Clarifying Two Controversies About Information Mapping's Method

by Robert E. Horn

Introduction

As the world has grown more complex, the problems of communication in today's technical and business environments become increasingly demanding. Vast challenging technical products, service, and administrative and managerial subject matters, diverse multi-lingual, multinational organizations - all present new problems for managers, technical and office personnel and other professionals. Documents, on paper and presented on the computer screen, must communicate effectively and efficiently. They must be prepared rapidly and often revised and updated frequently. Information Mapping's methodology for the analysis, organization, sequencing, and presentation of information was developed over two decades ago to meet these challenges.

As Information Mapping's method reaches its twenty-fifth birthday, I have taken the opportunity to discuss its aims and its accomplishments (Horn, 1991a). While the method has been extraordinarily successful in its handling of large complex training and documentation projects as well as routine communications assignments (Horn, 1989), it has not been without some controversy.

In the ongoing rush of guiding the rapid growth of the company that distributes the method, I have not always taken the time to provide answers to questions raised by academic commentators and to rebut certain critiques. I wish to do so in this article.

This paper is divided into two parts: (A) an introduction to the principal components of the methodology and, (B) a section that rebuts the major criticisms that have been made of the methodology through the years.

Section A. The Three Major Parts of the Method

The research on the method has focused on the a three part approach of (1) content analysis, (2) project life-cycle synthesis and integration of the content analysis, and (3) sequencing and format.

Content Analysis

The content analysis side of the methodology focused on devising a taxonomy and criteria for a new set of the smallest practical unit of meaning for writing documents. Initially this work focused on the domain of relatively stable subject matter. (Horn, et. al. 1969) Since then other domains have been explored and appropriate taxonomic approaches proposed. (Horn, 1989)

This work differed from the approaches to modularity taken by others in that it focused on a deep understanding of the basic units of the subject matter. It approached the problem of modularity with the goal of teaching writers easily and with great uniformity to sort sentences and diagrams of a subject matter into an easily understood taxonomy. This required the definition of a new basic unit of information for chunking information, called "information blocks". Initially we defined approximately 40 blocks but in the twenty-five years since then over 200 have been specified for particular documents.

The sorting was facilitated by the discovery of an underlying structure of subject matter called the information types that clustered the "information blocks" into seven information types in relatively stable subject matters. Information Mapping's method was not the first to incorporate the concept of modularity into technical and business writing. (Note 2) But Information Mapping's method can claim to be the first to to define and develop a precise modular concept ("information blocks") that are firmly grounded in a taxonomy of information types. (Note 3)

Let us examine both the concept of modularity and then the concept of information types. It will be useful for the reader who is unfamiliar with the method for me to give some explanation of the concept of a finite group of precisely specified block types.

What are blocks? Information blocks are the basic units of subject matter in Information Mapping's analysis. They replace the paragraph as the fundamental unit of analysis are presentation. they are composed of one or more sentences and/or diagrams about a limited topic. They usually have not more than nine sentences. They are always identified clearly by a label. Information blocks are normally part of a larger structure of organization called an information map which can be defined as a collection of one to nine blocks all related to a specific topic. In short, they are a reader-focused unit. There is something fundamental about this taxonomic approach. The information block scheme has proved capable of first-pass sorting of 80 percent or more of the content of virtually every subject matter that it has been applied to in the domain of relatively stable subject matter. Thus, it can be said to capture and sort the "core" sentences of the subject matter.

An unending sequence of structured information blocks would fail to provide readers with natural and logical ways to cluster important concepts, procedures, processes, etc. It would be little better than an endless sequence of gray paragraphs one after another. To solve this problem, the method was also the first to develop and incorporate the concept of the information map, as a collection of one to nine information blocks. This provides an important intermediate level of specification of document organization. It enabled the clustering of blocks all related to a topic (and where possible an information type) together and to suggest an appropriate labeling system for them. (see below for further discussion of labeling) It was also first to link the idea of the information map with the seven information types. (Horn, 1969)

This whole approach has been called structured writing and Information Mapping's methodology both pioneered the field of structured writing and is the one that has consistently led it in synthesizing the research into a workable tool for analysts and writers.

Life-Cycle Integration and Synthesis

The content analysis is integrated with various planning approaches into a life-cycle methodology for writing projects. It has been refined to incorporate efficient recursive procedures for ensuring, in so far as humanly possible, that all relevant subject matter would be gathered from the subject, thus providing for an approximation to completeness criteria.

The life-cycle integration has been elaborated to facilitate document writing projects at every level of detail and size from the office memo to the largest and most complex documentation projects encountered by industry and academia.

Getting the content analysis complete and appropriately divided and tagged early in the initial analysis phase contributes to efficiency all along the way in the document life-cycle. In particular, it helps specify what information is

missing at any given time in the process. Because the content analysis categories correspond to the deep structure of the subject matter, a systematic way of labeling the content is possible.

Sequencing and Formatting

The third broad area in the method is the ability to specify sequencing precisely and the ability to devise very effective formats for presentation of information complementary to the content analysis system.

Prior to the arrival of Information Mapping's method it was frustrating and challenging to specify patterns in a way that one writer or editor can communicate precisely with another about exactly which chunks of information go in exactly what order in the final presentation of the material. Unfortunately, most often they relied on the idea of making the sequence "logical, " without specifying just what "logical" meant. The ensuing fuzziness has left most discussions of the topic at dead ends. Information Mapping's content analysis brought the powerful capability of a taxonomy and technical vocabulary adequate to the task of specifying a sequence in even the most complex of documents. The method provides basic sequencing templates and facilitates communication in precise ways about sequencing patterns.

Information Mapping from which it takes its name from these formatting innovations. Like geographical terrain information has a topography. It has peaks and valleys, cities and countryside. Like geographical maps, format should relate to this topology on an point-to-point basis. Information maps should guide you through the information just like geographical maps do. The ability to show relationships and guide the user quickly to relevant places are features of the formats and the key to understanding the metaphor of Information Mapping's name.

Section B. Answering Critics

This section of the paper will answer two critics, who have raised a variety of questions about the method. The alleged deficiencies in the method I will address include: (1) the charge that no overarching theory of learning underpins the method, (2) the claim that the method is not truly original, (3) the alleged inability of the method to make certain contributions to teaching, specifically, motivation, explanatory depth, and connectedness among topics, (4) the charge that it is not plausible that you can sort sentences precisely into 40 or so blocks of information reliably at the 80% rate I claim, (5) the seemingly precise yet changing number of blocks used in the methodology, (6) the claimed lack of available research upon which to base guidelines, and (7) the alleged inability of guidelines to do the job demanded of them because of their lack of specificity. As the reader will see, I believe there are sufficient answers to each of these criticisms.

The Charge of No Learning Theory

One critic in England, Alan Fields, has claimed that Information Mapping's method is not based on any solid learning theory or any other kind of theory. Fields says, "Thus, the theoretically oriented educationist can observe two difficulties...(a) the lack of originality of the material in the system; and (b) the lack of an informing theory by which one can measure the effectiveness of the system in producing any results. It can therefore be described as a a theoretical compilation of other people's material." (Fields, 1983) While this criticism has not hindered the progress of the methodology, it should not go unanswered. I have answered the originality question extensively in another recent article, (Horn, 1991 b) so I will not dwell on that topic here.

The answer to Fields' criticism about the alleged lack of theoretical underpinning is that Information Mapping's methodology is based on several theories. Any problem with research is not so much in Information Mapping's

methodology as it is in the state of affairs in learning theory in psychology and educational theory. And what Fields fails to note is that from our first research report, we have claimed that the method was based on research and theory from many fields. (see Horn, et. al. 1969, p. 8-11). This report detailed our reliance on results from the psychological research on the facilitation of learning through the use of highly organized presentation: forms, the structure of subject matters, advance organizers, and critiques of overly optimistic approaches. In that report, we also quoted research or cuing and labeling, pictorial materials and charts, and sentence structure that came from psychological communications, and linguistic research. Further, we cited educational research in concept learning, focus of attention, and the use of active responding, feedback and knowledge of results.

In our second research report, we stated (Horn, et. al., 1971 p.5) That the rules and guidelines for Information Mapping's method had "their origins in such areas as... logical analysis of subject matter, learning research findings, teaching practice, programed instruction techniques, display technology, human factors research, communication techniques, including effective writing principles." Therefore, anyone requiring a single theory as a foundation is certain to be disappointed.

What Fields also fails to appreciate is that rarely if ever can an enterprise with the scope of Information Mapping's method be based on a single theory. This is like asking the design of an automobile to be based on a single theory. Thedesign of automobiles relies on theories of internal combustion engines, much of what we know about electricity, of aerodynamics in its exterior design, air conditioning theory for some of its comfort systems, in some of its details on such things as the chemistry of paints and lubricants, and more recently on all of the theory that goes into making computers, which are now increasingly being incorporated into them. One theory, indeed!

Similarly, Information Mapping's method incorporates user analysis, the analysis of subject matter content, the management of complexity, the sequencing of learning materials, and the formatting and graphic presentation of materials, as well as being closely coupled with the design of training materials of all kinds. In its use in proposals it is aligned as well with theories of presentation of information for persuasion. Each one of these areas requires drawing on research from many fields, as diverse as advertising, media research, human factors engineering, the psychology of learning and the cybernetics of feedback.

Several theories are used, in so far as they and the data which support them are applicable. Moreover Information Mapping is a tool which has multiple purposes. It is used for learning and reference, for communication of technical matter and for persuasion as in business proposals.

Mr. Fields, appropriately classifies himself as a "theoretically oriented educationist." He appears to yearn for a single learning theory that would somehow provide all that was needed for the foundations of a methodology. But some contemporary learning theories can be criticized because they fail to take into account how to devise material for people to use to both during initial learning and in later reference work (because human beings forget at a very rapid rate). Using only one theory (as they are typically developed in learning and educational research) could have serious consequences for a methodology with aims as comprehensive as Information Mapping's.

It is clear from the context of Field's article that he regards Information Mapping's method as a form of "programmed instruction" and merely a "format," both judgments which are incorrect. Rather than a format, it is the method is a life-cycle approach to document analysis, writing, organization, sequencing and presentation. (Horn, 1991b) All critical elements have been incorporated. Its application to literally hundreds of kinds of documents -- from reports and memos to training documents, reference data bases, and on-line help -- surely makes comparison to "programmed

instruction" untenable. Fields appears isolated from the mainstream of even academic research on the method. (see Horn, 1991, for up-to-date abstracts of the major research reports in the field)

Fields also claims that "...because no rigorous informing theory is provided, one cannot judge whether the techniques provided are either necessary or sufficient to enable the student to learn in a near-optimal manner." Here we may come to a simple difference in preference in whether or not some kind of rigorous overarching theory is necessary. In the 60's much innovation was informed by Skinner's behaviorism. It had pretensions of being a comprehensive theory of human behavior. This is not the place to detail the defects of that theory that were presented by the cybernetically oriented systems theorists. These days we have another overarching theory, that of cognitive psychology. What will we have tomorrow? I don't know. The Grand Theories have been of less help than experimental results, careful analysis, and effective synthesis, all of which we use in our approach.

Not Truly Original

Fields has another criticism. He says "It is not easy to say what is 'truly original' about the system." I have fully described my claims for original contributions elsewhere (Horn, 1991,b). Among the innovations I claim are:

- The invention and description of the information block as a new kind of modular approach that permits the use of truly structured writing. The information block has replaced the sentence as the basic unit of analysis and replaced the paragraph as the basic unit of organization and display in much business writing in the U.S. and increasingly around the world.
- The precise specification of different kinds of information blocks amid the specification of different ones of them for different discourse domains.
- The invention of a content analysis approach of question and seven basic information types that clusters different information blocks to guide question asking and to ensure completeness of analysis of the subject matters to be expressed in a document.
- The invention and description of an intermediate unit of structured writing, the information map, that permits easy and natural topic clustering. The map groups one to nine blocks in particular patterns.
- The development of a comprehensive and systematic set of criteria for labeling blocks and maps which permits efficient information management and rapid, effective scanning and retrieval of information from documents.
- The systematic specification of where individual graphics (illustrations and diagrams) should be used and where text would be better.
- The development of easy-to-scan formats that exactly fit with the analysis methodology and categories to aided learning and reference. A wide variety of formats for print and computer screen display have been devised.
- The incorporation of research results from many fields and the creation of an ongoing research program to keep the methodology current.
- The creation of a carefully structured framework that permits the ongoing incorporation and synthesis of good approaches to communication from many different sources.

Fields in particular seems not to recognize the fundamental importance of the information block and the four principles that form it as an important contribution. Yet these are fundamental to understanding the method.

Contributing to Teaching

Fields also takes up the question of the contribution of Information Mapping's method to effective and high quality teaching. He gives the method high marks on three of his criteria, (1) the need to secure and hold the learner's attention, (2) the need for intelligibility, and (3) the need for accuracy and relevance of content.

For another of his criteria, "the need for adequate learner motivation" his is correct in saying "Horn does not have much to say about adequate learner motivation." I have not felt it necessary to speak about motivation in the construction of documentation and instructional materials, because, by an large, I believe that motivation is a result of factors external to the documents. Documents including textbooks make marginal contributions to either initial or continuing motivation. What documents can do is to reduce motivation by being unclear, incomplete, unattractive and hard to use. I grant that the occasional cartoon or humorous example can contribute to enjoyment of reading and, hence, to motivation.

But I can not assign humor and verve of writing a very contribution to the motivation of learning from most scientific, technical, and administrative documents. In the educational classroom, situation the largest factor in the motivation of learning is the teacher-student interaction. The instructional materials have little to offer by comparison.

In two other areas, the need for explanatory depth and the connectedness amongst topics, Fields says that the method does "very little to guarantee these." He then goes on to suggest that this alleged defect in Information Mapping's method arises from its industrial context in which "leads to an assumed requirement just to tell the worker what to do, without elaborate explanatory theories." While there have been such tendencies in industry, recent trends in industrial training are totally contrary to Field's characterization (at least in the United States). Explanation of why a job is to be done and how a process works are regarded as essential to good training methodology. Information Mapping's method has thrived in these circumstances because it is fully capable of providing explanatory depth and connectness among topics. Fields then says, "From the standpoint of academic teaching, however, the lack of connectedness and explanatory depth is a serious defect. Subjects like physics and chemistry require the kind of teaching that shows the interrelationship of key concepts preferably by means of an all-embracing in formatting theory." I could answer these charges in a variety of ways, but perhaps best would be to present counter examples. In particular, a book of essays on philosophy certainly exhibits explanatory depth and connectedness among topics (Horn, 1983). Many other examples that could be cited. Olympia (1979) has written on the use of Information Mapping's method in teaching university-level chemistry and Petrusa, et. al (1985) have described its use in medical education. Twenty-five years of use show that there are few subject matter areas to which the method can not be applied with benefit.

Discomfort of Research Workers

Another English writer, James Hartley (1982) in an otherwise complementary article, listed a series of reasons that some academics are "reluctant" to give the method a try. He suggests that the papers on Information Mapping "suggest too much false precision." He says, "It is not comforting to workers in the field to be told that there are a specific number of blocks which deal with a specific number of types of text." Yet, neither Hartley nor other researchers have attempted to replicate the amazingly simple research that would convince them of these claims. To show how simple (and inexpensive) such a replication would be, let me sketch the protocol. This is a simple sentence sorting task. In it, your goal is to sort the sentences of a textbook into the categories that have been used in the method since 1965. The further goal is to verify if you can sort 80% or more of the sentences into these categories. We repeat this experiment is a slightly different form approximately twenty times a month in the classes the company teaches.

Research Protocol

Here is a procedure for replicating the experiments that resulted in the 80% claims.

1. Select a textbook. Separate out the text that is in what we call the domain of relatively stable subject matter. (Horn, 1989)
2. Count the total number of sentences. Call this number T.
3. Teach the analysts who are going to do the taxonomies of Information Mapping's method.
4. Have the analysts sort the sentences from the selected portions of text into the information block categories.
5. Count the number of these sentences. (call this number SASIB for "sentences appropriately sorted by the information block categories."
6. Look at each of the remaining sentences to determine if they are critical to understanding the subject matter or represent sentences that have been added to satisfy the requirements of different rhetorical approaches. Count these that are not critical. (call this number NC)
7. Calculate: T minus NC and call the result "CBNIM" for "critical but not sorted by information block taxonomies."
8. Divide CBNIM by SASIB to give you the percent of sentences critical to the subject matter that can be sorted by the information block taxonomy. If this number is anywhere around 80% of the total then we have not suggested too much false precision.

Number of Blocks Change

Hartley further says, "Nor is it comforting to find, if one looks into it, that these seemingly precise numbers have changed over time--for this contradicts the implied precision." Hartley doesn't give references for the different sources for this statement but I imagine that he has failed to appreciate that we have worked on several domains of discourse over the years. The initial number of around 40 blocks into which approx. 80% of the subject matter of "relatively stable subject matter domains" could be sorted was our first result. (Horn, et.al., 1969) This is the domain of the textbook, the training manual and most reference documentation. Subsequently, I started applying the information block creation criteria to other domains, with most spectacular practicality to business reports, memos and proposals and more recently to user documentation.

After the first success of this research, we began to use the number of approximately 200 for the number of information blocks that we thought were critical to a cluster of several domains and document types. We also proposed information block taxonomies recently for the domains of argumentation and scientific research papers and abstracts. (Horn, 1989)

I should mention that I don't think we have achieved the precision of some other fields such as chemistry, in isolating the elements and molecules of thinking and analysis. But I think that we have achieved great strides toward that goal. And I believe that the approx. 40 information block types and their linkage with the seven information types will stand the test of time. There is, however, certainly room for further research to establish even greater precision.

How Much Available Research?

Hartley also notes that the Information Mapping method "claims to be based on available research. However, as researchers all know, there is really very little research which is directly applicable to designing text, and what research there is often weak, or insufficient to answer all the questions that it raises." I would agree with Hartley that there is less research than we would like. That is a result of the amount of funding devoted to research in this field and partially to the choices of graduate students and their committees as to what they choose to take as a research topic. Surely the amount of science upon which we base our decisions is less than, say, medical science, where laboratories and funding is available to quickly replicate the most important findings, and as a result the researcher can often cite dozens of papers to support one point. But the lack of this kind of massive research program does not mean that we have nothing, nor that we are in as bad a position as Hartley declares.

Let us look at some of what is available in the way of research in only a few of the fields upon which Information Mapping has relied for its methodology. Consider for example, the 944 guidelines each backed by at least one study cited in Smith's and Mosier's (1986) Guidelines for Designing User Interface Software., a book which is 478 pages long and consists of brief statements of guidelines and supporting research citations. Many of these studies, particularly those in the data display section, are relevant to corresponding aspects of the Information Mapping process.

Fleming's and Levie's book, Instructional Message Design, (1978) is another approach at summarizing the specific guidelines and the research supporting them. There are other portions of the research base that are quite deep. For example, concepts are one of the major information types specified for the domain of relative stable subject matter, in the information Mapping method of outlining domains of information. Merrill's and Tennyson's book Teaching Concepts: An Instructional Design Guide, (1977) cites a host of specific studies on learning concepts. This approach has been used in devising the rules and guidelines for Information Mapping's method when it comes to dealing with concepts.

Hartley, however, sums of his part of his argument by saying, "Frankly, I'm amazed at what Horn has achieved by interpreting the available research. I suspect that this achievement points to Horn's success as a skillful practitioner rather than point to the practical value of the research." As complementary as this passage may be to me, I must beg to differ. I actually did find the research useful in developing Information Mapping's methodology and I continue to find it valuable in guiding enhancements including the research of Hartley and his colleagues. But there is no question that in the absence of adequate research, we have to make informed judgments.

Capabilities of Guidelines

Hartley has another observation: "Many research workers are critical of the notion...that one can provide a set of procedures -- or guidelines -- which will be uniformly applicable." He notes that Waller (1980) points out that guidelines oversimplify. Says Waller, "Complex information can only be made to appear easy and approachable by overlooking the exceptions and the special cases." But this criticism fails to note another subtlety of Information Mapping's approach. That is that guidelines and rules can be made very specific and hence quite useful because of the taxonomy of blocks and maps that are an essential part of Information Mapping's approach. It is true, and here I would agree with Hartley, that a very general rule or guideline is almost useless. This is because the rule has to cover so many different situations and so many exceptions that it ends up saying almost nothing.

This is not so with the rules and guidelines of Information mapping's method. We can specify the domain over which the rule or guideline is to govern. This permits the rule/guideline to be very specific. This leads to the kinds of quality control that we have claimed for the subassemblies of Information mapping's method. (see Horn, 1989, p. 114 for a more detailed explanation of this advantage of specifying the domain over which the rule applies) Because Hartley has an admitted suspicion of the ability of the Information Mapping content analysis taxonomies to sort sentences precisely into blocks, it would be logical for him to overlook the possibilities of applying the available research within quite specific ranges of applicability. And perhaps because he is such a careful basic researcher, he shrinks from making the judgments of an applied systems builder must make.

The ability of over 40,000 graduates to apply the guidelines with great precision and quality control is surely data that must confound researchers who doubt the abilities of guidelines to perform adequately.

Hartley is primarily a researcher in the field of learning of text. As I have pointed out above, the analogy of the designer of automobiles must use theory from many different fields. We have borrowed as much research as possible from many different fields, fields as far afield as advertising and human factors engineering, as well as learning research. And like the designers of automobiles, we have used rules of thumb based on the knowledge of skilled craftsmen of the field that as yet are not fully confirmed by research. But that is not so much of a problem because as is well know, research and theory often lags behind practice. The Romans were able to build magnificent bridges, towering aqueducts and the marvelous coliseum without having access to the mathematics that explains why they don't fall down, mathematics which wasn't invented until almost 1,800 years later.

Hartley, does however indicate his approval of the use of guidelines in Information Mapping's method by citing his own work in developing guidelines (Hartley, 1981) And he quotes me accurately as saying "Guidelines are helpful if they are treated as guidelines and not as inflexible rules of procedure."

Summary

Information Mapping's method has stood the test of time and research. (see Horn, 1991a for a summary). And, by and large, it has been treated fairly by the academic community. Hartley and Fields themselves generally give Information Mapping a deep appraisal and for that are appreciated for their contributions in the field. Almost 20 doctoral level dissertations have been completed or are currently in process examining various aspects of the methodology. This fact speaks for itself, demonstrating the ability of the method to generate further fruitful research.

Notes

1. The reader may be puzzled by Alan Fields' article which notes that Information Mapping's method was ten years old in 1981 and the statement of its age as 25 in the title to this article. The 25 year figure is based on the fact that I developed the basics of the method in 1965. All I can say for Fields dating is that he must have dated the method from our second research report. The method dates back to 1965 when I was a researcher at Columbia Universisty's Institute for Educational Technology. The earliest publication is Horn, 1969.

2. The STOP (Sequential Thematic Organization of Proposals) developed at the Hugher Aircraft Company in the late 1950's had a formatting style that required the text to be divided into no more than 500 word units with a fixed format for all of the two-page spreads, text on the left, and graphics on the right.

3. The Information types were completed in 1965, first published as a schema in Horn (1966); incorporated into a research proposal in 1967 and first published in a report in Horn, et. al. 1969.

References

Fields, A. (1981) Information Mapping Ten Years On: A Survey, PLET, Vol. 18, No. 3, Aug 1981, 155-161

Fields, A. (1983) Information Mapping: An Overall Appraisal, PLET, Vol. 20, No. 4, Nov. 83, 276-282

Fleming, M. and Levie, W. H. (1978), Instructional Message Design: Principles from the Behavioral Sciences, Educational Technology Publications, Englewood Cliffs, N.J.,

Hartley, J. (1982) Information Mapping: A Critique, Information Design Journal, Vol. 3, No. 1, 51-58

Horn, R.E. (1966) A Terminal Behavior Locator System, Programmed Learning, No. 1, Feb. 1966, 40-47.

Horn, R. E., Nicol, E., Kleinman, J., and Grace, M., (1969) Information Mapping for Learning and Reference, Cambridge, I.R.I. (A.F. Systems Command Report ESD-TR-69-296)

Horn, R. E., Nicol, E., Roman, R., and Razar, M. (1971) Information Mapping for Computer-Learning and Reference, Cambridge, I.R.I. (A.F. Systems Command Report ESD-TR-71-165)

Horn, R.E. (ed.) (1983) Trialectics: Toward a Practical Logic of Unity, Lexington, MA IRI, (Available from the Lexington Institute, 80 Marrett Rd. Lexington, MA, 02173)

Horn, R. E. (1989) Mapping Hypertext: Analysis, Linkage, and Display of Knowledge for the Next Generation of On-Line Text and Graphics, Lexington, MA, The Lexington Institute (Available from Information Mapping, Inc. 303 Wyman St. , Waltham, MA, 02154)

Horn, R. E. (1991a) How High Can It Fly?, (in preparation)

Horn, R. E. (1991b) Information Mapping at Twenty-five (in preparation)

Merrill, M.D., and Tennyson, R. D., (1977) Teaching Concepts: An Instructional Design Guide, Educational Technology Publications, Englewood Cliffs, N. J.

Olympia, P.L. Information-mapped Chemistry. Journal of Chemical Education, March 1979, 56(3), 176-178.

Petrusa, E., Horvatich, P. and Guckian, J. (1985) A Comparative Evaluation of Text Formats in a Medical School Course, The Journal of Biocommunication, 12, 18-25.

Smith, S. L., and Mosier, J. N. (1986) Guidelines for Designing User Interface Software. Mitre Corporation, Bedford, MA, Electronic Systems Division, AFSC, U.S. Airforce, Hanscom Air Force Base report ESD-TR-86-278

Acknowledgements

I would like to extend my appreciation to Doug Gorman and Irwin Mesch of Informaiton Mapping, Inc. for reading earlier verisons of this paper. I would also like to thank Carl Binder for especially helpful comments on an earlier version.

HOW TO GET IN TOUCH WITH INFORMATION MAPPING, INC.

* USA. Information Mapping, Inc. www.infomap.com
