CRASH - Community Road Accident System Homepage

Feasibility study on a European Road Safety Information System, financially supported by the European Commission

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Management summary - conclusions and recommendations

In its European Road Safety Programme 1997 - 2001 the European Commission stresses the importance of the dissemination of data and knowledge. There exists a lot of information which is not optimally used because the people involved do not know of its existence or the information is not easy accessible. This is a situation asking for improvement, because good information supports rational decision taking.
An information system, bringing e.g. tables, graphs and conclusions from research projects to the users' desks, is one of the ways to meet the objective of dissemination. This is why the Commission supported a feasibility study, having the following main question:

> Is it, with reasonable efforts, possible to develop and maintain a European Road Safety Information System with relevant and internationally comparable information?

For this study, we used our experience with national information systems. E.g. in the Netherlands it has shown to be possible to develop and maintain a Road Safety Information system. The system is operational since 1993 and is used by a growing number of enthusiastic road safety professionals. Although the requirement of international comparable information introduces extra complexity, the functioning of the Dutch information system appeared to be a useful example.
Besides that, international experts were involved in the study, to judge the items raised: are those items indeed the main questions and is the right balance found between describing concrete solutions and leaving options open for decisions (SWOV report A-99-4A).

The general outcome of this study is that it is possible to develop a European Road Safety Information System for professionals and citizens. Of course it has to meet certain criteria: the contents must match the subjects that occupy the users and the system must be intuitively in its use. We propose to develop an Internet application to reach potentially every European citizen and to develop a concise paper version for a selected target group not having access to Internet yet. We recommend to involve national correspondents in the organisation of the system, to make sure that the best use is made of national knowledge.
We also recommend to develop the system step by step. A first version of the system could be developed within a year, containing enough interesting information to be attractive for the users.
This study contains the outlines of the system and clarifies what has to be decided and arranged in order to make this system operational.

Contents

Data
There is enough information available to distribute through the information system. It is advisable to use public information as much as possible; this will prevent complications.

For the first version easy availability is quite important, to make sure that preparations can be finished in a reasonable time (e.g. within one year). We recommend to start with data on road traffic accidents, exposure and risk ratio's (chapter 6). The international sources, as we called them, reveal differences (chapter 5). For each subject we made a preselection of sources but definite arrangements still have to be made. It is important to note that, except in special cases, the information system will not give access to the sources themselves but to a selection of (aggregated) data originating from the sources. Benefits of the system are the selection and combination facilities offered to the user, the comparability of the data and the annotation. We indicate in the report which items should be included in the annotation to support interpretation of the data (chapter 4).
With respect to accident data we supposed in this study that the results of CAREplus will be available in due time. CARE consists of all national accident databases, which implies, as can be expected, different definitions and registration practices. The CAREplus project aims at making the data as comparable as possible. The EU Road Safety Information System would be an excellent way of giving access to the results of these efforts, integrated with other important data items and knowledge.
Exposure data are important as a reference for judging the level of safety but are not on-the-shelf available in the ideal way; we recommend to improve this situation.

Knowledge
There is a lot of interesting knowledge that could be entered into the Information System. We refer to research reports, international state-of-the-art reports, official documents (policy plans; legislation), other information systems and experts (chapter 7). We propose to select the best available for inclusion in the system. This means, among others, that information is verifiable, qualified and universally accepted. We distinguished areas of interest, like network planning, road design, speed management and novice road users, as an aid for the users when looking for interesting information. With respect to what is actually entered, the choices range from stating only a reference to the information (meta-information and/or a link to another Website) to incorporating complete documents. Considerations to take into account are discussed, like importance of the document, search possibilities, copyright issues and language.
We propose as well to include a successor of 'Who-is-who in road safety' in the information system.
If desirable, a separate section of the information system could be made available for national contributions, with which the Commission does not concern itself. The sender should be clear in that case.

Customers and road users
As information especially interesting for citizens, we regard crash tests, information about differences in rules to obey in different European countries (eventually in the form of knowledge tests) and road safety promotion information, explaining why it is important e.g. not to drink-drive (chapter 8). For citizens the language will be a more critical factor than for professionals. Where possible, links to national Websites can be a solution; otherwise information will have to be translated.

Processing of information
The report discusses the processing of input (chapter 9). The logical sequence of steps is to discuss possibilities and wishes; then to decide what to do. After this, contracts with information deliverers have to be concluded and the information will be delivered. It has to be checked against agreed upon criteria by people who are independent of policy, to enable them to have a independent judgement. After eventual feedback to the source, the information is entered into the system, tested and distributed, together with release information. It has to be decided how this should be organised exactly for each country. Essential for success is good mutual understanding between all parties involved.

System

We express our preference for a Website above a Windows application, mainly because of the advantages for distribution to in principle the whole of Europe (chapter 11). Examples of the desired functionality and user friendliness are to be found in *Appendix B*. Our advise is to use software components when developing the application; this results in lower costs, shorter elapsed time periods and a greater stability. When choosing the software, a condition could be that the application can be downloaded to a stand-alone PC and work there as well; this would be very convenient. Furthermore we describe in the report the provisions required for efficient maintenance of the system.
As a development path, one could think of starting with an (existing) Windows application for a limited user group and grow to an Internet application for professionals and citizens. We expect however that the release date of the first version of the system will be determined by compiling and processing the contents and that the application can be finished earlier.
For a selected target group not yet having access to Internet, a paper version of the system could be periodically distributed.

Development path, marketing and users support

We propose that in principle the system is free for everybody, unless certain sources require a users' fee; this would have to be settled for each source separately (chapter 10).
We recommend to start with a short test phase, with a restricted amount of information, and ask feedback from a limited user group. When these test users are positive, the system can be announced publicly. We recommend to consider an official happening, a brochure, free publicity, Newsletters, presentations and meetings, to make sure that all parties concerned have knowledge of the benefits the system can have for them.
For next versions we advise to have it grow according to user feedback and availability considerations, to maximize the gains of the investment. We recommend to do this through a periodical evaluation among 'all' users and meetings of representatives of user groups.

Central support can only be limited with potentially thousands of users. The only issue that has to be arranged centrally, is the actual availability of the system; if this is not the case, people must be able to report that. For support regarding all other questions, we recommend agreements with national

organisations, with different organisations taking care of different target groups.
It is advisable to register all questions and review them periodically, to see which improvements could be made to the system (user interface and contents).

Planning, management and organisation

The schemes in chapter 12 contain a planning of activities, for the development and the operational phase. Main groups of activities are indicated, as is an estimation of the budget required for these. A final budget estimation can be made after the necessary choices between different options have been made.

With respect to the organisation (chapter 12), it is important to involve in a clear and balanced decision structure:
- the European Commission;
- the High Level Group;
- road safety experts;
- an organisation being responsible for the activities on behalf of the Commission (the administrator);
- commitment on the national level and access to national expertise through national correspondents;
- information providers;
- users;
- arrangements for user feedback and user support;
- a system developer and a system administrator.

The administrator agrees with the Commission on the activities necessary to develop and maintain the system. Within the boundaries of the contract, the administrator is responsible for timely and correct execution of the activities. With respect to national contributions, we do not think that there is one model to impose on each country but it has to be discussed how the tasks, described in this report, can best be arranged in each country. Important criteria for suitable national coordinators are: overview of available data and knowledge, access to the official organisations involved and independency of road traffic safety policy.

It is to be expected that the efforts will result in a highly valuable system, bringing relevant information at people's fingertips.

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1. Introduction

This report on a European Road Safety Information System is the result of a feasibility study, financially supported by the European Commission. It follows the European Road Safety Programme 1997-2001 (COM (97) 131 final, 9/4/97), where such an information system is announced. The concept has the approval of the High Level Group (HLG 87/3-1).
It should provide key data and knowledge, which meets certain criteria and which is now not easy accessible for everybody concerned.
In October 1998 a prototype of an information system was demonstrated to the High Level Group; the reactions were positive as well.

The aim of the study is to support decision making about a road safety information system: what can be reasonably done, what can be said about investment and operation costs and what are the expected benefits? The ultimate aim of such an information system is contributing to the improvement of road safety in Europe, through better informed professionals and better informed road users. The feasibility study clarifies whether this can be realised and how.

For this study, we used our experience with national information systems. E.g. in the Netherlands it has shown to be possible to develop and maintain a Road Safety Information System. The system is operational since 1993 and is used by a growing number of enthusiastic road safety professionals. Although the requirement of international comparable information introduces extra complexity, the functioning of the Dutch information system seems to be a useful example.

Key issues are:
- When putting a European information system together, the first question is whether there is a substantial amount of relevant and comparable information that can be made available through the system. Which sources can be used and what are their strengths and weaknesses? How are they developing and what can be expected for the coming years?
- The next question regards the organisation: selecting, collecting and validating the input. Which roles are to be distinguished? Who could contribute to the information system and are parties prepared to commit themselves? Do parties involved agree about possibilities and limitations of information sources? How to select knowledge for inclusion and how to handle political aspects? Can the process of developing and maintaining the contents be organised with a reasonable effort?
- To be open to in principle every European citizen and to keep distribution costs relatively low, a Website is the most attractive option. Is it possible to develop a system with a rich functionality that can be used without training?
- It is not feasible to give extensive support to potentially thousands of users from a central point, but if users have questions they should know whom to turn to. How could this be organised?
- the idea is to start with a substantial minimum version of the system, from which the system develops and grows. Between which options can be

chosen? Which investment is required over time and what will the operation costs be?
- How could the management and organisation of the system as a whole be set up?

These questions are answered in this study.

We like to thank the international expert group, consisting of Mr Ekkehard Brühning, Mrs Edith Buss and Mr Axel Elsner of BASt, Mr Jeremy Broughton of TRL, Mr Göran Nilsson of VTI and Mr George Yannis, as well as DG VII B3 for their support.
An appendix to this report, SWOV report A-99-4A, contains two short accounts of expert meetings that were held with this group.

2. General description of the system

This chapter states the objectives and expected benefits of the European Road Safety Information System, the target groups, type of information to include in the system, prerequisites, and requirements.

2.1. Objectives and benefits

The European Road Safety Information System aims at promoting and supporting road safety by:

- presenting information that describes and explains the level of road safety in the EU-countries;
- presenting knowledge about road safety problems and the way to tackle them.

An information system facilitates international comparisons and contributes to the exchange of knowledge, which can be expected to contribute to rational decision making and thus to the improvement of road safety in Europe.

The information system is primarily directed at road safety professionals but also at European citizens as consumers and road users. The system could give them easy access to relevant information as well: e.g. information to support them if they want to buy a safe car and information about differences in rules to obey as a road user in different countries.

2.2. Target groups

Although the intention is to develop and distribute an open system, choices will have to be made regarding the target group: some knowledge of road safety is assumed. As stated above, the information system could be directed at European citizens, as road users and consumers, but in general the system will be most profitable to policy makers and other road safety professionals:

- road safety professionals working at the national level;
- road safety professionals working at the European level;
- road safety professionals working at local and other levels;
- researchers (institutes and universities);
- non-governmental organisations (like ETSC);
- private companies (insurance companies; car industry);
- press officers;
- the general public.

2.3. Type of information to include in the system

Typical information that supports policy makers answers questions like:

- What do others regard as main problem and how do they assess them? What is known about the impact of these problems on road safety? How do we compare to other countries on relevant road safety indicators?
- What can be effectively and efficiently strived for? Which improvements are to be reached?

- How to measure progress (not only in terms of number of road accidents or victims; of course this is a very important indicator but it does not clarify why certain results were reached);
- Which quantitative goals are ambitious enough *and* feasible?
- What are successful ways of tackling certain problems? At least attention has to be paid to infrastructure, regulation, education, road user campaigns (including enforcement) and vehicles.

This kind of information is a candidate for inclusion in the system.
In general professionals can learn from experiences in other countries by having easy access to relevant and actual information of a known quality (in other words: of which it is known what it means).

2.4. Preceding considerations

Regarding the data input, the intention is to use European databases and compilations as much as possible. Most of the time these will be the result of bringing together national databases or reports, which means that knowledge of the information (meta-knowledge) is available within the countries; using European compilations can go very well together with an international network of experts. The desired situation is not a one-way system but exchange of knowledge and commitment of many.
Furthermore it is the intention to use public, reliable and accepted information. This will contribute to the support of the system.
The system must be kept up-to-date. This can be accomplished better when not striving for putting everything into the system but making a selection. This selection can also turn out to be the power of the system. Many people feel overloaded with information but when they need something particular, they cannot find it. Before deciding to enter information into the system, the relevance for road safety must be unambiguously clear.
The European Commission launched several Websites already. It is a way of distributing current information with relatively low costs. It may lead to a huge number of users, who may sometimes feel the need for getting support or more information. Central support can only be limited, to keep costs under control. The idea is that users' questions are not going all to a central point but are directed to different national organisations. With these organisations agreements would have to be made.
For a restricted target group, who have no access to Internet, an alternative medium has to be provided which suites in principle everybody (e.g. paper).
With respect with data providers some considerations have to be taken into account. The system must not interfere with earnings of official information providers. Besides this, organisations providing information to the system, should not be charged for the information they delivered themselves.

2.5. Technical requirements

Considering the aim of the system, some key technical requirements are implied:

- It must be possible to include different types of information (data and text) in the system in an integrated way;
- The system should enable broad analysis of patterns, developments and relationships;
- The user should easily find his way through the system, also in the situation of a substantial amount of information;

- It must be easy to update and add information, including the addition of new European member states.

2.6. Development path

It is well known that users give more feedback once they have something to react on. Therefore the proposed development strategy is to select information that is readily available and of which the relevance is quite obvious, and develop a first version of the system as soon as possible. After that, it can grow, according to an agreed upon decision structure.

3. Data: conceptual data model

In this chapter a conceptual model for the data structure will be described. The data can be thought of as consisting of several 'building blocks'. Each building block has its own characteristics regarding quality aspects, possible data sources, etcetera. By using this building block concept it is possible to develop the system in phases, while at the same time a clear overview of the system can be presented to the user.
At some places the blocks will have hierarchical relations to each other. This structure does not necessarily have to be reflected in the underlying database design. Section 3.2 will describe this further.

3.1. Categories of data

The core of the data in a road safety information system is aggregated information on safety: the accidents and the victims. So this will be treated separately from all the other relevant information. The European Union now disposes of the CARE database (partly under development) with detailed information on accidents, vehicles involved and victims. In the following sections the information is described from the user point of view. Later in this chapter the relation with CARE and other sources of information will be described.

The other (non-accident) information can be split into two groups. In the first place there are the intermediate variables which measure aspects that influence the traffic process. These aspects usually relate to factors that are eligible to policy interventions. These interventions can be indirect, like campaigns on alcohol usage in general, and alcohol and traffic in particular. Both information on alcohol consumption in general *and* on alcohol usage in traffic can serve as intermediate variables.
Other interventions can be more direct, like speed enforcement. The mean speed driven on particular road types, e.g., can then serve as an intermediate variable.

Finally there are the exposure variables, which help to put the accident data into perspective and to enable comparisons, to analyse and explain differences between countries, to analyse the effects of certain interventions, etcetera.
The exposure variables also serve to calculate *risks*. In general risks can be characterized as an aggregated measure on some accident aspect, divided by an exposure measure (aggregated to the same level). Examples are the number of fatalities in different age groups divided by the number of inhabitants in the corresponding age groups, or the number of casualty accidents on different types of roads divided by the number of vehicle kilometres on those road types.

For most non-accident variables there often exist 'proxy variables', which do not measure directly the element one is primarily interested in, but instead measure an element whose value changes more or less in the same way (e.g. fuel consumption and holidays). How close this match is, can vary, as can the knowledge about the closeness of the match.

3.2. Accident information

To enable analysing all aspects of the chain of events that eventually lead to bodily harm and fatalities, it is of vital importance to break down the different elements of the accident information further. An analysis on the number of *accidents* requires other information than an analysis on the number of *victims*. The analysis of the number of vehicles (e.g. of a certain type) that is involved in (a certain type of) accidents, requires yet another type of information. The differences can be characterized in two aspects: the level on which the information is summarized (accident, vehicle, or victim), and the type of information which is being summarized (which can be an item 'belonging' to the same level (for the accident level, e.g. day-of-week) or an aggregation of a 'lower' level (again for the accident level, e.g. the most serious type of victim).
Accident data can be seen as a hierarchal system of information elements. The different layers of this system are the following (the indentation showing the hierarchical character):

- locations
  - accidents
    - objects: vehicles and pedestrian (including information on the driver)
      - occupants
        - casualties
          - fatalities

This hierarchical way of describing the information is being used here in order to be able to develop a clear user interface. It may be possible to use another way of presenting the information, if it also provides a clear picture of the organisation of the different data elements.
The linkage between this user interface (a conceptual data model) and the actual data system (the physical data model) is of no importance for the user. This is a matter which can easily be solved in the system design.
For each of these layers a proposal is given in *Appendix A*.

3.3. Intermediate variables

The intermediate variables refer to (measurable) circumstances which influence either the amount of traffic or conditions (from a safety point of view) for that traffic. These variables thus can indicate directly whether policy interventions targeted at specific aspects of the transport and traffic process are successful.
Also, the development over time of these intermediate variables can explain such developments in certain types of accidents (if the relation between the intermediate variables and the particular accident item is known or can be assumed). When it comes to these explanations or clarifications it is not necessary that a policy intervention is possible.

These variables can relate to:

- attitudes of the population towards traffic and traffic safety;
- seat belt wearing rates;
- alcohol usage (either as a direct indicator on the process leading to driving under influence, or as a proxy variable for driving under influence of alcohol);
- certain aspects of the weather;
- etcetera.

3.4. Exposure data

Exposure data refer to the amount of traffic or transport in a country, calculated (or approximated) by whatever method.
It should be possible to break down exposure data into different categories to be able to produce the risks (as described in section 3.1).
Exposure quantities that can be useful in an Information System are:

- vehicle kilometrages (possible proxy variable: fuel consumption), per vehicle type and/or per road type;
- distance travelled by persons, per age class and vehicle class;
- hours spent in traffic by persons, per age class and vehicle class;
- number of trips made, per age class and vehicle class;
- road lengths, per road type;
- area of country;
- number of inhabitants per age class;
- number of cars and other means of transportation (as a proxy variable for vehicle kilometrage, or a process indicator);
- etcetera.

4. Criteria for quality

The purpose of this chapter is to develop some criteria to assess the quality of the data.
The purpose of these criteria for quality is twofold. For the initial content of the system, and during the gradual development choices will be made about the sources of the data. The quality of the data must be an important element in this choice.
But also when the system is running, information on the data quality is important. Users will have to be informed on the definitions used, on the ranges of uncertainty, etcetera. As such the information on 'quality' will be 'knowledge' that will be provided in the relevant text part of the system, if necessary together with appropriate explanations and interpretations.

In chapter 5, 'Data sources', several possible sources of information will be described. Available information on quality aspects, as described in this chapter, will then be given. In chapter 6 this information will then be used to formulate a proposal for the first phases of the development of the progressive introduction of the information system.

4.1. Describing 'quality'

Before elaborating upon the different aspects, one general remark can be made upon 'quality'. The concept of quality of data can be approached in two different ways. One can define a level of quality for a system which then always has to be reached. In practice this will be difficult to work with, because the level of quality is often controlled by factors outside the system. Moreover, the level of quality one desires for a data item, depends on the purpose one has. This can vary enormously, and also therefore this is not a suitable approach.
Another approach would then be to demand that the actual level of quality is being recorded.
For instance, if registration level is considered a relevant quality aspect, we will not demand that a system registers at least 85% of all accidents, but instead we require that a well based estimate is available on the actual registration level.

In the following sections relevant criteria will be elucidated. Most of the criteria focus on the database as a whole. Accident registrations are used as an example but the criteria are valid for other data as well.

4.2. Representativeness (registration level)

The registration level of accident databases is a well-known problem. In most countries the registration of fatal accidents and of fatalities is fairly complete.

This is not the case for the other categories: hospitalized casualties, slight injuries and accidents with material damage only. This would not be a major problem if the accidents registered were a random sample of all accidents, but the registration degree varies greatly with the combination of vehicles involved. And it particularly varies between the different countries. This last

point makes it very important to arrive at good information on the registration level. Otherwise an analysis on the number of casualties between different countries may primarily show the differences in registration level, and not the differences in safety level.

4.3. Consistency between countries

The comparability of data between countries is, of course, the key factor for any successful international database. For some data elements there are internationally agreed definitions, but this does not guarantee that all countries adhere to those definitions. The definition of 'traffic fatality', e.g., has been agreed upon a long time ago (the Vienna convention, 1968), but the 'waiting time' of 30 days between the day of the accident and the moment of death to 'qualify' is not used in all European countries. Some use shorter time periods, others longer.
For many data elements there does not even exist an internationally agreed upon definition. Knowledge on the definitions used in the different countries (both in theory and in practice) is therefore important.

4.4. Consistency over years

For most purposes one will want to analyse the development over time of certain aspects. This can be for the accident data or the intermediate variables alone, or in relation with the exposure data.
Essential for a time-series analysis, whether it is a very simple one or a more elaborate one, is the consistency over time of the measurements. This consistency can be threatened by changes in actual definitions, but even more so by changes in registration practices. Information about both types of change therefore has to be available.

4.5. Correction procedures

It is a well-known phenomenon that the official statistical offices sometimes recalculate figures for previous years. This may be because of simple errors that have been uncovered, or because for instance a change in data collection procedures made a recalculation necessary to keep a time series consistent. Since a consistent time series is of great importance to an analysis, it will be an important quality aspect how 'indirect' data sources (see § 4.12) deal with such recalculations. This means, not only the data for the new (most recent) year will have to be inserted, but also the old data will have to be replaced.

4.6. Timeliness

Monitoring is one of the aims of the European Road Safety Information System. A good monitoring system has to make the data available as quickly as possible. The delay between the close of the time period and the provision of the data by the data providing institute therefore should be minimized.

4.7. Length of time series

Other sections have already mentioned the use of time series (sections 4.4, 4.6). This automatically introduces the question of the length of these time series. Again there is no general guideline to determine the necessary length of the period.
In practice two different situations can be recognized:

- short term policy monitoring: 4 - 5 years;
- research into development: 10 - 15 years.

Additionally there can have been defined a reference period to evaluate the target or targets in a road safety programme. In this case one does not necessarily need the whole of the time period.

4.8. Validity

The validity of a data element must be assessed: does the attribute really describe what it is supposed to measure? For this purpose, information on the data collection procedures must preferably be available, in order to be able to judge the consequences of the definitions not only in theory but also in practice.

4.9. Detail

The users of the information system will, in most cases, *not* be interested in a simple one-dimensional table of a particular attribute. Generally they will wish to be able to link it to a background variable, a process variable, or an exposure variable. Also cross tabulations or breakdowns into several classes are common wishes. So often it will be necessary to produce a table with several variables, like for instance the number of casualties, broken down by severity (fatal, hospitalized, other) and by vehicle type (car, bicycle, etc.) and by road type (motorway, rural road, urban road, etc.).
The level of detail of the underlying database determines to what extent it will be possible for the user to create the table he needs at that moment.

4.10. Correctness

A database has information on a certain set of events (in this case usually something like accidents on public roads). The level in which this actually is the case is called *correctness*. Errors in this respect can be either way: events that not fulfill the definition are recorded (e.g., accidents *not* on public roads), or events remain unrecorded. If the database is only a sample by definition, the latter case is only seen as an error if the sampling definition is not fulfilled.

4.11. Resolution

The *resolution* of a particular attribute describes the level of detail that can be given. In general this is the number of different values the attribute can have. The resolution should correspond to the exactness of the measurement: it is useless to record the time of an accident in tenths of seconds, when it can only be known at the most in minutes.

4.12. Exactness

No attribute will be exact; there will always be a number of random errors. Non-random errors are more serious. This kind of errors can occur when there are misinterpretations of a particular attribute, or where interpretations differ between regions or over time. An unduly large percentage of 'unknown' can be seen as an error of this kind as well.

4.13. Price

The Information System will in principle rely on publicly available data. In most countries this data will be available free of charge. However, it may be necessary to pay a nominal fee for handling costs.
Depending on the kind of data source being used, one may also have to pay for the costs made to cover the collection of data itself by that source. These costs may be direct costs (if that the organisation collects the data itself) or again indirect costs, paid to other organisations.
Additional actions on the data (transformation rules, consistency checks, etc.), to be executed by any of the concerned organisations, may lead to higher prices.

5. Data sources

There is a wide range of possible data sources. In order to facilitate the selection of sources for the initial content of the system, this chapter describes the different categories of those sources, and gives information on the main sources.
There are two main groups of data sources: national and international sources.
International sources are all those organisations that provide information on several countries. Within the context of this study all organisations that have information on all (or almost all) member states of the European Union are of interest.
Existing databases with information at the European level thus can form an important source for information system under consideration. This concerns databases within the realm of the European Union (CARE, EuroStat), and other sources that cover the European Union as well (ECMT, IRF, UN-ECE, IRTAD).
In most cases these databases will contain information aggregated in some way. In some cases the information is harmonized in some way, to make the values for the different countries (more) comparable. This can be seen as a quality aspect of the database.

The national sources mainly consist of the statistical offices of the member countries. This may concern several organisations within each country. This varies very much. In some countries one organisation is concerned with providing all statistical information on all subjects, in another country there may be different organisations for different areas.
A separate group of data sources are those international projects, that have collected data independently. However, these usually are incidental projects, without systematic data collection over the years.

5.1. National data sources - offices per country

It is not very practicable, and nearly impossible, to draw up an enumerated list of all the organisations within the different member states that are responsible for providing national statistics on different aspects.
If it becomes necessary to involve those organisation directly in the data collecting procedures, use will be made of the expertise of national experts and of international data sources, which already may have experience with these organisations. In these cases experience will prove important, because an efficient data collecting procedure has shown itself only possible if a good mutual understanding (using direct personal contacts) of the requirements is reached.

5.2. International projects

There are some international projects that have collected relevant information for European countries.
One of those projects is the SARTRE project, where information on attitudes among drivers is available. "The main purposes of this project are: to describe the state of drivers attitudes and reported behaviour throughout the

continent with regard to road traffic risk, to evaluate the range from approval to opposition towards regulations and countermeasures, to search for underlying social or cultural factors leading to various behaviour in term of risk, and lastly to recommend actions to take these into consideration when improving road safety policies" (SARTRE 2 reports, Executive summary, page 6).
There are also several projects where comparable information on the cost of traffic accidents has been collected: direct costs, indirect costs and immaterial cost. The COST-313 group, e.g. has assembled such material.

5.3. International data sources

5.3.1. *CARE*

The existing European CARE database should form part of the core of the new Road Safety Information System. The data have to be fairly comparable between countries to be eligible for inclusion in the system. Therefore, the focus will be on the results of the CAREplus project, which tries to arrive at exactly that.
The CARE database will contain data from 1991 onwards.
The so-called CAREplus project concerns itself with the development of transformation rules to make data elements in the accident records of the individual countries comparable. The first phase of this development is completed. After implementation of these rules in the CARE database the following information will be available:

- type of location (inside or outside urban area, motorway or not, at junction or not, type of junction);
- date and time of the accident (month, day of month, day of week, hour);
- light and weather conditions;
- collision type;
- accident severity;
- type of vehicles involved;
- age and sex of persons involved;
- role of persons involved (driver, front or rear passenger, pedestrian);
- injury severity per person.

It is noted that the CAREplus project resulted in a number of common definition values through respective transformation rules, which are already implemented in de CARE system for most of these values. Data are available for most countries (11-15) but for other values, data are available for a few countries.

The second phase of the CAREplus project will enlarge the number of variables. The following variables have been selected for inclusion:

- registration country;
- nationality;
- vehicle age;
- driver licence age;
- road surface;
- road surfacing and road condition;
- region, province;
- speed limit;

- alcohol test;
- alcohol level;
- carriageway type;
- movement pedestrian;
- manoeuvre driver;
- manoeuvre vehicle.

These last three variables might be combined in one variable 'accident type'.

This second phase of CAREplus is only in the first stages of development. It is not yet clear whether it will prove possible to develop so-called 'common-variables'.

5.3.2. *EuroStat*

Eurostat contains information on a wide variety of transport related topics, from a wide variety of sources and consequently also with a varying quality. The source of the data is described by Eurostat on its WEB-pages[1] as: "Eurostat collects its data from the National Statistical Institutes of the countries concerned. All data are checked by Eurostat, compiled in the required form, and, where applicable, harmonised with European Statistical System standards". There is however no explicit information on the control mechanisms in force to enforce a certain quality level. If the value for a particular country or year explicitly differs from definition for the whole of the table this is duly noted, but in general the data is publicized as given by the respective source (e.g. the different national statistical office, or ECMT, etc.).
Eurostat cooperates with other organisations which collect transport related data on countries, like ECMT, IRF and UN-ECE.

5.3.2.1. The Eurostat Yearbook

The main publication of Eurostat data is the 'Yearbook'. It is also available on CD-ROM. From the CD-ROM the data can be extracted and incorporated in documents or software.
The *Eurostat Yearbook* gives most data in annual time-series going 10 years back. The 1997 edition gives the data starting from 1986. For some data elements the information is complete including 1996, for some data elements there is no data at all for 1996 or it is very sparse, and for 1995 only for about five countries (this is e.g. the case with traffic fatalities).

The data on transport is mainly about freight transport. There is one table on passenger transport by railway.

More detailed information is available on population figures. Besides the totals per country, the relative frequencies for several age groups are available (0—15, 15—24, 25—49, 50—64, 65—79, and 80 years and older). Also the number of women per 100 men for the total population and for the age groups 65—79 and 80+ are available.

[1] http://europa.eu.int/en/comm/eurostat/serven/part1/1c2.htm

On traffic safety the mortality rates are given: the number of fatalities per 100 000 men and women separately. This is expressed in *standardized death ratios*, computed by the World Health Organisation against a European standard population. This table is part of the Chapter on Life and Risks of Life. In that chapter also a table on the number of traffic casualties can be found.
As a possible proxy variable, a table on the consumption of pure alcohol (in litres per person over 15 years old) can be found. This does *not* take into account individual import and export, but uses the production per country, and the difference of commercial import and export.

For all tables contact persons within Eurostat are listed.

5.3.2.2. Transport in Figures

Next to the yearbook there is also the annual publication 'Transport in Figures', produced in cooperation with DG VII (the Directorate General for Transport) of the European Commission. This publication is also available on Internet[2]. It must be noted that this is only available as GIF-images or in PDF-format. This means that although electronically available, the data cannot easily be transferred from that source into other software. It is assumed however that, for the purpose of the information system under consideration, easy access to the data can be organised.
This publication does not only contain information for the countries of the European Union, but for comparison also for the group of Central and European countries, the Mediterranean countries, Japan, and the USA.

5.3.2.3. New cronos

Eurostat also collects and harmonizes data in general databases. One of those is *New cronos*. This database is described as[3]:

> "New Cronos is one of the main databases used for publications, statistical documents and other information media distributed by Eurostat and presented on this site.
> The data relating to the 'General Statistics' theme have been collected, consolidated and harmonised, for each country concerned and include the following indicators :
> • Regional statistics,
> • Developing countries : demographic and social indicators, external trade, money and finance, external aid and debt burden, national accounts, production,
> • Data for short-term economic analysis : agriculture, balance of payments, unemployment, external trade, financial indicators, industry and energy, consumer prices, services, hourly wages in industry."

The database is *not* on-line available. The internet information contains a link to 'information on-line' for a specific request, but this leads to a PDF-form to be printed, filled out and faxed. Alternatively, one can contact the national Eurostat Data Shop.

[2] http://europa.eu.int/en/comm/dg07/tif

[3] http://europa.eu.int/en/comm/eurostat/serven/part2/21bd1.htm

5.3.3. *ECMT*

The ECMT (European Conference of Ministers of Transport) publishes the annual Statistical Report on Road Accidents.

The data are listed for 26 European countries (for 5 'recent' countries no data are available yet). The data for the four most recent years, and for 1975, 1980, 1985 and 1990 are:

- the number of fatalities (corrected numbers for countries that do not adhere to the 30 day limit);
- the number of casualties;
- the number of casualty accidents;
- the number of motor vehicles in use.

For the most recent years, some risk figures for each country are calculated, and a breakdown of fatalities and casualties for some modes of transport. Also for these breakdowns risk values are given. Finally the same figures are given for motorways separately.

The report also lists the main road safety actions and changes in regulation as given by the countries.

The tables from the report were circulated already before the publication. The information for the year 1996 was available in January 1999.

5.3.4. *IRTAD*

The IRTAD database is maintained by the BASt (Germany) under the auspices of the OECD (Road Transport Research Programma). The database was developed by an OECD Expert Group building upon an existing database. It is jointly financed and managed by the member institutions. The use of the database is strictly limited to members, which means that no copy of the database may be transferred to third institutions. Any other use of IRTAD data is pending upon decisions to be taken at the level of the OECD Steering Committee.
The IRTAD database has information on the number of injury accidents and on the total number of injured persons. The number of fatalities, and the number of seriously injured (mostly: hospitalized) is available separately. Breakdowns of these numbers are available for:

- the age of the victim;
- transport mode;
- type of road

and a few (not all) combinations of these aspects.

As background variables are available:

- number of inhabitants, per age group (mostly 5 year age bands, single years for 15 - 20);
- network length per type of road;
- area of state;
- vehicle fleet per type;
- vehicle kilometrage per vehicle type and per road type (road type: motorway, A-level roads, other roads outside urban areas, roads inside urban areas);

- occupant kilometrage by mode of transport;
- seat belt wearing rate, per road type.

Most data are available for a number of years: for the year 1965, and for each year after 1970. Not all countries can deliver all data elements, so some gaps remain. Newly introduced data elements, as the seat belt wearing rates, are available for recent years only.

The data comes from the relevant (statistical) organisation in the different countries.
The data is continuously being checked for consistency, both between countries *and* over years. If an inconsistency is found, the data delivering organisation is asked to look into the matter and produce a revised figure.
The number of fatalities notably is available in corrected form, where the numbers are adjusted for those countries that do or did not adhere to the '30-day limit' for traffic fatalities.
The definitions in force in the different countries for the variables and classes are checked against each other regularly (in regular meetings of representatives of the countries). 'Backward' changes in the data by data delivering organisations are reflected in the database.

5.3.5. *IRF*

The International Road Federation publishes at the end of each year an overview with data on several aspects of traffic and transport for more than 100 countries over the whole world. Among these are:
- the network length;
- the production and the export of motor vehicles;
- the active fleet of motor vehicles;
- the vehicle kilometrage;
- taxes related to transport and the annual expenditure of the national government on transport.

The data on traffic safety covers for each country, the last five years. The data given are the number of accidents with casualties, the number of casualties and the number of fatalities. Additionally the number of casualties within built-up areas and the share of the accidents at night are given. For relatively many countries the data is missing, or is not yet available for the most recent years.
There is no check on internal consistency of the data or on mutual comparability. The criteria the different countries use for the definition of a fatal accident (on site, or within a certain number of days, or without time limit) are given.

5.3.6. *UN—ECE*

The Economic Commission for Europe of the United Nations in Geneva publishes each year a multitude of data on the European countries, among which traffic safety.
There is no check on internal consistency or mutual comparability. The data elements consist of:
- the total number of accidents;
- the number of fatalities;
- the number of casualties;

The data is subdivided by:
- type of location (motorway, inside or outside built-up area);
- month of the year;
- day of the week (Monday-Thursday, Friday, Saturday or Sunday).

5.3.7. *CIECA*

The CIECA (Commission Internationale des Examens de Conduite Automobile) issues a CD-ROM containing information regarding the issue of driving licences in the member countries. These countries comprise almost all European countries and some North African countries. The latest issue contains information on the year 1997, based on a survey among the members. The CD-ROM contains information that can be used as a possible source for the knowledge part of the information system as well as for the data part. There is knowledge on all the member countries about the different categories of driver licences, the authorities responsible for issuing licences and the procedures (examinations, etc.) for qualifying.
Additionally there is quantitative information on the number of licences issued, and the number of practical and theoretical tests taken in 1997. This information however is not available for all countries. The countries from the European Union for which information is available are: Finland, France, Germany, the United Kingdom, Luxembourg, the Netherlands, Portugal, Spain and Sweden (those missing are Austria, Belgium, Denmark, Greece, Ireland and Italy). The data on the number of licences issued is in most cases available separate for the licence categories.

5.4. **Comparison of international data sources**

The international data sources described so far contain overlapping information but they are not consistent.
A comparison is made between the different sources, focusing on the aggregate databases. CARE, being a disaggregated database, will deliver information on another level — although when in the design of the information system data from the aggregated international sources are combined with CARE data it has to be guaranteed that they conform as well.
The comparison has shown that the presence of data differs: the same element which is missing for a particular year is present in another publication. These are not always official data however. It can also be seen that elements present in more than one publication, do not necessarily have the same value, nor do they have the same value as the official national publication.
The lesson from this is that it is essential to know where data come from and which procedures they run through. One possible solution could be to turn to the official national statistical bureaus for data. This however would imply quite a lot of work and would lead to yet another different database with other values. The desirable situation therefore is to select the best available international datasources and discuss any questions about the values with the people in charge, aiming at valid and reliable international datasources to draw upon.

6. Proposal for the contents of the first version

In this chapter a proposal is given for the data to be included in the first version of the European Road Safety Information System. This proposal is based on the importance of the variables concerned for road safety policy, in combination with the availability of this information of a sufficient quality.

6.1. Development of the contents

We developed an overview of fairly elementary variables which we expect to be important for road safety policy in all, or almost all, countries. This was confirmed in the meeting with the international partners in this project. The result is to be found in *Appendix A*, with three priority categories added to each variable.
It is not to be expected that, at the beginning of the information system, all variables with their decisions, can be installed. Based on the experiences with the great differences in the definitions of many variables between the countries involved, it would be too much of a burden to obtain every piece of information exactly down to the desired details. Experience has shown that it is best to work with a so-called growth model. In this way, at the beginning of the system, the emphasis should lie on the data availability. Then more attention can be paid to the experience and wishes of the users.

We recommend , in any case, to begin the information system with fatal accidents and road deaths. Because of the differences in registration rate and definitions, more problems are to be expected. There is a list of the definitions of injury severity in the European countries, but no list of common variables has been agreed on. Such a list is advisable. It would also be advisable to get a clear picture of the registration practice and registration degree in the European countries, to start with serious injuries and in-patients. When this information is available, is it to be judged whether the comparability of the data can be enhanced. As soon as it can be shown to the user how to interpret the data, they can be added to the information system.

6.2. Proposal for accident data

Experience has shown that, per variable, there are more sources than can be used. The quality of some of these sources is, however, unclear. Moreover, there are a number of sources that are unable to deliver the required data in one and the same table; the tables have been subdivided into a number of separate tables. This would lead to a decrease in quality of the information system because the user cannot make all the possible and desirable combinations. For example; in IRTAD, nearly all desired variables are present but in different tables. CARE-plus could make it possible produce the desired table, if the common variables are defined. CARE-plus would seem to be the most obvious source of victim and accident data. The disadvantage at the moment is the fact that the system is not yet fully operational, and some data is not up-to-date. It is to be expected that these objections will be largely removed by the time that the information system has to be filled with data.

The Council decision settles that all countries should provide their annual data to CARE by September of the following year.

We propose to include data on casualties and accidents in the system; the first version would contain fatalities and fatal accidents. The reason for including both is that targets often are set in terms of casualties; but to prevent casualties one has to prevent accidents. So both are relevant.

Item	Variable	Casualties	Accidents
Time:	Year	x	x
Severity:	Severity of accident		x
Victim:	Mode of transport	x	
	Injury severity	x	
Conflict:	Type of collision	x	x
Location:	Country	x	x
	Road type (only motorway or not)	x	x
	Urban/rural	x	x
Other:	Weather conditions	x	x
	Lighting conditions	x	x

For an explanation on these variables, we refer to *Appendix A*.

6.3. Exposure indicators

In order to make the numbers of road accident victims comparable for various groups (e.g. countries, mode of transport, or age), these numbers will be related to exposure data. The preferable choice is the number of kilometres travelled. For victims this is the number of occupant kilometres (as driver and/or passenger) and for accidents the number of vehicle kilometres.
It has been established that the desired exposure data is only available in a few countries. In order to calculate a more-or-less comparable 'risk' ratio, alternative exposure material is used.
For this information system we recommend the following, viz.:

- road length;
- population;
- number of vehicles;
- number of driving licence holders.

In principle, one is mainly concerned with the totals, but each of these exposure quantities can be subdivided. One must, however, keep in mind the fitting to other variables.
The extent to which a) the information is available for all countries, b) what the costs are, c) how quickly they are available, and d) what their quality is; are all points for consideration. The national correspondent would here seem to play an important role. From such experts, it may be assumed that they,

per country, can make an assessment of such quality criteria. Sources have to be chosen definitely in the next phase but we propose already sources that, as far as we could find out, meet the criteria better than other sources. They are added in brackets to the exposition indicators proposed:

- number of inhabitants by year, country, age and sex (EUROSTAT);
- number of kilometres travelled by year, country and mode of transport (IRTAD);
- number of vehicle kilometres by year, country, vehicle type and road type (IRTAD);
- number of vehicles by year, country and type (IRTAD);
- road length by year, country and road type (IRTAD);
- number of driver licences by year, country and category (CIECA).

6.4. Risk indicators

From the accident data and the exposure data, risk figures can be calculated. We propose to include the following risk indicators:

- number of fatalities per 100.000 inhabitants, by year, country, age and sex;
- number of fatalities per 10^6 kilometres, by year, country and mode of transport;
- number of fatalities per 10.000 vehicles, by year, country and vehicle type;
- number of fatalities per 10.000 driver licences, by year and country.

6.5. Classes of variables

Important as well are the classes that can be distinguished. We suggest the following classes as the most desirable:

Age:
- 0-4 years
- 5-9
- 10-11
- 12-14
- 15
- 16-17
- 18-19
- 20-24
- 25-29
- 30-34
- 35-39
- 40-44
- 45-49
- 50-54
- 55-59
- 60-64
- 65-69
- 70-74
- 75+

Mode of transport:
- Train/Tram
- Bus
- Lorry
- Delivery van
- Car
- Motorcycle
- Moped
- Light moped
- Bicycle
- Pedestrian
- Others

Collision opponent:
see mode of transport, plus:
- obstacles
- objects
- none

Primary colliders:
see mode of transport and collision opponents

Injury severity:
- Death < 30 days
- In-patient
- Other injury

Accident severity:
- At least 1 victim died < 30 days
- At least 1 victim in-patient and no fatality
- Other injury
- Material damage only (MDO)

Road type:
- Motorway
- Express/trunk road
- 80 km/h road
- Other rural roads
- Other urban roads

Road length:
- inside built-up area/urban
- outside built-up area/rural
  - motorways
  - trunk/express roads
  - others

Population:
- age-groups (see elsewhere)
- sex

Number of vehicles:
- lorry
- bus
- car
- motor cycle
- moped
- any others

Number of driving licences:
- lorry
- bus
- car
- motorcycle
- moped
- any others

6.6. How to handle non-availability of classes

To achieve the maximum uniformity and exchangeability, each variable must preferably have the same sub-division in each of the tables. Depending on the possibilities of each country, the sub-divisions should be adapted in such a way that comparability between countries is maintained. A problem here is that the maximum sub-division is then determined by the country with the least possibilities. It is preferable to have a flexible division of a variable during **input**, fitting that which in other countries is possible, and in which during **output** it becomes possible, via alternative classes already in the information system, to make comparisons with other countries, given the specific wishes of the user.
Apart from the technical possibilities, there is of course also the problem of whether all countries have sufficient flexibility when supplying certain (agreed) sub-divisions. As an example, existing age-groups are presented:

Country X	Country Y	Country Z (IRTAD)
0-4 years	0-4 years	0-5 years
5 years	5-9 years	
6-9 years		6-9 years
10-14 years	10-14 years	10-14 years
15 years	15-19 years	15-17 years
16-17 years (moped-licence age)		
18-19 years		18-20 years
20 years	20-24 years	
21-24 years		21-24 years
25- etcetera (5-year classes)	25- etcetera	25- etcetera
80+		

7. Knowledge

7.1. Introduction

Within the European Union there is a huge amount of knowledge. It can be assumed that this is not optimally used, because there is no overview of the available knowledge and because it is not easy to select the most suitable documents for a certain issue, neither to know whom to contact.
In all the research projects it supports or finances, the European Union stresses dissemination of results. An information system is a good instrument for dissemination.

Useful knowledge mainly regards problems and solutions:
- Why is a certain item a problem to road safety, e.g. alcohol and speeding? What do we know about the relationship?
- How to improve these road safety issues? which measures can be taken? What do we know of costs/benefits and about suitable conditions for high effectiveness?

To make the information accessible, a good system of key words is required, preferably meeting international standards, such as the IRRD (International Road Research Documentation).

Sources to take into account are:
- research reports;
- other documents, like policy documents and legislation, at national and European level;
- Websites;
- experts within the European Union.

The information especially interesting for European citizens, as road users and consumers, is treated in a separate chapter (chapter 8).

7.2. Proposal for knowledge to include

The information system intends to make relevant, existing information available. Different options can be thought of, by making choices about:
1. covering the whole or parts of the field of road safety;
2. types of sources to be used (research reports, official documents, other information systems, or experts);
3. the type of information to be entered into the system (e.g. only a reference, an abstract, or the complete document).

Furthermore a clear system of key words is essential.

7.2.1. *Coverage of the field of road safety*

The priority subjects to include in the system are those related to national and European policy. Therefore it is necessary to know what the main issues are in the European countries.

As an example, road safety policy on a national level and on the European level is characterized.

Dutch road safety policy as an example of national policy
In the Netherlands so called spearheads are defined. They refer to problems recognized as the most serious and open for interventions. Some have to do with road safety directly, like cyclists and mopedists, heavy transport, and hazardous situations. Others refer to road user behaviour as an intermediate variable: exceeding of speed limits, alcohol use, and use of restraint systems. For all these spearheads, quantitative targets are set.
Besides these official spearheads, vulnerable road users generally are considered an important issue, referring mainly to children and elderly (or pedestrians and cyclists, which is the same population to a large extent). The same applies for two-wheeled motorized vehicles: not only moped drivers have an extremely high risk as road users; the same applies for motor cyclists. Young car drivers as well are broadly considered as a group deserving special attention.
Since a few years the concept of sustainable road safety is very important in the Netherlands. It implies that function, design and use of the road infrastructure should be in agreement with each other, thus preventing accidents from happening. When accidents still happen, serious injury should be prevented, by influencing the composition of the traffic, potentially possible collision types, and collision speed.
The relation with mobility (how to influence the distribution of the growing traffic volume over the road network) and land-use planning is clear in the framework of sustainable safety.
Also relevant when describing the Dutch road safety policy is that many spearheads are brought under the umbrella of striving for a sustainable safe road traffic system.
Risk analysis is thought to give a new impetus to the decentralized policy implementation. Experiments are going on, enabling the choice of the most promising approaches.
Another instrument to influence decision making is stressing the social costs of road accidents and using cost/benefit analysis of measures; this is not easy (because of the of data) but seems promising as well.
For its potential future contribution to road safety, telematics, or ITS (Intelligent Transport Systems) get growing attention. From a safety point of view, especially the contribution of telematics to improving dangerous roads (rural roads outside and main roads inside urban area) and the safety of vulnerable road users is important.
An interesting experiment was done with a trauma helicopter, giving assistance at very serious accidents, which implies the subject of post crash care and consequences of accidents.

Road safety policy of the European Union
The European Union states the following subjects in the Programme for 1997-2001:
- vehicle safety;
- transport of dangerous goods;
- professional transport (among others driving time and driving licence);
- education of road users and driver training;
- blood alcohol testing;
- drink driving campaigns;

- road markings and signing;
- telematic systems (several pilot projects);
- influence of drugs on road safety;
- European code of conduct for advertising (prevents a bad influence on road safety);
- 4th Framework Programme:
  - workzones;
  - speed management;
  - road design guidelines;
  - standardisation of in-depth accident data;
  - automatic systems for collision avoidance;
  - longitudinal vehicle control and urban traffic management;
  - 'electronic tow bar' between trucks and automated driving;
  - driver state detection and emergency handling.

Proposed areas of interest
Combining all the policy issues, the following areas of interest are proposed as the most important:
- road safety policy at the European and at the national level: different approaches (centralized/decentralized; target setting; analysis of problem areas, risks and potential improvements);
- road network (including the relation to mobility and to land use and urban planning);
- road design principles;
- telematics;
- speed management;
- vehicle safety;
- professional transport;
- alcohol, drugs and medicines;
- restraint systems;
- vulnerable road users (pedestrians and cyclists, especially children and elderly);
- novice road users;
- two-wheeled motorized vehicles;
- post-crash issues.;

To start with, a selection of these areas of interest could be made (taking availability considerations into account).

If a Website is chosen, new phenomena could be given attention in a separate discussion area (e.g. what are experiences with roller skates in different countries).

7.2.2. *Sources to be used*

As stated in the introduction (section 7.1), the most interesting knowledge refers to two types of questions (in fact referring to problems and solutions):
- Why is a certain item a problem to road safety, e.g. alcohol and speeding? What do we know about the relationship?
- How to improve these road safety issues? which measures can be taken? What do we know of costs/benefits and about suitable conditions for high effectiveness?

All aspects are to be included: road, car, user, environment, regulations and enforcement (including communication strategies).
Answers to these questions can be found primarily in research reports. The legislation implemented for road safety purposes as well says something about measures being considered as beneficial; countries can learn from each other in this respect. But the most interesting are evaluation studies, clarifying the desired pre-conditions, the benefits and restrictions of legislation.
Not all knowledge is registered in reports or other readable media; experts as well are interesting sources for knowledge.
Any combination of the sources mentioned below can be chosen to start with. To select sources for the first version, a criterion could be the easy availability of information (within the condition of relevance, of course). We suggest that in the end, all sources should be involved in the process, selected according to the list with key items.
If no suitable sources are available for an area of interest, this should be reported to the Commission, as this might be a reason for initiating further research.

Research reports
The European Union funds international research and development. These projects bring together a great deal of knowledge, mostly on paper. The accessibility of this knowledge would be greatly enhanced if, in one way or another, it would be entered into the system. This would fit perfectly into the policy of the European Commission, which is to disseminate the results of their projects as good as possible. Lists of funded research projects (finalised, on-going and planned) are available at the Commission and through the EU Transport Research Website as well.

It is not necessary to limit the contents to European research reports. The IRRD gives access to abstracts of reports. We propose to select the five most relevant and actual reports on the key items mentioned above and make a reference to them in the European Road Safety Information System.

National ministries and research institutes are another source for knowledge. We suggest to give each EU-country the opportunity to propose a selection of 3-10 most interesting recent reports (including international overviews produced by one country).

Legislation
For national legislation there are some international sources to be examined but for information on regulation the EU member states will probably also be indispensable sources of information.
The Economic Commission for Europe of the United Nations (UN/ECE) does inquiries about national road safety regulations and compiles this into documents; the document of June 1997 contains information about the Netherlands which was outdated by then.[4] This means that, before entering information into the system, it has to be checked against national sources. European legislation is to be gathered via the European Commission.

[4] (use of seat belts at rear seats is obligatory, if available, since 1992 and since 1985 periodic technical inspections are obliged; both are not mentioned in the overview).

Experts
There are many organizations in Europe with very useful knowledge and experiences, who might want to get the opportunity to make themselves known via the information system, to enable others to contact them.

7.2.3. *Type of information to be entered into the system*

The contents can be more or less extensive. In principle the options are:
a. meta-information (bibliographic data or links to Websites);
b. complete documents;
c. abstracts;
d. short state-of-the-art documents, based upon the selected reports and other documents;
e. a combination of these options.
It can be decided for each document separately how to handle.

A distinction should be made between published reports and on-going research; about on-going research often it is only permitted to say something about the subject, the research method and the participants.

In this section some options mentioned will only be possible with an Internet-solution, like linking to other Websites.

Ad a: meta-information and links
This is the minimum option, where only bibliographical data are presented, classified by area of interest and other key words. The difference with a general documentation system lies in the selection of the documents; this selection helps the user in finding the quickest way to the information needed.

Ministries, research institutes and other organisations working in the field of road safety present themselves and their knowledge in Websites more and more. If they have English versions, a link to their Website can be considered. The European Commission disseminates formal information through Internet (in 11 languages) more and more, among others about European legislation. Links to these Websites can be added as well, stating what can be found in the Website according to the same search system (areas of interest and other key words). Offering only links to other Websites and not the relevant information itself, can be a disadvantage in the case a Website contains much more information than the user needs, without having a suitable search structure.

Ad b: complete documents
There are clear advantages of including complete documents: the user can be offered a free search possibility in the complete text and the user can look for the actual answer to his or her question. In addition he or she print (parts of the) document.
There are possible obstacles: copyright and language. Permission of the 'owner' of the document is required for electronic publishing and national reports in the native language can be read only by a part of the users. This implies that *option b)* can not be the only one applied and that this option is especially suitable for English reports.
If the document can be delivered by the author or the editor on a computer readable medium, the including of complete documents does not require much

effort. An alternative is to scan the document, but this will require some checking and correcting.
Where a Website is used as a source, in principle part of the contents can be downloaded. It is important to assure that if the Website in question is updated, the Road Safety Information System is updated as well.

Ad c: abstracts
The abstract of a research report should state at least:
- organisations involved;
- aim of the study and research question(s);
- short description of the research method;
- main results and conclusions.

An abstract is meant to help the user in deciding which documents to read; it will seldom directly give the information looked for. In many cases abstracts of key documents will be available already; the question then is whether those abstracts may be used. This has to be discussed e.g. with the OECD regarding the IRRD. Another question is whether the existing abstracts are suited for inclusion in an information system; electronic distribution of information poses its own requirements to structure and references of documents.

Option c) might require a substantial amount of work.
With respect to legislation an abstract is proposed as well. This should at least mention the rules in force and preferably also the motivation.

Ad d: state-of-the-art-documents if not available yet
This is the option which might be the most helpful for the users, but which will require the biggest effort as well. In the Netherlands the Road Safety Information System states for every area of interest:
- the (quantitative) relationship of the issue in question and road safety;
- the magnitude of the problem, developments and explanations;
- quantitative targets that are set and whether it can be assumed that those targets will be met;
- methods to attack the problem and references to handbooks and guides;
- relevant literature on the subject, with an abstract of key documents;
- annotation of the data source(s) used.

This type of texts are the most efficient means to get fully informed about an area of interest.

Ad e. combination of several options
We propose to start with a combination of the *options a) to c)*, depending upon formal issues, financial limits and the relevance of the subject and the report. The more relevant the report is, the more reason there is to include the full document. Of other reports abstracts are included when available; otherwise the Information System could start presenting bibliographic information.
It can be considered to develop state-of-the-art documents as a next step. Besides references to documents, links to Websites can be presented in the first version of the Website.

7.2.4. *System of key words*

A clear and consistent system of key words is very helpful in searching for interesting information.
The IRRD has an extensive thesaurus in four languages (English, German, French and Spanish). If it is considered too extensive, it can at least serve as a starting point.

7.3. Method

In principle the following method will be used with respect to information registered in documents or Websites, including legislation:

1. reports, other documents and addresses of Websites are asked for at certain sources;
2. the information sent is judged according to agreed upon criteria;
3. if necessary, the information is edited;
4. if necessary, the information to be included is sent back for validation purposes.

7.3.1. *Asking for information*

Sources to be approached, are:

- the European Commission;
- ETSC;
- OECD;
- denominated national experts.

Before turning to the European Commission for road safety research funded by the Commission, the Transport Research Website is studied and information is extracted. That however is not sufficient, first because this does not provide the complete report and second because the information on this Website is not updated frequently enough. As a consequence it is necessary to validate the information, first at the Commission (who might be informed already) and optionally at the project leader. Approaching the project leader, for validation purposes or to request the report on a computer readable medium, is preferably done by a national correspondent (see section 7.4).
The IRRD contains abstracts which could be interesting to use; it would handle only about a selection of documents in the IRRD. This has to be discussed with the OECD. An alternative is to approach the compilers of the abstracts through the national correspondent and ask them to provide the abstracts.
The national coordinators are the proposed channel to national knowledge. From the inquiries it must become clear which parts of the documents are allowed to be published electronically through the European Road Safety Information System and under which conditions.

Organisations providing information are asked to send new information when it is available. Once a year it is checked via the channels mentioned above. Special attention has to be paid to updating of the information about legislation. This is done by returning the information entered into the system to the source and ask to validate and adjust it.

7.3.2. *Judging the information*

To keep the credibility of the system, it is necessary to check information before including it. We propose that research results to be entered in the European Road Safety Information System meets the following criteria:

- clear;
- relevant (matching one of the chosen areas of interest);
- recent (the newest insights available);
- verifiable, qualified and universally accepted;
- no politically sensitive statements if they cannot be based on facts;
- no commercial involvements;
- preferably in the English language.

It is recommended to publicize the criteria chosen, to enable organisations to take them into account. It is also to be considered to limit the number of reports referenced per country, to prevent unbalances in the contents.
For each document it is determined whether it will only be referenced by bibliographical data, it will be entered completely or an abstract will be presented. Criteria are mentioned above (*option e)*).
The description of legislation must be clear. It is advisable to develop a format which is to be used be each provider of information.

7.3.3. *Editing the information*

Editing will often be necessary. This is especially the case when an abstract is desired but not available in the right format (*option c*), when it is decided to compile state-of-the-art documents (*option d*) or when the desired information is not available in English.
If texts contain personal opinions, political preferences or advertisements, they will be rejected (see 7.2.2) or adjusted to objective information.

7.3.4. *Validation*

The proposal for information to include, is sent to the organisation which is in the position to authorize it. This might be e.g. the Ministry of Transport or a research institute. The most convenient way seems to give the organisation two weeks to react; if they do not do so, approval is assumed.

7.3.5. *Method with respect to who-is-who*

Regarding references to expert organisations being entered into the system, we propose that organisations are invited to apply when announcing the system. They are asked to fill in a format (to be developed), at least containing address, special expertise, and main activities of the organisation. After checking the organisation against some agreed upon criteria, the administrator enters their information into the system. Criteria might be whether they can clarify what they can mean for road safety, what they are prepared to do for free and, which services have to be paid for.
Further we propose that they themselves are responsible for the correctness of the information in the system. Technically spoken there are two possible methods for updating when the choice for Internet is made:

1. the organisations send a special form to the administrator, who adjusts the information;
2. the organisation adjusts the information itself.

The second solution requires an investment in a quite extensive system administration but has relatively little operation costs. The first solution is the simplest one.

7.4. Organisation

The organisation maintaining the Information System on behalf of the Commission has the following tasks:
- coordinating and facilitating;
- contacting international bodies;
- processing of the information received.

We recommend that national correspondents are appointed in each country (see also chapter 9), who can act as the link to national sources. They must have (or be able to obtain) the overview of what is available at e.g. the Ministry of Transport and road safety research institutes and they must know whom to approach. With each correspondent it should be agreed to what his or her organisation commits itself.
The responsibility for the information in the system must be clear. In general The European Commission is responsible for the information; if in particular cases another organisation is responsible, this should be explicitly stated. The responsibility of the Commission requires clear arrangements with the administrator.

7.5. Quality control

Activities undertaken and reasons used to decide what to do with information received, will be documented and brought at the disposal of the Commission.

7.6. Documentation and computer readable media

The result of the activities will be added to the European Road Safety Information System. As stated in the last section, a statement of what has been done and why, is available for the Commission.

8. Consumer information

Apart from giving information to 'professionals', the system should also provide information for the 'Consumer Market'. Every year, a substantial part of European money is spent on road safety projects which are also important for individual citizens. For example, the many Crash Tests of various car makes and models.
There is also other information that can be important to the citizen when travelling through various countries; for example the different traffic laws. In a number of cases, this, and other relevant information is already available through national traffic consumer organisations. The greatest problem here is probably that of uniformity between the different countries.
The language in which such information is given is more important for consumers than for professionals. Although professionals can probably be content with English, the consumer must have such information in his/her own language. Because of this, it is of utmost importance to examine the extent to which Websites of local organisations, which already exist, can be used (linked).
Maybe those organisations having no Website, but do having valuable information, can be prickled financially to putting their information on the Internet. The other way round is also possible; viz. those organisations having a Website, but not sufficient information. These organisations should be encouraged to put desirable information on their Website.
Knowledge tests are a popular method for presenting traffic rules; people feel challenged to think about the subject themselves and get immediate feedback. It is further to be considered to include campaigning information, explaining to road users why it is important to follow the rules, supported by facts.

Subjects that could be included especially for road users and consumers are:
- crash test per make and model of car;
- knowledge test of traffic rules & laws (national);
- knowledge test of traffic rules & laws (Europe, differing laws, etc.);
- knowledge test on alcohol (alcohol use measurement);
- knowledge test braking distance (moped, motorcycle, car);
- campaigning information, illustrated by facts;
- key information on road traffic safety, to be reached using clickable maps;
- information of national information centres.

9. Plan for information input, control and distribution

The availability of relevant information does not guarantee the timely input of this information into the database. Proper procedures are needed to ensure this. This is very important because, for virtually every kind of data, the process of gathering the data, checking their quality, inputting them into the database and making these data available to the users will have to be repeated regularly, usually on an annual basis.

9.1. Organizations to be involved

Different roles can be distinguished regarding the data input process. Although the proposal for the first version of the Information System is based primarily on the relatively easy availability and on relevance, extensions and adjustments should also be based on user requirements. It would therefore be a good idea to set up a **user group** in order to obtain feedback. This group could, for example, highlight important subjects or the desired level of detail. This is described in further detail in the section 'Marketing and Users Support'.

The feasibility of the user requirements needs to be looked into. This could be done by a group of **correspondents**. These correspondents should have an overview of available information in their own country and of the quality of the information. They should preferably not have affiliations to policy, which will enable them to make independent judgments about national sources. We propose that they act as a 'broker' between national data sources and knowledge on the one hand and the information system on the other hand. The next section clarifies their role further.

Decisions will be made by the **European Commission**, advised by the High Level Group or another board. Different options are explored in the section 'Management'.

The **administrator**, being the organization maintaining the system on behalf of the Commission, will organize and facilitate communication and strive for good mutual understanding between all the parties involved.

9.2. Correspondents

There will be a minimum of one correspondent for the data (and knowledge) per country. In principle this can be a person or an organization. This correspondent must be independent of the policy and have no vested interest in certain results. They must be an expert in the field of road safety. Who will be correspondent, has to be discussed with each country separately.

The correspondent will be primarily responsible for the provision of the data and the associated quality of the information. This means:
- giving advice on the right (= best) data sources;
- concluding agreements (or acting as an intermediary in this) with possible data suppliers;

- ensuring that the agreed data are made available;
- ensuring good-quality information from each source.

If the correspondent suggests that central data sources be used (such as CAREplus and IRTAD) which are also available to the administrator, the administrator can, after consultation with the correspondent, obtain the required data directly from these central sources. The correspondent will still be responsible for the overview of quality.

The correspondent or the organization to which he or she belongs can also play a role in support and national marketing. This will be explored in further detail in the section 'Marketing and Users Support'.

The correspondent will carry out the activities under the auspices of the administrator.

9.3. **Preparation** (*Scheme 9.1*)

9.3.1. *Establishment of required data*

In close consultation with the user group the requirements regarding the information which the group would like to see included in the information system will be established. Once the requirements have been charted, a study will be carried out into the extent to which these data are available and to what level of quality. The group of correspondents, the data experts in the various countries, will be used for this. In consultation with them, discussions will be held with possible suppliers about the applicability and the quality of the data (see chapter 4: 'Criteria for Quality').

On the basis of this information a proposal can be made about the purchase of these data. The data (of sufficiently good quality) will not always turn out to be available. In this case one consideration would be to recommend improvements to the data or to propose that the data be collected after all.

9.3.2. *Decision-making*

On the basis of the proposal the decision-making partners can indicate whether they do in fact want to include the data concerned of the quality indicated in the information system. The costs and the degree of detail and accuracy of the data will play an important role in this.

As soon as a decision has been taken to include the data concerned in the information system, the preparations for this can begin. The requested data will not always be available for every country. One factor which could play a role in the decision-making is the number of countries which have the information.

9.3.3. *Supply agreements (what, when, how, etc.)*

Definitive agreements will now have to be concluded, if necessary through the national correspondents, about the way in which the data are to be obtained. It will be established what data will be supplied in what degree of detail and

in what form. Agreements will also be concluded about the supply deadline. The correspondent will be responsible for a good description of (the quality of) the data supplied. All the agreements, together with agreements about possible costs and supply conditions, will be set out in a contract.

Moreover, good agreements need to be concluded about who is authorized on behalf of the Information System to hold these discussions and conclude these agreements with possible suppliers.

9.3.4. *Establishment of meta-data, preparation for input*

Using the information issued by the supplier a start can be made on the establishment of meta-data in the information system (specification of e.g. variables and classes). This will prepare the system for the input of the new data. Also the input program can be made, geared to suit the form of the data supplied.

For these activities a test supply would be preferred.

9.4. **Production process** (*Scheme 9.2*)

9.4.1. *Progress checks on receipt of data*

The dates on which the data are to be supplied will be recorded in the system based on the agreements. If there has been no update or input within a certain amount of time following the agreed supply date, the system will give an alert signal. On the basis of this signal a check will be carried out to ascertain the reason for the delay. Depending on the outcome of this, a decision can be taken as to whether additional measures/activities are needed.

9.4.2. *Quality control of the data received*

When the new data are received, a quality check on design and content will be carried out. The form and the internal consistency of the data received will be looked at. In as far as earlier supplies have already been input into the system, consistency in terms of time (breaks in trends) will be examined, and in the case of overlapping periods possible differences will be looked at. These checks should to a large extent be carried out automatically.

Irregularities noted during the quality control do not always have to indicate incorrect data; they could, after all, be corrections to data supplied earlier. All irregularities noted need to be discussed with the correspondent as regards (possible) explanations for these differences. In the case of the supply of incorrect data the correspondent preferably arranges the supply of the correct data. If the data are correct, but there are corrections or other explicable developments, this information will be input into the system (source files and/or the interpretation).

9.4.3. *Input of data into the system*

Once the data received have passed the quality control, they can be input into the system. In addition to the data, the associated texts (source file,

interpretation, etc.) also need to be modified or supplemented. In view of their national knowledge, this information can best be handled by the local correspondent. The administrator will then be responsible for the good internal consistency of all the national information supplied within the system. To get this information into the system in due time good agreements need to be made.

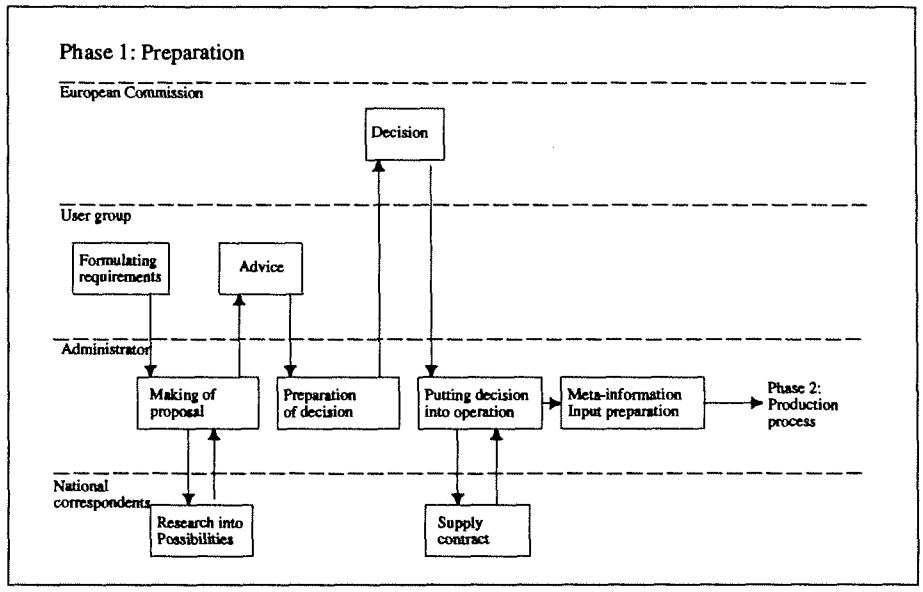
9.4.4. *Quality control of consistency in time-series*

When the data and texts have been input, one last check is carried out. This is a check on the correct input of the data and the correct references to the texts and other special items.

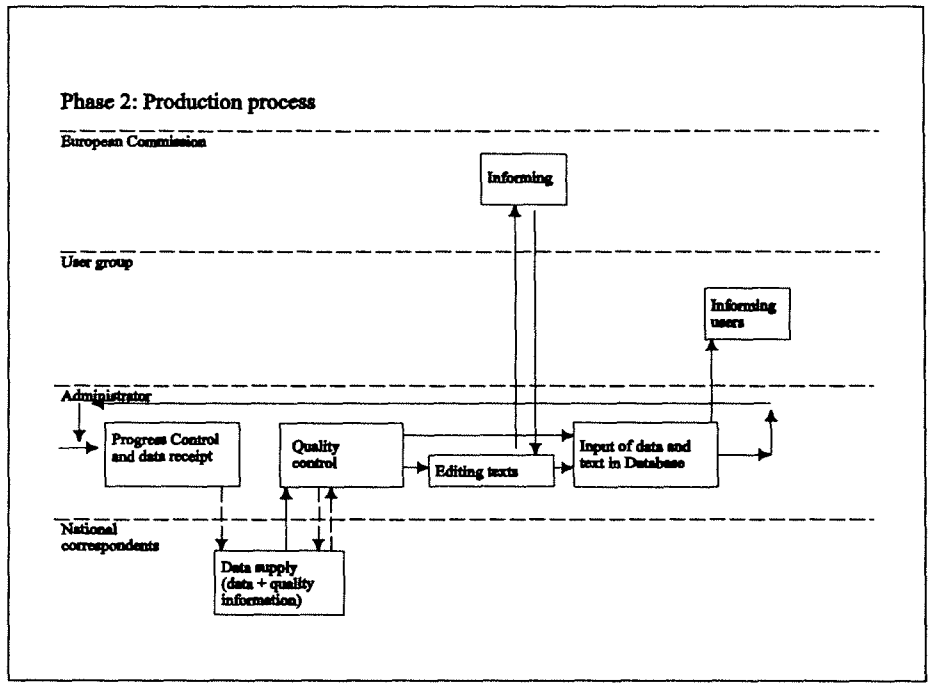
9.4.5. *Making the data available*

Once all the quality controls have been successfully carried out, the new data can be made available to the users. If the choice for Internet is made, in principle all the data are put onto the Website. As an alternative for users not matching the technical requirements (yet), parts of the information will be distributed e.g. on paper at certain frequencies.

As well as the information being made available, the release information is modified, the newsletter which is being drawn up is modified and any other signals are modified which provide the user with the information that new data have been input into the system.



Scheme 9.1. *Development process (phase 1) of the 'European Road Safety Information System'.*



Scheme 9.2. *Production process (phase 2) of the 'European Road Safety Information System'.*

10. Marketing and users support

10.1. Introduction

Marketing and users support are indispensable for getting 'return' on the investment in the information system. Potential users must know that the information system exists and must have an idea of the type of information they can find in it. To keep the system in line with what users regard as relevant, they must be able to give feedback. Without users' feedback, it is very difficult to keep the system attractive. The world evolves and so do users' needs as well as possibilities to provide a better system. If users have questions, remarks, or wishes with respect to the information system, they should be able to utter them and the issues raised, must be taken into account.

To make sure that a working system is launched which appeals to users, we propose to start with a test, offering the system to a restricted group of users for a certain period, e.g. three months. The aim of the test phase is to get user feedback on the application (aspects like functionality and ease of use) and the contents (issues like selection of subjects and type of information; clarity) and to find out which support is needed.
Proposals are made for the different stages of development, especially what has to be considered before the system is launched, how to operate in the test phase and what can be considered as 'normal' marketing and support activities in the operation phase.

10.2. Decisions to be taken before pilot starts

Access, type of distribution and pricing
In principle the Road Safety Information System will contain public information, which is gathered with public money. In that case there is no reason to prohibit anyone from looking at the information system nor to ask a price for the information. Only handling costs could be charged, which then should be attributable to organisations or persons. In the case of making a Website available, there are no attributable handling costs so we propose not to charge users in that case. If CD's are to distributed, a fee could reasonably be asked.

It is another situation when information is entered into the system where normally clients would be charged for. This is not the desired situation, but it might be the best solution for some parts of the system. In these special cases the access, the pricing and eventually a financial compensation will have to be discussed with the owner of the information. It could even the case that the information system gives access to another information system, for which subscription is required. Anyway the information system will not provide information for free when that means that the official provider is injured financially. A solution could be to work with chargeable subsystems (or links in the case of a Website), which of course should be made unambiguously clear to the user.

Not all interested parties will have access to Internet yet. When it is decided to choose for a Website, we advise to send a selection of key information to restricted population and on request. We suggest to send the paper version only to the national (and federal) ministries and the network of national correspondents, which is discussed chapter 7, who then can take care of distribution in their own country. This could be done free of charge. If others ask for the paper version, we propose to charge handling costs.

When intending to offer information electronically to European citizens (road users and consumers), this is practically only feasible through Internet. In theory it could be decided to send CD's to thousands of citizens, followed by periodical updates, but it is not what we advise to do.

Preparation of test phase
It has to be decided how to compose this pilot user group. We suggest that each country, maybe through the members of the High Level Group, nominates five road safety workers, belonging to at least three different organisations, who will be working with the system and sharing their experiences with the organisation maintaining the system on behalf of the Commission. Of course they must understand the English language. If a Website is offered, they should have access to Internet. Preferably they have affinity with information systems; otherwise it can not be assumed that they will work with it sufficiently.
Furthermore it has to be decided how the test users will be supported. If it only a limited number of users for a limited period, it is advisable to centralize the contacts; the focal point could be the organisation maintaining the system on behalf of the Commission.

10.3. Activities during the test phase

To get commitment of the test users, we advise to organise an introduction meeting, where the purpose of the system is explained and the system is demonstrated. It is also to be clarified what is expected of the users and whom they can turn to with questions and remarks.
During the test phase, all users should be contacted at least once, to make sure that they try the information system and have no barriers to do so.
We suggest to prepare an evaluation form and send it to the test users towards the end of the test phase. The test phase could be closed with another meeting, where the experiences and possible improvements are discussed. Such a meeting will put some pressure on the test users to prepare a thorough judgement. It also enlarges the chance that they will promote the system in their own country.
The strong and weak sides of the system, proposals for improvement and the support needed are to be reported to enable decision making for the next phase: introduction of the system for all potential users.

10.4. Recommendations for arrangements before starting the operational phase

Brochure, free publicity and newsletters
If people want to be informed about the system, a brochure is very helpful. We advise to prepare this before the official introduction of the system.
Free publicity in professional journals draws attention as well; it is advisable to seek this regularly.

Improvements and plans can be published through a periodical Newsletter. A number of newsletters could be send to the national correspondents, who then distribute it in their own country. This keeps people alert of the system.

Introduction of the system
If the system is introduced at a special occasion or with some conspicuous news, this will draw extra attention. A functionary who is in some way or another (politically) responsible for road safety in Europe could e.g, after some handing over or opening action, request the accumulated number of death in the European Union in 10 years from the information system. Maybe a new Road Safety Action Programme could be announced as well.
To get attention in all European countries it might be necessary to invite road safety representatives of each country or to join a meeting where they are present already.
Presentations at international and national congresses are a good way of informing the target groups of the information system.
Eventually national introduction meetings can be considered as well.

Users support
With a potential enormous amount of users, support can only be limited.
Of course users should be able to contact a central address for technical problems. As the information system is not a mission critical one, we propose that they can do so only by e-mail or by fax, because telephone calls can disturb people's work.
Other questions can regard the information presented, requests for extra (national) information and suggestions for information to be added to the system. For these questions and remarks different options can be considered.
The zero option is that no additional support is available, from the principle that the information in the system is all that can be made available. But this would in the end be contra-productive, because, as mentioned at the beginning of this chapter, being open to suggestions for improvement helps keeping the system attractive.
The second option is to give the opportunity to express suggestions but users get no personal answer. All remarks could be directed to a central point (e.g. the administrator).
The third option is that users get a reaction to all their requests. Directing all these questions to a central point, would probably mean a too heavy burden and would probably be too expensive. An alternative is to make arrangements with national contacts. Anyway a distinction should be made between professionals and other citizens; these groups need a separate focal point.
Preferably these focal points are organisations who see the support of professionals or citizens with respect to road safety as their responsibility. Presumably they still will not be prepared to give the support within the framework of the European information system for free, because it means extra work for them.
They in their turn should, if necessary, also be able to fall back on some central support, e.g. the organisation maintaining the system on behalf of the Commission.
Independent of the choice for the second or the third option, all questions should be registered and analysed periodically, to see which adjustments to the application or the contents should be considered.

User feedback
As stated earlier, to develop the system in a way that suites users' needs and wishes, feedback is needed.
A solution could be to organise national meetings of users representatives and let a representation of these user groups meet in a European context. We propose that the composition of the national users group is the responsibility of each country.
The meetings should be prepared partially by a central organisation. Proposals and special questions are to be coordinated by the organisation maintaining the system on behalf of the Commission. A system of national correspondents would be very helpful here as well.

In addition to, or as an alternative to user consultative bodies, a periodical evaluation of the system can be considered, e.g. an annual survey. If there is no physical distribution to named organisations or persons, the users are not known at a central location. In that case it is difficult to know whom to send the questionnaire to. Here again a network of national correspondents seems the best solution, who make sure that key organisations receive a questionnaire.

Organising user meetings will ask for a larger investment in time than evaluation on paper but it will be far more informative and contribute more to the use of the system.

11. Development and maintenance

For the yet to be developed CRASH-system, a choice has to be made about the supporting operating systems. A design also has to be made of the system itself.

11.1. **Choice of supported hardware/operating systems/network**

Computers are now half a century old. During their development many types of systems have sprung up. This heterogeneity is tantamount to incompatibility. Across Europe there is a wide range of hardware, operating systems and network protocols. So the challenge is to serve as large a user group as possible and at the same time to keep the complexity of the system to a minimum.

11.1.1. *Windows*

The desktop is dominated by PC's which run under Windows. By choosing a system under Windows, one can serve just about every potential user. This is an obvious choice for a European-wide target group.

There is an extended arsenal of development tools available by which it can be ensured that every functional demand on the application can really be built in.

11.1.2. *Internet*

At the beginning of the 1990s the use of the Internet was greatly simplified by the availability of browsers with a graphical user interface. The use of the Internet has grown explosively since then. Increasing numbers of organizations are now offering information via this medium.

The result of this popularity is that there is technology available for using the Internet on virtually any platform. This applies to both the protocol used (TCP/IP) and the browsers.

If no entry restrictions are made, the information will be continuously available world-wide.

11.1.3. *Discussion*

Windows and Internet are both popular environments that each have their advantages and disadvantages. Both will next be compared for a number of aspects.

11.1.3.1. Distribution

The CRASH-system consists of 2 components, the contents of the system and an application to consult the contents. Both will change in time.
The application will be up-dated because of new functionality, performance improvements, and corrective maintenance.

The contents will be changed regularly because of additions of new items, or up-dating the existing contents. In both cases, users must be provided with a new version.

Windows.
It has to be arranged that the CRASH-system will be present on the user's PC, e.g. by sending a CD to every user. The system then must be installed before the user can start consulting the contents. For every new version this procedure has to be repeated.

Internet.
Using Internet, in principle one can not talk of 'distribution'; the complete system is available on a server. The user connects to the server and can start consulting the system. Additions are available the moment they are installed on the server. Every user disposes of the same information.
The updating can be a continuous process, in a manner of speaking, which benefits the user directly. Every upgrade of the user interface is also available the moment the user makes a connection.

In terms of the effort needed to get the information to the users, an Internet connection is by far to be preferred. As an information provider, all one has to deal with, in principle, is the maintenance of the Website. One does not need to concern oneself with systems at user sites.

11.1.3.2. Network connection

Windows.
The CRASH-system is integrally present on the user's PC. It is not necessary to have a network connection.

Internet.
Internet requires the presence of TCP/IP and a connection to the Internet-network. This will not be the case with all potential users. It is expected that over the years this problem will get smaller.

11.1.3.3. Stand-alone use

As just mentioned, for a system under Windows, a network connection is not necessary, but for a system under Internet, in principle, it is. This is not only a problem for potential users who do not have such a connection. Mobile users working outside their normal work-place wanting to consult or demonstrate the system at congresses etc., will experience this also as a disadvantage.

As far as the static part of the system is concerned, it is possible to download all static information (files in HTML or XML format) and to consult them later in a browser without there being a network connection.

The problems are in the dynamic part especially the cross-tabulation.
There are OLAP-applications (OnLine Analytical Processing) which can, by choice, reside at a server or locally.

So if desired, it is in principle possible the have the full functionality of the Website residing on a offline local computer. It might however put constrains on technologies and components used in the system.
A decision has to be made whether one would like full functionality offline.

11.1.3.4. Operating systems/hardware

Inherent in distributing it through the whole of Europe is the fact that there are so much different hardware and so many operating systems.

Windows
If one chooses Windows one can reach a very large group. The market share of other systems on the desktops such as UNIX, Apple, Linux, etc. is too small to develop separate versions of the CRASH-system.
In practice one will come across all Window versions: the 16 bits Windows 3.x and the 32 bits versions 95, 98, and NT. One could consider developing a CRASH-system in a 32-bits environment. In general, these are more stable and have less limitations than the 16-bits version. Moreover, one may expect, that in time the 3.x versions will be replaced by a 32-bits version.

Internet.
A CRASH-system under Internet is, in principle, completely independent of the operating system/hardware of the user. The only necessity is that the user has a browser.
Older browsers have a limited functionality. This does not matter very much for the text part. The original function of a browser was little more than requesting and subsequently displaying a file in HTML or XML format. However, for the data side of the system interaction is necessary; after all, the user has to be able to indicate which variables need to be input into the table. In practice a bottom line needs to be set for the functionality of the browser, e.g. Netscape 3 / Internet Explorer 3.

11.1.3.5. User-friendliness

Compared with Windows the Internet environment lacks sophistication. Things which are characteristic of the Windows environment and are important in making user-friendly applications - such as drag-and-drop support, MDI navigation, enabling/disabling of screen elements, fixed sequences via dialogue boxes - have no equivalent in browsers. This has very much to do with the technology, namely the stateless client server. The client asks a question of the server, and the server generates the response in the form of an HTML page and sends this back as a response. This completes the transaction. In fact the user always has a passive image on the screen instead of an active application. It is expected that in the long term browser functionality will increase and so therefore will user-friendliness.
These arguments concern the data part of the system. For textual/graphic information, the difference between the two environments is marginal. In the meantime, there are various products for sale by OLAP suppliers that show that data can be consulted in a user-friendly, interactive way.

11.1.3.6. Exchange of information

Windows
Is, in principle, a closed system that assumes no external users.

Internet
Internet is, by definition, interactive. Besides using for offering information, one can also find utilities to exchange information between users, or users and provider.
Discussion groups can cater for contact between users; the contact between user and provider can work through e-mail.

11.1.3.7. Response times

Windows.
The response times are stable because they are determined by the capacity of the PC.

Internet
Response times can fluctuate considerably. They are dependent on the capacity of the server and the network, and of course the intensity of its use.

11.1.4. *Conclusions*

The great advantage of Internet is that one can provide a world-wide distribution of information without having to worry about the users' technical infrastructure. As the information is being spread completely electronically, one is saved the expensive and time consuming physical distribution.
Everyone having an Internet connection and a browser can consult the information.
It is a future-targeted choice.

11.2. Functional demands of user application

The CRASH-system will contain qualitative as well as quantitative information. The qualitative information is, technically spoken, static (i.e. the presentation of texts, graphs, etc.). The quantitative part presents data and is interactive. The user can compose tables him/herself. Of course, the user has to have search methods at his/her disposal to obtain insight into the contents of the system.

11.2.1. *Quantitative information*

This part of the system enables the user to make multidimensional cross-tabulations him/herself.

11.2.1.1. Dynamic versus static tables

Instead of enabling the user to make cross-tabulations him/herself, one could present data by means of predefined and therefore static tables. This of course will make the system less complex and is beneficial for the performance. The problem with static tables is that either the combination of variables one is looking for is in the system or it is not.

Experiences in the Netherlands with SWOV's Road Safety Information System has proven that to be able to perform dynamic cross-tabulation is highly appreciated by the users and by far the most popular part of the system. So we strongly recommended to include likewise functionality in the CRASH-system.

11.2.1.2. Matrices

Matrixes are offered that consist of a number of variables.
These variables can be:

- classifications. These are descriptive variables, e.g. region, mode of transport, etc.
  For this sort of variable it is important that the user has a good insight into the meanings of these variables and that the classes are described accurately.
- measurements. These are variable that indicate how often certain combinations of variables occur; for example 'number of victims', 'number of vehicles', etc. With this sort of variable it is essential that the unit is clear, e.g. 'kilometres travelled (billion)'.

It is also important that the matrix can be documented as a total. For this one has to think of administrative matters as well as contents.

Matters of contents are a description of the representativeness, accuracy, and validity, etc. of the data.
The more administrative matters are supplier, date supplied etc. This is actually qualitative information. In terms of a system still to be developed, this includes the demand that it must be possible to show quantitative as well as qualitative information.

11.2.1.3. Dynamic cross-tabulation

With respect to the interactive composing of tables the requirements are:
The user has to be able to draw up tables him/herself simply by:

- indicating on which dimensions of the table (rows, columns, or pages) the classification variables are to be displayed. The minimum number of possible dimensions in one query should be 6.
- indicating conditions by selecting classes;
- taking classes together;
- storing table compositions.

Tables enable users to express the content as percentages.
Tables can be shown in graph form.
Tables/graphs can be printed out.
Tables/graphs can be exported to another environment for further processing.

11.2.1.4. Confidentiality and privacy

Publishing data raises the question of confidentiality and privacy.
Given the nature of the system, it is not likely that confidential data will be included. If it ever happens one might go for password-protection of confidential area's.

When publishing e.g. accident-data there is in principle a change to recognise individual persons. There are several ways to avoid this.

- data will be presented in aggregated tables;
- variables witch are relatively easy related to individuals will not be present in the system e.g. date of birth;
- combinations of variables witch might result in the recognition of individuals will be avoided or shall yield a sufficient high number to avoid recognition.

Given the proposed contents of the system, it is not very likely that privacy will be at stake. However, every time a matrix is defined, it will be examined on this aspect.

11.2.2. *Qualitative information*

This contains documents which may contain graphic elements as well as text. Users have to be able to move the content of the document to their own document.
Apart from textual information, other forms of qualitative information are possible. Examples are: animations, video, clickable maps, music, etc. Such means are especially relevant for information aimed at consumers. One can also imagine instruction material, selection of national information, etc.

11.2.3. *Search methods*

It is very important for both the users and the administrator that the content of the system be clearly organized.

- The content of the system will be described in the form of topics.
- Keywords will be linked to each topic. Users can both run through the list of topics and search on specific keywords.
- The content will have a tree structure. Users will be able to use this structure to access the information concerned.
- The content can be searched using words input by the user. This is a normal search method, especially on the Internet (free text search).

11.2.4. *How to use the system*

Users are faced with an abundance of information systems. Naturally they can learn how to use one system. However, the large number of different systems makes it impracticable for users to go on a training course for every information source they want to consult. If the system is placed on the Internet, then it is impracticable and not desirable to try and give 'everybody' a training course.

The operation will therefore have to be as intuitive as possible.

Obviously there needs to be a help function for the use of the system. This can take the form of text or of graphics. A good 'running demo' can make a course redundant.

11.2.5. *Multi-linguality*

The CRASH-system must be capable of offering its information in a number of languages. With qualitative information (the menu structure, key words and texts) this is quite straightforward. One makes identical parallel structures in which, per subject, the contents are given in another language. As far as the quantitative information is concerned, there must be facilities in the data model and the interface which can be supported in different languages.

11.2.6. *Access*

It is possible to completely or partially limit access to the CRASH-system. This might be necessary to meet conditions of information providers but it is not the preferred situation.

11.2.7. *Examples*

The above describes the main lines of the required functionality. It is of course possible to work these out in detail to the level of an Functional Design. This is an activity that falls outside the scope of a feasibility study. There are, however, two examples of applications that demonstrate which functionality is required.

BIS-V
This Road Safety Policy Information System has been developed by SWOV, commissioned by the Ministry of Transport. It is a system that offers users quantitative and qualitative information in a simple fashion. Within this project, an adapted version was developed to demonstrate which sort of functionality CRASH required.
The information system is operational at the Ministry, the provincial safety boards, the provinces, the police, and a number of municipalities. The system was designed to work in Windows and has a client/server architecture.

Cognos - Powerplay
Cognos is a world-wide operating company that produces, among others, Powerplay. This is a typical OLAP-product that enables the user to quickly, interactively analyse a matrix. It is the sort of product that the data section of CRASH could employ.
The original product worked in Windows. Nowadays, a version has been developed for Internet. There is a demo on the web available under:
http://ppweb.cognos.com/cgi-bin/ppdscgi.exe?xt=highlevelcube

Examples of the functionality of both systems can be found in *Appendix B.*

11.3. **Development environment of user application**

For developing a Website there are many tools available. In principle, the developer can choose which working system and tools he requires.

As far as the qualitative information in CRASH is concerned, no special problems are expected. The presentation of texts, with or without explanatory images, fits excellently in an Internet environment.

A number of points requires further attention.

11.3.1. *Quantitative information*

A user interface in Internet for requesting data can be obtained in two ways: tailor-made or by using existing components.

11.3.1.1. Tailor-made

One can decide to re-engineer the functionality of BIS-V by using a development environment that is suitable for Internet use.

The advantage of a tailor-made interface is obvious: the product can be made entirely to one's own specifications.

There are also disadvantages.
The re-engineering cannot be 1 to 1. There are too many differences between the Windows environment and Internet. Especially the handling of dialogues have to be redesigned.
Another disadvantage are the costs. In principle, the design effort is limited; one always has a clear example. However, quite a lot of programming will be necessary. There can also be consequences for the elapsed time of the project.

11.3.1.2. Components

A development that has lately received a lot of attention is the Component Based Development. The idea behind this development is based on the finding that every time one achieves a new design, one is confronted with:
- high costs;
- long elapsed time periods;
- maintenance and correction of mistakes.

If one uses existing components for (parts of) a new application, this results in lower costs, shorter elapsed time periods, and a greater stability.

As there is a number of companies that offer their OLAP products for an Internet environment, there is a lot to be said for *not* starting one's own development, but to integrate existing components in the Website to be developed. The already-mentioned Powerplay of Cognos is a good example of the above. The disadvantage of this approach is that one has hardly no influence on the functionality of the product.

11.3.2. *Stand-alone use*

To be able to work off-line is also a desirable situation. Mobile use of PCs is increasing, whereas the availability of facilities to lay wireless contacts with Internet are, at this moment in time, only very limited. It is also desirable that the CRASH-site can be downloaded integrally, and can be used off-line. This aspect should be kept in mind when choosing a development environment.

11.3.3. *Search method*

The already-mentioned search methods can be achieved in an Internet environment by free text search and tree diagram. Searching by means of key words involves the necessary consequences, particularly on the provider side. Every relevant item/document must contain key words. These must be, of course, unambiguous and immediately recognizable as unique for a computer. This argues for a method in which documents and key words are stored in a relational database so that the choice can take place unambiguously.

11.4. **Functional requirements regarding the administration environment**

Presenting a consistent contents to the user requires good management. To achieve this, a number of provisions have to be made.

11.4.1. *Maintenance*

The content of the system consists of components which are inter-linked. A good example is a data matrix. The content is described by means of variables; the content of the variables is described by means of classes. In addition, the content of the matrix is described in qualitative terms such as representativeness, validity, etc. The basis of the system is therefore formed by a relational database. This is an excellent tool for establishing and monitoring the link between components.

For efficient administration a good tool which manages the database is required. In addition to obvious functionality such as being able to input new items and process existing items, this tool should also provide insight into the relationships between the items.

11.4.2. *Deployment*

Given a relational database in which the contents of the system are stored, provisions should be made to publish the contents in Internet. Depending on the demands made by the user interface still to be developed, one can consider routines that upload the database to the web server, or techniques making it possible to read the contents directly from the database.

This last is a technique that is being used ever more frequently. Then, one often makes a separation of form and contents. This is to achieve a consistent form and altering the contents has no consequences for (the ways of) presentation.

The way in which the data are provided depends on the user interface chosen. Characteristic for OLAP products is the data cube. This can usually be generated simply from a relational database.

Texts will have to be converted to HTML. Current word processors offer the facility of saving documents in this format. Large texts will have to be split up into sections and sub-sections. It is recommended that this should not be done manually but rather using a tool such as HelpPerfect.

11.4.3. *Documentation*

The working of the system and the way in which the system is maintained, should be well documented. The types of documents are:

System design
A description of the functionality of the system and the way in which this has been achieved. Alterations in the system are kept up-to-date in this documentation.

Production and Maintenance
- the procedures for keeping the system operational
- the procedures for altering the contents of the system
- the procedures for publishing the system
- the procedures for the system backup
- documenting the configuration of the system.

11.4.4. *Hosting*

It is assumed that the hosting will be taken care of by the EU.
It should be ascertained whether special requirements have been set for the software to be used. The server operating system in particular can be of importance in the choice of software for the data part.

Moreover, measures should be taken regarding maintenance. These should take the form of a connection which enables the administrator to modify the content of the site.

11.4.5. *Shadow*

A disadvantage of modifying a web site is that the modifications are immediately operational. In other words, while one is developing and testing, this is at the same time visible to the 'world'. This is not desirable, especially for the data part. It is recommended that a site be set up where the development takes place. When the test phase has been completed, the content can then be transferred to the production site.

11.4.6. *Availability*

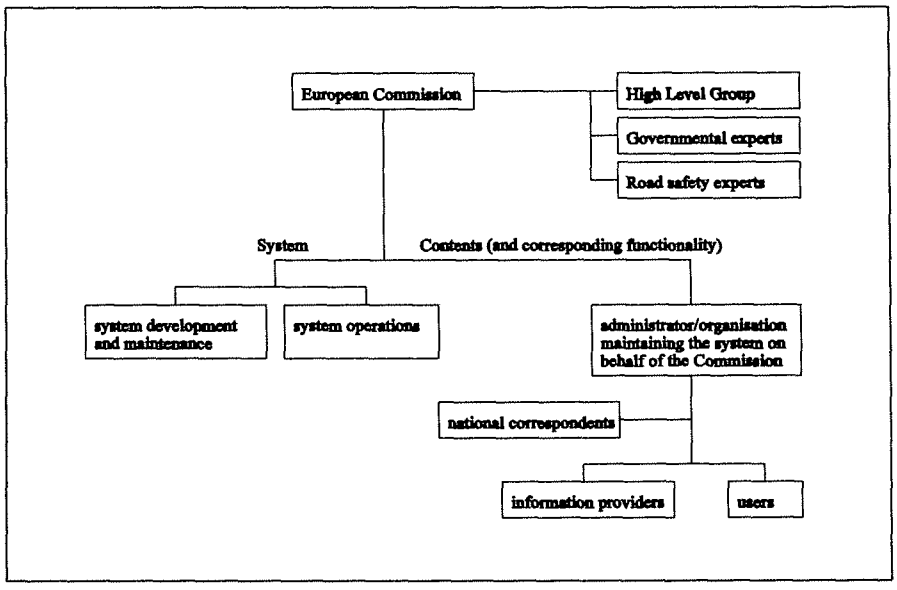
Given the quality of current computer systems, virtually continuous availability is a possibility. It will be mainly administration work such as upgrades to new operating-system and system-software releases that will render the system temporarily unavailable for the end users.

Given the nature of the information, this cannot be considered a mission critical system. So there is no basis for taking special measures other than carrying out the maintenance of the system as much as possible outside office hours.

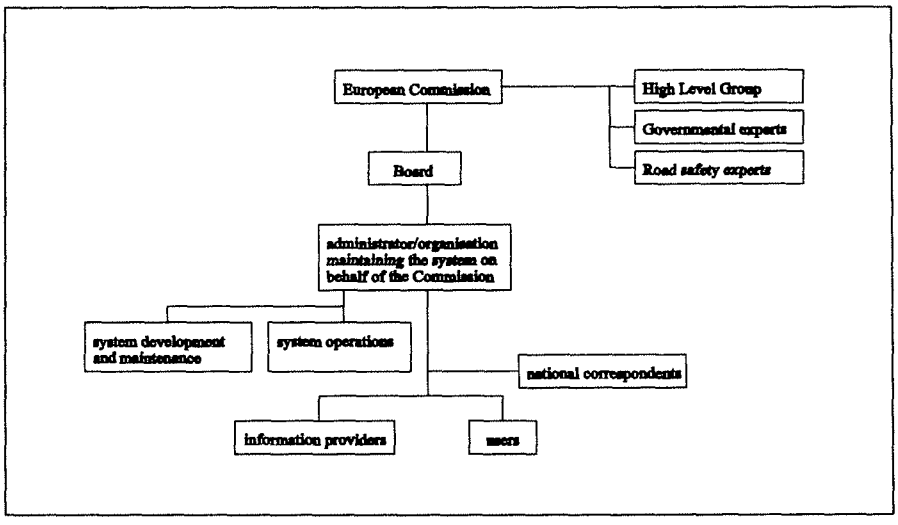
12. Management and organisation

12.1. Introduction

In this chapter the parties concerned, their possible roles, and the decision structure will be described. Starting point is *Scheme 12.1.* Alternative solutions are shown in *Scheme 12.2.* Both schemes are discussed comprehensively in the next sections.
An overview of activities and an estimation of required efforts is to be found in section 12.6.



Scheme 12.1. *Structure (option 1) of the parties involved in management and organisation of the 'European Road Safety Information System'.*



Scheme 12.2. *Structure (option 2) of the parties involved in management and organisation of the 'European Road Safety Information System'.*

12.2. Management

The Commission decides about the system, in consultation with parties involved, e.g. the High Level Group.
In addition to this and partly as an alternative, the Commission could install a Board, who is allowed to decide about the information system within certain restrictions set by the Commission (e.g. with respect to budget and type of information). The advantage of this is that it would save the Commission work, while still assuring that broadly supported decisions are taken. Above that, the board could be composed of people having special affinity with electronic distribution of information.

12.3. Preparation and execution of decisions

The decisions have to be prepared by the administrator, who is advised by the national correspondents. They should bring together the users' needs and wishes on the one hand and efficient solutions on the other.
Preferably the administrator prepare an annual plan with a budget estimation, which can be decided about by the Commission. The plan should leave some room for unexpected new wishes and new insights, as responding quickly to urgent wishes and new situations highly contribute to the popularity of the system. The annual plan could be part of the contract with the administrator.
This organisation acts and decides within the boundaries of the contract with the Commission and reports to the Commission about this. It coordinates the actions of the national correspondents, with whom it keeps in touch regularly.
The profile of the correspondents is to be found in chapter 9.

12.4. System development and maintenance

It is supposed that a group of specialised technical experts is responsible for the application.
To be decided is whether they work on behalf of the intermediate organisation or directly on behalf of the Commission. This is, among others, a matter of time and available expertise. If an external consultant would be engaged, the preferred situation is to keep executive responsibilities for the system in one hand, that is with the administrator. If the Commission would take care of technical development itself, this would be less logical.

12.5. System operations

Having the hardware and all the necessary software run, is the last distinguished responsibility. The same considerations with respect to reporting lines are valid as with system development.

12.6. Estimation of required efforts

All activities to develop and maintain a EU Road Safety Information System are summarized in two overviews: one for the development phase (*Scheme 12.3*) and one for the operational phase (*Scheme 12.4*). These overviews give an impression of what is involved in setting up an information system. An indication of the required effort is added (in man-months), as well as an estimation of the elapsed time (in months as well). The activities in the

operational phase are spread over a period of 15 moths. This reflects the gradually growing and developing of the system, which might take relatively much time in the first years.
A final budget estimation can be made after the necessary choices between different options have been made.

Activities Phase I "DEVELOPMENT"	MM.	NUMBER OF MONTHS 1 2 3 4 5 6 7 8 9 10 11 12
1A. PREPARATION State definite plan Agreements with involved parties & the CEC	1	
1B. PROJECT-MANAGEMENT Monitor the fulfilling of the contract Internal communication Decisions within boundaries of contract Consultation with the Commission	3	>>>
2. PREPARE CONTENTS Collect data & information Recall (if necessary) Judge received material according to criteria Conclude contracts with info. providers Definite proposal for contents to the CEC Obtain approval of Nat. authorities (if necess.) Administration	11	
3. ENTER INFORMATION INTO SYSTEM Process data and prepare tables Compose and edit texts Enter contents (meta-data, data and texts) Test and adjustment	3	
4. APPLICATION Final statement of functional requirements System Development Make helpfile Test and adjust system Documentation Acceptation test and final delivery of system Maintenance: Correct errors	8	>>> >>>
5. SYSTEM ADMINISTRATION Technical and organisational provisions Also purchase of hardware and software?	1	>>> >>>
6. MARKETING Make a leaflet about the new systems Select key information for distribution on paper Select/invite potential users to test 1st vers. Install a users advisory board Make agreements about support and feedback Edit a periodical newsletter	3	
7. DISTRIBUTION Make Website accessible Make key information on paper available for parties concerned without access to Internet	1	
8. SUPPORT AND FEEDBACK Act as focal point for the test users Ask test users for their experiences Organise user meetings Collect user wishes and requirements	3	
9. PREPARE DECISIONS FOR NEXT PERIOD Report on activities and process Elaborate proposal	1	
	35	

Scheme 12.3. Planning of activities for the development of the 'European Road Safety Information System'

Activities Phase II "OPERATIONAL PHASE PER YEAR"	MM.	NUMBER OF MONTHS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1A.PREPARATION State definite plan Agreements with involved parties & the CEC	1	
1B.PROJECT-MANAGEMENT Monitor the fulfilling of the contract Internal communication Decisions within boundaries of contract Consultation with the Commission	3	
2. PREPARE CONTENTS Extention & Adjustments according to user wishes Collect data & information Recall (if necessary) Judge received material according to criteria Conclude contracts with info providers Definite proposal for contents to the CEC Obtain approval of Nat.Authorities(if necessary)	18	
3. ENTER INFORMATION INTO SYSTEM Process data and prepare tables Compose and edit texts Enter contents (meta-data, data and texts) Test and adjustment	3	
4. APPLICATION Adjust/extent proposal according to user wishes Construction of required adjustements Test, adjust and complete new version Correct errors Adjust documentation	3	
5. SYSTEM ADMINISTRATION Technical and organisational provisions Purchase and install new software releases	1	
6. MARKETING Free publicity/leaflets about the website Periodical newsletter Introduction meetings for (groups) of countries Adjust selection of output on paper Adjust users advisory board Make agreements about support and feedback Prepare periodical evaluation	3	
7. DISTRIBUTION Make adjusted & extented system available Periodical or on request making key information available on paper	1	
8. SUPPORT AND FEEDBACK Act as focal point for the users Organise user meetings Collect user wishes and requirements	3	
9. PREPARE DECISIONS FOR NEXT PERIOD Report on activities and process Elaborate proposal	1	
	37	

Scheme 12.4. Planning of activities for the operational phase of the 'European Road Safety Information System'

Appendix A Selection of items

This appendix contains a proposal for data to be included in the European Road Safety Information System. The variables chosen are quite basic data in the framework of road safety. Because easy availability is a relevant criterium, we investigated 'international' sources: compilations of national data files (see chapter 5). For each data item it is shown whether it is available in one or more of the sources, accompanied by special notes. The first selection of subjects and variables is based upon this investigation; it is presented in chapter 6.

CRASH									
Proposal for provisional contents									
Road victims									
			Potential sources						
Item	Variable	Urgency	Care+	IRTAD 5)	EUROSTAT	ECMT	IRF	UN-ECE	Other:
Time:	Year	A	+	+	+	+	+	+	
	Month	B	+	+					
	Week	C	+						
	Day of the week	B	+						
	Hour group	C	+						
Victim:	Age	A	+	+				+	
	Sex	B	+						
	Mode of transport	A	+1	+	+				
	Injury severity	A	+	+					
Conflict:	Collision opponent	A	2						
	Type of collision	A	+						
	Alcohol used	A							
Location:	Country	A	+	+					
	Province/County (NUTS-2)	B	2						
	Municipality	C							
	Road situation	A	3						
	Speed limit	A							
	Road type	A	4	+					
	Urban/rural	A	+	+					
Other:	Weather conditions	A	+						
	Lighting conditions	A	+						
	Work in progress	B							
	Other temporary circumstances	B							
Notes:	+ = Available		1= Excluding pedestrians			5 = not all combinations of variables available			
			2= Not yet possible						
			3= Available in two years						
			4=Only motorway						

Casualties

CRASH									
Proposal for provisional contents									
Road accidents									
			Potential sources						
Item	Variable	Urgency	Care+	IRTAD 5)	EUROSTAT	ECMT	IRF	UN-ECE	Other:
Time:	Year	A	+	+					
	Month	B	+	+					
	Week	C	+						
	Day of the week	B	+						
	Hour group	C	+						
Severity:	Severity accident	A	+	+					
Conflict:	Primary collision	A	3						
	Type of collision	A	+						
	Alcohol used	A							
Location:	Country	A	+	+					
	Province (NUTS-2)	B	+						
	Municipality	C	2						
	Road situation	A	3						
	Speed limit	A							
	Road type	A	4	+					
	Urban/rural	A	+	+					
Other:	Weather conditions	A	+						
	Lighting conditions	A	+						
	Work in progress	B							
	Other temporary circumstances	B							
Notes:	+ = available		2= Not yet possible			5 = not all combinations of variables availabl			
			3= Available in two years						
			4=Only motorway						

CRASH									
Proposal for provisional contents									
Inhabitants									
Number of inhabitants									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF	IRTAD	UN-ECE	Other:
	Year	A		+			+		
	Country	A		+			+		
	Age	A		+			+		
	Sex	A		+			-		

Population

CRASH									
Proposal for provisional contents									
Kilometres travelled									
Number of kilometres travelled									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF	IRTAD	UN-ECE	Other:
	Year	A					+		
	Country	A					+		
	Mode of transport	A					+		
	Age	A							
	Sex	B							

Kilometres travelled

CRASH									
Proposal for provisional contents									
Vehicle kilometres									
Number of kilometres driven									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF 1)	IRTAD 1)	UN-ECE 2)	Other:
	Year	A				+	+	+?	
	Country	A				+	+	+?	
	Mode of transport	A				+	+	+?	
	Type of road	A					+3		
Notes:	1 = Reliability and comparability of data are very limited in both databases								
	2 = UN-data concern only motorways								
	3 = Urban, rural, motorway, A-level								

Vehicle kilometres

CRASH									
Proposal for provisional contents									
Vehicle fleet									
Number of vehicles									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF	IRTAD	UN-ECE	Other:
	Year	A		+	+	+	+	+	
	Country	A		+	+	+	+	+	
	Mode of transport	A		+	+	+	+	+	
Notes:	There are important differences between the figures in each database								
	Special attention should be payed to mopeds.								

Number of vehicles

CRASH									
Sugestion for provisional contents									
Length of road network									
Road length in kilometres									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF	IRTAD	UN-ECE	Other:
	Year	A		+?	+?	+	+	+?	
	Country	A		+?	+?	+	+	+?	
	Type of road	A					+1		
Notes:	Different classification of roads is used in each country,								
	Consequently data are either incompatible or refer only								
	to specific types of network (e.g. motorway)								
	1 = Urban, rural, motorways, A-level								

Road length

CRASH									
Proposal for provisional contents									
Country:									
Cause of death									
Number of deaths									
			Potential sources						
Item	Variable	Urgency	Care+	EUROSTAT	ECMT	IRF	IRTAD	UN-ECE	Other:
	Year	B							
	Country	B							
	Cause of death	B							
	Age	B							

Death causes

Appendix B OLAP examples of BIS-V and Powerplay

Two examples of systems with OLAP-functionality are given:

BIS-V is an existing system in the Windows environment. It is in use in the Netherlands. Also a modified version has been developed on behalf of this project.

Powerplay Web by Cognos is presented as an example of multidimensional analyses in a Internet environment.

BIS-V

BIS-V is a client/server application in Windows.
In the Netherlands it is used to provide policy-makers and experts with knowledge about traffic safety. It is in use at the Ministry of Transport, its regional subdivisions, provinces, police en municipalities.

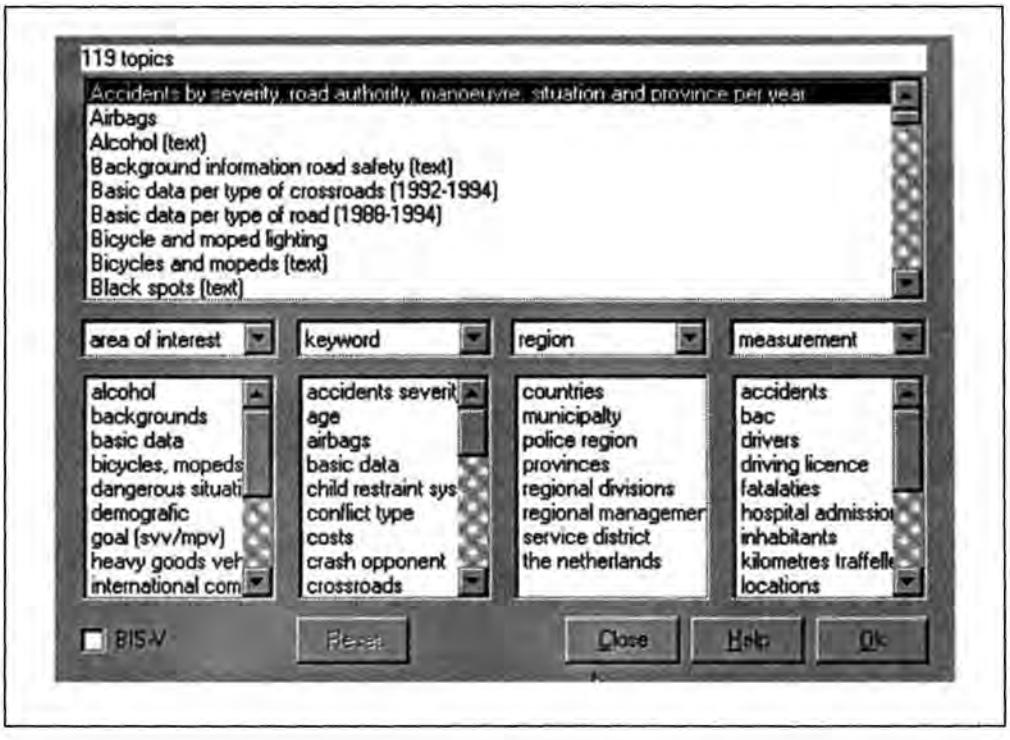
The system is developed and maintained by SWOV on behalf of the Ministry of Transport.

Search

BIS-V features 3 search methods:
- searching with keywords;
- navigating in a tree structure;
- free text search.

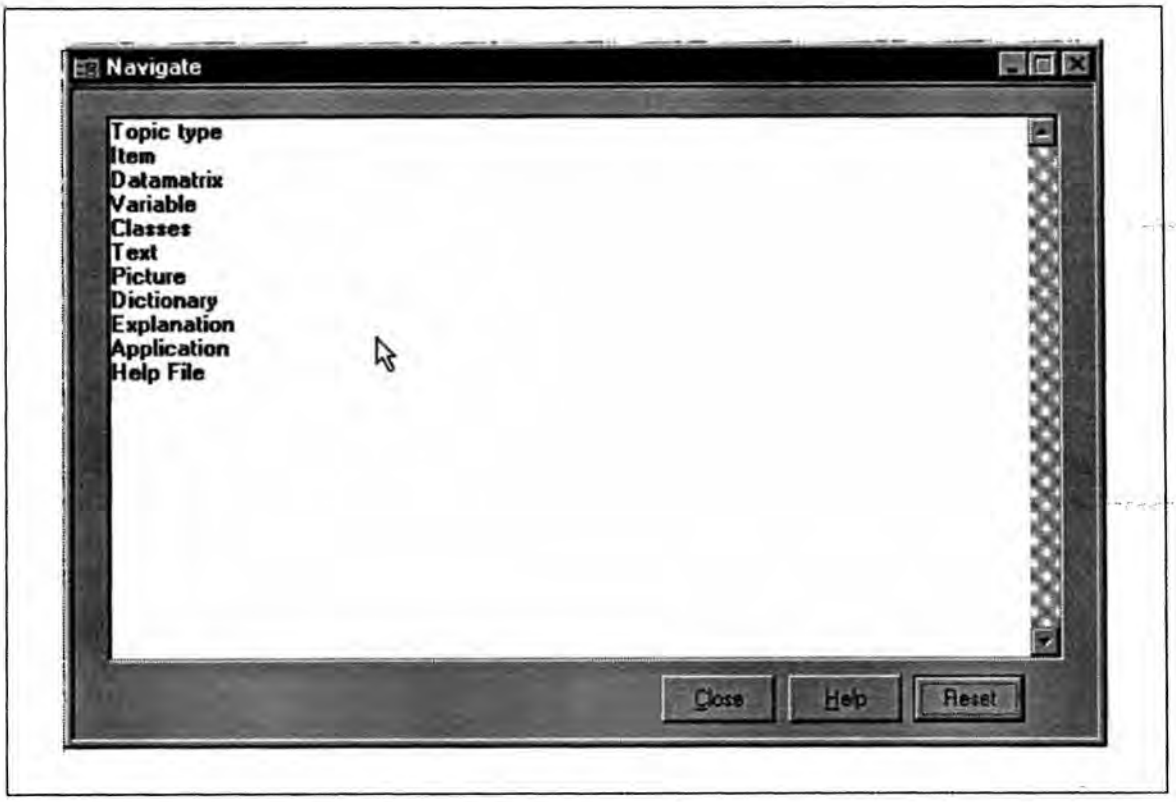
Searching with keywords

The upper list box of this screen presents all item in the system. A double click on a item shows the contents. Due to the lists in the bottom half of the screen, this list can be filtered.

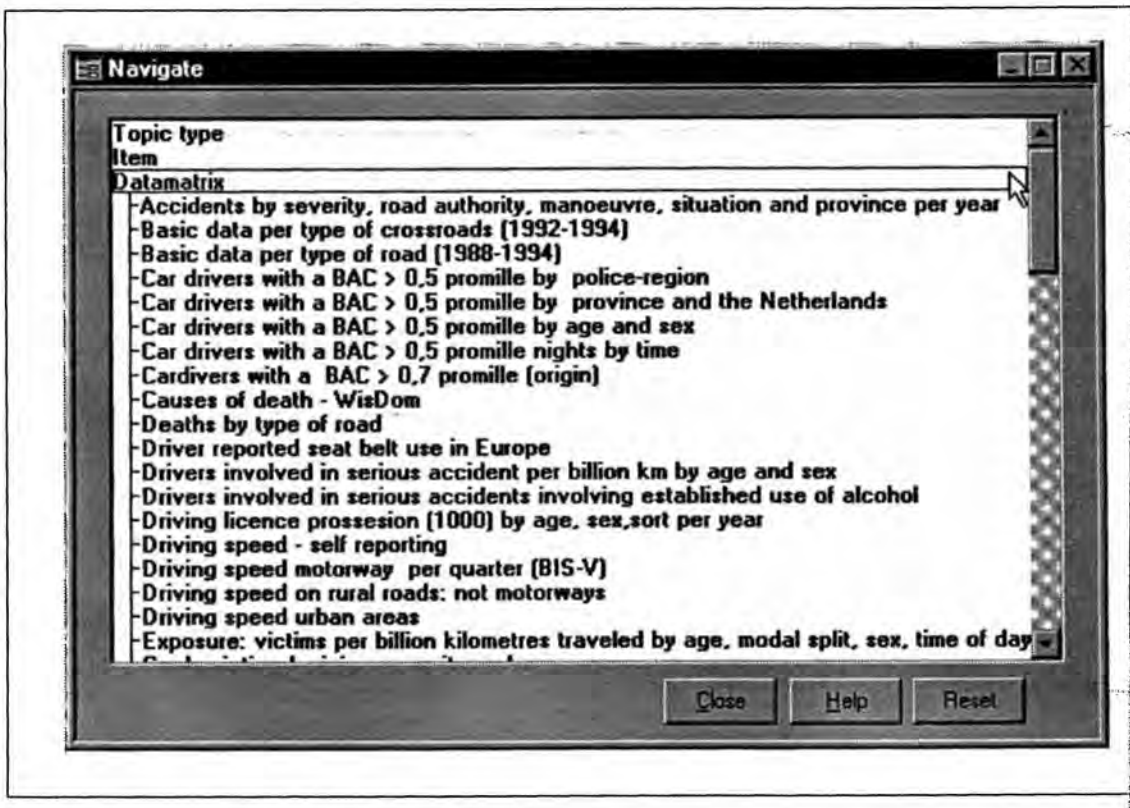


This screen shows all items in the system. By double clicking on a item the tree will expand and in that way shows the relationship between the items. Where applicable, a right double click shows the contents of a item.

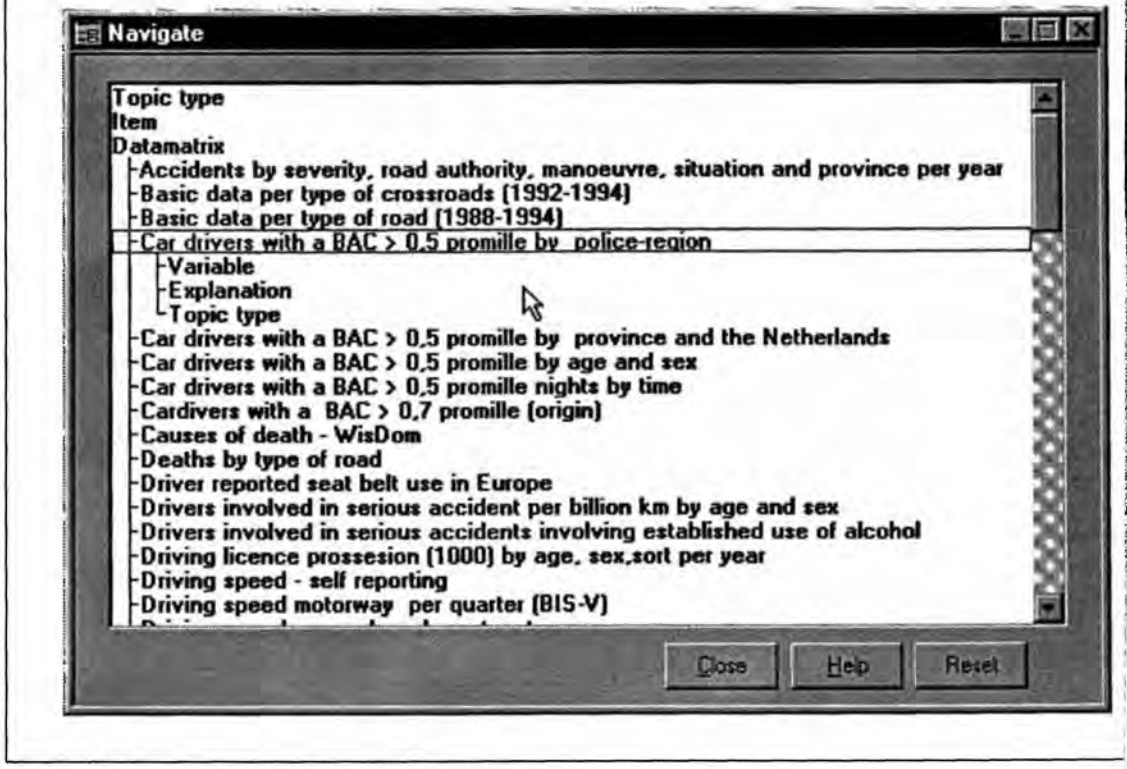
Initial screen:



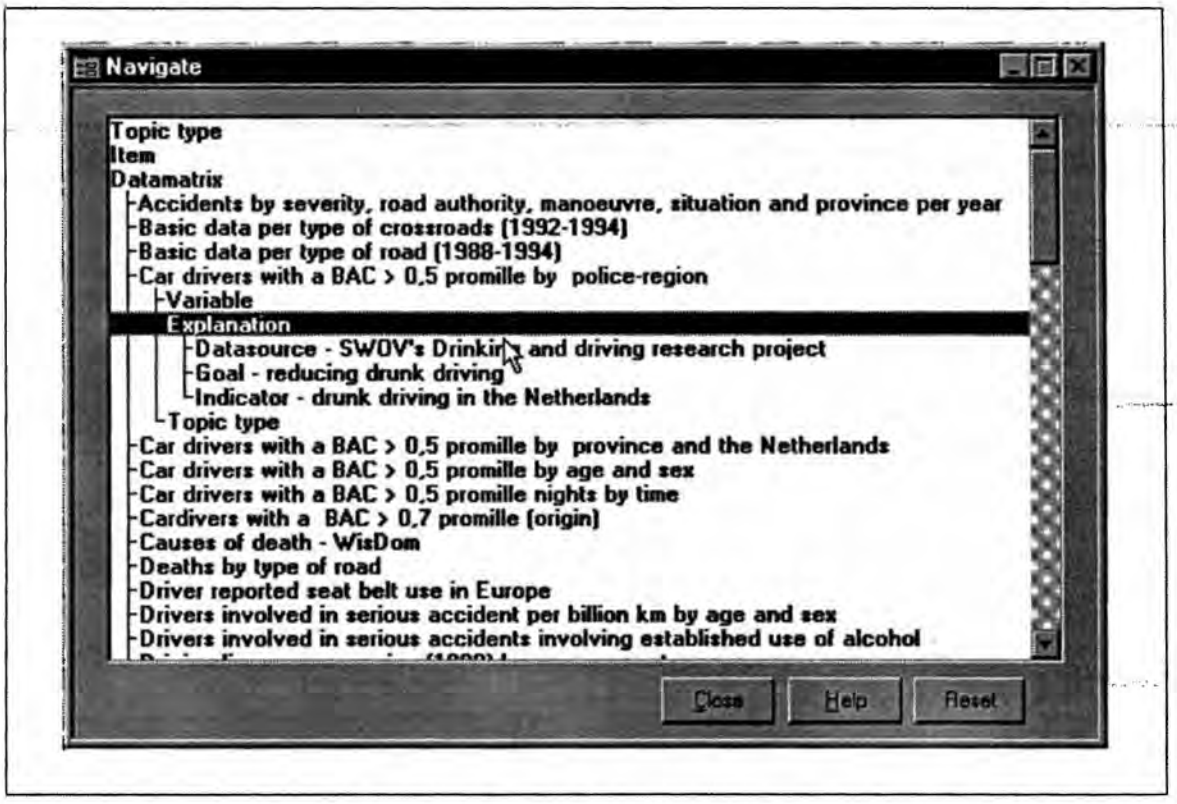
Expanding the data matrix-section presents all available data matrices:



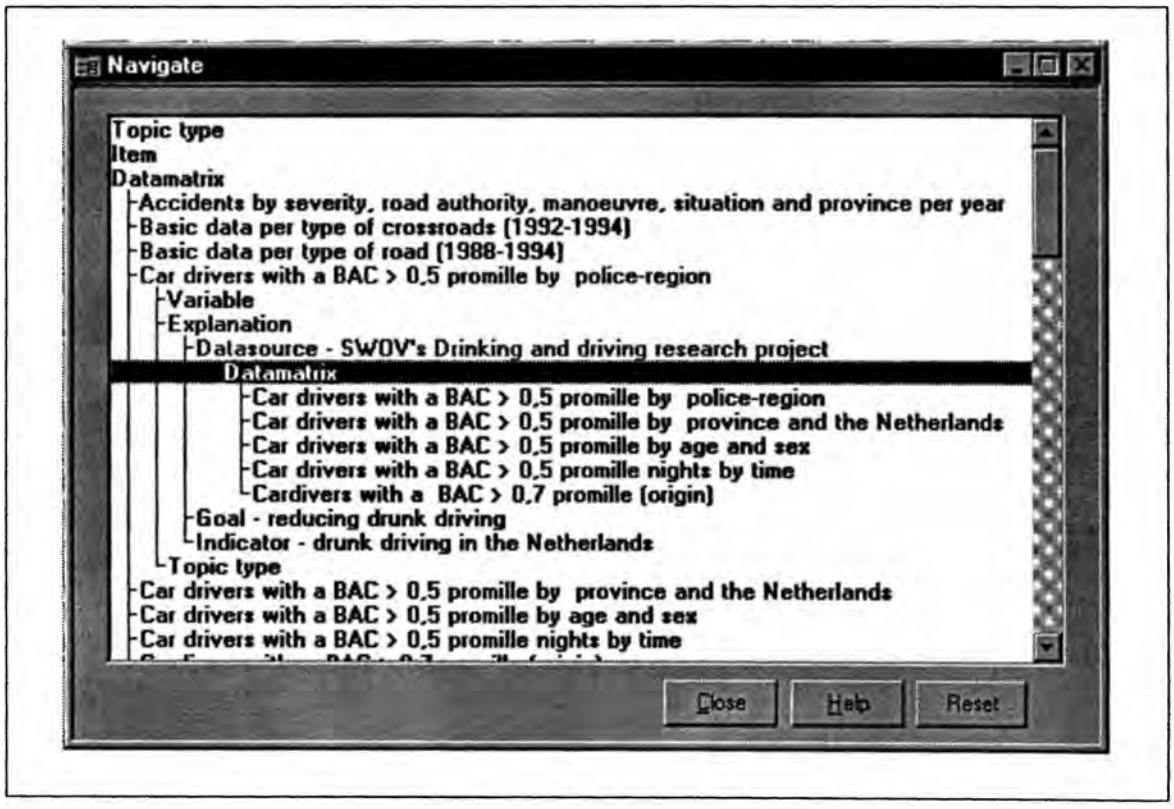
Expanding a matrix presents the elements it is related to:



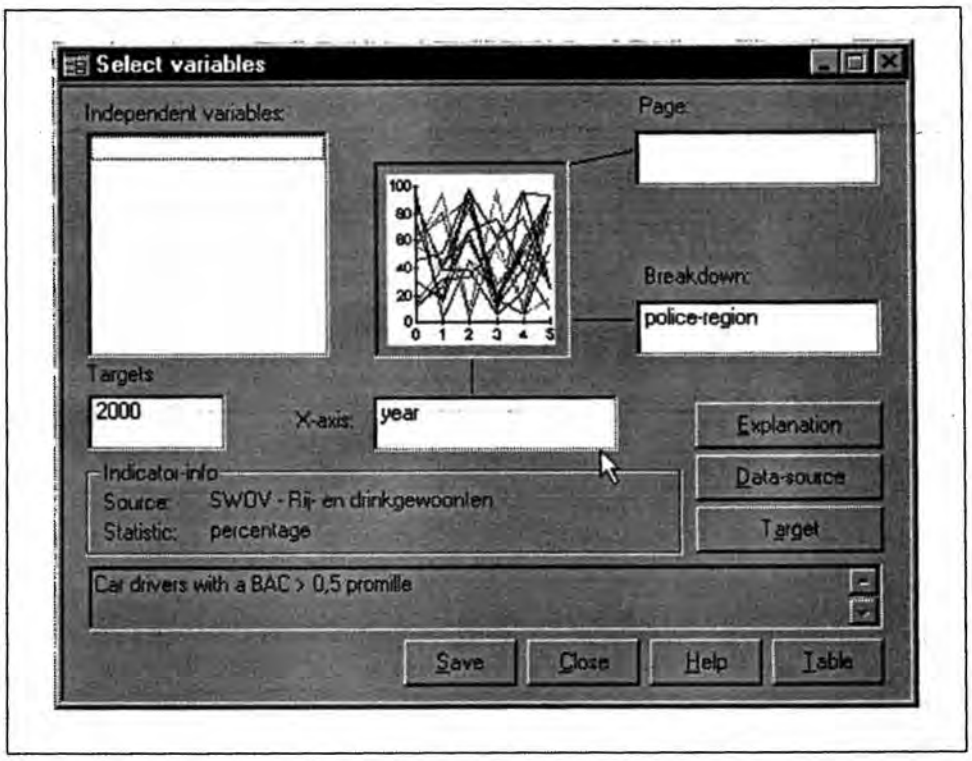
Expanding the explanation section shows all related explanations:



Showing related items by expanding the data source (data matrices that have the same source):



Starting the data-part by double right click on a matrix:

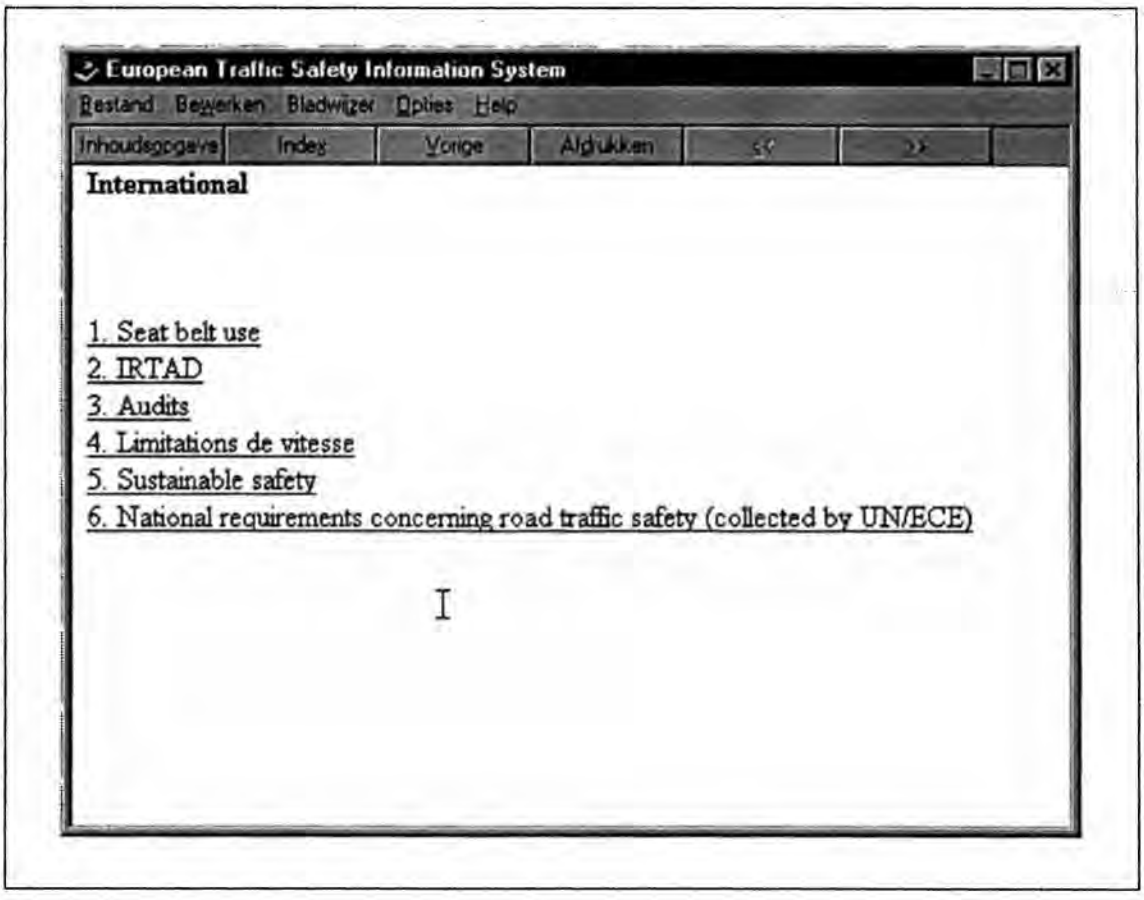


The next steps are shown in the Data-section.

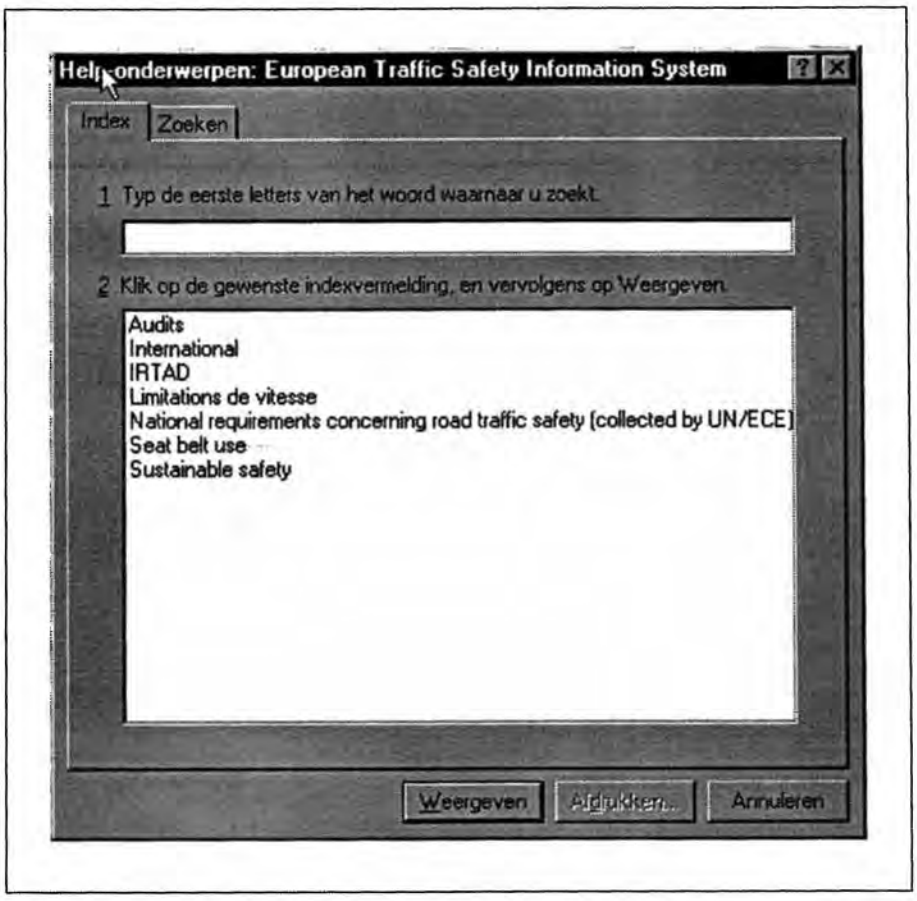
Free text search

All textual information is supplied in Windows Help.
All search methods in Windows Help can be used.
The interface to Windows Help is of course in the language of the operating system.
As far as the contents is concerned, one could go for different help files in different languages or one help file containing information in different languages.
Below a sample of a small help file developed for demonstration purpose only.

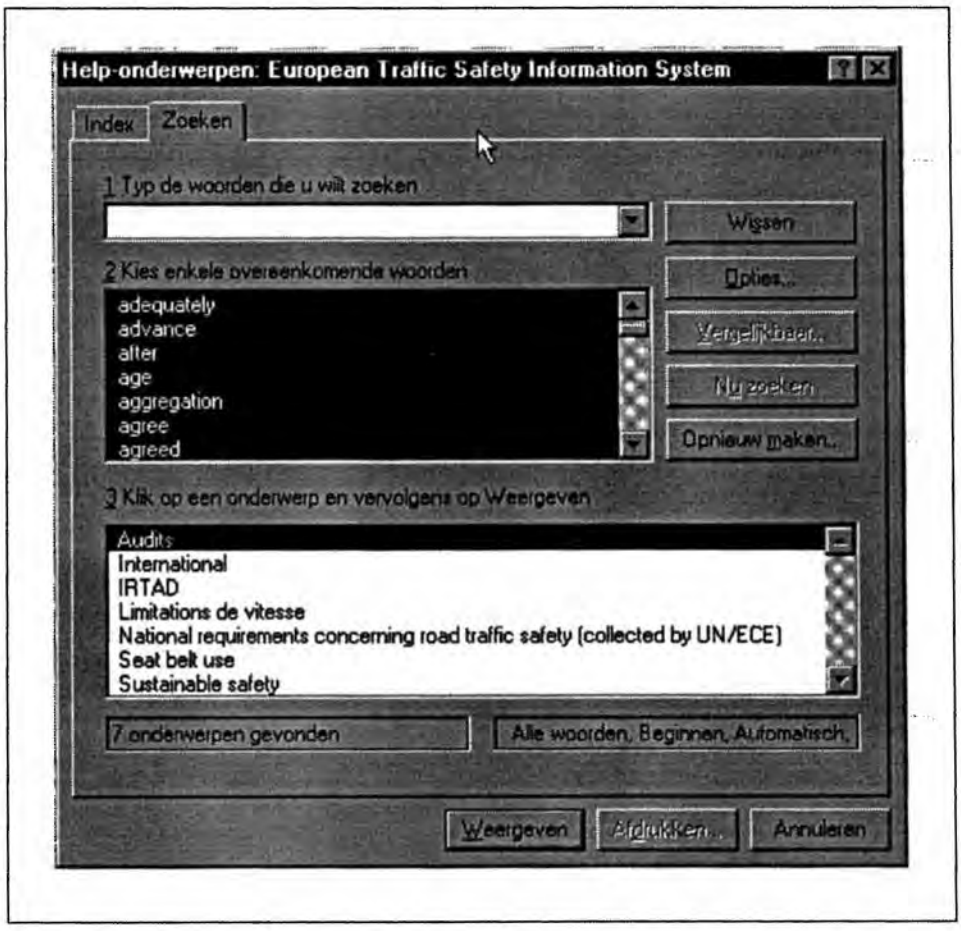
The contents of the system:



The index (standard facility of Windows Help):



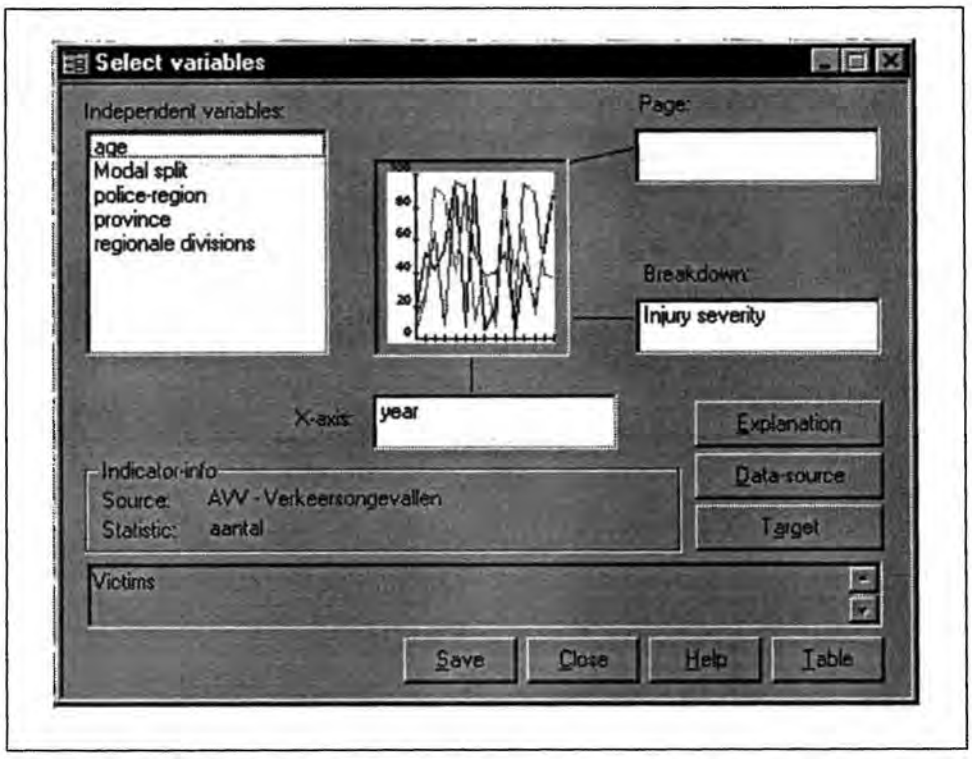
Free text search (standard facility of Windows Help):



Data

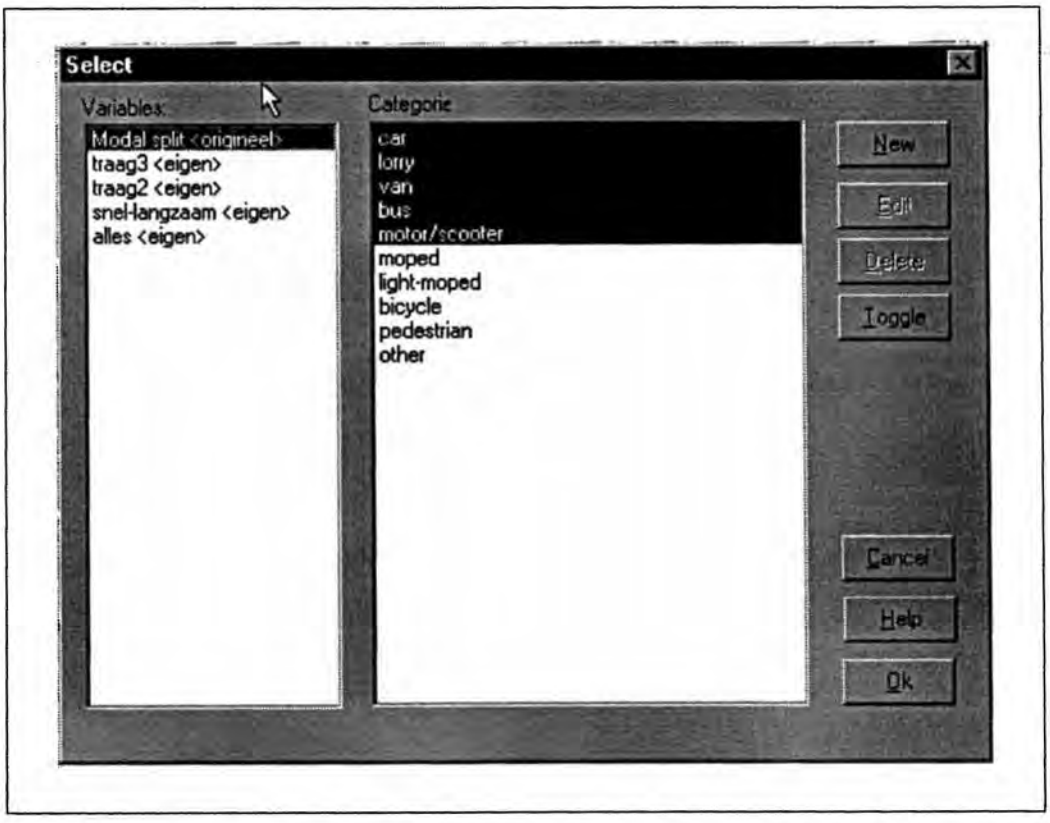
Generating tables and graphs

- Variables available in the list can be placed on any dimension with drag and drop.
- Individual classes can be selected.
- Users can define their own grouping of classes.
- Additional information is available behind the text buttons.



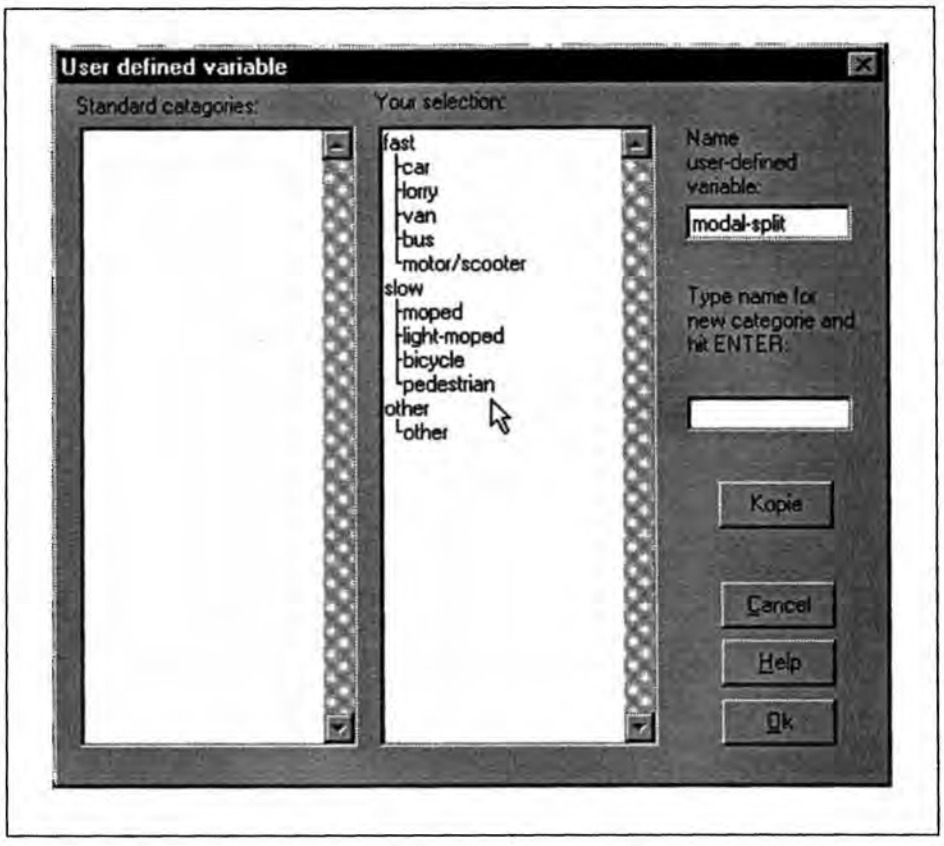
Selection of classes

A selection of any combination of classes can be made, e.g. high speed vehicles:



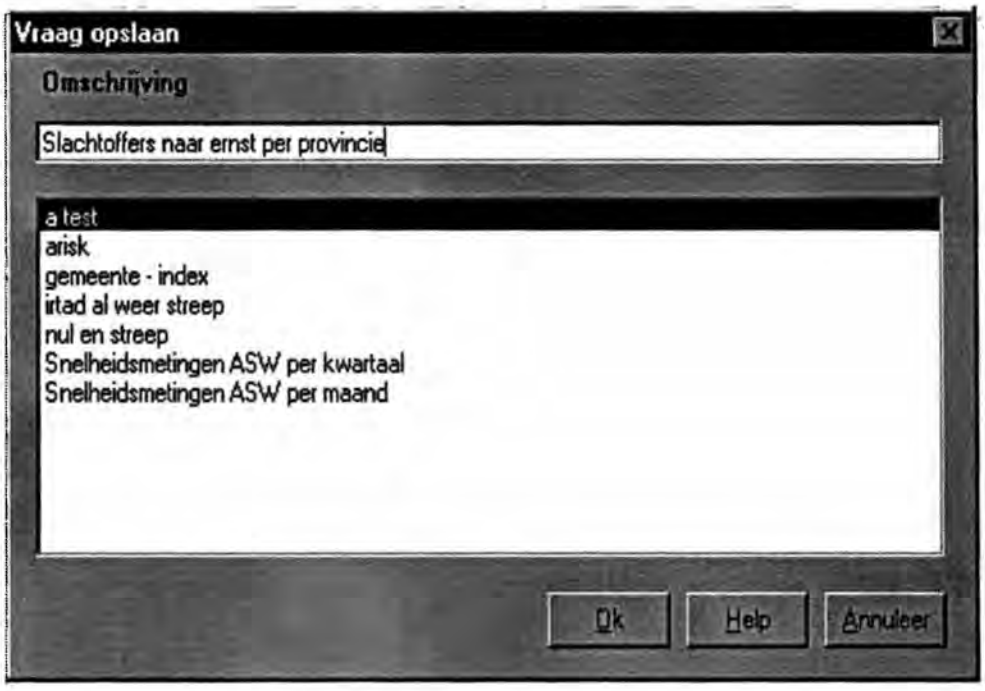
User defined groups

High-speed and low speed modes of transport can be aggregated into new classes:



Saving user defined query

Selections made can be saved; the user specifies a name for each query. The user defined queries can be re-executed any time.



Additional information

Additional information is available:

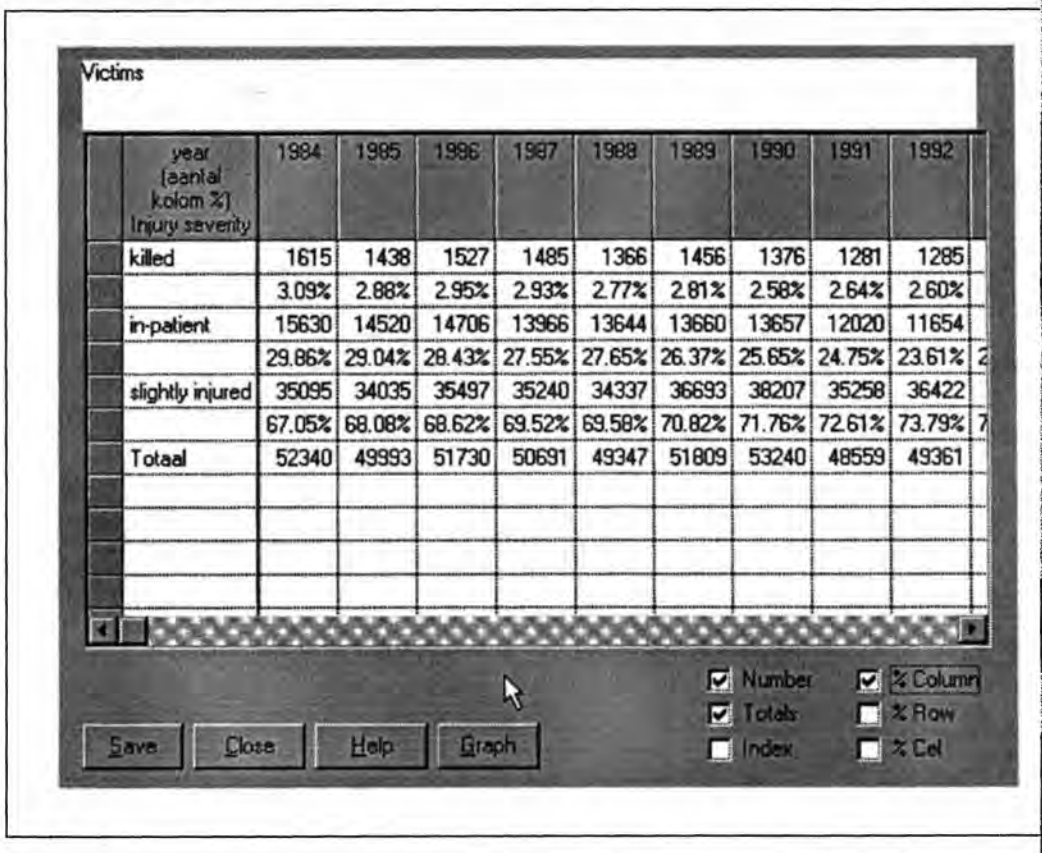
Explanation - the analyses of the data.
Targets - targets for the years 2000 and 2010 as defined by the Ministry of Transport.
Source - data sources used.

(see beginning of the Data-section)

Table

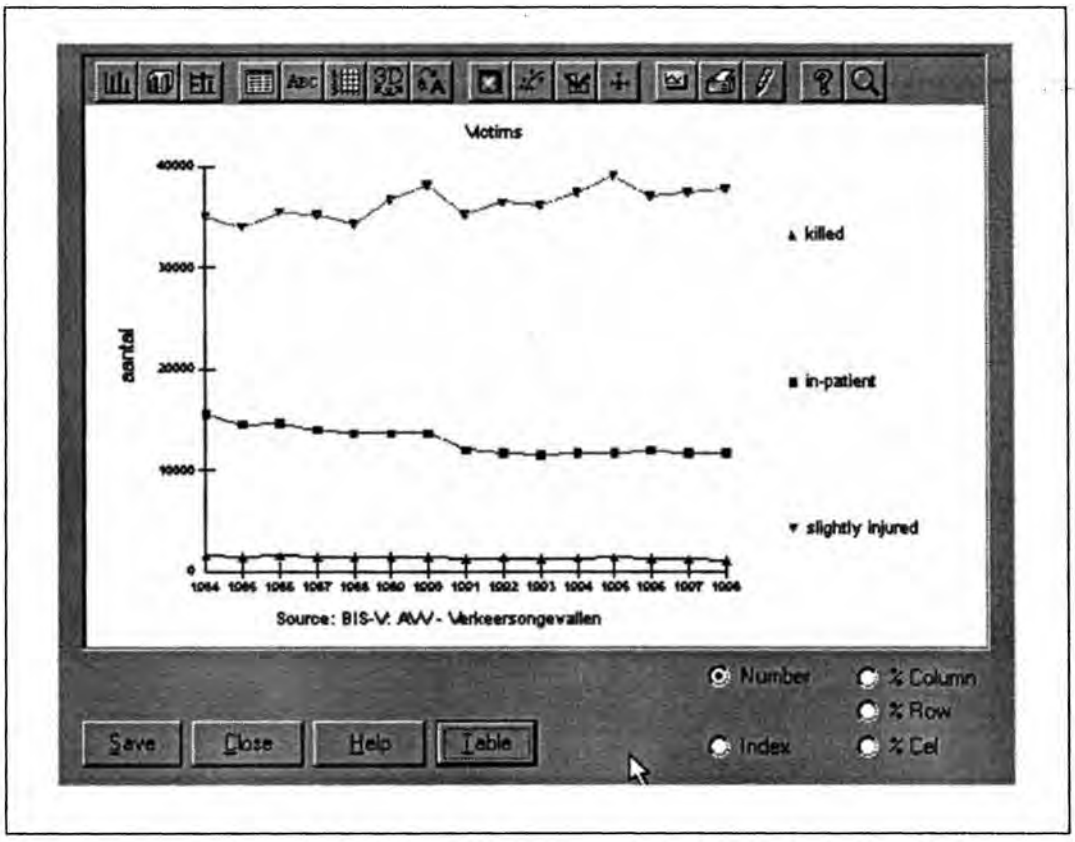
The table screen offers the following options:

- visualise the table as a graph
- elementary statistics can be calculated
- export to
  - file
  - clipboard
  - printer



Graph

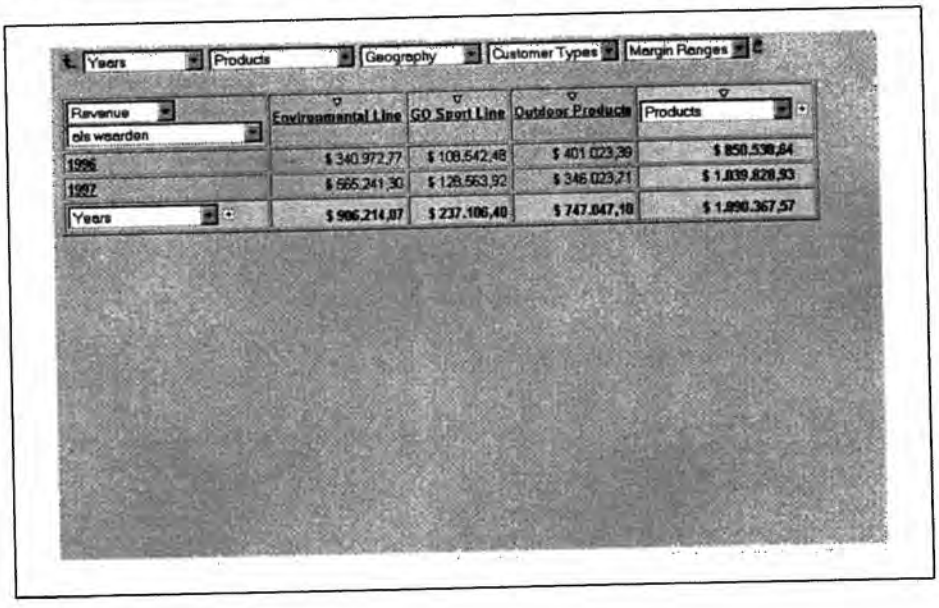
The toolbar in the graphical object offers a lot of options.



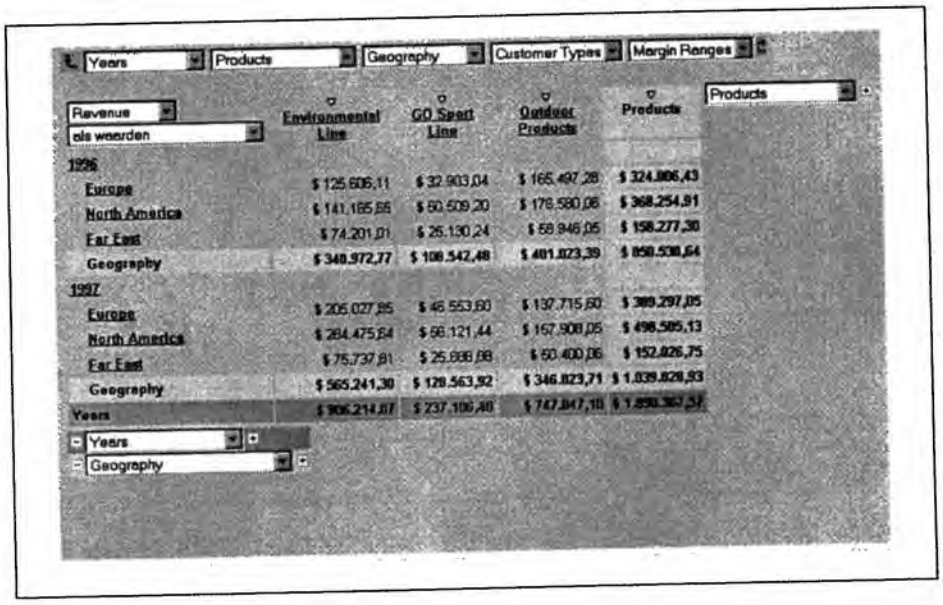
Powerplay Web

Powerplay is available in a Windows and a Web version.
It is developed by Cognos, one of the bigger reputations in OLAP.
A life demo is available at:
http://ppweb.cognos.com/cgi-bin/ppdscgi.exe?xt=highlevelcube

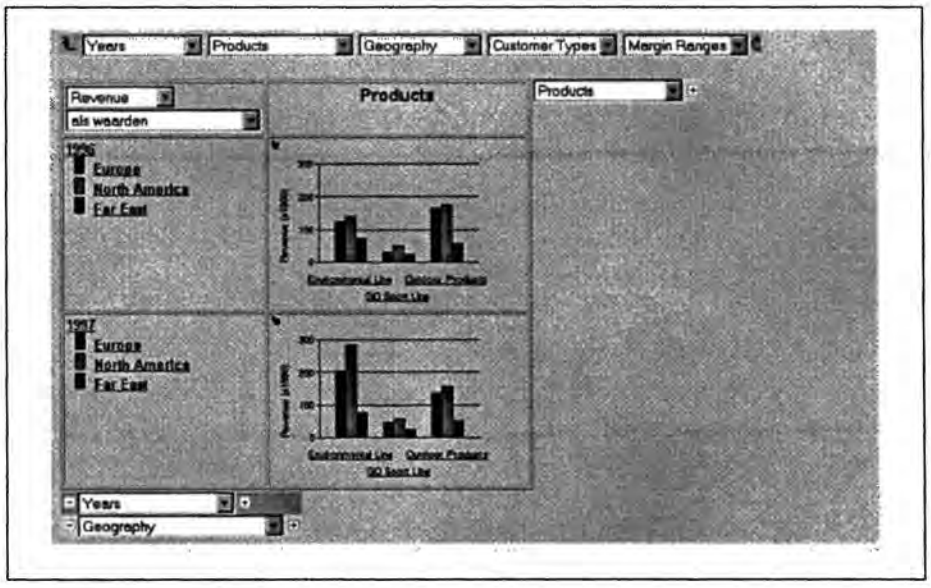
The data is shown as a table as soon as the user opens the page.



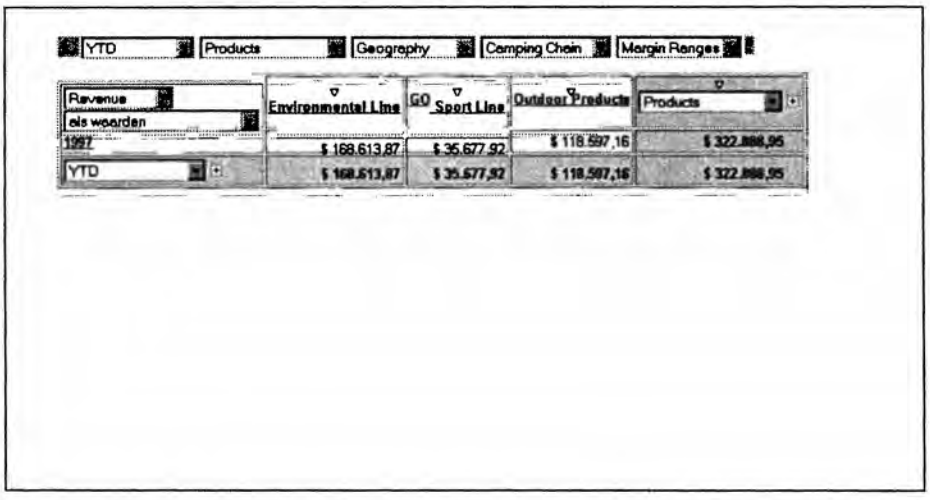
Multiple dimensions are possible both on row and column.



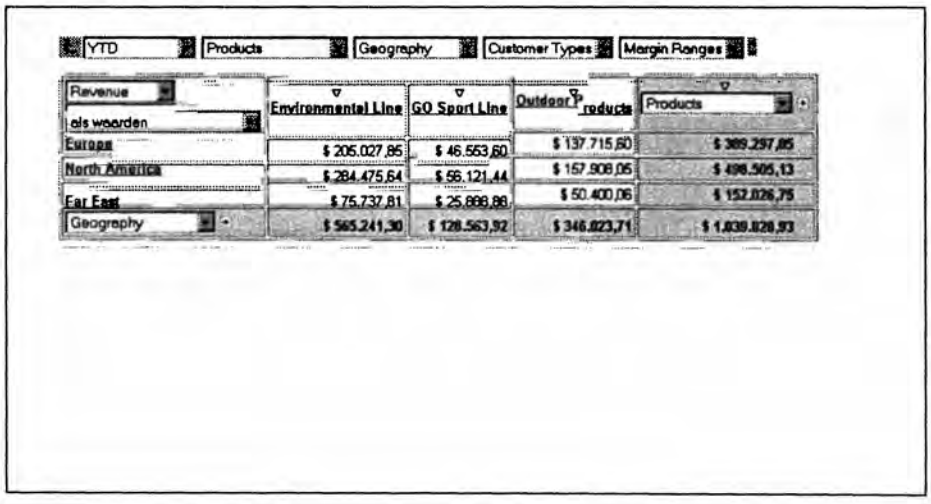
Also a graphical representation is available.



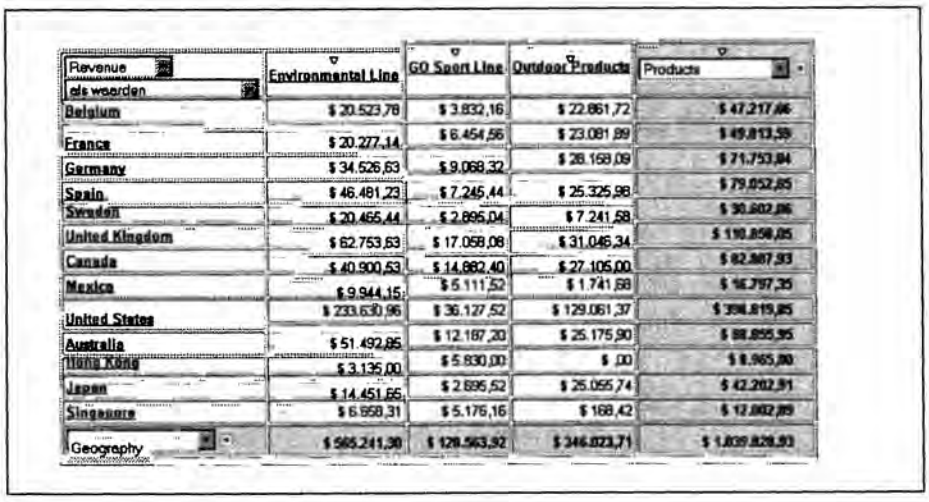
Selection of classes is limited to one variable b.e. Camping Chain in Customer Type



Variables can be hierarchical.

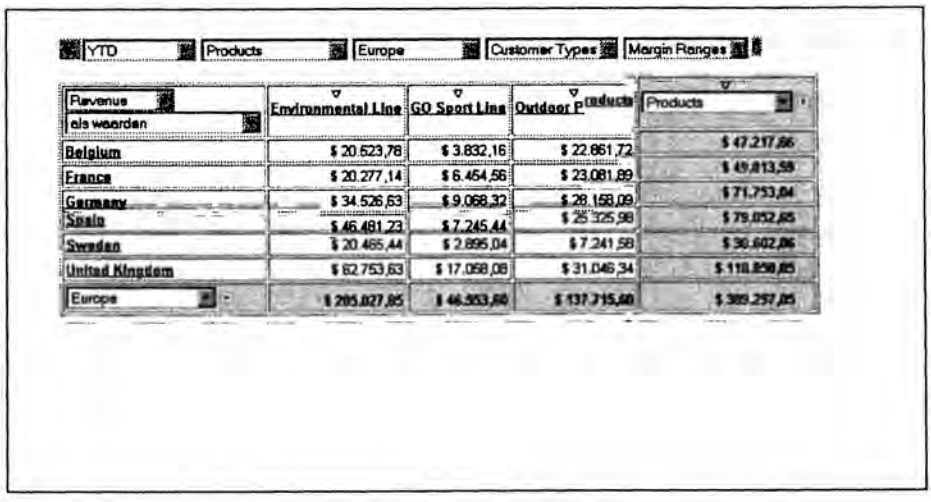


Hierarchical variables could be shown on a specific level.



Revenue als waarden	Environmental Line	GO Sport Line	Outdoor Products	Products
Belgium	$ 20.523,78	$ 3.832,16	$ 22.861,72	$ 47.217,66
France	$ 20.277,14	$ 6.454,56	$ 23.081,89	$ 49.813,59
Germany	$ 34.526,63	$ 9.068,32	$ 28.158,09	$ 71.753,04
Spain	$ 46.481,23	$ 7.245,44	$ 25.325,98	$ 79.052,65
Sweden	$ 20.465,44	$ 2.895,04	$ 7.241,58	$ 30.602,06
United Kingdom	$ 62.753,63	$ 17.058,08	$ 31.046,34	$ 110.858,05
Canada	$ 40.900,53	$ 14.882,40	$ 27.105,00	$ 82.887,93
Mexico	$ 9.944,15	$ 5.111,52	$ 1.741,68	$ 16.797,35
United States	$ 233.630,96	$ 36.127,52	$ 129.061,37	$ 398.819,85
Australia	$ 51.492,85	$ 12.187,20	$ 25.175,90	$ 88.855,95
Hong Kong	$ 3.135,00	$ 5.830,00	$,00	$ 8.965,00
Japan	$ 14.451,65	$ 2.895,52	$ 25.055,74	$ 42.202,91
Singapore	$ 6.958,31	$ 5.176,16	$ 168,42	$ 12.302,89
Geography	$ 585.241,30	$ 128.563,92	$ 346.823,71	$ 1.039.828,93

This could be combined with a selection b.e. Europe



YTD | Products | Europe | Customer Types | Margin Ranges

Revenue als waarden	Environmental Line	GO Sport Line	Outdoor Products	Products
Belgium	$ 20.523,78	$ 3.832,16	$ 22.861,72	$ 47.217,66
France	$ 20.277,14	$ 6.454,56	$ 23.081,89	$ 49.813,59
Germany	$ 34.526,63	$ 9.068,32	$ 28.158,09	$ 71.753,04
Spain	$ 46.481,23	$ 7.245,44	$ 25.325,98	$ 79.052,65
Sweden	$ 20.465,44	$ 2.895,04	$ 7.241,58	$ 30.602,06
United Kingdom	$ 62.753,63	$ 17.058,08	$ 31.046,34	$ 110.858,05
Europe	$ 205.027,85	$ 46.553,60	$ 137.715,60	$ 389.297,05

More than one measurement variable is possible b.e. Revenue, Quantity Sold en Cost.
Percentages could be calculated.

Multiple languages are supported