

ITBE

SYSTEMATICALLY AND EFFICIENTLY SEARCHING FOR SCIENTIFIC INFORMATION

**Systematically and Efficiently
Searching for Scientific Information**

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ITBE

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Foreword

The Service Department ITBE/University Library of the University of Twente has a long and innovation oriented tradition of training in information literacy. This also includes the development of training tools which can be tuned to differences in level of education, scientific discipline, specific training demands, available time, etc.

This syllabus will be used in the course 'Systematically Searching for Scientific Information'. This course is developed primarily for scientific researchers of the University of Twente. The main goal is to teach methods and techniques for systematically searching and registering scientific information.

This syllabus has recently been updated. It originates from a Dutch language syllabus accompanying the digital interactive training programme Meewiz. Although an English version of this programme is not available, this syllabus can help you to expand your knowledge of systematically searching for information. If necessary information specialists of ITBE are available to support you.

Of course we welcome any comments on the content of this syllabus.

Drs. P.G.G.M. Daalmans,
University Librarian
March 2006

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0 Systematically searching for scientific information: An overview

Searching for information is time-consuming. If it is done methodically, it will save time and has the highest output. The SSI course and this syllabus, which belongs to the course, offers you the possibility to learn how to search for information efficiently and methodically.

You will reap the benefits of the SSI course if you carefully read this syllabus beforehand. Some parts of the syllabus will get further attention in contact hours during the course.

Chapter 0 is an overview. It briefly describes the four phases of an “extended search” when searching for scientific information. Whereas, Chapters 1 to 6 will treat these aspects much more thoroughly.

Phases search process

In the process of methodical searching for information, four phases are to be distinguished:

1. defining the problem statement and getting orientation on the subject;
2. developing strategy and planning,
3. performing a systematic search and organising the results;
4. evaluating the process and output; and if necessary, restarting earlier phases.

0.1 Defining the problem statement and getting orientation on the subject

In order to search for (literature) information efficiently, a good problem statement is necessary. The problem statement defines the subject that you are going to search for, as well as the objective you want to achieve. On the basis of the problem statement, and the side conditions formulated in that framework, you must decide which referring sources you are going to search for, how you are going to search in these sources, and in what order you are going to do this.

Provisional problem statement

Draw up a provisional problem statement and determine what demands have to comply with the compilation report, for example. On the basis of this, you start general orientation. This must lead to a more detailed demarcation of your subject, the manner of searching and the means that are used in this. For that purpose you trace relevant reference literature, by means of the library catalogue, such as (specialized) encyclopaedias, and handbooks. You can also use the Internet in an orientating way.

- Demarcation** Further demarcation occurs according to:
- The period within which the searched literature has been published.
 - The language in which that information may be phrased.
 - The kinds of documents (e.g. journal articles, dissertations, Internet sites).

Now, you also determine with what search terms you are going to search for literature. With the help of a thesaurus, lists of keywords, multilingual specialized dictionaries and the like, these search terms can be extended; synonyms and translations can be found, more specific terms or just more general ones. If you also have to search for information via classification systems you can, , quote the relevant classification codes at this stage.

- Sources** You trace the relevant (referring) sources for your subject and then skim through them. They give you an indication about the amount of (literature) information that has been published on this subject. You may make notes on this in your personal documentation system for example. Finally, you should search for persons and institutions that can/could be of use when searching for information (e.g. via referring sources). During orientation, it may appear that the subject must be adjusted, restricted or extended.

0.2 Developing strategy and planning

In the strategic phase you must finalize the preparation of your systematic search process. By doing this well, you can save a lot of precious time. You should consider drawing up a schedule within which the searching must take place, and add any relevant data and agreements. You can record this in your personal documentation system.

- Planning** You should draw up a strategic planning for the search process, i.e. you could determine the manner in which and the sequence in which the selected referring sources will be searched. This means for example, that of each source that is written down, what years will be searched through, and what source specific search terms are going to be used in the search (e.g. in your personal documentation system).
The previously determined search terms must therefore be “translated” into the search terms that are specific for the sources to be searched.

0.3 Realizing a systematic search process and managing the results

- Tracing information** After undertaking all of the described preliminary work, including the development of a personal documentation system, the actual trace of the information takes place with the help of the selected referring sources. You should record data on ‘found titles’ in your own personal documentation system (possibly via downloading) and you try to obtain the documents by downloading or borrowing them/applying for them in libraries.

Your personal documentation system also minimizes the risk of constantly re-obtaining the same information over and over again. You do this by constantly taking down notes whether the information is already in your possession, or has been ordered, what arrangements have been made with specialists, if available information has already been processed, what the possible benefit will be, where it is stored etc.

- Processing information** Now you also need to start to study all of the obtained information. In this way you can determine whether the found literature indeed deals with the subject to be studied. If this is not the (sufficient) case, then the search terms will have to be adjusted. All relevant data should be recorded in the personal documentation system.
- Retrieve more** Particularly when you have already found key articles or reviews, you can, departing from those articles, search for more recent literature with the help of the “Citation Indexes” as discussed in chapter 3.4. Older literature can be found via the references in the articles that you have already obtained (the so-called snow ball method). If necessary, you could contact a number of institutions or authors who are working on the same subject. Finally, you should take steps to keep informed of new publications via alerts or SDI’s.
- Lack of time** During the search process, if you notice that you are running out of time, you can, after determination of the cause, take the following measures:
- consult your subject librarian / information specialist;
 - claim more time;
 - restrict your subject, i.e.: focus your problem statement;
 - restrict your search area, e.g.: only publications of after 1990, only English-language literature, no report literature or only publications in full text databases or present in your own library;
 - only search for referring source(s) of which you expect the highest yield;
 - contract out part of the searching.
- All measures you take must be recorded clearly and expressed with reasons. After all, you must be able to justify your method of searching. Moreover, you will be able to fill in any possible gaps at a later stage.

0.4 The evaluation of process and results

- Responsibility** Through the search process you constantly make choices and establish priorities. This happens when developing the problem statement and when taking decisions about the sources to be consulted. Choosing and deciding are professional activities, which you will have to be able to justify. Therefore it is important that this happens explicitly and is recorded in your personal documentation system. Of course this also true for any necessary modifications that occur during the process.

Scope search process

Passing through all phases and steps of the search process seems very time-consuming. However, this is not necessary with good planning. However, you should remember that the whole search process does not always have to be carried out down to the minutest detail.

It is not advisable to start more and more endless refinements again and again, but you should not hesitate to return to an earlier point in the cycle.

1 Formulating a problem statement

For an efficient search of literature, a good problem statement is necessary. The problem statement indicates the subject on which you are going to search and also the target you want to achieve. On the basis of the problem statement and the side conditions you decide in which referring sources you are going to search, how you are going to search in those sources and in which order you are going to do that.

Formulating a good problem statement is not simple. If your problem statement is insufficiently clear or too elaborate, then there is a great chance you will find too much information, which will divert you from your problem. In this course some general characteristics of good problem statements will be discussed.

What? why? In the first place, it must become clear what you want know and why you want to know this. Formulating this part of the problem statement in the form of a question often works.

Kind of information In the second place, it must become clear in the problem statement what kind of information is demanded for the problem solution, e.g.:

- facts or opinions;
- very new information and/or older information;
- information of a high theoretical calibre or practical information;
- written in which languages;
- what kind of documents (articles, folders, Internet sites, theses, advices, policy documents ...)

Terminology In the third place, terminology is of the utmost importance. Which concepts are at the centre in your problem statement, are there equivalents for these concepts, are these concepts clear, are there relations between the concepts taken etc.

Side conditions Finally, it is important that there is clarity within which side conditions you are going to search for information. Think of questions such as: how much time and money is available, where can you search (libraries, Internet, experts), when can you search / when do you want to search (day time, evening, at the weekend), how do you want to process the found information and how much time do you have for this.

2 Knowledge and choice of referring sources

2.1 What are referring sources?

When tracing scientific information, referring sources are indispensable because they provide you with titles and sites of the information you are searching for. There are different kinds of referring sources.

Some traditionally distinguished sources are: bibliographies, catalogues and citation indexes. In the last few years, electronic sources (databases) have been added. Databases traditionally use referring sources. On the Internet, search engines and web indexes play an important role. Internet can serve different purposes: as referring and as informing source. Searching on the Internet is dealt with in sub module 3.3. Some knowledge about kinds of referring sources is essential. Next to this, it is important to know how you can choose from the multitude and where to find them. All these questions are dealt with here.

2.1.1 Bibliographies

A bibliography is an orderly list with references to documents, and is meant to signal the existence of those documents, irrespective of the place where they are. A bibliography can occur as an independent publication (book, journal, database or cd-rom), as a journal article or as a supplement to a book or article.

- Kinds** There are many kinds of bibliographies. These can be divided up into:
- Publication areas (national bibliographies)
 - Subject area (general or special bibliographies)
 - Publication period of documents (retrospective and current bibliographies)
 - Publication form of documents (bibliographies of books, dissertations, congress papers, journal articles, etc.)

There are also bibliographies of bibliographies.

- Abstract journals** A special form of a special, current bibliography is the abstract journal. This is a periodical publication in which brief summaries of recent literature on a certain discipline are published (also mentioned as abstracts or excerpts). It mostly concerns articles from journals and/or proceedings. Abstract journals are often electronically accessible.

- Current awareness service lists** Another category worth mentioning is the current awareness service lists. These lists are continuously kept informed about any recently published material in a particular discipline. Acquisition lists of libraries are to be considered as current awareness service lists. Current Contents are journals that offer current awareness service in the form of lists of contents of certain journals.

Individual current awareness service

In many literature databases it is possible to set up a quick form of individual current awareness service, called 'Alert' or 'Selective Dissemination of Information' (SDI). On the basis of a so-called 'interest profile' you can periodically review the latest titles that are recorded in a database. In the Picarta database, you can personally select which journals you want to receive lists of contents. Then you will receive, by e-mail, the lists of contents of new issues as soon as they have been added to the database. Also a current awareness service from Picarta is possible on the basis of a personal interest profile.

2.1.2 Catalogues

Catalogues form an essential tool when tracing and obtaining information. A catalogue is a, mostly electronic, database containing title descriptions of documents such as books, reports, journals and/or cd-roms which form a part of a collection in a specific place. Characteristic for library catalogues is the indication for the location of each document: the shelf number. In a catalogue, like the one of the University of Twente's library, you can, among other things, search for names of authors or editors, title words, year of publication and keywords or on a combination of these so-called search keys.

In the past, catalogues were found in university libraries mainly in the form of card trays. In libraries abroad and in smaller libraries you will still find them. Also the Universiteit Library Twente started with a card tray system. However, in 1986, the card system was replaced by a computer database system. The catalogue of the University of Twente's library is now one of the many PICA-databases. PICA is an organization that has been established by a number of university libraries that wanted to automate their card tray system.

2.1.3 Citation indexes

Within the referring sources the citation indexes have an important and special place. In such indexes you can, originating with a publication of which the bibliographic data are known, find later references to that publication. So it is possible to find more recent publications about your subject via a citation index. More information about working with citation indexes see paragraph 3.4.

2.1.4 Databases

There are many different kinds of databases that serve as referring sources. However, they have one characteristic in common: they are to be consulted electronically. It can be traditional catalogues, bibliographies in electronic form but also combinations of referring sources, with sometimes possibilities to click direct the online available full text informing sources as, e.g. in Picarta. National and international organizations, trade unions and ministries are also computerizing their systems, and hence providing searchable online databases. You may search these databases via the University of Twente's library webpage.

You should realize that most databases are strongly aimed at literature in the English language.

2.1.5 The Internet

The databases mentioned in section 2.1.4 are mostly all accessible via the Internet – with some requiring subscription. In order to use the open Internet as referring source, there are search engines and web directories at your disposal. Search engines often pretend to index the “whole” Internet. You can also use them to search the parts selected by you (e.g. certain countries or discussion/news groups). Web directories work with subsequent subdivided rubrics from which you can choose. See for more information on searching on the Internet in paragraph 3.3.

2.2 Choosing referring sources

Problem statement

Choosing referring sources is not easy. There is a great offer spread over many different places. Most of them are to be searched and consulted via libraries and/or the Internet. Here your problem statement plays an important role. It determines in first instance what kinds of referring sources you will need. Problem statements can be restricted to one discipline or on the contrary be related to different disciplines. Likewise, there are referring sources that are restricted to a certain discipline whereas others are multidisciplinary. Also, in relation to the problem statement, the size and the nature of the information to be searched for contributes to the choice of the referring sources to be consulted. It makes a difference, whether you are searching for information for a lecture or for a thesis. Note that the latter search is less demanding than the first.

Assessment

Once you have traced some referring sources, it is necessary to assess them globally before you determine your choice. The first assessment mostly concerns the title and other formal characteristic of a source. A further assessment is to be formed on the basis of the prefaces or explanations with sources. In these there is often more to be found concerning the significance of the covered area, but also about the character of the information to be found and the size of the database. This makes it possible to estimate what meaning the referring source can have for you.

2.3 Finding referring sources

Search systems

Searching for referring sources will often be done in libraries and/or via the Internet. On the Web site of a scientific library, surveys of the referring sources are presented summarizing what is available. When searching via a catalogue, it is recommended to combine significant subject entries with form characteristics. So search for example, for a referring source about business administration with the term or the code that represents the subject ‘business administration’ in combination with a form characteristic like ‘bibliography’ or ‘index’.

3 Search techniques

When you are going to search for literature about a certain subject in referring sources (such as abstract journals, catalogues or databases) you will have to 'translate' your subject into the search terms used in those sources. These can be for example, keywords or classification codes. Sources mostly give information themselves about the search possibilities. Printed sources do this in the introduction, and electronic ones in the help function. The three most common ways of subject searching are with the help of classifications, keywords or free text.

3.1 Subject searching

3.1.1. Classifications

Classification codes

A classification is a scheme in which subjects or concepts are arranged in classes or headings. In the library, world classifications are used to arrange literature. The headings are often indicated by alpha-numeric notation codes: the so-called classification codes or systematic codes. Thus, these codes refer to subjects. When tracing literature you should realize that a subject can belong to different headings. Moreover, in one document different subjects can be dealt with next to each other. Therefore it is advisable to search in all appropriate headings.

Before searching, it is also useful to look at the complete classification, i.e. the list with available codes and their descriptions, so that you can select the desired codes. Such a list is usually available in print and/or electronically. Should the list not be available, you can still work with desired codes as long as you have found some good hits using another method. By looking at the headings of the hits that have been stored and which codes belong to these, you will discover codes that are usable, in order to continue searching.

3.1.2 Controlled terms

Keywords

A controlled term is a word or a combination of words by which a subject occurring in a document is stipulated as accurately as possible. Specialists allocate controlled terms.

However, certain words are fashionable, so that in the course of time different terms have been used for one and the same subject.

When searching with controlled terms in a referring source it is advisable to consult an alphabetical list of these terms used in that source.

Thesaurus

An extended form of a list of controlled terms is a thesaurus. A thesaurus is a kind of dictionary that systematically arranges the mutual relations between terms used within a discipline. It is in fact a list consisting of preferred terms (also called "descriptors") chosen from terminology. Via the descriptors can be searched in the referring source. A thesaurus often consists of non-preferred terms as well as synonyms, for example, accompanied by references to preferred terms (such as from the extra entrance "bike" to "bicycle"; see the example overleaf).

To illustrate this, look at the example below from a thesaurus in the field of traffic and transportation.

Bicycle

Explanation	is only used here for the means of transportation, not for the activity
Extra entrance	Bike
Broader term	Means of transportation
Narrower term	Carrier cycle City bike Mountain bike Racing bike
Related term	Moped

Explanation of the terminology:

From both synonyms “bike” and “bicycle” the latter has been chosen as preferred term (in bold letters).

- Explanation is given if clarification or restriction of the term is desirable.
- Extra entrance indicates in this case that “bike” is not the preferred term in this thesaurus; along with the term “bike” see “bicycle” is mentioned.
- Broader term gives a reference to more general keywords, for there is a possibility that in a publication about “means of transportation” something is mentioned about a bicycle.
- Narrower term indicates a reference to more specific keywords; you now see that “racing bike” is also a preferred term. So if you are searching for something in that field you had better directly try this more specific, narrower term.
- Related term gives a reference to keywords that are not narrower or broader but do have a relation with the term used: “moped” and “bicycle” are very much traffic regulation related.

3.1.3 Free text

Other search keys

Next to classification codes or keywords other search keys are also to be used when searching in referring sources, e.g. “title words” or “abstract words”. When searching in this free text you do not need to consider the lists of controlled terms when ‘translating’ your search question, but you do have to take into account that authors use their own terminology in their publications. That terminology comes back in titles and summaries. Then it is important to observe different styles of writing (e.g. fibre and fiber, in British and American English respectively), synonyms, singular/plural, different languages and so on. In electronic databases free text searching can often be done with search keys as a ‘basic index’, ‘key words’ or ‘subject’. Note that search keys allow you to simultaneously search within all abstract words, title words and controlled terms. Searching with such search keys can provide more hits but less specific results than only using title words or controlled terms.

N.B. When writing a publication, use words in the title or in the summary that someone else is likely to choose when searching for literature about that subject (e.g. terms from a frequently used thesaurus). If you have thought of a funny or playful title, add a subtitle that describes the subject clearly.

3.2 Searching databases

If you want to do a search as completely as possible it counts that a good 'translation' of the subject in search terms is important for the result. Such a translation will seldom provide one search term. Therefore it is important to know how in a search system terms can be combined to a search phrase. Unfortunately, there is no question of standardization: each search system has its own (im)possibilities.

3.2.1 Boolean operators

To combine search terms in search systems you often make use of so-called Boolean operators: AND, OR and NOT. The methodology of how to do this is described in some detail in chapter 5 of Sieverts and De Jong-Hofman (1996). You will find an abstract of this text in the appendix at the back of this syllabus.

3.2.2 Combining search terms

Regarding a basis set-up, first the search question is analyzed in terms of independent aspects. E.g. the demand for literature about 'corrosion of steel constructions under water' has three aspects. Then the separate aspects are 'translated' into suitable search terms. The different possibilities are combined with the OR-operator. In the case of a search in the 'basic-index' of a database this could be as follows:

(aspect)		(search terms)
Corrosion	->	rust OR corrosion
Steel constructions	->	steel
Water	->	water OR sea OR maritime

N.B.:

- On behalf of the survey ability not all possibilities are mentioned in this example.
- Notice that the word 'constructions' is not included in the search terms. This word is not strictly necessary, so using it will decrease the amount of hits. Even very good hits can be excluded, e.g. about corrosion of steel test plates in water.

Combination Finally the different aspects are connected with the AND-operator so that the search can be written as:

(rust OR corrosion) AND steel AND (water OR sea OR maritime)

Analyzing in aspects

"Translation" in search terms

If this search sentence is entered into a search system, hits will be found that include all the three aspects. Each hit contains a combination of at least one of the mentioned words per aspect.

'Simple search' modes

Most search engines on Internet do not accept extensive search sentences with a lot of nesting. In that case the search sentence must be split up in a way according to the system.

In many 'simple search' modes it is not obvious how well the system performs when more than one search term is entered; if so, use the Help-function. If Help is absent: first try one search term and then add another term. In the AND-function the number of hits decreases ('restrict set') whereas in the OR-function the number of hits increases ('enlarge set').

Truncation

A frequently occurring extra-ordinary form of the OR-function is the so-called truncation ('wildcard'). If, for example, you type the truncated 'polym?' into the catalogue of the University of Twente's library, the system searches all terms that begin with 'polym', such as polymer, polymers, polymerization. Sometimes truncation at the beginning or in the middle of a word is possible, e.g. colo?r for colour/color.

Truncation saves time and often results into unexpected search terms thus more hits.

Proximity operators

In some search systems it is also possible to indicate, with the help of proximity operators, the relative position of two search terms. When two search terms in a text are closer together, it may be concluded that they have a stronger relation to each other and thus the relevancy of the search result is greater.

The most used proximity operator is NEAR/n. The search phrase 'airport NEAR/5 construction' indicates that it is allowed to have a maximum of 5 words between the search terms 'airport' and 'construction'.

If you do not enter the n-value then a default value is chosen in many search systems. Note that some search systems do not allow the definition of an n-value, in which case only a simple NEAR operator is available.

Phrase searching

Most search systems are able to search on two or more search terms in a specific order. Type (double) quotes at the beginning and the end of the phrase, e.g. "harley davidson" or 'harley davidson', see the Help function. Phrase searching (also called Sentence Search) and proximity-operators are an extra-ordinary form of the AND-function.

3.2.3 Search tips

Say 'and' but use 'OR'

When splitting up your search question in aspects you must pay attention to the fact that in common speech the word 'and' in enumerations means 'and/or', so the Boolean OR must be used.

E.g. when searching for books on the subject 'traffic and transportation', you really mean: traffic and/or transportation. The search sentence must be 'traffic OR transportation'.

- Finding search terms** Don't forget singular and plural forms (use truncation), English and American spelling (e.g. fibre/fiber). Use classification codes (e.g. patents) wherever possible. Further it is important to use synonyms and broader or narrower terms when appropriate. E.g. if you search for articles on the economic importance of the Dutch large rivers, may search for the latter as ('large rivers' OR rhine OR waal OR meuse). More and more it is possible to use so called 'auto stemming' or 'stemming'. In that case large lists of synonyms, plurals/singulars and spelling variations are incorporated in the search system. If desired, these terms will be used automatically when the user enters a search term. Be aware of the simplicity of these stemming systems. The example previous regarding the narrower terms of the 'large rivers' in the Netherlands is not possible with auto stemming yet!
- Capitals** Do not use capitals in search terms unless you only want hits written with these capitals in particular. Search systems find both, Holland or holland, when the search term 'holland' has been entered.
On the contrary, always use capitals when typing the search operators AND, OR, NOT, NEAR. This leads to better surveyability of the search sentence, and moreover some search systems demand capitals when you want to use Boolean operators.
- Stop words** Avoid simple words like 'a', 'the', 'in', 'with', 'if', as a search term, because often they are suppressed in the search index of databases. If so, there is a great chance that the system will give no hits at all when this kind of words are entered as a search term.
Stop words however are allowed within phrase searching, so the search phrase "a tale of two cities" will suffice.
- Too many hits** If you get too many hits on your subject to handle properly, it is possible to restrict the set by making more demands, such as
- Add more search aspects (more AND
 - Ask for young results, hoping older ones are included
 - Important words must occur in the title instead of the abstract
 - Search for 'review' or 'portal' or 'overview'
- Very few good hits** If you wonder, "is this all there is ?" (always do!) perform another search with:
- More/better search terms, e.g. that you found in your hits or asked an expert (more OR)
 - Less demands: drop aspect(s)
 - More languages or publication dates (older)
 - More databases/search engines
- Too many 'bad' hits** If there is a lot of 'noise': hits that don't have any relation with your subject: search again with adjustments, such as
- Replace truncation by full terms, e.g. car*-> (car OR cars) to avoid the words: careful, cara etc.
 - If search terms occur far from each other (no relation), use NEAR or Phrase Searching
 - Homonyms: exclude unwanted meanings, e.g. jaguar NOT car , if you want the animal

3.3 Searching via the Internet

The Internet is a network that connects computers throughout the world. Since the beginning of September 1973 the Internet has grown steadily. In the meantime it is, especially thanks to the introduction of the World Wide Web (WWW) in 1993, an indispensable source of information. Recently, scientific information on the Internet has become a valuable source, although highly qualified information is generally not freely available. Large online sources of electronic scientific information (databases, e-book/e-journal collections) are accessible via WWW, but they are not free of charge. An important development in this respect is the growing full text availability of scientific output of academic institutions by means of their so-called institutional repositories. In the Netherlands for instance, all universities and some other academic organizations have their own repository full of text scientific publications offering free access to these via their own website and via other services on the Internet, like Google. The repository of the University of Twente can be searched via www.utwente.nl/ub (frequently used databases > repository UT publications). The repositories of all the Dutch universities and academic institutions can be searched via www.darenet.nl.

Other sources of free scientific information are:

- Web sites with catalogues of (scientific) libraries
- Web sites with contents of journals (via publishers)
- Web sites with free electronic journals, e.g. for a list see www.doaj.org
- Web sites with preprints of journal articles

www.scholar.google.com has free full text, but also paid full text via commercial article providers

Reliability and quality of information

The reliability and quality of information on the Internet is often not, as by the traditional ways of publishing in books or journals, controlled by publishers, editors or peers. Especially with scientific information it is important to get an idea of the quality and reliability, this can be done by

- knowing who is the owner of the site and whether the author is qualified.
- verifying why the information is published on Internet (commercial?)
- checking to see if the information is published on a personal site, for which the organization named in the URL is not responsible. (Then you see in the URL the word 'users' or 'members' or the sign ~).
- verifying if the information has also been published in other media is reliable.

Search Tools

A lot of electronic information is available via the Internet. In order to make this information much more accessible, different tools and services are available. The most common way of classifying web search tools is to make difference between 'search engines' and 'web directories'. A search engine is a database of automated collected and indexed websites and offers the possibility to search in that database with the help of search terms. A web-directory (or web index) is a database of websites that have (partly)

been selected by hand and have been classified according to subjects and made suitable for searching. In some cases (e.g. Google, Yahoo) both ways of searching are provided.

For both, search engines and web directories, it is possible to register your own web site in order to make it 'findable'. After registration, it is advisable to check on a regular basis whether the website appears in the database's engine/index.

3.3.1 Search engines

Search engines are the most popular tools for searching information on the web. Awarded examples (2005) are Google (www.google.com), Yahoo (www.yahoo.com) and MSN Search (<http://search.msn.com>). Generally the search engines have larger databases than web-directories. Moreover, the variety of the entered websites is greater. Yet the databases of the largest search engines contain no more than about 50 percent of the total free accessible web (2005). The 'deep web' information in catalogues and other databases (that is only accessible after searching in that specific database) is generally not easy to find with normal search engines. Some of them do find PDF-documents, pictures or messages from discussion or news groups (Usenet).

For possibilities, scope and other information of individual search engines, see www.searchenginewatch.com.

Parts search engine

A search engine consists of three parts:

1. a program which collects web-sites by tracing from link to link, also indicated with spider, crawler or robot,
2. a database (index) with copies of collected websites and
3. The actual search-engine, software with which the database can be searched and the hits are ranked on relevance.

Indexation

Collecting and indexing of websites occurs for the most part automatically. The spider crawls the Web on a regular basis and selects websites. Changes in pre-selected and indexed websites will automatically be adjusted in the database.

How the collected websites have been indexed differs per search engine. These differences are expressed in the search possibilities that a search engine offers, and the accuracy in which a search order is carried out.

Search possibilities

Searching for information with the help of a search engine is comparable to searching literature databases (see par. 3.2). Together with entering search terms there is a possibility to,

- make use of Boolean operators (AND, OR, NOT, sometimes AND NOT, nesting);
- demand or exclude certain words in already found results
- search for literal text ("phrase searching").

Searching with truncation and proximity is in general not possible (2005).

Many search engines offer the possibility, besides in the complete text, to search in specific areas, such as in the title or the address (URL). Searching in a certain area provides a more accurate result than searching the complete text.

Search result The quantity of the search result is less important than the quality (accuracy) of this. Mostly the number of hits is very large. This is because all web pages in which the search terms are mentioned, are noted as a hit. Many web pages originate from the same website. Moreover search engines with 'OR' as default generate many hits.

Relevance Most search engines present the search result in a sequence of relevance. Although it is not completely understood how the search engine determines this relevance. In general, the relevance of a 'found web page' is assessed by (among others):

- the number of times that search terms occur in that web page
- the distance between 2 or more search terms
- the place of the search terms (in the URL, title, bold text or normal text)
- number of links in other popular web pages to that page
- number of links in that page to other popular web pages

Tips Tips how to operate search engines:

- Try different search engines.
- Use the Help-function in order to know which search facilities are offered and how to apply these.
- Use the possibility of advanced searching and the application of Boolean operators (AND, OR, NOT)
- Enter search terms as specifically as possible, use 'phrase searching'.
- Enter search terms as many as possible.
- Mind a possibly double meaning of search words (Jaguar for example, is both an animal and a name of a car).
- Think of synonyms, plurals and language.
- Do not use capitals, unless specifically required.
- Do not trust the sequence in relevance of the search result and also observe hits mentioned further on in the list.

Meta-search engines You can also search using different search engines at the same time with the so-called meta-search engines. A meta-search engine has its own system of relevance ranking. Awarded examples (2005) are Dogpile (www.dogpile.com), Vivisimo (<http://vivisimo.com>) and Kartoo (www.kartoo.com, if you like seeing your search results visually, these meta search engines show the results interconnected by keywords).

However, meta-search engines have two important disadvantages:

- Only simple search orders are possible, since more extensive search orders requires negotiation with other search engines with a different set of rules.
- Meta-search engines only search a random part of the databases of other search engines.

Difference with search engines**3.3.2 Web-directories or Web-indexes**

Whereas search engines index websites automatically, web-directories effect this partly by hand. With some web-directories the websites are both selected and classified by editors. Changes to a website are not automatically recorded. The most remarkable difference with search engines is the way in which can be searched in the database. Whereas in search engines it is found by using search terms in combination with all kinds of extra facilities. However, in web-directories searching is done by means of browsing through the headings and sub headings.

Although the gap between search engines and web-directories is narrowing, almost all search engines have classified a number of popular websites, and because this can also be searched via a list of headings. Whereas, web-directories offer the possibility to use search terms, they are fairly limited to a fixed number of extra facilities.

Examples of Web- directories

Yahoo (www.yahoo.com) is a general web-directory. Suggested and collected web-sites are automatically added to the database. There are also web-directories which work more selectively, such as The Argus Clearinghouse (www.clearinghouse.net/index.html). Virtual Library (<http://vlib.org>) and Infomine (www.infomine.ucr.edu) are web-directories with selected scientific information, just like Librarians Index to the Internet (www.lii.org), but the latter offers its own descriptions and reviews of the web sites as well. There are also web-directories that only record web-sites about a specific subject or field, such as MedWeb (www.medweb.emory.edu/MedWeb) for medical information.

3.3.3 Choice of means

When do you choose a search engine and when do you choose a web-directory, when searching for information on the Internet? This choice is determined by the kind of question you have or the kind of information you are searching for. The following table can be used as a guideline.

Kind of question/information	Means in searching
The general question, survey of information about a certain subject, mostly in the orientating phase, such as which technical journals are available on the Internet.	Web-directories, both general (Yahoo) and more specific and selective (Argus Clearinghouse, MedWeb, Librarians Index, Virtual Library).
Specific, but frequent questions such as flight schedules of a well-known airline company.	General web-directories (Yahoo). Search engines (Google, MSN Search, AltaVista, etc.).
Specific, but less frequent questions such as information about the construction of an airport in the sea.	Search engines
Questions about a topical, much-discussed theme, specifically or generally, such as a book that has had publicity lately.	Discussion groups or news groups (Usenet, available through Google, Yahoo, AltaVista, etc.).

3.3.4 Searching for specific information on the Internet

Scientific information

Many catalogues of scientific libraries and other (subscribed) databases with scientific information are accessible via the home-pages of Universities and/or their libraries (e.g. www.utwente.nl click on 'University Library'). There are more and more Universities that, independently or in mutual co-operation, offer selecting, indexing and search facilities. In this way technical-scientific information sources can be searched for with the help of EEVL (Edinburgh Engineering Virtual Library: www.eevl.ac.uk). Social science information on the Internet is indexed by SOSIG Social Science Information Gateway: <http://www.sosig.ac.uk/welcome.html>

Via the internet-address <http://xxx.lanl.gov> you can search for pre-publications (pre-prints) of articles in the field of physics, mathematics and informatics.

Geographic determined web-sites

Websites originating from a certain country can be selected with the help of their www-address. Google and AltaVista e.g. ('advanced search') offers the possibility to search in the field 'domain'. This field contains the country-codes that have been entered in many URLs, such as 'nl', for The Netherlands, or 'de' for Germany.

Discussion groups

If you are searching for discussion groups on a certain subject, then you can consult Liszt (www.liszt.com), a database that offers a similar kind of search facility as a web-directory.

E-mail addresses

Worldwide e-mail addresses can be found via Metanamesearch <http://www.inventio.nl/metanamesearch> or the World Email Directory (<http://worldemail.com>). With Yahoo! People Search (<http://people.yahoo.com>) there can also be searched for telephone numbers (USA and Canada) next to e-mail addresses, whereas with WhoWhere (www.whowhere.lycos.com) you can also search for postal or home addresses.

Internet-addresses

In order to find Internet-addresses, you can consult the Internet Address Finder (www.iaf.net).

3.4 Searching citation indexes

Scopus

Citation indexes play an important role in many literature searches. The essence of 'indexes' is that you are able to find more recent articles, departing from previous bibliographic data that is already known. Therefore, if you have an important article or book, you can find more relevant recent articles including any colleagues or institutions that are actively working in that area.

The University Library has acquired a trial license for Scopus: from July 2005 until September 2006. Scopus is an abstract and indexing database, and may be compared to Web of Science. Citation references are available from approximately 1966. The use of Scopus will be evaluated in September 2006, after which will be decided to continue with Scopus or not.

Web of Science The University of Twente is currently subscribed to the so-called Web of Science, a group of reference databases via the Internet in which citation data has been entered since 1988. The Web of Science consists of the following databases that can be searched separately or simultaneously:

- Science Citation Index (science and technology)
- Social Sciences Citation Index
- Arts & Humanities Citation Index

The citation information prior to 1988 is listed in printed Citation Indexes. The University of Twente's library has owned these indexes since the 1960s.

Searching the Web of Science and printed Citation Indexes assumes special insight into the nature of citation indexes. A discussion of the way in which the printed Science Citation Index has been organized can make this clear and is, for this reason, given below. We restrict the explanation to the Science Citation Index. The two other indexes mainly differ from the SCI because they open up journals in other fields of study.

Content printed SCI In the printed SCI the following data were entered in a database of some 750,000 articles annually:

1. name of the journal, year, issue number, pages;
2. author(s) of the article (plus the institution where he/she is employed);
3. title of the article (always translated into English);
4. all references, thus all quoted publications in the article.

These data were sorted out in four indexes:

- Source Index
- Citation Index
- Permutation Subject Index
- Corporate Index

Of these indexes, an annual and five-yearly editions are published. We will discuss these printed indexes in order to clarify the set-up of the SCI. After that we will go into the Web of Science again.

Source Index In the Source Index all articles are mentioned from the database, arranged according to author. In this index you can search when you want to know what a certain author has written in a certain period.

Citation Index The Citation Index consists of a view of all publications to which is referred in the literature, which has been incorporated into the Source Index. The Citation Index gives the data of publications that have been cited. Under each of the cited publications there is a list of citing articles. The application will be clear: departing from the article by Anselin from 1963 in the Comptes rendus hebdomadaires des sciences de l'Académie des Sciences – see the example shown below – we find in the Citation Index the French article by Pezat:

-> **ANSELIN F**
63 C R HEBDOMA D SE ACAD 256 2616
-> PEZAT M J SOL ST CH 18 381 93
76 T AM NUCL SOC 20
BLANCHAIR P T AM NUCL S 23 151 93 M

So in his article of 1993, Pezat referred to the article by Anselin in 1963 and on the basis of that relation it can be interesting for the scientist to study that article. The complete data are in the Source Index:

PEZAT M
*TANGUY B VLASSE M PORTIER J HAGENMUL P-(FR)
RARE EARTH NITRIDE FLUORIDES A4684
J SOL ST CH 18(4):381-390 93 28R

Departing from a publication from 1963 we find another publication also from 1993, that is possibly about the same subject.

Permutation Subject Index

In the Permutation Subject Index all articles that are mentioned are also in the Source Index, and are arranged according to the words in their title. This index could be used for subject searching, but this method is now out of date.

Corporate Index

In the Corporate Index all articles are mentioned under the names of the institutions in which the authors are employed. Thus, in this index, you can find which publications have been written by authors of a certain institution. The complete bibliographic data can be found again in the Source Index. The Corporate Index is a very useful method of finding literature, in institutions that are known to be actively working upon the subject of interest.

Web of Science

The online version of the citation indexes provides more possibilities than the printed version. More and more abstracts and keywords awarded by authors are entered in latest issues, next to the usual data. This means that searching by subject is now extended, and therefore the Web of Science offers the 'General Search' possibility. Searching for cited publications occurs via the 'Cited Reference Search'. You will find the Web of Science on the University of Twente's library homepage.

Search tips for Web of Science

When searching under (cited) author names, it is prudent to begin with only the surname (at most followed by the first initial with an asterisk * for truncation). In this way different initial notations or full first names will also be found. Typical Dutch names like R.F. van de Berg can be found as (berg r* OR vandeberg r*). After this, you can select the hits you want from a presented list.

If you search by 'cited journal title', a clickable standard list of title abbreviations must be used.

When you are searching for citations of a given book, only type in the name of the author and not the title, because titles of cited books are often entered in an abbreviated format and/or truncated by the system.

- Journal Citation Reports** ISI, the publisher of the Science Citation Index, annually launches a report with numerical data regarding the citations of journals, which have been entered in the citation indexes.
It is prudent to use these Journal Citation Reports if you want to judge the quality of a found article, but also if you want to choose a journal you want to publish in. In the Journal Citation Reports a list is given, per discipline, of journals mentioning the 'Impact Factor' and 'Cited Half Life'. These figures give an indication to the quality of a journal.
- Impact Factor** A high Impact Factor means that a journal publishes articles, which are in general cited a lot. The Impact Factor is calculated for a certain year, e.g. 1998, by determining first how many articles in the two preceding years, i.e., 1996 and 1997, were published in total in that journal.
Next it is determined how often the articles from that journal were cited in total in 1996 and 1997. The fraction of this last number and the first one is the Impact Factor.
- Cited Half Life** The Cited Half Life of e.g. 1998 indicates 50 % of the total number of publication years (calculating back to 1998) that the journal in question has been cited in that year (i.e., 1998). For example, if a journal has a Cited Half Life of 8 and it was cited 420 times in 1998, then articles older than 8 years were cited 210 times. There are obviously many older articles cited from a journal with a high Cited Half Life. So that journal includes articles that are generally cited long after publication (standard articles).
- Quality of journals** Journal Citation Reports (and also citation figures per author) are used by the management of scientific research institutions in order to determine the quality of scientific output. However, it must be considered that the figures are strongly dependent on the discipline; it is possible that the publication culture and the number of scientists working in this area can vary considerably. Publications or journals that do not have the same target audience, are not allowed to be simply compared with each other. Moreover, the (S)SCI is mainly aimed at the Anglo-Saxon language regions, whereby the emphasis lies on the scientific disciplines considered as important there.

4 Informing sources

Informing sources can be classified in

- General informing sources, aimed at one broad or more disciplines (encyclopaedia, dictionaries, large literature reviews and handbooks)
- Specific informing sources, aimed at a limited field of interest (dissertations, textbooks, reports, journal articles, etc.). Some particular kinds of specific informing sources are statistics, patents, standards, parliamentary papers and European Union documents. We refer to these as 'special informing sources'.

In this chapter the different kinds of informing sources are discussed whereby the special sources will be treated extensively because of their complicated nature. It should be obvious that the importance of the different kinds of informing sources differ per discipline and per situation. You can find informing sources via referring sources. When searching a special kind of informing source, in catalogues often a specific type of descriptors can be used: the form descriptors (e.g. dissertations, encyclopaedias). In most bibliographic databases there is the option to search for special 'document types' (e.g. conference articles) or 'treatment types' (e.g. applications, review). See the Help-function.

4.1 General informing sources

Encyclopaedia

An encyclopaedia can be considered as a descriptive and educational dictionary. Per entry descriptions are presented, mostly written by specialists in the concerning fields. Occasionally some literature references are given along with those descriptions. There are roughly two kinds of encyclopaedia that need to be distinguished: general encyclopaedia (e.g. the Winkler Prins or the Encyclopaedia Britannica) and a subject encyclopaedia, that aims at a specific discipline or theme. Although encyclopaedia are principally used in the first phases of the search process, when the problem statement and the search strategy under discussion, it is often very useful to refer to them at a later stage. Certainly subject encyclopaedias often yield more fundamental information, which can be useful when processing information. Most University Libraries offer entrance to one or more large online encyclopaedias. A free online encyclopaedia is www.wikipedia.org.

Dictionaries

A dictionary is an alphabetically or systematically arranged inventory of words or phrases of importance. Dictionaries are principally used in the first phases of the search process, certainly when searching for information concerns a new and/or relatively unfamiliar subject. Also here we talk about different kinds, viz. dictionaries aimed at linguistic usage and subject dictionaries in which explanations and interpretations are more relevant. Dictionaries can be very useful tools to search for terms and phrases in order to clarify the problem statement, and to perform a search well. However, thesauri (see 3.1.2) can play a part in this, and in their own way also function as dictionaries. Online thesauri are findable via the search page of

bibliographic databases, a free online linguistic dictionary is offered by the European Union at <http://europa.eu.int/eurodicautom>.

Information or literature guides

You can consult an information or literature guide if you want to know which methods are at your disposal in order to find information within a certain scientific field, how that information is offered there and what the important bodies and sources are in that subject field. You can use this syllabus as such a guide for example.

Such guides mostly have both an informing and a referring function. In this syllabus they are arranged under the informing sources.

Directories

A directory is a reference book in which address data of persons and/or institutions are to be found in alphabetically or systematically arranged order. Well-known examples are the Pyttersen's Dutch almanac, the State almanac, "Who-is-who"-publications, the telephone directory and directories of universities inside and outside The Netherlands.

Literature reviews

Literature reviews provide a review about the state of knowledge or insight with relation to a certain subject on the basis of relevant literature. They are also called 'advances', 'reviews' or 'state-of-the-art' publications. They mostly contain substantial lists with references to the original sources and they are written in a compact way. So literature reviews are very informative and can save a lot of time, certainly when information must be collected and incorporated in a short space of time. Often it is not important to search in literature older than the literature review. Literature reviews are presented in different ways: as reports, articles, volumes or textbooks. As mentioned before, most bibliographic databases offer the possibility to search for reviews via search options like 'document types' or 'treatment types'. See the Help-function.

Handbooks

Handbooks give a systematic summary of a scientific field. They are useful when developing and formulating problem statements and search concepts to be used, but they can also have a useful function as reference work. The

Textbooks

same applies to textbooks.

4.2 Specific informing sources

In specific informing sources (aimed at a specialist audience) new information is presented. Such sources can vary considerably in quality, since most scholarly publications are usually assessed by specialists, editors or publishers. Therefore, if such an assessment is made beforehand, then it is an indication of the higher quality of the publication

Congress reports

Congress reports contain recent research findings presented on congresses. The separate contributions often give new and reasonably detailed information. The bundles as a whole, present a good overview of the state of affairs with respect to the subject of interest.

Theses	Theses or dissertations are academic writings on the basis of which the author obtains the doctor's degree after successful defence of their thesis. Before the author is admitted into that defence, a committee of specialists assesses the content of his/her thesis. Theses usually furnish the reader with an extensive literature review and new results (obtained from research) on the subject. Therefore, they can be very valuable sources of information.
Journal articles	Journal articles can have various values in searching for (scientific) information. In the first place, it is important to make a distinction between professional journals and scientific journals. Professional journals present developments and news from the discipline, whereas scientific journals focus more on results of and developments in scientific research. Professional journals do not have a high scientific status, but they can be very informative when the searcher is not yet familiar with the subject. If articles appear in leading scientific journals, they are firstly reviewed by a group of specialists (peer review). The status of the journal is an indication for the quality of an article. In many disciplines the Journal Citation Reports (see 3.4) play a role when determining that status.
Report literature	The quality of report literature varies considerably. In many cases new information is presented in this format. This is sometimes to be regarded as confidential or classified and therefore hard to procure.
Monographs	Monographs (in common language 'books') are about a defined subject or part of science. They are marketed via publishers that deal with quality control. Leading scientific publishers have to keep a good reputation and will therefore have to take care that information they publish is reliable and new.
News or discussion groups	Via news or discussion groups new information is often circulated as well, e.g. in the form of preprints (see also 3.3).

4.3 Special informing sources

Statistics, patents and standard specifications, parliamentary papers and documents of the European Union can also be regarded as special informing sources. Usually new information is to be found but because of their complex structure that is not always simple. Therefore, special attention will be given to both the content and the accessibility of these informing sources. The University of Twente's library possesses actual collections of statistics, standards, parliamentary papers and documents of the European Union.

4.3.1 Statistics

In statistic publications mainly numerical data about societal phenomena are presented which have been registered in tables and/or graphics. For The Netherlands the institute Statistics Netherlands (abbrev. in Dutch: CBS) plays an important part in this field. Statistic publications are published both in print and electronically. The StatLine database can be consulted via www.cbs.nl.

International statistic material is made available by the EUROSTAT, the ILO, the UNESCO and UN.

In order to be able to find the demanded statistic material easily, the use of the available registers is recommended.

4.3.2 Patents

A patent is a right of ownership awarded by the government for a certain invention. This means that the invention may only be exploited by others after an arrangement has been made with the inventor, i.e., a licence agreement. This ownership is granted on the condition that the description of the invention in the patent is in the public domain. What kinds of inventions can be patented differs per country. In The Netherlands, a patent is exclusively related to new products or processes whereas new plants fall under the breeder's right. In the United States, a distinction is made, resulting in three different patent categories: utility patents for new products or processes, design patents related to the appearance of something and plant patents for vegetative reproduction of new plants.

Utility Patents
Design Patents
Plant Patents
Legal demands

Moreover, the legal demands appointed to patents differ per country. In The Netherlands inventions are patented if they are

- new (not published earlier regardless where, when and by whom),
- inventive (sufficient level of invention; not obvious for the expert) and
- industrial applicable.

Period of validity

A patent is a legal document of which the validity is limited to those countries where the patent has been awarded. A patent is awarded for a certain period of time only, this referred to as 'validity'. In The Netherlands, validity ranges from 6 to 20 years, and is charged annually in order to maintain the patent. Note that a patent loses its validity if the annual subscription is not paid.

Construction

A Dutch patent publication is constructed from a number of settled parts:

- preface (bibliographic data; mostly an extract; sometimes a figure);
- content (the familiar standard technique, and what is wrong with it);
- description (of the invention and the working/construction);
- conclusions (summary of what the invention implies);
- possible figures/graphs/schemes (making the invention visual).

Application procedure

The application procedure is just like the demands a patent has to comply with, it is legally arranged and differs per country. In The Netherlands, applications are submitted to the Patent Office. Usage can be made of supranational patent routes, arranged in international treaties, such as via the European Patent Office (EPO), via the Worlds Intellectual Property Organization (WIPO) or in conformity with the Patent Cooperation Treaty (PCT).

When a first patent application has been submitted, it is possible to submit an application in or for other countries up to one year after initial submission (the priority date or priority application).

Novelty search The novelty search, which is carried out by the Patent Office, must give insight in that what is already known and is protected in a patent. The report of the study can be a reason to rewrite or adjust the patent application. You are not obliged to undertake a novelty search. Also the regulations to award a patent differ per country. In The Netherlands, the 1995 Patent Act allows a patent to be awarded without novelty search. The applicant him/herself will have to calculate the possible legal consequences of his/her application.

Searching for Patent publications Searching for patent publications can be useful for three reasons. Firstly, the information in patents is unique. It is estimated that 70 per cent of the information in patent publications has never been published elsewhere. Secondly, a patent shows whether a certain invention is protected or not. Thirdly, patent publications contain important information about activities of research and development in a certain field or within (competitive) companies. Patent publications can be traced with the help of a patent databases. These databases contain in general the information that is in the preface. Thus, patents can be found with the familiar search keys, such as name of author or applicant, words from the title of the patent or words from the abstract.

Nevertheless, searching for information in patents is not simple. Because of the demand of publication there is sometimes masking language. Often the patent is limited to sub techniques and secondary parts of an invention so that essential details are not made public. The titles of patents are often rather insignificant. Moreover the text in a patent is not focussed so much on what a certain invention is, but more on what it does or how it works. A chair for example can be indicated as a 'sitting device'. Therefore, it is advisable to leave the search for patents to a specialist, especially if a thorough search for patents is demanded and specifically when it has to be a novelty search.

Classification systems An important means when searching for patents is the classification system. At least one classification code is awarded to a patent, but often sub codes are also awarded to sub aspects. An example of a part of the International Patent Classification (IPC) follows below:

B:	Processing; Transport
B66:	To hoist; To lift; To pull up
B66B:	Lifts; Escalators or moving floors
B66C:	Taps, Load-bearing elements or fixtures for taps, capstans, winches or hoists
B66D:	Capstans; Winches; Hoists, e.g. pulley blocks; Hoisting apparatus
B66F:	Not classified elsewhere hoist, lift, pull up or push, e.g. fixtures that practice a direct lifting power or pushing force on the surface of a load.

The IPC is used for the European patents and is to be found amongst others on a webpage of the World Intellectual Property Organization (WIPO): <http://www.wipo.int/classifications/en/>.

Via this webpage you can also find the official keyword list. The American patent office, the US Patent and Trademark Office (USPTO) uses a classification system of its own: <http://www.uspto.gov/go/classification/>. Classifications are revised from time to time. Therefore, in an exhaustive search, it can be worthwhile to use the older classification systems as well.

Patent families

When searching for patent publications it is important to know that patents that have the same priority date or priority application form a patent family. Mostly this concerns the collection of patents that protect one invention internationally. An example of such a patent family from the World Patent Index is shown here:

PATENT INFORMATION:

PATENTNR	KIND	DATE	WEEK	LA	PG	MAIN IPC
DE 3805522	A	880908	(8837)*		6	
US 4841144	A	890620	(8931)		6	
SE 8800561	A	80828	(8941)			
DE 3805522	C	920827	(9235)		5	H04B010-02

APPLICATION DETAILS:

PATENTNR	KIND	APPLICATION	DATE
DE 3805522	A	DE 88-3805522	880222
US 4841144	A	US 88-160769	880226
DE 3805522	C	DE 88-3805522	880222

PRIORITY APPLN. INFO: JP 87-U29813 870227

From the last line can be derived that the priority application in Japan (JP) was submitted on January 27, 1987. The ‘application details’ on top of that show that just within a year two patent applications have been submitted in Denmark (DE) and one in the USA (US). These applications were honoured according to the ‘patent information’ in DE in respectively 1988 and 1992 and in the US in 1989, whereas also in Sweden (SE) patent was granted. Moreover, it appears from this example that every country has its own number system.

Via the patent specialists the following patent databases can be consulted:

World Patent Index

The World Patent Index (Derwent). This is the most important patent database if you want to search according to subject. The patents of about 40 countries and institutions are indexed here, among which the European Patent Office (EPO). The World Patent Index goes back to 1963 (for medicines). There is a record present per patent family completed with an abstract and various indexes. Nowadays the most important illustrations from the patent can also be asked for. There is also a Derwent patent database by which, e.g. in the novelty search, can be searched for cited patents: Derwent Citation Index.

INPADOC The database INPADOC, which indexes patent publications of a great number of countries, of the EPO and the WIPO as from 1968, contains bibliographic information only. It is important for mapping patent families and the legal status of patents.

Some other patent databases that you can consult yourself within the University of Twente are:

Espacenet The European Patent Office provides the Espacenet on <http://ep.espacenet.com/>, which contains more than 30 million patent descriptions, both from inside and outside of Europe. Many of these patents are available in full text. The information of all the patent titles and many prefaces are loaded in English, so you don't have to search with words in any other languages. A restriction is that no more than four search terms are allowed in the text boxes (2005).
If Espacenet does not contain the full text of a patent, you can apply for it via the Inter Library Loan (abbrev. in Dutch: IBL) facilities in the same way as for other documents.

Chemical Abstracts The Chemical Abstracts, in which next to other information also the chemical elements in patents of 27 countries, of the EPO and of the WIPO have been indexed as from 1967. Keywords are awarded from the Index Guide and Registry numbers, so that you can search by both subject and material name. Regarding a patent family, one patent is indexed with an abstract and various indexes. The patent family is only available in the printed Patent Index.

More information More information about patents or retrieving patent information the reader is referred to the following institutions:

- Centre for Knowledge Protection and Patent Information (Centrum voor Kennisbescherming en Octrooi-informatie), Rijswijk
- Patent Information Services (Octrooi-informatiedienst - OID) / Centre for Information and Documentation (Centrum voor Informatie en Documentatie - CID) – TNO, Rijswijk
- International Patent Research Office (IPRO), The Hague (www.ipro.nl)
- Netherlands Industrial Property Office (Bureau voor de Industriële Eigendom - BIE), Rijswijk (www.bie.nl)

Furthermore information may be found via the following internet addresses:

- www.uspto.gov (United States Patent and Trademark Office)
- www.european-patent-office.org (European Patent Office)
- www.derwent.co.uk (Derwent)
- www.micropat.com (MicroPatent's Patent Web Services)

4.3.3 Standards

Standards are (inter-)national agreements for any field of technology or company for the advancement of unity and inter-changeability. Standards are determined and published by standardization institutes. Especially in the technology sciences, standards can be very informative. They provide mainly factual information.

In a standard it is indicated, among other things, what applications there are, how the concerning 'product' can be tested, and what the demands are for the test results.

There are many different standards, e.g. DIN (Germany), ISO (International), NEN (The Netherlands) and ASTM (US). An attempt is made in order to 'tune' the national standards more and more to the international standards.

NEN The NEN (formerly NNI, www.nen.nl) acts in The Netherlands as central point where national and international standards are obtainable. The NEN advises on the use of standards and standardization issues.

If there are still no standards available for a new product a producer can report this to the NEN. If a new standard is demanded, then NEN will form a (inter)national committee with representatives from the industry to produce a draft standard. After some time the draft standard, possibly with changes, is transformed into a definite standard. So producers can participate actively in realizing standards.

4.3.4 Parliamentary papers

Parliamentary papers contain reports of meetings and all printed meeting papers of the First Chamber and Second Chamber. A year of session is from the start of September until September in the following year; a special session, such as after a cabinet crisis, has a deviating term.

Proceedings The so-called Proceedings contain the literary reports of the meetings of the First Chamber, of the Second Chamber and of the extensive committee meetings (abbrev. in Dutch: UCVs) of the Second Chamber. The Proceedings, published in weekly editions, also contain a table of contents and references to the printed meeting papers (letters, notes, bills etc.). Per year of session they have a consecutive pagination and are filed in chronological order. The literary report of the extensive committee meetings is to be found in the Proceedings of the Extensive Committee meetings, which is also filed chronologically.

Parliamentary Documents All printed meeting documents are recorded in the confines of the Proceedings of the First Chamber and the Second Chamber (the so-called Parliamentary papers). Parliamentary documents are the written papers, which are exchanged between the government and the parliament. Each case, say, a bill has, up to the moment of final settlement, a fixed file number of its own (printed in bold). This number is the same for the First Chamber and for the Second Chamber, although it is stipulated from which Chamber the paper originates.

File number The parliamentary documents are filed according to file number. Thus, in order of publication, the papers belonging to a particular bill have, next to the file number, a printed serial number that is not in bold.

Government Estimation The Government Estimation, a series of bills, is actually a Parliamentary paper, but is because of its special characteristics is filed separately. Per year of session the Government Estimation has a file number of its own that ends

with 00. The estimations of the separate departments have, next to their file number, a fixed sub number in Roman. Preceded by the budget, the papers are filed according to the Roman numeral number system.

Appendixes The Appendixes of the Proceedings of the First Chamber and the Second Chamber contain the questions in writing from members of parliament and the answers from the Ministers or State Secretaries. Stated, but not yet answered questions are published on yellow paper. Answers and questions in writing are usually filed according to the 'number per year of session'; the questions that have not yet been answered are filed according to date per year of session.

Statute Book or Bulletin of Acts and Decrees The Statute Book or Bulletin of Acts and Decrees is the official edition in law, in which general measures of government and other Royal Decrees are published. When a law is proclaimed in the Statute Book, a statement is given of the parliamentary papers related to that bill.

Treaty Paper The Treaty Paper announces conventions between The Kingdom of the Netherlands and any other states or international organizations. The Treaty Paper gives a complete overview of the treaty texts.

Netherlands Government Gazette The Government Gazette is a daily newspaper of the government and contains press notices, regulations and official advertisements. It is published every working day and is an important source of information and documentation.

All parliamentary papers are indexed with the help of various printed registers. Next to this 'Opmaat' and the 'Wettenbank' form important electronic referring sources for official publications. These databases contain information since 1995. You will find more information and possible access to the mentioned databases on www.sdu.nl or on the University of Twente's library homepage.

4.3.5 Documents of the European Union

At different universities in The Netherlands there is a European Documentation Centre (EDC). Such a centre possesses all official documents of the institutions of the European Union (EU, formerly European Communities). The publications are arranged in twenty rubrics, based upon the areas of work inside the EU.

Official Journal of the European Communities The Official Journal of the European Communities is the official newspaper of the European Union. It provides information on legislation, proposals for legislation, official announcement and information on activities of the institutions of the EU. Over the years, there have been different amendments to the title, format, set up and registers.

Since 1968, the following division has dealt with: Series C, Series L, Supplement (Series S) and Proceedings of the European Parliament. From 1-1-2000 the Official Journal, Series L and C, are published monthly on a CDROM. The Supplement has been published and has been available on CDROM for several years now.

- Series C** In series C the following documentation is published:
- Statements of the Commission;
 - Opinions, minutes of meetings, resolutions and questions in writing of the European Parliament;
 - Advice from the Economic and Social Commission;
 - Proposal from the Commission to the Board of Ministers for new legislation;
 - Cases brought before the Court of Justice and also a brief summary of the verdict;
 - Vacancies at institutions of the European Union.

Series L In series L, all community legislation is published. A great part of the legislation published is formed by resolutions with relation to daily management, which have been taken in the framework of the agriculture policy and which in general have a restricted validity. The other legislation and administrative resolutions are of more importance. Two kinds of notations are dealt with, viz.:

- Notations for regulations, e.g.
(EEG) 4283/88
88 is the year and 4283 is a serial number within the concerning year.
- Notations for all resolutions which are no regulation (ordinances, resolutions, guide lines and recommendations), e.g.:
88/667/EEG
88 is the year and 667 is a serial number.

Searching in the Official Journal of the European Communities

Official Journals of a terminated publication year can be searched by means of the year index. This year index contains an alphabetical and a systematic part. The alphabetical index is a keyword index based upon the so called Eurovoc-thesaurus. In the systematic index, regulations, other resolutions and cases that have been brought before the Court of Justice are recorded by number. Searching in the Official Journals published on CDROM (from 2000) can be done with the help of a search menu available on the same CDROM.

Directory of Community legislation in force

Twice per year the Directory of Community legislation in force is published in addition to the series L of the Official Journal. The Directory gives insight into all applicable legislation on a certain date, and is arranged by subject. The Repertory is published in two parts. Part I forms the main part in which the legislation is classified in 20 chapters according to subject. Part II contains the chronological and alphabetical index for the legislation included in part I.

Supplement

In the Supplement of the Official Journal (series S) invitations for public tenders are published for contracting-out work and delivery of goods and services. The Supplement is published twice a week on CDROM. Although it does not contain any registers, it does have a menu-based search tool.

Proceedings

The Proceedings contains the complete reports of the meetings of the European Parliament. The information is accessible via annually published registers on name, subject and list of session documents. Proceedings will be published on CDROM in the near future.

Bulletin The monthly Bulletin of the European Union gives an overview of the activities of the Commission and other EU-institutions. It is an important document as starting point for questions on recent developments. References are given to other publications of the EU, such as the Official Journal.

COM-documents COM-documents are work documents of the Commission. In the COM-documents important initiatives and preparatory legislation on all policy areas of the Commission are published. The commission documents are numbered per year, e.g. COM(89)360. The number between brackets is the year, 360 is the serial number of the concerning year. A monthly register with quarterly and yearly accumulations is published. The register is divided up into work areas of the EU, with index on keywords and on document number. The register does not only pertain to the COM-documents but also the documents of the European Parliament and of the Economic and Social Committee.

Some other official publications of the European Union, which are in the EDC, are the law reports of the Court of Justice and annual reports of the EU. Next to information sources in writing, the EDC disposes of electronic sources with relation to the EU, such as the juridical database CELEX and bibliographic database SCAD.

More information More information about the European Union can be found at <http://europa.eu.int>.

5 Information management

Information management is important for an efficient search process. Thus, Information management may be summarized as:

- organization of the search process; i.e., the planning of the searching operations, obtaining and storing found information and process monitoring,
- processing of information with regards to content, including evaluation of the information, and
- keeping pace with the latest developments in the subject.

Personal documentation system

A separate element that is important with all these aspects is the personal documentation system. In this chapter the 'usual way' of information management is presented, which can be used for efficiently searching for information and processing it.

5.1 The organization of the search process

5.1.1 Planning

A rule of thumb for a good planning is based upon the 'one-third rule'. This means that for the following three activities, one-third of the total available time will be used:

- collect information,
- elaborate information,
- report.

This division seems rather unbalanced, but works very well in practice. However, since the time taken for reporting is often underestimated, an insufficient recording of the findings during the search process, often contributes to panic and stress around completion time.

5.1.2 Obtaining information and process monitoring

Obtaining information

In the first instance, you will be able to search the via referring sources, found by searching for documents in your University Library as long as they are not available via the Internet. Should the required document be lent out, then it is possible to reserve it from your work station via the catalogue. If the titles you are searching for are not available at the University of Twente, then it is possible to order them via the University Library for entry into the collection. If necessary, there is an emergency procedure. For more information, please talk to a library member staff.

Besides, there are the so-called Inter Library Loan facilities (abbreviated in Dutch: IBL). If you have a library card with a zip code you can order from any location, as many documents (books and articles) as you like. Picarta is the appropriate channel for borrowing books and applying for journal articles from other libraries in the Netherlands. If you have any problems, or need a document from abroad, then contact one of the University of Twente's many library helpdesks for more information.

Dutch library and documentation guide

Of course you can also search the other library catalogues via the Dutch library and documentation guide. This guide includes data about more than 1800 libraries and documentation institutions in The Netherlands and provides an overview of all the national organizations. Therefore, you will not find such information in this syllabus.

Process monitoring

The monitoring the search process is important with a view to your planning, and any subsequent adjustments. Of up most importance, certainly with regard to larger projects, is to have continuous insight into the state of the process.

What is already in your possession and/or has been processed. What has been applied for? What about possible agreements with others? Does the evaluation of the process and the found information lead to satisfaction about the process or adjustment of your search activities, planning and the like.

With the assistance of your personal documentation system it is relatively simple to implement such a monitoring system (see 5.4).

5.1.3 Storing information

Storing found information demands special attention. In principle you want to store two cases: a description of the found information (reference) and the actual document (perhaps electronically). You should enter the descriptions or references in your personal documentation system, which have been designed in such a way that it is easy to generate literature lists, references and the like on behalf of the eventual reporting. You can add all kinds of information to these descriptions, i.e. a code for the location in your own filing system (boxes, (electronic) document files, etc.). Furthermore it is important to pay attention to the sequence and codification of the documents and boxes, document files, etc. You should pay attention to the following considerations:

- Storing printed documents according to a specific keyword (and subsequently on publication year) has the advantage that literature on a certain topic is grouped together. A drawback is that you may need to re-organize the documents now and then, since headings that contain too many documents will usually have to be split up.
- Storing documents simply by serial number has the advantage that you don't need to re-order the documents. A drawback is that literature about a subject is not grouped together.

5.2 Elaborating information

Elaborating information consists of both the evaluating and the processing of information. The evaluation and processing of information are closely related with each other.

5.2.1 Evaluating information

The value of found referring sources and informing documents determines the progress of your search process and also the quality of problem-solving. Is it worthwhile to spend more time (and money) on this found information? There are different criteria by which you can answer this question.

By paying attention to this, you will save time wandering from your search question. However, such wandering is different to adjusting your search question on the basis of found and evaluated information.

Criteria First of all, there are content related criteria you can use on qualitative judgement of found information:

- is the argumentation good?
- has the information been reproduced accurately and objectively?
- is the text understandable?
- have the facts and opinions been distinguished?
- have illustrations, graphs and the like been entered?
- is it based on decent empirical research and/or literature study?
- has the same information already been found via other sources?

Also, since some criteria can be used concerning the origin of information, it can be meaningful to work out the name of the author, publisher, journal or authors institute with a Citation Index. However, the danger here is the limited scientific circle in which the same authors continually refer to each other. An author who is not in that particular circle does not necessarily supply unscientific work.

More specifically, content pertaining to the quality criteria can be dealt with: is the information relevant ?

Finally, there are 'use' related criteria such as:

- relevance for the problem statement and for the target group
- availability
- do you have firm understanding of the language in which the information is presented?
- is the year of publication suitable?

With the help of such considerations, you must decide whether or not certain information is important for your requirements.

5.2.2 Processing information

There are many ways of processing information that are often used subconsciously. It is informative to pay attention to the different methods of processing, and assess which one is the most suitable.

**Paraphrasing, summarizing
and citing**

The processing of information consists of activities such as paraphrasing (described in other words), summarizing and citing. The latter is important, since exact references including page numbers are essential for cross-referencing your work. For further processing, the information can be analyzed: split up in logical parts such as hypotheses, arguments, measurements and conclusions. After this, the information can be synthesized or integrated with aspects of your own problem statement.

Analyzing

Synthesizing

This often leads to the identification of important elements.

Interpreting Of course, the interpretation (explanation) of information also plays an important role here. Closely related to interpretation is the evaluation of the information (also see 5.2.1).

It should be clear that when processing a large amount of information the personal documentation system (see 5.4) can serve us well.

5.3 Keeping pace

Certainly in long-term projects it is important to keep informed of new developments. There are many possibilities for this, which mostly demand a simple 'one-off' effort.

Attention profiles As for keeping pace of publications, one can think of 'alerts' or 'attention profiles' in electronic databases. When these profiles have been drawn up and implemented, perhaps with the help of an information specialist, newly added items that are important to you will be highlighted. This may take the form of a monthly, electronically forwarded descriptions of publications for example.

If a zip-code is coupled to your University of Twente library card you can simply enter your attention profiles into Picarta . This is also possible for most other referring sources, including scholarly publisher web sites. Probably the most practical way of using attention profiles is to enter alerts in Metalib. Metalib is a meta search engine for simultaneously searching through most of the University of Twente's library sources.

The Science Direct database of Elsevier offers the possibility to install a 'Citation Alert' that draws your attention to new citations of a given article. Citation Alert presents a simple and effect method of keeping track of any citations to your articles. If there is no possibility of entering an automatic alert in a referring source, then you can just store one or more search sentences. You may then frequently repeat your search without much typing work.

Contents Contents of key journals in your field of interest are mostly very informative too. If a zip-code is coupled to your Univeristy of Twente library card, then you can program Picarta or Online Contents simply to e-mail you journals that you are interested in receiving.

Current research projects The Dutch Research Database (abbrev. in Dutch: NOD) presents an overview of current research projects in The Netherlands. You can consult this database with the help of different search keys, such as keywords and names of persons and institutions.

Personal contacts Naturally, traditional activities such as congress visits and maintaining personal contacts are also excellent to keep pace. A lot of 'keeping pace' will only provide brief information, but there will also be information with which you want to do more. For this the personal documentation system is very useful.

5.4 Personal documentation system

When searching for information it is always important to enter all relevant search results in such a way that data are easily to be found again. A personal documentation and information system can be of great help. With the help of a flexible system, you can easily arrange the vast amount of found information, remembering that adjustments remain possible all the time. You can expand your system in the course of time and it can serve you well for each new process of the (literature) information search. In short, such a documentation system will make it an efficient process as possible. A personal documentation and information system contain all kinds of data. These different kinds of data have all been entered in a basic file, from which different partial files are to be generated; e.g. with relation to the progress of the search process, about the content of found information, about the processing of information and on behalf of the final product. In this way, you keep the titles (i.e. literature references and urls) of informing and referring sources in your personal documentation system. Moreover, in this documentation system you lay down where those sources are, how you can consult them, which subject they are related to, whether you have applied for them and/or consulted them and to whom you have possibly lent them to. Establish which phase of search process you are presently in. Which institutions and persons are of important for the research (including their addresses). Finally, in some situations you can, enter the found information in such a way that a rough version of a 'to be written' review article or presentation can be generated by the system.

5.4.1 Description of sources

Bibliographic data

Descriptions of sources play an important role in working with scientific information. Without any useful descriptions of titles, finding any previous information is much more difficult.

How can you make useful descriptions of sources efficiently? First of all, it is necessary to stipulate essential bibliographic data from the beginning of the search process. By doing this in a uniform and consistent way, it will save you a lot of time in the process of ordering the information and making the report ready for publishing.

For the descriptions of printed and electronic titles (inter)national rules have been designed which require very special punctuation. Examples are APA and MLA. In practice, these rules are neglected in many cases. Also, editors of journals often deal with their own rules for literature references.

Special software packages for personal documentation like Endnote or Reference Manager, can compose references according to many different rules. The program uses data from its general database that has been built up by downloading descriptions from referring sources or typing in (copy/paste) the information by hand.

When you are not obliged to use special rules for references, it is not that important which rules you prefer. But it is important that you apply the rules consistently and that you provide a full description of your sources, such that a third party may easily refer to them.

ISBN and ISSN When referring to the official regulations, the so-called International Standard Book Number (ISBN) and International Standard Serials Number (ISSN) receive very little attention. Yet these are valuable pieces of publication data. With the help of these unique numbers, publications are easier to trace than a search by author or title. Books have an ISBN consisting of 10 figures. The first two figures indicate a country code; for example, The Netherlands has the country code 90. Journals and serial works have an ISSN consisting of 8 figures. Occasionally, a publication has both an ISSN and an ISBN. This is also true with works in a series, which can also be considered as an independent publication.

Elements of title descriptions A title description for literature references is short and enumerates the characteristics of books and other documents according to fixed regulations. For example, the author's name is mentioned without entitling. When the author of a publication is not known this can be indicated by the term Anonymous. When a publication is written by more than two authors, only the name of the first author is mentioned followed by "et al.". In some cases the document has a corporative author, which means that an institute, company or other organization must be regarded as the author. Furthermore the literature reference should contain both the main title and subtitle. If publisher, year or place of publication are not known this can be indicated by: no publ., no year or no place (or in Latin: s.n., s.a., s.l.) respectively. If a document is published by more than one publisher, or in more than one place, you only mention the first followed by "etc."

The elements of a literature reference differ according to the type of document: books, contributions or papers in a composite work (i.e. congress proceedings) or journal articles.

Book In the case of a book, the elements are: author(s); year of publication; title; series, edition, translator and the like; publisher, place of publication.

For example:

Butterworth, I. (ed). 1998. The Impact of Electronic Publishing on the Academic Community. An International Workshop organized by the Academia Europea and the Wenner-Gren Foundation. Wenner-Gren International Series, vol. 73. Portland, London, etc.

Composite work In the case of a contribution or paper in a composite work, the elements of a title description are: author(s) of the contribution/paper; year of publication; title of the contribution/paper; title of the composite work; series, edition, translator, and the like; editor; publisher, place of publication; volume; page(s). In these title descriptions often the "in"-reference is used. Moreover, for the sake of clarity, the title of the composite work is underscored or in italics.

For example:

Mackenzie Owen, J. 1998. Organizing for digital archiving: new distribution models in the scientific information chain. In: *The Impact of Electronic Publishing on the Academic Community*. I. Butterworth (ed). Wenner-Gren International Series, vol. 73. Portland, London, etc. pp. 128-133.

Journal article In the case of a journal article, the elements are: author(s); year of publication; title of the article; title of the journal; volume number; journal number; page(s). Also in these title descriptions often the “in”-reference is used. Moreover, for the sake of clarity, the title of the journal is underscored or in italics.

For example:

Speier, C. et al. 1999. Faculty Perceptions of Electronic Journals as Scholarly Communication: A Question of Prestige and Legitimacy. In: *Journal of the American Society for Information Science*, vol. 50, no. 6, pp. 537-543.

Electronic documents References of electronic documents have basically the same regulations as for printed documents. However, in order to become usable references, some information is added at the end of the description, such as

- the statement ‘published on CD ROM’
- www-address followed by the date of entry
- the organization that is responsible for the Web site

When it is known that an electronic document is also published in print, then, if possible, also mention the necessary data to retrieve it in that form.

For example:

Walker, T. J. 1998. Free Internet Access to Traditional Journals, *American Scientist*. Vol 86, no. 5, pp. 46-71, <http://www.sigm.org/articles/98/wa.html> (27-5-2000).

5.4.2 Set up of a personal documentation system

The set up of a personal documentation system demands a ‘one-off’ design effort, which eventually pays for itself in time saved. Therefore you will first have to determine a ‘program of demands’ by which you stipulate how you wish to use your personal documentation system. On the basis of this program of demands, you develop a ‘format’ that meets your demands. In this format you take into account the demanded basic file and the partial files that are important to you (e.g. the progress of the search process), the content of information, the processing of information and the final product. There are many different software packages on the market for general database management, especially for personal documentation. Examples of the latter are Endnote, Reference Manager, Procite and BibTeX/LaTeX. These programs also offer standard formats. The choice of a package strongly depends on your personal demands and circumstances. If you work in a group it can be useful for reasons of interchangeability to work with the same package. It could also be that you opt for a card system. However, whichever system you decide to use your starting point, when setting up your own documentation system, must be that each source is represented by its own ‘record’ in the system.

You may think that setting up a personal documentation system is time consuming. However, investment in a good system at the beginning of a search process will save you a lot of time in the overall process. By way of example, three kinds of data are discussed here which you can use when

searching and processing information, especially when you have to deal with large numbers of document descriptions:

- source file;
- strategy file;
- process data.

Of these, you need to only permanently store the information in the so-called source, as this information can be useful at a later stage. Data in the other files can be destroyed when you have completed the report of the search process.

Source file A source file contains data about referring and informing sources in your discipline. Each new process (literature) information search is started by consulting the relevant referring and general informing sources that have been stored in this file.

As previously mentioned, each record from the source file contains 'case fields' for the bibliographic data, i.e.: author(s), title, place of publication, publisher, date of publication, and other pieces of data that you may require. Moreover an 'in'-field is necessary in the case of articles from journals or congress reports. Electronic publications require, fields for medium, URL, date consultation and the like. Other fields include:

- Location: an indication of e.g. the library where the publication can be found, with the shelf number; or a serial number, in case you file your own publications according to number sequence (see 5.1.3);
- Abstract: if necessary, a summary of the content of the source;
- Classification codes: if the collected literature is broad, then an existing classification can be used (e.g. that of the library). See section 3.1.1. for more information on classifications. If it concerns literature collected for a specific purpose then it is advisable to make your own classification;
- Keywords: the same rules apply to keywords as remarked upon in classification codes;
- Kind of source: Referring, informing.
- Comment: e.g. contribution of the source to your research

Strategy file A strategy file helps developing, planning, revising and report the strategy for searching for information. It contains information on the search techniques that you use in referring (and sometimes also in general informing) sources. The records contain fields with a brief title description (title) and finding place of the referring sources. Furthermore you can define fields for:

- Years to be searched
- Search concepts: keywords, codes etc., with which you are going to search in the source.
- Results: how many hits have occurred with the used combinations of keywords/title words/codes, average quality.

Also, in case of a limited search process, you must store the aforementioned pieces of information. When you think that creating a strategy file in a personal documentation system is superfluous, write this data down and store it. Many refinements to the search processes are done inefficiently due to a lack of good former search strategy information.

Process data The data of all informing sources, which you find during the search process, must be firstly recorded in the source file. Furthermore, these records can contain a field with the so-called process codification, which indicate at what stage of the process of methodical searching you are.

For example:

A = applied for
 V = processed
 N = not received
 O = appeared to be of no importance
 C = cited, but not applied for
 S = important (star-)publication

In the case of a long term project it is recommended to store the following information as well:

- names of the institutions where similar research is done, with address, telephone number, e-mail etc.;
- similar information about persons;

Store any details of appointments, e-mail texts, reports of telephone calls, obtained advices with dates; etc.

Arranging results With the help of the aforementioned data the results of the search process can be arranged according to many characteristics, for example:

- alphabetically according to author;
- stage of the search process;
- source;
- keywords and/or systematic codes;
- finding place;
- chronologically;
- on provisional arrangement of the end-product.

5.5 Checklist

With the help of the following checklist you can structure your search process. It will enable you to search more systematically and efficiently.

Problem statement **Have you formulated the problem statement accurately?**
 Is there a clear statement of

- purpose
- search terms to be used
- side conditions for the search process

Have you familiarized yourself with the subject, if necessary, with the help of the informing sources?

Is there a clear recording of your sources?

- handbooks
- Internet
- encyclopaedias
- experts

Planning Have you planned the search process?

Is there a record of

- the available time for searching, obtaining and processing/ reporting
- the sources you are going to consult.
- the sequence in which you are going to consult them.

Search Have you recorded during the search:

1. What referring sources have you consulted?

- catalogues
- databases
- Internet search engines
- bibliographies, abstract journals
- citation indexes

2. What search keys have been used ?

- systematic codes
- keywords
- free text
- author names
- other search keys
- have you recorded the search phrases accurately?

3. Which combinations of search terms have been used

4. What the output is per source, how many hits.

5. Which relevant titles you found and where they are available

Information management

Have you paid attention to the management of searching and processing

- are you following the time plan ?
- are you keeping score of the information acquisition?
- have the title and place descriptions been recorded in a personal documentation system (if necessary, with your own comments)?
- did you take appropriate steps in order to keep informed of any new developments (alerts, current contents)?

Quality **Do you have an opinion about the quality of:**

- the used referring sources (indicate per used source)
- the informing sources

6 Searching for information within the University of Twente

The University of Twente's library (abbrev. in Dutch: UB Twente) is a part of the University service department ITBE (Information Technology, Library and Education). The service is primarily aimed at students and employees of the University of Twente.

For general information about the University Library Twente and its locations, including information about specific services such as courses, for the access to many catalogues and databases and for the latest news concerning the provision of scientific information in the University of Twente you can consult the homepage: www.utwente.nl, click on 'University Library'.

Metalib with Combi-search

Since November 2005 the University Library has been offering a new service called Combisearch.

Combisearch uses the Metalib technology, which enables you to find all of the university's available electronic resources and search a number of them simultaneously. If a source cannot be searched with the Combisearch interface, you will be able to use the native interface of that source.

Metalib also offers you the possibility to personalize your search environment by creating your preferred sets of sources, save and re-run your searches, and run alerts on your searches. In order to personalize your search environment you have to log on. Metalib uses the University's Single-Sign-On feature, so once you've been logged on to My Campus, it will use your personal ID to log you on automatically. If you prefer not to log on, you enter Metalib as a Guest user, which means that your personal settings will not be available. At any moment, however, a personal log on is possible.

Incorporated into Metalib is the SFX-service that was launched in July 2005. It provides you with context-sensitive linking to the university's e-collections and services.

SFX

Since July 2005 the University Library offers a new service called SFX. SFX stands for 'Special Effects'. All students and staff members of the University of Twente have access to an SFX link server. An SFX-button appears along with each retrieved reference from a growing number of resources like Web of Science, Scopus, Compendex, Inspec, Picarta, etc. While the delivery of full text to the desktop offers a key service to researchers and students, SFX also enables users to use many additional services. For example, if the full text of an article is not available electronically, the user can check the library catalogue for print holdings or can perform a search with a web search engine like Google, or can look for articles by the same author in Web of Science.

Collections

The University of Twente's library contains approximately 400,000 books and audiovisual media. It is subscribed to many journals, most of them in electronic form. Next to this, the library has licenses for the use of many electronic databases by employees and students of the UT. You can find a survey of databases and e-journals on the Web site.

The greater part of the collection in print is accommodated in the reading

rooms, the remaining printed publications are in the stack-room of the Central Library. The scientific collection aims at the needs of education and research in the faculties and institutes. The central library also contains more general works such as papers (not only in Dutch), magazines, encyclopaedias and atlases. You can also find basic literature for disciplines that are beyond the scope of the University of Twente, such as documents/articles on art and theology. Moreover the Central Library contains some special collections like DIN-standards and Dutch and European Government documents.

**Borrowing, reserving,
renewing and ordering**

You can search the University of Twente's library catalogue in order to establish what literature is available in the University's library. You will find this catalogue via the homepage. Most books can be borrowed. After you have found the shelf-number in the library catalogue you can take the book from the shelf and have it registered for loan at the loan desk. Moreover, the catalogue offers the employees the possibility to request books for loan and to have them sent to the desired campus location within two days. You can reserve 'lent out' literature without the need of library staff, and also renew borrowed literature (with the help of your borrower number and the first 3 letters of your surname). If a searched book or journal is not to be found in the catalogue of the University Twente's library there is the possibility to apply for it at other libraries via the Picarta database. Employees can do this from their work area via their Inter Library Loan (abbrev. in Dutch: IBL) -account (with the help of their borrower number and the awarded zip code); students can do this via the desk of the Central Library or a faculty library. You should contact a library desk if you cannot find a title in one of the aforementioned databases.

Finally, you can also make proposals at the loan desks or via an e-mail to your information specialist to purchase literature that is not yet available in the library collection. With the order you can indicate whether you wish to be the first borrower or not.

Information specialist

In case of questions during your search for information or the publication of scholarly material, you can ask for the support of an information specialist resident at the University's library. They specialize in searching the UT's databases for all disciplines, and they have a wealth of knowledge regarding journal quality and the repository procedures. For a survey of information specialists, see the Web site.

Appendix to section 3.2.1 and 3.2.2 - Boolean operators*

Boolean operators

Search terms can be combined by means of Boolean operators (named after G. Boole, the founder of mathematical logic; it is also mentioned as logic operators) AND, OR and NOT. The application of this is illustrated with the so-called Venn-diagrams (see figure 1 and figure 2).

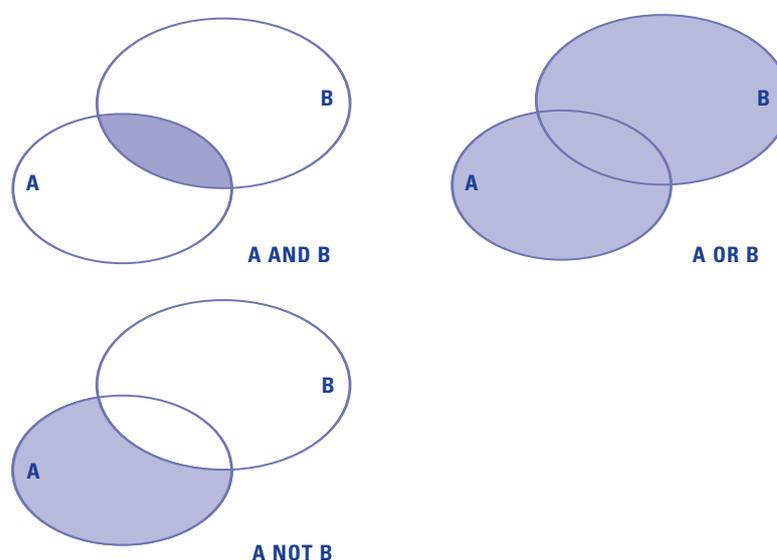
AND

With the combination A AND B, a search is undertaken that contains both references to the term A and term B.

search term	setnumber	number of found references
POLLUTION	SET 1	2833
NETHERLANDS	SET 2	369
BELGIUM	SET 3	225
POLLUTION AND NETHERLANDS	SET 4	9
POLLUTION AND BELGIUM	SET 5	15

Thus, using the AND-operator the search operation can be specified more precisely and the results are reduced.

Figure 1: Venn-diagrams 2-sets



* This appendix on Boolean operators was made with the aid of:

D.L. Brand-de Heer and E.G. Sieverts: Het zoekproces. In: E.G. Sieverts and M.W. de Jong-Hofman (final editing) Online opsporen van informatie; theorie en praktijk van het gebruik van interactieve informatiesystemen, 6th completely revised eEdition, Den Haag, NBLC, 1996, p 63-65.

OR

With the combination A OR B, a search is undertaken that contains references to term A and/or B.

NETHERLANDS	SET 2	369
BELGIUM	SET 3	225
NETHERLANDS OR BELGIUM	SET 6	581

So, with the OR-operator a search result is extended. Note that the number of found references is less than the sum of set 2 and 3, because the 'double' references (overlap) are counted singularly.

NOT

With the combination A NOT B a search is undertaken for the references that contain term A but not term B. It should be noted, that when applying the NOT-relation the sequence of the terms is important. This is different to applying the AND- and the OR-relation. A NOT B gives another result than B NOT A.

When searching for the references that contain the word 'pollution', but are not written in the French language, the NOT-relation can be entered:

POLLUTION	SET 1	2833
POLLUTION NOT language=FRENCH	SET 7	2798

Comparing the number of found references with that of set 1 (2833) it appears that the NOT-operator specifies the search operation more precisely on the basis of negative criteria.

The Boolean operators can be applied with each other in all kinds of combinations. In specific search systems, the sequence in which they are completed is fixed (see the HELP function). Changes to the sequence can be obtained by adding parentheses. The combinations placed in parentheses are completed first. Examples of multiple combinations are (see also figure 2):

POLLUTION AND WATER AND NETHERLANDS
(NETHERLANDS OR BELGIUM) NOT language=FRENCH
POLLUTION AND (NETHERLANDS OR BELGIUM)

Omitting the parentheses in the last case (in a search system that simply applies the operators from left to right) would be equivalent to the combination NETHERLANDS OR (BELGIUM AND POLLUTION), which would contain next to references about 'pollution in the Netherlands' everything about 'Belgium' without necessarily dealing with pollution (compare the two diagrams at the bottom of Figure 2).

Figure 2: Venn-diagrams 3-sets

