scholars who judged their compatibility with the subject matter. Various losses brought the total number of searches evaluated down to 279 but this was judged adequate for analysis. Finally, relevance assessments were made.

Relevance assessments were based on the scholars finding of compatibility of search results with original source documents. The final relevance assessment rate of 80% will be discussed. Making the assessments, was probably the most difficult part of the project. From Cleverdon's report:[6]

> Relevance assessment is not easy, but (we) have done the best (we) can. In the case of this subject matter, the literature is so extensive that the chances of a relative newcomer picking out what mattered would be very poor . . . only long association with such a subject can enable one to appreciate what is useful and to judge what is misleading.

A relevance assessment rating of 80% may not appear to be a substantial amount in light of the tests involved, but for the purposes of the study it was judged adequate.

In the conclusions to his final report, Cleverdon discusses the areas of importance on which his stury has shed light. First, intelligence of the search staff is directly related to best results. "Search staff will apply their intelligence to deciding the exact meaning of the question and to preparing a suitable search."[7] While this may seem like a logical and straight forward finding it had never before been proven in the literature since computer searching was still in its infancy.

Cleverdon and his group made one surprising conclusion from this project, one that generated rebuttals in the literature. They found that single term indexing languages are superior to any other type and that natural language indexing could give reasonable performance.

Many of the expected articles disagreeing with Cleverdon's findings which appeared in the literature centered on the test methodology, particularly the use of subjective assessments by scholars. However, Gerald Jahoda of Esso Research and Engineering wrote:

> The recent history of indexing systems is not without paradoxes. Comparative studies of indexing systems based on experimental studies are rare. Cleverdon's work is such a study and is a real contribution to our knowledge of the subject.[8]

Other writers praised Cleverdon for doing what

no one else had done and in 1962 Cyril Cleverdon was awarded the SLA Professional Award for outstanding contributions to the field. In doing so he became the first European to receive SLA's highest honor. Statements attesting to Cleverdon's contributions were made by then SLA president Eugene Jackson, ". . . professional work of an exceptional nature." and by Gordon Randall, "The Cranfield Study constitutes the most important work done in the field of cataloging in recent times. The results are among the more significant contributions to technical information activities."

The NSF supported Cranfield project was concluded in the mid-sixties but Cleverdon continued to publish consistently concentrating in the area of information retrieval. One such article published in the Journal of Documentation was an interesting treatise "On the Inverse Relationship of Recall and Precision."[9] This was a general hypothesis developed during the Cranfield project which, simply stated, means that as the total number of citations generated by searching increases, the number of useful citations decreases. Improvement of both recall and precision was based (as in the original Cranfield results) on the intelligence and skill of the searcher and his knowledge of the indexing system.

Cleverdon last published in the indexed literature in 1978. As he would have been 64 years old at that time it is assumed that he retired soon after. His contribution to the body of knowledge concerning indexing, and his landmark studies at Cranfield on the evaluation of indexing systems cannot be overstated. They are the foundations by which today's high speed computer assisted searches may be judged. Although not apparent at that time (early 1960s) or even now (1987) Cyril Cleverdon may be known in the future as the father of information science. A series of courses offered, and the very names of many accredited programs of library and information science, may be a silent tribute to him.

FOOTNOTES

1. Report on the Investigation Into Comparative Efficiency of Indexing Systems. Cleverdon, Cranfield, England. 1960. p. 1.
2. _____ Ibid., p. 61.
3. _____ Ibid., p. 62.
4. Factors Determining the Performance of Indexing Systems Vols. 1-2. Cleverdon, Cranfield, England. 1966. p. 22.
5. _____ Ibid., p. 29.
6. _____ Ibid., p. 386.
7. _____ Ibid.
8. Efficiency of Indexing Systems (Review by G. Jahoda) Cleverdon. College and Research Libraries, 22:5 (May 1961) p. 228.
9. On the Inverse Relationship of Recall and Precision, Cyril Cleverdon. Journal Of Documentation, 28:3 (Sept. 1972) p. 195.

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