OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

18299

STUDY ON THE POSSIBILITIES OF USING AN EXPERT SYSTEM AS AN AID FOR NEGOTIATIONS

Prepared by:

Tom Jansen

UNIDO Consultant (CLT 89/017)

Contents page

1. An Expert System in Negotiations; Introduction.

An expert system, in general terms, is a computer program of questions and answers, enabling the user to benefit from the knowledge stored in the program by experts. A well known example of an expert system is the diagnostic tool Medical Doctors use when they try to establish the origin of a patient's complaint that cannot easily be traced. By using the Expert System in Medical Diagnostics, the doctor gets assistance from colleagues and specialists who have pooled their experience in the program in the form of dedicated series of questions and options. If the answers do not produce a clear solution, more questions are asked up until a final conclusion is reached.

Negotations are strongly influenced by the "human factor". "Too much", the pessimist would say, to ever put it in an expert system as described above. Yet some people are called "experts" in negotiating, which means their know-how could be tapped one way or another. In this report the viability of an expert system for negotiations will be demonstrated. The elements of its design concerning the negotiation methodology, originate from the experience of consultants in negotiations.

In the following chapters an analysis of negotiations will be made (see chapter 3.), the users' requirements are analysed (chapter 4.) and a description of the system and the extension possibilities is given (chapter 5.).

In the last chapter (6.) a draft schedule of activities resulting in an Expert System in Negotiations is discussed. It should be stressed that this schedule can only be tentative. After discussions with various experts, both in negotiations and in automation, it will be possible to devise a final activity schedule with accompanying costs. It is paramount that these discussions are held before approaching sponsors to eliminate any doubts of the sponsors about the applicability of the Expert System in Negotiations.

2. Conclusions and further actions.

The main conclusions are:

- An Expert System for assistance in Negotiations is possible, but needs a large computer capacity.
- It must be possible to create a simple version for those users who have available not more than a small computer and one disk-driver.

The prccess of negotiating can be "mapped out" in general terms and every step in the negotiation can be planned rationally in order to reach a specific desired outcome.

An expert system in negotiations should be a practical system and should be no more than a tool, guiding the negotiator in his preparations and during breaks in the negotiations to check on the progress.

The expert system follows the structure of thinking that is generally used by a negotiator. This means that the system starts by asking for the endgoal, to commence immediately thereafter with the preparation phase. Choosen the endgoal at the start, the system determines which paths lead to that goal. The user will be guided towards the goal by means of questions and reminders that are displayed on screen in the form of menus.

The expert system will be able to generate a draft contract.

As soon as the funds for a try out are available a UNIDO team can make up the terms of reference for the executing experts. First a try out as a demonstration model should be made.

The developing costs, not including the purchasing of a shell and literature etc., will be 2.200 manhours.

3. The elements of negotiations.

In this chapter those elements of negotiations are discussed, that contribute to a better understanding of the computerised expert system.

In negotiations the goals, subjects and parties will be different each time. One time the goal might be to sell something to a third party, another time the main goal might be to create a new company in which two or more parties are going to participate, while the subgoals may be transfer of know-how, access to new markets etc.

However different the goals may be, the negotiations can always be split up in a number of phases in a logical sequence. Analyzing negotiations one can distuinguish:

- an initiative
- basic research
- a first encounter
- technical and/or psychological scanning
- taking positions
- further scanning
- the offer of a first bid and a second one etc. etc.
- the drawing of a contract.

Given this sequence of events it is possible to "map out" the process of negotiating in general terms and to plan rationally every step in the negotiation to reach a specific result. One should however be aware that rationality of planning is limited by two important factors:

- law (not everything one may want to do is legal);
- the "human factor" (people's emotions are - mostly - much stronger than their rationality).

As mentioned before a negotiator always follows the same kind of pattern, known as a decision tree. This pattern is determined by a number of questions and reminders posed before and during the negotiation. Most of these are standard (they have to be answered in any negotiation); others will be specific. During the preparation

period the negotiator answers these questions or skips them if they are not relevant. Basically these questions form a checklist.

To clarify the above, the following may serve as an example:
Mr X wants to buy a piece of equipment for his factory. He will ask himself all kind of questions, for example:

a) What is the purpose of this piece of equipment?
b) What should be the production capacity to match the current output of the factory?
c) How much is saved by the introduction of this piece of equipment; hence what can Mr X accept as the maximum costs (break-even analysis)?
d) If imported; are there any import restrictions. If so which, and do they cost any money?
e) Is there a license fee involved, and if so how much will that be? Are there any government restrictions on license fees?

etc.

Looking at these questions it becomes already obvious that some of these questions can be regarded as standard (i.e. c, d and e), whilst others (a, b) are more specific for this particular "piece of equipment". But at the same time a and b are still standard for all kind of "pieces of equipment" that may be bought.
Completely different questions will be asked by Mr X, if he wants to have a cooperation agreement with a foreign consulting firm.
On the other hand again when Mr. X evaluates the merits of a consultant to be hired and wants to compare these merits with those of an other firm, the questions asked are nearly the same as for an evaluation of two or more equipment suppliers.

A negotiator will always maje notes of key questions and answers for later reference when the actual negotiations start.

It should be stressed that a contract in itself is not the goal of the negotiation, but merely a mean to reach the goal. This implies that all paragraphs and rules of the contract should contribute to the objectives of the negotiations. It is therefore of the utmost importance that the making of a contract is planned in detail. However it is a fact of life that no matter how carefully the process is planned, the

way things will turn out in reality, will always be different than expected. Because of this "friction", planning should never be rigid or too exhaustive.

On basis of the above the next chapter describes the user requirements of an expert system. Also a more complex Expert System for Negotiations will be discussed because it should be stressed that a user who is becoming experienced in both negotiations and the use of the Expert System for Negotiations, will ask for more elaborations.

It is therefore, that the system should have the capability to distinguish levels of knowledge in its users. Some user will stay very much on the surface, while others will go into depth. Als some users should be guided to more details than others.
Hence also the above mentioned should be reflected in the requirements as discussed in the next chapter.

4. User requirements of an expert system in negotiations.

Thanks to the fact that almost any negotiation process can be split up into various phases and that each phase is characterized by a set of standard and specific questions, it will be possible to develop a system which can lead the negotiator towards his goal.

As stated in chapter 3. a practical and automated system of assistance to negotiations should not try to provide an exhaustive "check-list" of do's and dont's: reality is more diverse than any system can ever aspire to be.

> A practical system assisting in negotiations, therefore, should not pretend to be more than being a tool, guiding the negotiator in his preparations and during breaks in the negotiations to check on progress.

Such a system cannot claim to "give all the answers", but instead should call the negotiator's attention to possible problems, which the negotiator himself has to solve. Only some 'standard' solutions to recurring problems can be supplied by the system whenever the need arises.

In general terms the system to be used, should be geared to the following:

1. A practical system of negotiation should indicate phases in the negotiation and distinguish the various possible items to be covered. Adequate information on these items should be available, either within the system itself or by reference.

2. The system should present various options to reach the objectives. It should eliminate options which appear irrelevant as a consequence of previous actions. The user can also eliminate options by himself to cancel intermediate steps. The by-passed steps will be filed as macros for easy and fast use later. The possibility to break into these macro-steps will however be present

3. The system should open a kind of dialogue with the user. The system poses questions which are answered by the user. This leads in turn to a new set of questions until all aspects are dealt with.

4. The system should contain different levels of questioning, descending from, general to subject-specific. The user can switch between levels and add questions to the system as needed.

5. The system should allow extensions and additions at any time and place in the program. If needed these can be stored on seperate floppy disks. The system should warn the user when a new diskette has to be inserted.

6. The system should include a "notepad". At every decision the user can write remarks in this pad. Whenever the user scrolls through his previously taken decisions the corresponding remarks will be displayed on screen. It will also be possible to leaf through the notes, which indicate where the note was made.

7. The system should check whether the planning meets the following conditions:
   - The purpose, background and the goals of the negotiation should be considered. Not the negotiations are important, not even the contract. Only the achievement of the ultimate goals are.
   - The cultural and psychological aspects. The characteristics of the people involved determine to what extent and at what pace goals can de achieved.
   - The legal aspects of the negotiation. The contents of the various paragraphs and alineas within the contract should be drafted conform the applicable law.

8. If the system registers an inconsistancy between the ultimate goals and the negotiation strategy it should indicate whether the planning has to be adjusted.

9. The system should enable the negotiator to evaluate each phase, that is to say: comparing the planning of that phase with what happened in reality. Based on the evaluation the system should indicate which items, if any, have to be altered in the next phase(s).

10. The system should be user friendly and fool-proof. An unexperienced user should be able to install the system and use it without entering into situations where only an outside expert can solve the situation. The contents of the disks should be protected against mistakes.
    This means for instance: The user cannot but use the Y (for yes), the N (for no) button or a third button to indicate that the user has a "problem": a "don't know-button". When the user pushes the "don't know button", the user should get easy instructions on how to proceed.

11. At the same time, the system, should not be a bore for the experienced user by asking all kind of obvious questions (however valuable they may be for the first-time-user).

12. At the end and beginning of each session, the system should make clear which questions are still unanswered.

13. The user should be able to abandon the system at all times. Also this must be displayed as a permanent instruction. If the user doesn't act right, the system should stop within a certain period out of its own.

Also the following requirements can be formulated for the system:

14. At all times simple and clear English is to be used (for instructions, explanations, questions, reminders etc.);

15. The system should be able to run on all MS-DOS computers on Apple systems and preferably on any advanced system available at the time of the making.

16. The installation of the program has to be explained on the disk-label or on its container. This information should also be stored on the diskette in a socalled readme document.

5. Description of the System.

The system will guide the user by means of structured menus through a series of questions and reminders. In this way the user goes through a complete checklist. However some questions will encompass a specialised field of know-how. Depending on the strength of the computer (its internal memory and the possibility to incorporate the accompanying database) the data of this special field are incorporated in the system or just referred to.

On a computer with sufficient internal memory and a hard disk the program can be run without the need for additional floppy disks or reference books. If the machine does not avail of a hard disk, the system will ask the user to insert floppy disks containing the required data. If the memory of the computer is not sufficient to run the complete program, reference books will be needed.

In this chapter the system will be described in two ways:
- From a view point of the user (5.1.).
- From a view point of the programmer (5.2.).

5.1. The expert system for negotiations; a users' approach.

The user will receive one or more floppy disks in a simple container. On the cover an instruction how to use the disks and how to start the program will be printed. Further instructions are filed on the disks itself and will appear on the screen. The instructions on the cover and on the screen will be such that also unexperienced computer users are able to use the system.

After inserting the diskette and starting the program the user will see a complete guide on the screen, explaining the program in simple and clear English. The user benefits from the system because it provides:
- The collected knowledge of experienced negotiators. (5.1a.)
- The ability to transfer the results of the first way into the basics of a contract (5.1b.).

Hereunder the two benefits are discussed in detail:

5.1a. Using the system to prepare negotiations.

The system follows the structure of thinking that is generally used by a negotiator. This means that the system starts by asking for the objectives of the negotiation. It then offers a number of options to achieve them. The user is guided by menus of questions and reminders shown on the screen.

The screen is divided in two:

- One half asks the user to indicate what he expects the system to do.
- The other half gives information on the first part's questions.

If the explanation in the first part is not sufficient, the user can ask for elaboration. This elaboration is going quite far, so that any unexperienced negotiator is able to use the system.

When the system arrives at a subject which is presumably well-known to the user, this subject is covered firstly by only one menu of questions. The last option of the menu is however:

- Do you want to elaborate on this subject?

If the user anwers this question affirmative the system enters a secondary level in which all details of the subject matter are showed to the user in the same way as described above.
In some cases the system can even go into a yet more detailed level.

If the user is an experienced negotiator he may want to suppress some of questions. Every menu offers the opportunity to skip the set of questions and reminders, either permanently or just for the time being. In this way the user creates his own levels. It is also possible to reverse this activity. The user may also retrieve one or more of the standard secondary levels and keep them permanently in the system.

In every menu one of the options is:

- Do you want to make a note about the matter at hand?

If the user confirms, the system displays a notepad and a menu. For this notepad a side-kick program will be needed. This notepad is

linked to the matter at hand. The instruction tells the user how to use the notepad. Basicly there are two ways. The user may either type in his own comments or he may select a standard text from the menu. There are two possible sets of texts:

- One covers items put in by the makers. These texts are designed by experienced negotiators, covering the most probable remarks.
- The other covers "contract clauses" generally used in this kind of situations.

The standard texts may be either in the system as such or the system clearly informs the user where he can find these texts. In the latter case books with standard texts are part of the system.

The systems stores answers and notes in a file and reopens this file whenever the program is restarted. However also this can be changed by the user. He can ask the system to leave the file as it is and create a new file. He can also ask the system to indicate where the second file deviates from the first. In this way the user can compare the result of different options.

5.1b. Using the system to prepare the contract.

The system is able to generate a draft contract.

Although this will usually only be done at the end of 5.1a. the user can ask the system at any moment to restructure the choosen texts of contractclauses in the way a standard contract is organized.

The system then asks the user wether it should add standard clauses to the selected ones. These standard clauses are for instance the introduction to the contract (whereas ...) and the like.

The user has the following possibilities to go through the system:

- Just reading questions and reminders without answering them.
- Answering at random.
- Making notes at random.
- Making corrections both in answers and in notes.
- Just reading questions and given answers without showing the notes.
- Reading given answers and notes.

The user may choose to print whatever felt necessary. He can also make copies of his selections and notes on disks at any given moment.

5.2. The expert system for negotiations; the technical aspects.

The core of the system consists of a database, combined with a menu structured querysystem of standard reminders and questions and dedicated reminders and questions, a related empty database in which choices of the user are stored, a sidekick notepad, a sidekick database with contract clauses in standard sequence, a menu structured help program and options for inputs of text and/or know-how. Hereunder these aspects will be detailled. To organise the system as a whole a shell will be needed in which the various databases and query systems can be programmed and interrelated, which will be described at the end of this chapter.

5.2a. The database.

The database consists of the various aspects of the negotiation proces. It elaborates on each phase of the negotiation proces as far as possible. The elaboration is limited by the space available on the disk (or disks) used by the system. It is estimated that one disk contains approximately 100 pages. If the system runs initially on a computer with only one diskdrive, this limits the possibilities, however it extends dramaticaly the usability. By building in possibilities for reference to other databases the system may be extended limitless. The only constraint becomes the processing time. If this will be too long in the end the sytem has to be redesigned.

5.2b. The query system.

The query system is based on the assumption that whatever negotiation is being executed, the negotiation follows in its preparation and during the negotiation itself the same kind of pattern. Every specific negotiation selects its own path by means of the decission-tree. At every division the kind of questions are basicly the same, however also specific questions are added, thus determining the path.

5.2c. The storage of the choices.

Every time the user has made the choice to follow a certain branche this choice is stored. As long as the user does not change his choice whatever happens after this last choice is connected to the formentioned branche. When the user changes his mind (his branche) the system transfers the previously selected path to that other branche and audits this path to the new situation. If a conflict occurs the system will display this and ask for a solution.

5.2d. The sidekick notepad.

The sidekick notepad is related to the decissiontree and the users choices. Notes are stored in the system as described in 5.2c.

5.3. The description of the shell.

A shell is a computer program that communicates between the user, the operating system and the various application-programs and subprograms. The shell contains all commands necessary to run the various programs, so the user does not have to know these commands. The user activates the commands by selecting his wishes from a menu on screen.

To define the kind of program necessary, it is assumed that it is possible to find an appropriate shell. The programmer therefore shall not be involved in developing such a shell, unless an applicable shell cannot be found. One has to search for the limitations of existing shells on the system as well as for the demands a shell needs to fulfil, to be appropriate for the developing of the indicated computer program.

Limitations of the shell on the system:

- It is recommended that in the beginning the total of text of the system does not exceed about 250 kilobyte. A model containing substantially less than 250 kb of text may be less useful to the user, while for a model that contains more text it may be difficult to find an appropriate shell.

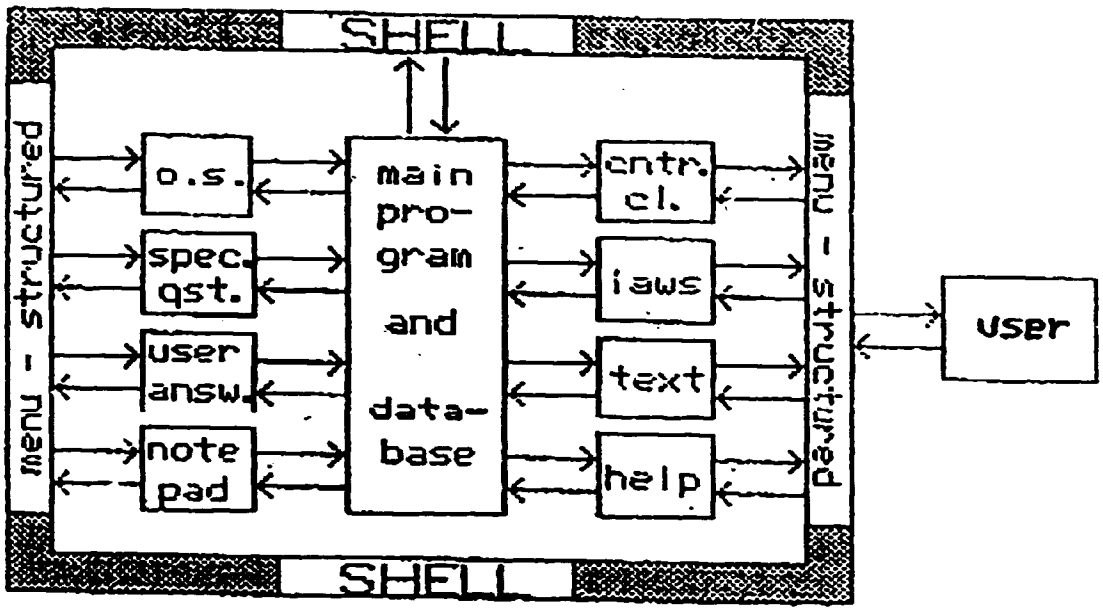
- The model needs to be decision-tree-based. Preliminary it is presupposed that the shell in which will be programmed is not making use of rulebases or other tools from the Artificial Intelligence Laboratories but just of a decision-network. If and when other tools appear necessary to make the system, this will influence severely the time necessary for the programming.
- The model has to have an open communication possibility with prewritten text and with other data-files. For start-up and demonstration purposes this necessity may be deleted, because this requirement limits the possible application of many shells. However in that case eventually another shell must be found or made.

Required functions of the shell.

User friendliness of the shell is regarded as very important.

- It is therefore recommended that the shell is fast enough to avoid perceptible waiting-time for the changing of screens.
- Opening, writing or closing of files should take place while the user is able to proceed, i.e. while the changing of screens continues.
- It must be easy to arrange the screens neatly to enable the user to recognize at once the subject of a screen.
- It should be possible to take a quick view at the program as well as to study a particular issue in depth. For this purpose the possibility of presenting standard answers is important.
- There needs to be sufficient space on each screen to present the required information.
- It must be possible to call a window inside the screen, containing additional information. For this purpose these windows need to contain sufficient space.
- The shell must enable the user to write, edit, and print text-files.
- It is recommended that the shell does not presuppose the use of a hard disk, but may work with floppy disks as well as with a hard disk.

It is very likely that a shell that fulfils the indicated requirements, at least the most important of them, can be found.



The user will only communicate with the shell, while the shell takes over the communication between the operating system and the various programs. The shell asks the user to select an option from a so-called "menu".

o.s. - operating system (e.g. dos)

spec. qst. - questions and reminders on a specific subject, not stored within the main database.

user answ. - storage of answers to the questions previously given by the user. These answers have been selected from a menu.

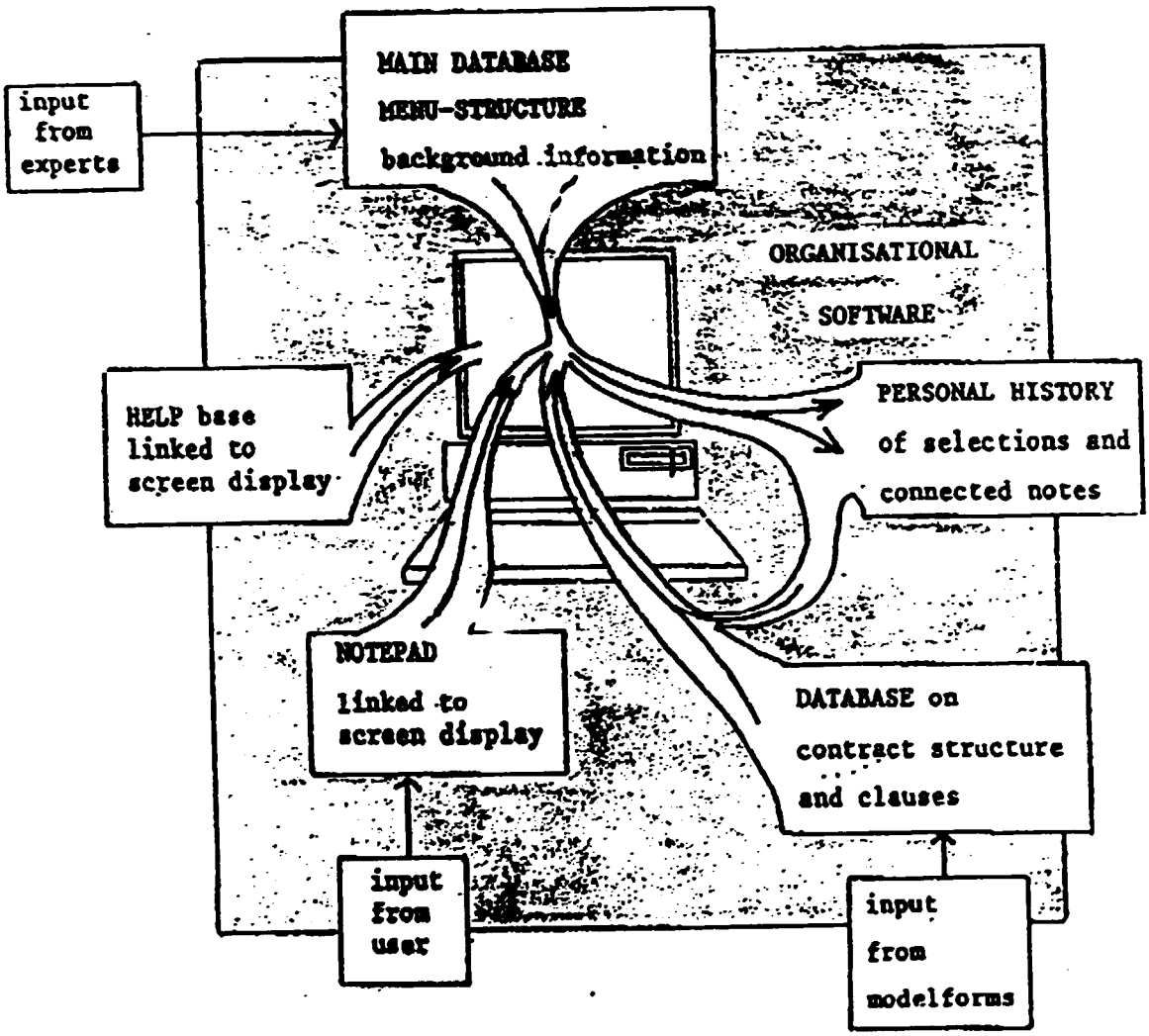
notepad - storage of notes and contract clauses made by the user. The notes are either selected from a menu or formulated by the user. Contract clauses are selected from a menu.

cntr.cl. - storage of contract clauses. These clauses are retrieved when notes are made and when a draft contract is generated.

laws - storage of important legislation of involved countries.

text - storage of standard texts. When using the notebook the user selects from these texts through the menu.

help - instructions on the program. Retrieval on users request. The retrieved information is always linked to the current situation on screen.



Structure of expert system for negotiations.

6. A possible schedule of activities.

As has already been indicated it is recommended to discuss this report in a meeting in UNIDO. This meeting may be attended by experts in negotiations as well as experts in expert systems. It should be stressed that this meeting shouldresult in a new report describing in detail the requirements of the expert system and the possible application in developing countries.

After the above mentioned meeting UNIDO can look for sponsors for a try-out of the export system in negotiations. The sponsor should be made aware that the expert system will not be just an assistance tool for negotiators but also a teaching and learning tool.

As soon as the funds for a try out are available the same team as mentioned above can make up the terms of reference for the executing experts.

The consultants who will make the try out can then select the experts. It goes without saying that this should be an expert team that encompasses both experienced negotiators, system analists and programmers. The try out has to be made in such a way that it can be used as a demo-model. It is the task of the expert team to monitor the consultants in their efforts. This means that the expert team will have freedom to change the terms of reference according to the findings during the developing process.

As soon as the try out system has been developed the model should be demonstrated. Demonstration should be organized for UNIDO officials and representatives of the sponsor(s). It would be prefered to apply the demo model first within the UNIDO itself. During this application the main flaws and bugs in the system will be found. The consultants will then have ample opportunity to correct and improve.

The last period will lead to a final try out model that can be applied in the field. In view of the most probable used language (english) one should choose an english speaking developing country. Here the flaws in the english language used by the experts are debugged, whereafter a second field application can take place. It may be necessary to repeat

this procedure. During the field application the users should make notes of their findings. Only those findings that can be regarded as mistakes will be improved; the others will be stored untill money is available for the development of the first "real version".

It is recommended to organize again a meeting in UNIDO with the expert team, the consultants, the people involved in the internal try out and those involved in the field application(s). The target of this meeting to prepare the terms of reference for the development of the real version.

UNIDO may then start finding sponsors for this first "real version".

As soon as money has been raised the first full version of the expert system in negotiation can be made. It goes wihtout saying that also these activities should be monitored, tested, improved etc. untill a final real version has been completed.

When this real version operates to full satisfaction, the program can be translated to other languages.

The total time elapse for a try out should not be underestimated. It is expected to be approximately one and a half year.
The developing costs, not including the purchasing of a shell and literature etc., will be 2.200 manhours. (Construction of the decission tree 800 manhours, system analyses 450 manhours, negotiating expert's input 100 manhours, rough programming 100 manhours, programming and testing 400 manhours and first testing within the developing team 350 manhours.)

- 0 -