Jochen Ganzmann
Lehrinstitut für Dokumentation
in der DGD Frankfurt am Main

CRITERIA FOR THE EVALUATION OF THESAURUS SOFTWARE

Ganzmann, J.: **Criteria for the evaluation of thesaurus software.** Int. Classif. 17 (1990) No. 3/4, p. 148 – 157, 23 refs., 1 App.

The growing number of thesaurus programs, especially for microcomputers, calls for criteria which facilitate the decision on the appropriate tools for thesaurus construction, application and maintenance. Following a brief outline of the determinants of the criteria, i.e. the changing environment and the routines of thesaurus management and application, criteria are discussed in detail. Only the most important requirements relating to central functions of thesaurus work are touched upon, further criteria being included in a check-list attached. Applying the criteria to existing thesaurus software in a final short assessment, the author concludes that some programs reveal substantial shortcomings.

(Author)

A. The Need for Criteria

Over the last ten years we have seen a renewed interest in the thesaurus which is reflected both in the literature on the topic[1] as well as in a steadily growing number of thesauri (4).

The reasons are manifold and complex. Most important have been the impact of artificial intelligence resp. the concept of knowledge representation, dissatisfaction with the results of free-text retrieval and finally advances in computer technology which entailed decreasing costs, easier handling and better performance both in respect to software and hardware. These advances, esp. the advent of the micro-computer, have greatly facilitated the previously tedious task of development, management and application of thesauri (5).

Over the last decade the number of thesaurus programs (i.e. software for both development/updating and application) in general and especially for micro-computers has been rapidly increasing. The programs available today can be classified

either

by the type of computer for which they have been developed:

- software for microcomputers (e.g. INDEX, PROTERM, CICADE, LIDOS, TMS)
- software for mainframe computers (e.g. DOMESTIC, BASIS)

or

by the functions which they fulfill:

- stand-alone software for the construction and maintenance of thesauri (e.g. PROTERM, TMS, INDEX)
- thesaurus software integrated into retrieval systems (e.g BASIS, DOMESTIC, LIDOS)

Stand alone software systems, very often for microcomputers, can facilitate the construction and maintenance of thesauri to be used in main-frame computers where the handling can still be laboursome and the updating procedures are often time-consuming. Of course this implies some transfer of the thesaurus data into a retrieval system in order to use the thesaurus in indexing and retrieval.

For the end-user it has nowadays become easier and also less expensive to develop, maintain and use thesauri even in small-scale institutions and, equally important, with the advent of the micro-computer his independence from computer experts has considerably increased. At the same time, however, the rise in number of programs and the above specified diversification of thesaurus software types have more and more imposed the burden of decision-making on him.

Knowledge of the requirements caused by the changing conditions in which thesauri are used nowadays and of the criteria that are to act as a measure-stick in the decision which software is best suited to one's specific needs has become more important than ever before.

Checklists of criteria can be helpful since they can identify possible pitfalls and help reduce decision-making based on uncertainty as to the essential requirements of a software type. That there is an increasing need for orientation has been my experience at several seminars on thesaurus software held at the Lehrinstitut für Dokumentation (LID) for which the check-list to which this paper refers has been originally developed. The checklist had these end-users in mind and consequently it is above all concerned with defining criteria for micro-computer applications but can to a great extent also be applied to mini and mainframe computers.

I will outline those criteria from the check-list which seem to be most important taking into account the functions of thesaurus software and the changing environment of thesauri already mentioned. These determinant factors for the development of the criteria will be presented (chapter B) before a discussion of the criteria (chapter C). A short look at the present state of the art of thesaurus software in which I will try to make an assessment in how far programs measure up to the defined requirements will conclude the paper (chapter D).

B. Determinants for the Definition of Criteria

B.1 The Thesaurus and its Environment

Over the last thirty years the thesaurus concept has undergone a change. Traditionally and even today the thesaurus has been foremost an indexing language developed by individual institutions for their specific needs. Due to this the main functions of the thesaurus have remained relatively the same over the decades: its purpose was to optimize indexing and retrieval in a given environment with a circle of users with specific needs.

There have, however, been factors affecting this traditional concept, especially over the last ten years:

- increasing national and international technical, scientific and political cooperation
- increase in data communication relating to local networks as well as to online databases
- closely related, office automation
- growing importance of artificial intelligence and with it the concept of knowledge representation
- renewed interest in machine translation.

These factors which cannot be seen isolated but rather as interrelated determinants have resulted in various trends (6 – 11):

(1) Growing importance of multilingual thesauri which facilitate cooperation among institutions from different countries in the exchange of data and in indexing and retrieval of documents in a common database. Multilingual thesauri can also help users of online data-bases to search in their own language for documents indexed in a foreign language. Finally, multilingual thesauri have gained increasing importance since they can be integrated into expert systems supporting machine translation and retrieval (3,6).

(2) Renewed and increased interest in the compatibility or integration of various indexing languages. The creation of so-called switching languages/intermediate lexicons and mapped or integrated thesauri (12) admits, above all, an easy integration of data downloaded from other systems into one's own database, supports retrieval in the search in various document collections (either in-house as with office automation or in online databases (8,9)) indexed with various indexing languages (either of one or different natural languages), and can suggest amendments concerning the specificity and scope of the vocabulary (12).

(3) Increased importance of additional differentiation of relations between concepts in thesauri which can be integrated into expert systems as knowledge bases, for instance for improvement of automatic indexing and so-called intelligent information retrieval (8,9,13).

These changes in the environment of the thesaurus must be taken into account when the functions of software are defined.

B.2 The Tasks of Thesaurus Software

Considering what has been said so far, the specific functions of thesaurus programs can be related to tasks associated with the following complexes:

a) The Construction and Maintenance of the Thesaurus

Construction and updating of a thesaurus includes a variety of tasks and activities:

Word-material is selected and recorded, sometimes parts of existing thesauri must be integrated, information as to the source of terms, language, systematic grouping has to be recorded. Terms are controlled in respect to clarification of meaning (homonyms, definitions) and relations must be defined between terms.

Finally, thesauri must be updated regularly with regard to relations and terminology due to changes in the terminology of a given subject-field, to changing indexing and retrieval practice, to failing adequacy of the vocabulary's scope or specificity.

b) The Output of the Thesaurus

The output of the thesaurus (or parts of it) is necessary in all phases of thesaurus work, either on the screen, by the printer or also into a file in case the data are to be transferred to a word processor or for integration purposes to another system (thesaurus maintenance or retrieval system).

The display of vocabulary usually follows standards and conventions which have developed in more than thirty years. Most thesauri have at least one alphabetical and one systematic section, often KWIC/KWOC or hierarchical displays, sometimes even graphical displays are added. The representation of three types of relations (equivalence, hierarchical, associative relationship) in accordance with the respective standards on thesauri and their construction (14,15) has also become a common trait of most, though certainly not all thesauri (4).

c) Indexing and Retrieval with the Thesaurus

All thesaurus programs support the construction, maintenance and printing of thesauri.

It is possible to index documents and search for relevant information in a retrieval program when a *printed* thesaurus is used.

The *integrated* thesaurus can support specific tasks associated with indexing and retrieval, by acting as an interactive instrument for orientation about potential index and search terms, a tool for consistency controls regarding the data used in indexing and searching and a tool supporting update routines.

d) Exchange, Integration and Compatibility of Vocabularies

This aspect refers to all of the above mentioned complexes of thesaurus work, it is, however, given special attention here because it is gaining more and more importance in the near future and entails a variety of specific tasks and functions, above all:

- batch input and output of machine-readable data in a suitable format
- special types of relation for multilingual thesauri (either with a dominant language or with equal languages) or the connection of various thesauri
- use of compatible vocabularies in indexing and searching.

C. The Definition of Criteria

With regard to the criteria for the evaluation of thesaurus software the author could refer to various sources:

a. the literature on thesaurus construction and maintenance which mentions some of the possible applications and advantages of the computer (2,3,16,17).

b. the check-lists of three authors concerned with the development of criteria for the evaluation of thesaurus software (11, 18, 19).

Whereas the general literature on thesauri lacks systematization of criteria and mentions only some aspects relating to the evaluation of thesaurus software, the checklists have been more specific in their definitions of criteria. Still, these checklists have either been developed for and applied to the evaluation of stand-alone programs (11,18), been restricted to a limited set of criteria (19), or more specific criteria are only made explicit in the discussion and evaluation of a thesaurus program (11).

The approach chosen here differs from that of the three authors (11,18,19) in that it integrates criteria for stand-alone and integrated thesaurus software and adds criteria not mentioned in these check-lists.

The criteria in my check-list are categorized as follows:

(1) general criteria (i.e. criteria applicable to any type of software):

- criteria relating to technical data concerning hardware configuration, operating system and the software package evaluated
- criteria relating to "market data" (development data, pricing, support, acceptance)
- general criteria relating to overall ergonomics with respect to software and documentation
- criteria relating to data security (access controls, user views, backup routines, recovery etc.)

(2) criteria relating to the specific tasks of thesaurus software

Since the purpose of this paper is the definition of criteria for thesaurus software with respect to the specific requirements of a tool for the construction, maintenance and updating it will concentrate on aspects relating to these functions of the software. General aspects to be considered with any type of software will be left aside in the following discussion though they have been included in the checklist since they may well affect a user's decision, too.[2] Ergonomic aspects have been considered in the following discussion only where they can be referred directly to specific functions of thesaurus software.

In the following I will concentrate on the most important criteria to measure the capability of tools for thesaurus construction and application under several headings relating to the process of construction and application of the thesaurus and discuss the criteria with respect to their relevance concerning the different tasks and functions. Taking into account that the various functions of thesaurus software mentioned are not equally important I have differentiated between basic requirements, i.e. requirements fundamental to any thesaurus work, and desirable requirements which might be important in more specific applications.

C.1 Structural Definitions

Structural Definitions refer to those features that determine above all the degree of complexity and differentiation which the software will admit in the construction of a thesaurus and therefore to criteria highly important in the evaluation of thesaurus software, namely term resp. term related attributes and the number and types of relations that can be defined between terms.

C.1.1 Term and Term Related Attributes

Any thesaurus software program must help the user to create the terminology suited to his specific purpose. Two decisive factors determining the degree of flexibility are *length and number of fields.*

Basic requirements for any thesaurus program are, besides the term field, a field for scope notes to define the meaning of terms and a field for notations to facilitate the structuring of vocabulary and a systematic display.

Some thesaurus programs restrict the length of the term field to 50 characters or less which can be problematic for two reasons:

- the more specific the vocabulary of a thesaurus the more likely are compound terms, but also proper names (for instance of parties) which can have considerable length.
- exchange of data can be made impossible when words from a source thesaurus program with more characters than admitted by the target program are to be transferred.

Since the selection of vocabulary should not be dictated by restrictions in the length of the term field it should admit at least 50 characters and – ideally – be user-definable.

Scope notes should preferably be of variable length to provide for long definitions, and the field for notations should ideally be user-definable in order to admit even more complex notations (like, for instance, the long MESH notations).

Apart from these basic requirements there are further desirable features, depending on the size, planned display and the languages to be used:

- a field for the recording of sources of the origin (s) of terms during the collection of terms
- a field for facet codes in case grouping of vocabulary according to facets is planned
- finally a field for information on the language the term belongs to (for multilingual thesauri).

C.1.2 Relations

With regard to the *types* of relations the demands of individual institutions can conflict with the standards which recommend the representation of three types of relations (synonymy, hierarchical relation, relatedness). Many institutions have chosen to ignore these standards and/or have defined additional relations (4). To meet these demands any thesaurus program should ideally let

the user define freely the type of relations he wants to use.

If the relationships cannot be defined freely the following requirements apply:

- The standard relations as defined in the standards (equivalence, hierarchical, relatedness/associative relationship) are a **must.**
  If the associative relationship between terms cannot be defined individually by the user, as is sometimes the case in retrieval software, this means lack of a structurizing device facilitating orientation in indexing and retrieval in general and especially in the social sciences where the associative relation plays an important role since the relation between concepts cannot always be clearly defined in terms of hierarchies.
- Often more specific relations which can also be labelled equivalence relations are required: on the one hand the relation between compound terms which are not to be used for the representation of concepts and their semantic factors, on the other hand the kind of relation which exists between a non-descriptor and two or more terms to be used alternatively instead (e.g. homonyms or broad concepts represented by different resp. more specific terms). Especially semantic factoring can be very important since it supports consistency in indexing/retrieval concerning the representation of complex concepts and is necessary when so-called "inexact equivalences" between terms from different natural languages in the construction of multilingual thesauri are to be treated in accordance with the respective standards (20, 21).
- For the construction of compatible or multilingual thesauri the program should let the user define special equivalence relations between different indexing or natural languages to admit compatibility or multilingual vocabularies (either with equal status or a dominant language).
- In many instances, especially where large vocabularies are compiled and displayed the differentiation of hierarchical relationships (generic and partitive relationship) can be helpful.

With regard to the *number of relations* individual terms can have, there must be no restrictions (as long as they do not affect consistency (cf. C.2.)). This applies especially to the relationship between terms and their broader terms (polyhierarchy as a characteristic trait of thesauri) and to the more specific equivalence relations described above – semantic factoring into various (three or more) factors or representation of homonymous terms or broad concepts by alternative terms in the thesaurus should be made possible if the vocabulary requires it.

C.2 Input of Terms and Relations

Capture of data, modification and deletion of terms and their relations are the typical work routines, when thesauri are constructed and maintained with a computer program. Most important are the mode of input and consistency controls relating to vocabulary and relations. Display of data on the screen does also refer to these phases of work but will be treated in connection with the general aspects relating to the output of data (cf. C.3.1.).

The *mode of input* should ideally be possible by keyboard as well as by data capture from outside in batch mode. Batch input of thesaurus data is becoming increasingly important since thesaurus construction can involve the adaptation of parts of already existing thesauri and additionally there is, as already pointed out, a growing interest in the integration and merging of machine-readable thesauri. At present there is no generally accepted exchange format for thesauri[3] so that the batch input of structured thesaurus data generated by another program depends to a great extent on the ability of the source system to create the format needed by the target system.

Consistency controls concerning the relation structure as well as the terminology are of prime importance in thesauri. Any program for the construction and maintenance of thesauri must include consistency checks, to avoid illogical features in the thesaurus terminology and structure. The most important checks are those that prevent:

- multiple entries of the same term (duplicates), unless the user wants to construct compatible or multilingual vocabularies
- multiple relations between two terms (either of the same or of different type)
- incomplete relations, like
  – relation from one term to another without reciprocity
  – relation between only one factor and compound terms
- rejection of relation other than that of synonymy between a non-descriptor and a descriptor
- rejection of contradictory relations between terms across several levels of a hierarchy.

These consistency checks must of course be applied when terms are entered and the relations are defined but any time a term or relation is modified or deleted these changes must be reflected correctly and consistently in the thesaurus, too.

C.3 Output of Terms and Relations

As has been already said, output of data is necessary in all phases of thesaurus construction and maintenance and must be possible on the screen, by the printer or into a file. In addition it can be referred to the output of the thesaurus on the screen when the thesaurus is applied in a retrieval system. The specific requirements of an integrated thesaurus concerning orientation and support of indexing/retrieval are defined in the section on indexing and retrieval (cf. C.4).

The output of data must optimally support the routines of conctruction and updating by presenting the vocabulary from various angles, in various forms and freely definable layout (for the print).

C.3.1 Display on the Screen

In any of the phases of thesaurus construction and maintenance, display on the screen is necessary, above all:

- in order to check if terms have already been entered
- in order to check if all necessary relations have been established
- in order to check if deletions of terms or relations have been performed correctly by the program

Selection of words for specific modifications or checks according to certain criteria will largely depend on how differentiated the description of a word can be made in terms of its attributes, that is on the structural definitions. Output of terms according to the various relevant criteria (source, notation, facet, language, type of relation) should be possible as well as a combination of criteria (including strings). It should also be possible to select certain words that have been previously marked for specific purposes (deletion, modification, change of relationship etc.).

The *display forms* on the screen must – for orientation purposes – include an alphabetical display (with or without relations resp. term attributes) and a systematic display of terms. Desirable requirements are a KWIC display for large vocabularies with many compound terms and a hierarchical display to check the consistency of the hierarchical relations.

As concerns the possible forms of *interaction* navigation through the semantic net of the thesaurus should be made as easy as possible, and editing functions should ideally also apply to the term lists in order to facilitate the routines of construction, modification and deletion.

C.3.2 Output by the Printer

The output of word lists by the printer is necessary for several reasons:

- the physical limitations of the screen can only offer a restricted view on the vocabulary at a time
- controls of word-lists are easier with printed material
- not all institutions make use of an integrated thesaurus software but want to use a thesaurus in print.

As has been pointed out the ability of a thesaurus program to present the vocabulary from various angles depends above all on how differentiated the term description (term related attributes) can be made. The *selection* should be possible according to the various criteria of selection as defined for the screen thesaurus. Again all selection criteria should be freely combinable for the output.

As regards the *display form* of the vocabulary (or selected parts of it) a program for the construction of thesauri must, in accordance with the standards, at least be able to generate a display in an alphabetical array (including the scope notes and indications of relations between terms) and in a systematic display (with the notations necessary for systematic ordering and indication of the hierarchical level of a term, ideally also with inclusion of node labels for a faceted display in a classaurus). Additionally the multitude of known variations and various additional forms of display (e.g. broad subject groups, ordering by facets) (17) should also be generated by a computer program, above all the two types of display useful for structuring and controlling consistency of large vocabularies with many hierarchical levels and many compound terms, namely hierarchical displays as well as KWIC or KWOC lists. These additional forms of display cannot usually be generated by microcomputers, except for one defined term and its upper and lower terms (hierarchical display) or a defined string (KWIC, KWOC).

Optionally the program should be able to generate a graphical presentation of the thesaurus. The standard thesaurus programs do, however, not offer that option.

More specific questions of display relate to the details of presentation of the vocabulary. The user should be given as much freedom as possible so that he can print a thesaurus according to his own needs.

Especially the layout for the print of the thesaurus should be freely definable with respect to pagination, typographic differentiation of descriptors and non-descriptors, line pitch etc.

Free selection of the types of relations to be included or ommitted in the print (e.g. only synonymous terms, no implicit relations or relations not defined in the standards etc.) and free definition of their external representation by abbreviations (either by user-defined or standard national or international reference codes) can be important, since it facilitates the output of the thesaurus for a variety of applications (e.g. comparability of thesaurus structure for integration or compatibility) while admitting the maintenance of a very complex thesaurus with a multitude of specific relations (e.g. for use as a knowledge base).

C.3.3 Output into a File

Transfer of data to other systems will ask for a special format of interchange which the program must be able to generate. The transfer of thesaurus data to a word processor or of wordlists into a thesaurus software is usually no problem as long as the program can generate standard exchange formats (e.g. ASCII) whereas the transfer of *structured* thesaurus data into a retrieval system or a thesaurus maintenance program is much more difficult since there is no generally accepted exchange format for thesaurus data and the input formats required by the individual thesaurus maintenance programs and retrieval programs vary greatly. As has been said, a thesaurus software should ideally be able to generate some or various formats necessary for this transfer, but usually these devices will have to be programmed on demand.

C.4 Indexing and Retrieval Functions of Integrated Thesauri

In addition to the requirements mentioned so far integrated thesaurus modules in retrieval programs demand specific functions in order to gain an advantage over the printed thesaurus.

For *easy orientation* on the vocabulary and the semantic relations among terms it must be possible to display the thesaurus on the screen both alphabetically (both as a single word-list and with indications of relationships) and systematically while the user is indexing and search-

ing. Orientation on the term best suited for the representation of a given concept is greatly facilitated when navigation through the thesaurus, i.e. the quick switching from one term to semantically related terms and browsing through both the alphabetical and systematic display is easy.

The function of *control of input* must be supported by the software as well, that is the program must check whether a term used for indexing is contained in the electronic thesaurus and eventually reject it (unless otherwise defined by the user). Furthermore the software should enable the user to select descriptors directly from the online thesaurus without having to enter them. Of course a program should automatically replace those terms contained in a thesaurus but not admitted for the representation of concepts. This will be the case whenever equivalencies between a given set of terms can be represented by one term only whereas the others serve as lead-in vocabulary, e.g. non-descriptors (normal synonymy, compound terms – provided the program admits semantic factoring) and also terms from a secondary language in the case of multilingual thesauri.

The *updating of vocabulary* can be greatly facilitated when the frequency of use of thesaurus terms in indexing and retrieval can be verified. Statistics on whether and how often a term has been used for indexing and searching can help identify failures of a vocabulary with regard to specificity and scope of vocabulary. The system must admit global changes, i.e. whenever a descriptor that has been used in indexing (and retrieval) is replaced by another term better suited to represent a concept (either a former non-descriptor, a completely new term or a term of broader scope), the former entries in the index must be replaced automatically by the new descriptor in the inverted file.

One specific advantage of the online thesaurus in retrieval is its ability to facilitate the *formulation of a search strategy*. Automatic generic search (i.e. searches for all documents indexed with terms belonging to a specific hierarchy) is a function common to many retrieval systems and can be regarded as a basic requirement of thesaurus software. The user should, however, also have the opportunity of automatic inclusion of all terms defined as related terms of a specific search term to optimize recall.

D. The State of the Art

As the discussion of criteria relevant to the evaluation of thesaurus software has shown there are a variety of features relevant to almost any application of thesaurus software whereas others will largely depend on the user's specific environment and requirements (KWIC, definition of layout, multingual thesauri etc.).

Certain qualifications can be made as to vital and basic elements any thesaurus software should have. Especially important are those features which determine the structure and complexity of the vocabulary and features related to consistency control and display of the vocabulary since the value and applicability of the thesaurus will largely depend on these features.

This means above all:

- The software must provide for: adequate term length (not less than 50 characters), scope note facilities and notation.
- In the interest of effective application in indexing and retrieval every program must admit at least definition of the basic types of relations, semantic factoring and differentiation of hierarchical relationship being a desirable requirement.
- Since the applicability of the thesaurus in indexing and retrieval as well as the updating depend largely on the consistency concerning vocabulary and relations, the consistency checks as described above can be regarded as vital for any program.
- Any program should at least be able to display the thesaurus in alphabetical and systematic order on the screen, transfer it to the printer or into a file.
- All the functions relating to orientation and control with regard to the integrated thesaurus must be available in a retrieval program, in order to guarantee consistency and predictability in indexing and retrieval. Support in the formulation of requests and in the updating of the thesaurus can also be regarded as elementary functions.

A short glance at software packages available suggests that most programs fulfil the basic requirements for thesaurus software.
But in several of the programs some of the basic requirements are not fulfilled[4]:

- the maximum number of characters is limited to 40 or even less
- the associative relation is either missing completely or cannot be defined explicitly by the users
- semantic factoring is not possible or the number of factors is limited to two
- fields for scope notes and notations are missing
- consistency controls concerning the vocabulary and the relations are either missing completely or only incomplete
- presentation of the systematic display either on the screen or on paper is not possible
- control and orientation devices in indexing and retrieval are missing (e.g.: no automatic replacement of non-descriptors or rejection of non-thesaurus terms), no alphabetic display of terms and difficulties in navigation
- automatic generic searches are not always possible.

Considering this short survey of substantial shortcomings one can only assume that some thesaurus programs (esp. those integrated into retrieval software for microcomputers) have been developed for end-users who apply their programs to small-scale if not mini-thesauri and small-scale document collections. Whether a user will – in the long run – be satisfied with a software of such limitations is doubtful.

However, even thesaurus software which fulfills all basic requirements will, in many cases, not be sufficient. Thesaurus construction still means above all creating an indexing language optimally suited to the specific situa-

tion where it is to be used, i.e. to the potential or real size of the document collection, to the user's demands, to the type of documents, to the subject field etc. Thesaurus features like vocabulary size, the relations defined and the display of vocabulary are interdependent but also determined by these specific conditions of a given environment.

In order to meet these needs a good thesaurus program should leave as much flexibility and freedom in adapting the indexing language to one's requirements with respect to size and complexity of the vocabulary, the definition of relations and the display of vocabulary.

Additionally, thesauri must more and more respond to needs and demands from outside the traditional individual working environment. The new tendencies have already been outlined: Office automation calling for compatibility or integration of thesauri resp. subsystems of thesauri, the increasing importance of artificial intelligence calling for additional relations, but above all a trend that will more and more affect the end-user directly, namely the exchange and integration of data from different systems which demand for greater openness of the systems both in a technical and conceptional respect, that is, import and export of thesaurus data must be facilitated by suitable import and export facilities of the software, and the software must support the construction and use of compatible languages (multilingual or monolingual).

Taking a look at the available thesaurus programs with these additional requirements in mind it seems that a considerable portion of these programs do not meet all of the requirements. Of course, it is the end-user who must decide which software is best suited to his purposes. There is no harm in choosing a software that fulfils only basic requirements as long as the functions of the software meet the end-user's requirements. It is, however, harmful if the user buys the wrong software product because either he does not exactly know what he must expect from the software or what he wants to achieve with it. The design of a thesaurus should not be dictated by the software but the software should be made subservient to the requirements of thesaurus work.

The actual purpose of this paper has been to provide the end-user with criteria in order to help him select the appropriate software for his specific needs. If, however, one takes into account the present state of the art of thesaurus software, it seems that the check-list might well be useful in more than one way: Like check-lists for other types of software, it may also – hopefully – stimulate some of the developers of thesaurus software to revise their software conceptions and improve their sometimes insufficient programs.

Dr. Jochen Ganzmann,
Lehrinstitut für Dokumentation in der DGD
Westendstr. 19, D-6000 Frankfurt 1

Notes:

1 Cf. for instance the special issue of Nachrichten für Dokumentation (1) on thesauri and the second editions of Aitchison/Gilchrist (2) and Lancaster (3)

2 For an extensive and comprehensive discussion of these aspects the reader is referred to Van Wyk's (22) checklist for retrieval software

3 MATER (23) has not been accepted as an exchange format for thesauri so far and any feasible alternative has not been developed yet

4 This judgement is based both on the author's experience with various programs and on the literature on this topic (11,18,19)

References:

(1) Nachrichten für Dokumentation 39(1988) No. 1
(2) Aitchison, J., Gilchrist, A.: Thesaurus Construction and Maintenance: A Practical Manual, 2nd ed., London 1987
(3) Lancaster, F. W.: Vocabulary Control for Information Retrieval, 2nd ed. , Arlington 1986
(4) Schöndorf, P.: Nicht-Konventioncllc Thesaurusrelationen als Orientierungshilfen für Indexierung und Recherche – Analysen ausgewählter Beispiele. Nachr. Dok. 39(1988) p.231-244
(5) Burkart, M.: Neue Thesaurusansätze – frischer Wind in alten Segeln?, Nachr. Dok. 39(1988)p.207-208
(6) Svenonius, E.: Compatibility of Retrieval Languages: Introduction to a Forum. Intern. Classif. 10(1983)p.2-4
(7) Dahlberg, I.: Towards Establishment of Compatibility between Indexing Languages. Intern. Classif. 8(1981)p.86-91
(8) Rada, R., Martin, B.K.: Augmenting Thesauri for Information Systems. ACM Transact. on Office Inform. Syst. 5(1987)p.378-392
(9) Rada, R.: Connecting and Evaluating Thesauri: Issues and Cases. Intern. Classif. 14(1987)p.63-69
(10) Panyr, J.: Thesaurus und Wissensbasierte Systeme – Thesauri und Wissensbasen. Nachr. Dok. 39(1988)p.209-215
(11) Sick, D.: Aufbau und Pflege komplexer natürlichsprachig basierter Dokumentationssprachen (Thesauri): Aktuelle Tendenzen und kritische Analyse einer ausgewählten autonomen Thesaurus-Software für den Personal Computer. Universität Saarbrücken 1989
(12) Aitchison, J.: Integration of Thesauri in the Social Sciences. Intern. Classif. 8(1981)p.75-85
(13) Schwantner, M.: Entwicklung des Indexierungswörterbuchs PHYS/PILOT. In: Deutscher Dokumcntartag 1987. Ed. H. Strohl-Goebel. Weinheim 1988. p.329-339
(14) International Organization for Standardization: Documentation: Guidelines for the Establishment and Development of Monolingual Thesauri: ISO 2788, 2nd ed., 1986
(15) Deutsches Institut für Normung: Erstellung und Weiterentwicklung von Thesauri: Einsprachige Thesauri: DIN 1463, T.1. Berlin 1987
(16) Soergel, D.: Indexing Languages and Thesauri: Construction and Maintenance, Los Angeles 1974
(17) Wersig, G.: Thesaurus-Leitfaden: Eine Einführung in das Thesaurus-Prinzip in Theorie und Praxis. 2nd ed., München 1985
(18) Ritzler, C.: Vergleichcnde Untersuchung von PC-Thesauruspflegeprogrammen, FHDarmstadt 1989
(19) Rohou, C.: La Gestion Automatisée des thésaurus: Etude Comparative de Logiciels. Documentaliste 4(1987)p.103-108
(20) Deutsches Institut für Normung, Erstellung und Weiterentwicklung von Thesauri: Mehrsprachige Thesauri: DIN 1463, T.2, Berlin 1988
(21) International Organization for Standardization, Documentation: Guidelines for the Establishment and Development of Multilingual Thesauri: ISO 5964. Genf 1985
(22) Van Wyk, J., Tönsing, R.E.: The Evaluation of Interactive Information Storage and Retrieval Software. South African J. of Libr. and Inform. Sci. 55(1987)p.34-50
(23) Deutsches Institut für Normung: Format für den maschinellen Austausch terminologischer/lexikographischer Daten – Mater: Kriterienkatalog: DIN 2341. Berlin 1986

CHECK-LIST FOR THESAURUS SOFTWARE

A. GENERAL CRITERIA

1. Technical Data

* Hardware Compatibility:
  - computers on which software runs
  - storage required:
    - RAM
    - external storage devices
  - operating systems
    - single user
    - multi user
* Software Package
  - programming language
  - single user
  - multi user

2. Development Data

* Developer
* Versions:
  - recent version
  - first version
  - overall number of versions

3. Prices

* Software Package:
  - single user
  - multi user
* Extras/Modifications
* Updates:
  - single user
  - multi user
* Support:
  - installation
  - updating
  - application
  - hotline
* Training
* Discounts

4. Support

* Supporting Institution
* Forms of support
  - hotline telephone
  - consultation
  - training
  - newsletters
  - active support
    - installation
    - updating
    - modification

5. Acceptance

* Number of installations
* User groups
* Reviews in articles

6. Ergonomics

6.1 Documentation

* Types of manual:
  - operations manual
  - user manual
* Parts included:
  - table of contents
  - documentation of:
    - technical specifications
    - installation
    - application
    - error messages
    - backup and recovery
  - index
* User Friendliness:
  - structure of manual
  - completeness of information
  - correctness of information
  - clarity:
    - style
    - examples
  - training disc
  - tutorial

6.2 Software Ergonomics

* Language of User Surface
* Complexity of Screen Layout:
  - structure of information
  - colouring
  - window technique
* Dialog Forms:
  - command driven
  - menu driven
  - hybrid
  - mouse
* Help Functions
* Messages:
  - self-explanatory
  - explained in manual
  - error messages
  - feedback messages
  - alert messages
  - confirmation messages
* Provision for Different User Levels

7. Data Integrity

* Access Control:
  - password
  - restrictions for individual users
    - restriction to specific databases
    - restrictions to specific functions
* Backup Procedures
  - automatic
  - storage device
* Reorganisation Features
* Recovery Features

B. CRITERIA RELATING TO FUNCTIONS OF THESAURUS SOFTWARE

1. Structural Definitions

1.1 Term and Term Related Attributes

* Predefined Fields for:
  - Term
    - maximum number of characters
  - Scope Note/Text
    - maximum number of characters
  - Notation
    - no differentiation
    - differentiation for:
      - broad categorization (subject groups/facets)
      - systematic categorization
    - maximum number of characters
  - Source of Term
    - maximum number of characters
    - variable length
  - Information as to Language of Term
    - maximum number of characters
  - additional fields
    - maximum number of characters
* User Definitions
  - number of fields
  - length of fields
  - sequence of fields

1.2 Relations

1.2.1 Among Terms of One Vocabulary (Monolingual Thesaurus)

* Definition of Relations:
  - predefined relations
  - relations user-definable
* Number of Predefined Relations
* Types of Relations:
  - equivalence relationship:
    - normal synonymy (non-descriptor(s) → descriptor)
    - semantic factoring (nondescriptor → descriptors)
    - alternatives (non-descriptor → alternative descriptors)

- hierarchical relationship:
  - no differentiation
  - differentiation of partitive and generic relation
  - definition of dividing principles (categories)
- associative relationship:
  - no differentiation
  - differentiation of various types (e.g. predecessor–successor, appurtenance relation etc.)
    - which relations?

* Number of Relations between Individual Terms:
  - equivalence relationship:
    - normal synonymy (max. number of non-descriptors per descriptor)
    - semantic factoring (max. number of factors per non-descriptor)
    - alternatives (max. number of alternative descriptors per non-descriptor)
  - hierarchical relationship:
    - number of lower terms per broader term
    - number of broader terms per lower term (polyhierarchy)
    - number of hierarchical levels
  - associative relationship

1.2.2 Among Terms from Different Vocabularies

* Type of Vocabularies:
  - multilingual thesauri
  - compatible vocabularies
* Connection Between Different Natural Languages (Multilingual Thesauri)
  - max. number of different languages
  - status of individual language(s):
    - equal languages
    - dominance of one language
* Connection between Different Indexing Languages:
  - max. number of indexing languages
  - types of indexing language:
    - classifications
    - thesauri
  - status of individual language
* Mode of Connection:
  - reference of terms to a switching language
  - direct translation of different vocabularies (mapping of vocabularies)

2. Input (Thesaurus Construction and Maintenance)

2.1 Capture of Data

* Mode of Capture:
  - batch input from other system
  - keyboard:
    - mode of input of terms and attributes
    - mode of input of relations
* Ease of Capture:
  - complexity of input of terms and relations
    - separate steps?
    - fixed sequence of input routines?
  - display of entered terms (and relations) on screen
  - automatic derivation of implicit relations

2.2 Modification

* Mode of Modification:
  - global changes possible (of language codes etc.)
  - keyboard
    - mode of modification of terms and attributes
    - mode of modification of relations
* Ease of Modification:
  - complexity of modification
  - ease of changes affecting the status of terms descriptor – non-descriptor)
  - display of terms (and relations) on screen

2.3 Deletion

* Mode of Deletion:
  - global deletions of terms/relations
  - keyboard
    - mode of deletion of terms and attributes
    - mode of deletion of relations
* Ease of Deletion
  - complexity of deletion
  - automatic deletion of relations of a term deleted

2.4 Consistency Controls

* Definition:
  - predefined
  - user-definable
* Term and Term Attributes:
  - rejection of duplicate entries of the same term
    - modification of control possible for input of several natural or indexing languages
  - definition of admissibility of characters for attribute fields (language codes, notation etc.)
* Relations:
  - control of reciprocity of relations
  - rejection of more than one type of relation between two terms
  - rejection of incomplete relations (e.g. semantic factoring with only one factor)
  - rejection of duplicate relations of one type between two terms
  - rejection of hierarchical or associative relationship between descriptors and non-descriptors
  - control of illogical relations across hierarchical levels
  - other controls

3. Output

3.1 Display on the Screen

* Mode of Search for Terms:
  - browsing
  - scrolling
  - other possibilities
* Display of Individual Terms
  - with attributes
  - with relations
* Display of Word-Lists
  - criteria for selection of terms:
    - alphabetical section
    - strings
    - attributes (language, notation, source etc.)
    - types of relation
    - words marked for specific purposes
    - combination of criteria
  - forms of display of word-lists:
    - alphabetical array:
      - word-list
      - word-list plus relations and attributes
      - other variations
    - KWIC-display
    - hierarchical display
    - systematic presentation (sorting by notation)
      - detailed system
        - without reference to relations
        - with reference to relations
      - broad categories (subject groups/factes)
    - graphical display
* Interaction Possible in Thesaurus on Screen:
  - scrolling/browsing
  - navigation to semantically related terms
  - selection of terms for editing and deletion
  - direct modifications and deletions in lists

3.2 Output by the Printer

* Definition of Output Formats:
  - standard formats predefined
  - user definable formats
    - storage of user defined formats
* Criteria for Selection of Terms:
  - alphabetical section
  - strings
  - attributes (notation, facet etc.)
  - types of relation
  - combination of criteria
* Forms of Display:
  - alphabetical array
    - without further information
    - with relations
    - with attributes
  - KWIC-display
  - hierarchical display
    - without relations
    - with relations

- systematic presentation (sorting by notation)
  - detailed system
    - without relations
    - with relations
    - with attributes
    - with node labels
  - broad categories (subject groups/facets)
- graphical display
- display in columns for multilingual/compatible vocabularies

* User-definable Features:
  - information added to terms:
    - relations
    - attributes
  - presentation of the relations:
    - suppression of certain relations (e.g. implicit relations)
    - sequence of relations in print
    - user-definable reference codes for output (e.g. in accordance with ISO/DIN)
  - layout:
    - pagination
    - line pitch
    - caption
    - typographic differentiation of descriptors/non-descriptors
    - other features

3.3 Output to a File

* Formats of Output:
  - ASCII file
  - Special format required by other system (i.e. retrieval software, thesaurus maintenance program)

4. Indexing and Retrieval

4.1 Indexing

* Orientation:
  - display forms of thesaurus on screen (cf. also 3.1):
    - alphabetical display
    - systematic display
    - other forms of display
  - search mode for terms
  - navigation through semantic structure
* Mode of Input:
  - entering of terms
  - direct selection of terms from screen thesaurus
* Control of Input:
  - rejection of unknown terms
  - user-definable for use of candidate terms
  - replacement of thesaurus terms not admitted for indexing:
    - replacement of compound terms by semantic factors
    - replacement of non-descriptor by descriptor (for thesauri with preferred terms)
    - replacement of terms in secondary language by terms from dominant language in multilingual thesauri
* Representation of concepts:
  - preferred term (descriptor)
  - no preferred term
* Updating:
  - global changes in index
  - statistics on use of descriptors

4.2 Retrieval

* Orientation:
  - display forms of thesaurus on screen (cf. also 3.1.):
    - alphabetical display
    - systematic display
    - other forms of display
  - search mode for terms
  - navigation through semantic structure
* Mode of Input:
  - entering of terms
  - direct selection of terms from screen thesaurus
* Control of Input:
  - rejection of unknown terms
  - replacement of thesaurus terms not admitted for the representation of concepts:
    - replacement of compound terms by semantic factors
    - replacement of non-descriptors by descriptors (in thesauri with preferred terms)
    - replacement of terms from secondary language by terms from dominant language in mutilingual thesauri
  - automatic inclusion of all synonyms (in case of thesauri without preferred terms)
* Formulation of Search Strategies:
  - automatic generic search option
  - automatic search for related terms
  - automatic inclusion of search term predecessors
* Updating:
  - statistics on the use of search terms

ASTM Symposium, Cleveland 1991

The ASTM (Amer.Soc.for Testing Materials) Symposium on *Standardizing Terminology for Better Communication: Practice, Applied Theory, and Results* will take place from June 13-14, 1991 at Cleveland, OH. It is sponsored by the ASTM Committee on Terminology in cooperation with the American Translators Association (ATA), the Terminology and Linguistic Services Directorate of the Government of Canada, and the Canadian Standards Council. Authors are invited to present papers on practical methods and techniques of terminology work, selecting and defining terms - analyzing and classifying concepts, applying terminological principles and theories to terminology problems, measuring and enhancing the quality of terminology products, computer assistance in terminology work, structured documents as terminology database, experience with online or CD-ROM terminology products, the nature and use of vocabulary control - thesauri, indexing, etc., standardizing terminology in ASTM - terminology policies in technical committee, and national and international activities in terminology. For further information contact: Mr. Richard A. Strehlow, Martin Marietta Energy System, Oak Ridge, TN 37831-6088, USA.

Terminology for Knowledge Transfer, Vienna, 1991

A second announcement on the 3rd Infoterm Symposium to be held under this topic in Vienna, October 1991 has been released. Its subtopics cover: Terminology work by subject specialists; Preparation of high-quality multifunctional terminologies; and International Cooperation. The following seven themes have been outlined: General theory of terminology and special theories of terminology - Terminology unification in theory and practice - Terminologies and knowledge transfer - Terminology standardization - Tools to support terminology unification - Applications (in different countries) - Dataflow management (bibliographical, terminological, factual data; availability of terminological publications). For further information turn to the Conference Secretariat at Infoterm, P.O.Box 130, A-1021 Vienna, Austria.