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A GROUP DECISION SUPPORT SYSTEM FOR
INTERNATIONAL TRANSFER PRICING DECISIONS
WITHIN THE PHARMACEUTICAL INDUSTRY

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A GROUP DECISION SUPPORT SYSTEM FOR INTERNATIONAL TRANSFER PRICING DECISIONS WITHIN THE PHARMACEUTICAL INDUSTRY.

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Abstract:

During the last few decades, a lot of attention has been paid to studying and modelling transfer pricing decisions for management-control purposes. This resulted in corporate models in which transfer pricing was used as a communication mechanism between the holding and the divisions.

Not much attention has been paid, however, to problems related to international transfer pricing, which is concerned with financial, commercial and fiscal implications of international transfers between companies belonging to the same multinational group of companies.

In this paper, we try to answer the following research question:

“What are the characteristics of a Decision Support System (DSS) designed to support organisational decision making with regard to transfer pricing in the pharmaceutical industry?”

With regard to international transfer pricing, the pharmaceutical industry finds itself in a complex, hostile and turbulent environment. This “post-industrial” environment requires organisations to make faster and better decisions in order to survive.

As various experts are involved in the decision making process with regard to international transfer pricing, the DSS needs to support group decision making. Also careful attention needs to be paid to structuring the decision making process.

The three main activities of the decision making process are defined as: Feasible Solution Search, Preference Ordering, Disaggregation.

For these activities appropriate support tools are described.

Initial conclusions are:

1. Structuring of the decision-making process is of main importance in order to improve organisational decision making in the area of international transfer pricing. In this structuring process, careful attention should be paid to the issue of aggregation / disaggregation.

2. In order to survive, a Group Decision Support System (GDSS) needs to have a minimal “frequency of use”. This should be guaranteed by a broad scope of applications which can be supported by the GDSS. In case of an application oriented GDSS, like our (G)DSS for international transfer pricing, availability of the support tools for individual and sub-group use can also be a viable approach. In the latter case, careful attention should be paid to interfaces with existing management information systems and integration of the (G)DSS in the organisation.
SECTION I: INTRODUCTION

The research question addressed in this paper is:

"What are the characteristics of a Decision Support System (DSS) designed to support organisational decision making with regard to transfer pricing in the pharmaceutical industry?"

As will be shown in the next section, the nature of international transfer pricing problems is such, that they only can be studied in a natural setting. As far as we know, no previous studies have been carried out with the aim to design a (Group) Decision Support System (GDSS) for international transfer pricing decisions. According to Benbasat (1986, page 3 and 4), a "case study approach" is considered to be especially appropriate under these circumstances.

The strength of the case study approach is the in-depth and first-hand understanding the researcher obtains. Weaknesses are the potential lack of objectivity stemming from the researchers stake in effecting a successful outcome and a potential lack of generalisability to other situations. However, given the nature and complexities of the application domain, and given the fact that no DSS exists in this area, we consider a case study approach the most promising one.

In order to check the generalisability of our approach, we held a small survey on aspects of transfer-pricing decisions as perceived by 12 experts from the European based pharmaceutical industry. This survey was organised in 1986 in close cooperation with Management Forum, an independent educational institute. Outcome of this survey was that the perception of the decision situation concerning transfer pricing, was similar amongst all 12 experts. Their view on the decision situation is not only shared by the decision makers with whom we currently cooperate but also supported by theory (see Section II and III).

This paper deals essentially with DSS and not with transfer pricing issues. In the research set up, problem specification is heavily stressed (Sol, 1982, page 3 and 4). As we use commercial available "DSS generators", less attention needs to be paid to purely technical aspects. While studying transfer pricing, however, we came to realize that "transfer pricing" means something completely different to different people. Some relate it to management control or international tax issues. Others to mathematical optimisation or political economics. Again others regard transfer pricing mainly as a financial instrument.

As concepts related to transfer pricing vary, we start this paper (Section II) with an overview of what international transfer pricing is about. As the pharmaceutical sector differs sharply in many respects from the manufacturing industry as a whole (Burstall, 1984, page 11) we shall also discuss some aspects of pharmaceutical transfer pricing.

On the basis of characteristics of post-industrial organisations, the Group DSS concept is explored in Section III. In Section IV the global design of the GDSS is described and in Section V initial conclusions are drawn.

SECTION II: INTERNATIONAL TRANSFER PRICING: A COMPLEX ISSUE.

In this section, we intend to give an impression of what international transfer pricing is about. However, no comprehensive overview of all as-
pects involved should be expected as we consider that outside the scope of this paper. Our only intention is to give some insight in the financial, fiscal and commercial issues related to international transfer pricing.

The pharmaceutical industry is strongly internationalised. As the transfer price between the various parts of the company is the price for which the product crosses the border, the height of the transfer price has, among other things, consequences for the international allocation of financial resources and profits, corporate taxes paid in various countries and import duties. Because of the impact of transfer pricing in these areas, also an increasing interest from the media and the general public can be observed. We define transfer pricing policies based to these considerations as “international transfer pricing”.

While discussing multinational companies the OECD report on transfer pricing states:

"... Such an international economic entity generally operates in a legal framework which has remained national; it has therefore to conform with the varied and sometimes conflicting national laws of the countries in which it operates" (OECD, 1979, page 7).

Some examples illustrate this issue:

- A company in country A bought from its subsidiary in country B at a price which was too low, according to the Customs Authorities, and therefore the price was increased. This increase, however, was not accepted by the Fiscal Authorities in country A. The company took this decision to court but the court decided that the decision of the Duty Authorities was not relevant to tax on profit (Verlage, 1975, page 107).

- Less developed countries often increase duty revenues through uplifts in transfer-price values instead of changing the duty rate. Valuation changes have the advantage of low international visibility and great "flexibility" from the point of view of the local authorities. For the multinational company, however, this implies that they are subject to arbitrary and unpredictable customs payments (Sherman, 1980, page 128 and 129).

- Minority shareholders and/or profit-sharing personnel may require a low purchasing transfer price level with the aim to maximize own income (OECD, 1979, page 8).

- Governments usually try to capture the largest possible slice of the taxable cake. All in all, the fiscal authorities tend to look critically at business practices which reduce their portion of taxable revenue but show no interest in questioning the payments that increase their revenues. Their attitude is asymmetrical which may result in double taxation (Plasschaert, 1979, page 56).

These examples illustrate the difficult position of the multinational company. Over the last two decades however, the awareness that an international approach to transfer pricing is needed has increased. The "arm’s length principle", which resulted from this international approach, will now be discussed briefly.

In 1979 the OECD committee on fiscal affairs developed the arm’s length concept for fiscal purposes. The arm’s length price is in the committee’s report defined as the price which would have been agreed upon between unrelated parties engaged in the same or similar transactions under the
same or similar conditions in the open market (OECD, 1979, page 7). Fiscal consequences are usually judged at aggregate level. In order to assess whether prices are at arm’s length or not, the following four approaches are established:

- **Comparable Uncontrolled Price**

  The comparable uncontrolled price method offers the most direct way of determining an arm’s length price. The transfer price is set by reference to comparable transactions under the same or similar conditions between a buyer and a seller who are not associated enterprises (OECD, 1979, page 34).

- **Cost Plus and Resale Method**

  There will be many cases where no useful evidence of uncontrolled transactions will be available because, for example, the goods which are supplied are so special to the multinational company that there is no open market. This may particularly be the case for semi-finished products or in relation to transfer of technology. An example may illustrate this issue: A pharmaceutical company in country A developed a patented drug which can be regarded as a major breakthrough in treating a specific disease. This drug is sold to a subsidiary marketing company in country B as semi-finished product. Within that subsidiary, final treatment takes place before the finished product is sold to pharmaceutical wholesalers in country B. As the company in country A is the single producer of this patented drug, it is impossible to determine the transfer price of this semi-finished product by comparing it to the price of the same or similar products sold in the open market as no "open market sales" of the product exists. In such circumstances it will often be necessary, in order to establish an arm’s length price, to use either the cost plus method or the resale (or sales minus) method. The cost plus method starts from a third party purchasing price and adds on a mark-up which can be considered to be at arm’s length. The sales minus method starts from a third party selling price and subtracts a mark up which can be considered to be at arm’s length. The resale method is probably most useful in case of marketing operations, like in the example described above. (OECD, 1979, pages 13 and 40).

- **Other methods**

  The complexity of real life business situations may put many conceptual and practical difficulties in the way of application of the methods referred to above. So when the methods mentioned above fail, a mixture of these methods or other methods, not mentioned above, may sometimes have to be used. An example of such a method might be to determine the "yield on capital" involved. (OECD, 1979, pages 14 and 43)

The different approaches to transfer pricing from various types of authorities (e.g. tax and duties requirements; double taxation) cause conflicting requirements for the multinational company. As the first example given above showed, these problems may be difficult to resolve.

Above, we concentrated on various regulations concerning international transfer pricing. Now we will discuss the financing aspects. As the pharmaceutical industry is strongly vertically integrated, we limit ourselves to the multinational company with centralised financial management. So only the financial relationships between a mother company and its various local daughter companies are considered. In our case the relationship between the mother company and the local company has many aspects as the mother company
is not only the main shareholder but also the local company's main supplier of goods, management support and patent rights. It also happens that the mother company acts as the local company's bank. Marketing is the main task of the local company. Production and research are done at the mother company's site. Financial transfers between the local companies are assumed to take place via the mother company. The mother company together with the local daughter companies are defined as "The group". Shareholders of the group are compensated via the mother company. To compensate for these costs, funds need to be transferred from the local company to the mother company. From a financial point of view, it is not important which product causes the transfer. Hence, financial consequences are judged on an aggregate level.

It is important to realise that transfer price payments are only one alternative amongst many. However, as we consider it outside the scope of this paper to discuss all financial alternatives in detail, besides transfer pricing, only two alternatives (royalty and dividend) for transferring funds are described below (Ammer, 1977).

1. **Transfer prices**

Transfer price payments are the payments from the local company to the mother for goods bought from the mother by the local company. Please note that we limit ourselves to the prices of goods. These payments are related to the mother company's role of production centre and supplier.

2. **Royalty**

Royalty payments are payments from the local company to the mother company in exchange for the right to use proprietary trade marks, patents or other intangible assets from the mother company. These payments are related to the mother company's role of research centre and patent holder.

3. **Dividend**

Dividend is the part of a local company's profit that is distributed among the shareholders in proportion to their share of ownership. It is a payment from the local company to the mother company. These payments are related to the mother company's role of shareholder.

Apart from these alternatives, share capital payment, allowances, loans and various other means can be considered.

It will be clear that the financial aspects of international transfer pricing seriously complicate the decision making process. This is especially so as many regulations exist with regard to each of the alternatives. To discuss these regulations in detail goes beyond the scope of this paper.

So far, international transfer pricing in general was discussed. For the pharmaceutical industry one other aspect deserves attention. In many countries, price regulations exist in order to contain health care cost (at least in the short term). These regulations are very specific and vary per country, but in general one can say that they result into an additional governmental body which is concerned about transfer prices.

The brief descriptions above present the "state of the art" at this moment. It should be realised however, that these regulations are by no means static. The fiscal, customs and health care authorities continually adapt rules and legislation to new insights and changing political requirements.
An example of new developments in the area is the EEC "Transparency Document" (Commission, 1986) on pharmaceutical (transfer) pricing. This "transparency document" is a small first step towards harmonisation of the community's pharmaceutical market. In the coming years it will presumably result in changing requirements for the industry.

Another aspect of international transfer pricing is the impact it can have on commercial and marketing goals of the company.

From a commercial point of view, it is not only important that money is transferred from one part of the company to another, it can also be important to look carefully at the products used for that money transfer. In other words, the transfer pricing policy is considered at a disaggregate level.

Research and development cost and other overheads are relatively high within the pharmaceutical industry. These costs cannot be allocated towards the various products, other than on an arbitrary basis. From a commercial point of view, however, it is important that this should be done carefully for the following reasons:

- To limit the price divergence between the various markets. As different market conditions cause different selling price levels and different levels of local costs, the local gross margin and the local import (= transfer) price level differ per country. To avoid big price differences for individual products between different countries, transfer prices of highly internationalised products are kept at the same level as much as possible.

- To allocate cost of marketing support. Each individual product requires a different level of marketing support from the holding. Although also these costs are difficult to allocate too, it can be said that, in general, new products require more local marketing support than older products.

- To relate price differences to differences in product quality. Although development costs of various products cannot be allocated towards individual products, this does not mean that every product should contribute the same amount. High quality products with great benefit for the patient should contribute more to future research than other products. These benefits, and consequently the price and transfer price, are determined on the basis of comparison with other pharmaceutical products in the same therapeutic area.

This means that, for commercial purposes, the prices of individual products (disaggregate level) should be considered carefully. However, as customs authorities also screen transfer prices at disaggregate level, this does not mean that the company does always has the freedom to set its prices at the desired level.

The fiscal, financial and commercial aspects of international transfer pricing are so complex that no human experts exist who combine expertise in all areas. Consequently, within the pharmaceutical industry, transfer pricing policy is decided upon by a group of experts and managers:

The following organisational groups are represented:

- Price Coordinaton Staff
- Local Management
- Central Management
This group of experts acts as a team with the following common goal: To determine that policy which is best in view of the long term goals of the group as a whole. So the main aim of the decision-making group is expertise sharing with regard to transfer pricing.

The qualification "decision making group" does not necessarily imply that this group also formally authorises the decision. This might for instance be done by regional management. In fact, however, the decision is made by the group of experts on the basis of consent.

SECTION III: CONCEPTUAL FOUNDATIONS OF GROUP DECISION SUPPORT SYSTEMS

As far as transfer pricing is concerned, the pharmaceutical industry operates in a hostile, complex, and turbulent environment.

Huber (1984 and 1986) considers these three characteristics important features of the "post-industrial" organisational environment. Post-industrial organisations need to take more complex, more frequent and faster decisions in order to survive. Awareness of this fact provokes and promotes developments both within organisations themselves and within the science community. Huber expects that these efforts to increase decision quality will be successful and that, in order to enhance their decision-making processes, post-industrial organisations will adopt on a widespread basis these design features:

1. Communication and computing technologies,
2. Decision group technologies and structures and
3. Decision process structuring.

These design features will now be discussed in more detail.

1. Communication and computing technologies

With regard to communication technology, electronic mail systems and other devices will be extremely userfriendly. The consequent increased accessibility to people, increased efficiency of communication, and increased timelines of communication (all much more important in the faster-paced environment of post-industrial organisations) will cause post-industrial communications to be adopted on a scale not greatly different from that of the telephone today.

With regard to computerised aids in decision making, Sprague and McNurlin (1986, page 363-385) expect the addition of artificial intelligence techniques to decision support systems. They also expect extreme userfriendliness to become a common characteristic of computerised systems.

2. Decision-group technologies and structures

Increased environmental complexity leads to the need for more information exchange. Often this exchange takes place at meetings between staff experts and line management. As said earlier, an important point to note is that the organisational members meeting may not make the ultimate decision. They may be creating and/or reviewing alternatives to be submitted as a short list to the next level in the organisational hierarchy (Gray, 1986 page 158). Given higher levels of environmental complexity, there will be pressure for the number of meetings in post-industrial organisations to be greater. This pressure will be resisted
strongly, however, since the managerial time available for meetings may be approaching its limits and because meetings are widely regarded as less than optimal uses of time. What is to be the resolution of this situation?

As one approach, behavioural scientists and individual organisations will develop and implement additional technologies for increasing the efficiency and effectiveness of decision-oriented meetings. Even though a good deal of development work has already been done, and some adoption of decision-group technology is emerging, in the post-industrial organisations the increased need to exchange information leads to much higher density of application of such technologies.

As a second approach, a significant increase in decision-group efficiency and effectiveness will be achieved by creatively integrating communication and computing technologies into decision-group technologies. (See also Sprague and McNurlin, 1986, page 365 and Phillips, 1985 page 29). This has already occurred in a rudimentary way in the form of teleconferencing, video-conferencing, and electronic-mail-enhanced Delphi studies. Face-to-face groups also are made more effective with marriages of communication and computing technologies and behaviourally-based technologies as when, for example, in the Nominal Group Technique each participant writes his or her ideas on an electronic pad and then transfers them to the “public screen” (a kind of electronic blackboard) with the touch of a “send” button, or when ratings are forwarded and compiled electronically and displayed as histograms so that discussion can be directed in more fruitful channels.

The Social Judgement Theory is a significant contribution to the developments in the area of group decision support. The Social Judgement Theory was originally developed to “aid those persons who must exercise their judgement in the effort to formulate social policy” (Hammond, 1975, page 276). Social judgement theorists build cognitive aids to improve human judgement. Their aim is not to develop a law seeking theory but to develop “life relevant” tools. They develop interactive computer graphics terminals which display pictorial representations of weights, function forms and uncertainty in judgement policies of organisational members. Although these tools were originally developed for “social judgement”, they are nowadays also applied in business settings (Cook and Hammond, 1982, page 13-39). Like Huber, social judgement theorists concentrate on cognitive processes and information exchange within decision making groups. This includes collecting and evaluating information, forging alternative courses of action and selecting one as preferred. They do not focus on the socio-psychological dynamics of group behaviour (Guzzo, 1982, page 4).

In summary, given the apparent need for more decision-group meetings and, at the same time, a considerable resistance to them, we expect post-industrial organisations to seek and adapt on a widespread basis more sophisticated group technologies, and that as a result of GDSS use, the efficiency and effectiveness of decision groups will increase.

3. Decision process structuring

The demand for faster decisions will cause logistics-related delays in decision processes to be considerably less tolerable in post-industrial organisations. In addition, the need to make more complex decisions will require organisations to ensure participation from a wider variety of experts and managers. Together these needs will motivate post-industrial organisations to adopt more formal approaches to "decision-process man-
Although the idea of formally managing the organisation's decision-making process is new, it is so similar to the concept of project management, that Huber expects it to be readily operationalized. Also Sprague and McNurlin (1986, page 385) expect changes in the way organisational decision making is structured. It is likely, in fact, that as decision-making receives more explicit recognition, decisions will increasingly be viewed as 'projects'. This can be explained as follows: As situations change rapidly, it is impossible to install fixed bureaucratic procedures to react to stimuli from outside the organisation. On the other hand, to assure the quality of the decision making process, the involvement of several organisational members, both from line and staff, is required. The timeliness of the decision process requires this involvement to be without delay. This will lead to the adoption of project-management technologies for managing the production of tactical and operational level decisions.

It appears that process-management technologies such as these could be readily transferred to the organisational decision context, and it is likely that future demands will lead to the development and use of technologies specifically designed for decision-process management. This does not mean, however, that decision making should also be more formalised as in some situations. The decision process may be optimal in case of an informal, adaptable and flexible way of decision making.

To summarise, we can state that post-industrial organisations should include, among other design features, advanced communication and computing technologies, improved decision-group facilities and decision-process management as responses to the post-industrial environment's demand for more frequent, faster, and more complex decisions.

We agree with Huber, however, that we do not expect any particular feature, technology, structure, or process, to be lasting. Opportunities and problems, and means for dealing with them, will change. The appropriateness of any particular organisation design feature will change, often quickly. So innovation in organisational design and organisational decision support is, and will be, called for.

And innovation is the aim of our research project. In this section we developed a theoretical basis for the decision support system that we designed. Relating the characteristics of the pharmaceutical industry to its post-industrial environment, the following aspects will be recognised in the DSS design:

- The use of user friendly computing technologies
- Improved decision group technologies
- Decision-process structuring

These three features form the basis of the decision support system. In the next section this is explained in more detail.

SECTION IV: OUTLINE OF THE PROPOSED DECISION SUPPORT SYSTEM

Based on the requirements for effective decision support for post-industrial organisations, we developed a group decision support system for international transfer pricing decisions in the pharmaceutical industry.

In our case, the concept of "Decision Support System" should be interpreted
in a broad sense: An integrated framework of hardware, software, models, data, procedures, roles of organisational members and training, set up to increase the effectiveness and efficiency of the decision-making process. In this description, the word "integrated" does not only refer to the links between the various aspects of the decision support system but also to the links with the organisation. According to the definition of DeSanctis (1985, page 3), the DSS should be considered a Group DSS as it is a computer-based system for use by a group of people who are jointly responsible for making decisions, in our case about international transfer pricing. We would like to stress however, that this does not mean that the DSS should only be used by the group as a whole during especially organised "decision room sessions". The application domain elements should also be used by individuals outside the group. In this paper, the word DSS refers to a "specific DSS" (Sprague, 1982, page 14) for transfer pricing problems. It should not be considered a "DSS generator".

Integration of the GDSS software with the software used within the organisation is important. This in order to guarantee a certain minimal "frequency of use" (see Huber, 1984, page 198) of software and procedures.

Related to the concept of group decision making is the concept of "Decision Process Structuring". This implies that the decision-making process is divided into various activities with predetermined formats for input and output. Input and output of the various activities are recorded. Recording is done for two purposes:

- The recorded data can be used when reconstructing and reconsidering the decisions taken later on.
- Systematically ordered files of the group decision-making sessions can increase insight in transfer pricing problems when considering new cases.

The structured decision-making process will stimulate that careful attention is paid to all relevant aspects. By referring to this process, "jumping to conclusions" should be avoided. However, as transfer pricing problems differ enormously in content, the chosen structure should be a very flexible one. E.g.: In case of problems with customs valuation, there is no need to go through all alternative ways to transfer funds (like dividend, royalty etc.) in detail. So the GDSS should be divided into modules, in order to invoke only the parts which are needed.

The decision making process with regard to transfer pricing is normally activated by one of the following two triggers:

- Liquidity shortage /surplus of a local company,
- External requirements of governmental agencies.

In case that the first trigger occurs, transfer price changes are considered simultaneously with other instruments to transfer funds, like loans and dividends etc. If transfer prices are considered a good alternative, the outcome of this part of the decision making process is expressed as an average gross profit margin for the local company as a whole. This average is translated into new prices of individual products (disaggregation).

In case of the second trigger the transfer prices are changed to comply with the rules. However, the transfer-price changes which are forced upon the local company may result into a liquidity shortage/surplus. As this liquidity problem needs to be solved, various alternatives to transfer funds (like loans, dividends etc.) are considered. The external requirements which cause the trouble may be set at aggregate or disaggregate level. The exact structure of the specific decision-making process depends on the
specific requirements under consideration.

The group decision-making process, exists of the following three activities:

- **Activity I: Feasible Solution Search**

  During this activity, regulations concerning aggregate level figures are interpreted. In relationship with the specific problem at hand, it is determined which range of transfer price level is acceptable to the authorities. This range is expressed as a range of Cost of Goods/Sales ratios (The Cost of Goods/Sales ratio is 100% minus the Gross Margin). Also of the alternative ways to transfer funds (eg. loans, dividends), the limits as set by the authorities are determined.

- **Activity II: Preference Ordering**

  Financial consequences of funds transfer by means of the various alternatives are determined. For these calculations, among others, interest-, tax, duty- and foreign exchange rates are used. Also the desirability of each of the alternatives is expressed in a "Preference Factor". By means of these Preference Factors, qualitative differences between the various ways to transfer funds are translated into monetary terms. It should be stressed that the preference factor is a subjective interpretation of many aspects relevant in a specific situation. Hence, Preference Factors can easily change over time and should be determined separately for each decision situation. On the basis of the financial evaluation including the Preference Factors, a choice is made out of the feasible solutions, as determined during Activity I. The output of this activity is the Cost of Goods / Sales ratio on aggregate level and the amounts which should be transferred by means of each alternative (royalty, dividend, loan etc).

- **Activity III: Disaggregation**

  During Activity III, the new transfer pricing policy, as expressed as a cost of goods/sales ratio, is translated into transfer prices for individual products. During this activity, attention is paid to prices in reference countries and requirements of authorities with regard to the transfer prices on a disaggregate level.

  It should be realised that these activities are closely interrelated. E.g. it can happen that an overall cost of goods/sales ratio as determined during the Activities I and II cannot be implemented because of constraints at the disaggregate level. Another possibility is that the interpretation of regulations during activity I is too limited to find a solution for the liquidity problems in Activity II. So decision making will be an iterative process.

  During the design process, a prototyping approach is used. Prototyping is used to increase problem understanding and to specify systems requirements. It should be stressed, however, that we are not building test versions of the final prototype, as shown in Figure 1, that we want to develop. For that reason we prefer to use the word "discussion draft" for the intermediate prototypes we develop. These discussion drafts are mainly used to facilitate communication between the designers and the decision makers (see Sol, 1984).

For each of the activities mentioned above, a component of the DSS is designed. All components offer problem-oriented support and are built in Personal Wizard. By "problem oriented support" we mean that the software is designed to support a certain application domain. In our case, the applica-
Figure 1: The provided decision support
tion domain is international transfer pricing. The software can be used outside as well as inside the decision-making sessions. For the experienced decision maker the support should be a checklist and a fast calculation tool. For the inexperienced decision maker it should help him to structure the decision-making process. Analyses of the support tools should also prove to be an effective training instrument.

In our DSS, the financial modelling package ("DSS generator") Personal Wizard is used. We think that the use of Personal Wizard for our modelling purposes will stimulate the necessary frequency of use, because:

- Personal Wizard can be used by most staff members as it does not require extensive training.
- Personal Wizard can be easily interfaced with other systems.
- Personal Wizard models can easily be adapted for individual use outside group sessions.
- Individuals can develop their own models for input in the group sessions.

For more details on Personal Wizard, see Comshare (1986) and Van Schaik (1986).

During interviews with the experts involved in transfer pricing, it became clear that not everybody speaks the same language. To avoid misunderstanding during the decision-making process, a "Data Dictionary" is set up which defines all concepts and parameters.

The three components in a DSS are (see Figure 1):

- **Component I: Support for Activity I (Feasible Solution Search)**

  Financial models are developed which reconcile balance sheet and profit and loss figures as set up for Management Control purposes on the one hand with the predefined formats as required by the authorities on the other hand. An example of such a predefined format are the Profit and Loss Account and the Balance Sheet as required by the fiscal authorities.

  It is important to bring these models in the group process, as interpretation of the figures can be subject to negotiation with the authorities. Hence the way these figures are related to each other should be subject to careful examination by the decision-making group.

- **Component II: Support for Activity II (Preference Ordering)**

  The financial models for this activity calculate the effect of the various ways of transferring funds. The financial impact of tax legislation, interest rate, time delays and exchange rates is determined. Total financial results are multiplied by the Preference Factors in order to determine the preference ordering. On the basis of the total amount which needs to be transferred and the limits per alternative as determined in Activity I, the amounts per alternative are calculated.

  An important feature of this component is modularity: for each alternative to transfer funds, a module exists but only the relevant modules are invoked by the decision-making group.

- **Component III: Support for Activity III (Disaggregation)**

  Component III provides three kinds of support:
- The actual disaggregation calculations which are done by means of "what if" calculations and "goal seeking".

- Comparison of transfer prices to transfer prices of reference countries.

- An indicator which helps the decision makers to determine whether the impact of a transfer price on local company figures will increase or decrease in future.

It will be clear that Component III makes extensive use of the data stored in management information. The design of this component is such that it is possible to interface the support software with existing systems. For more details on (dis)aggregation for decision support, see Sol (1985).

Above, the specific software components for the three activities are described. This software can be used outside as well as inside the decision room. The use outside the decision room should guarantee the necessary "frequency of use" as this specific application domain software can also be used by a small sub-group or an individual.

Another aspect of the system is the group interaction support. Relevant are the procedures, roles of organisational members, hardware and software designed to support group decision making. So this part of the DSS is mainly related to group decision making in general and less to transfer pricing.

In principle, the Activities I, II and III take place at one or two one-day sessions outside the normal working environment. Participants are not allowed to be disturbed and the whole day, including lunch, is spent with the decision-making group (see also Phillips, 1986). This session should replace the meetings, memos, telephone calls, telex messages etc. which otherwise should have been necessary to make a decision. This requires that, during these sessions, all decision-makers are present and that relevant information is available. Information should be made available via the support software or brought in by decision makers.

As we are designing a system for "real life" situations and not for a laboratory setting, we have to accept the constraint that, at the current time, not all decision makers know how to work with a personal computer: "End user technophobia" (Suchan, 1987, page 441). So some of the participants of the meeting should take care of handling the computer. In fact they perform the role of analyst. In our set up, two of the participants should perform this role. These analysts, with a personal computer each, should have thorough understanding of the decision-support software. They should have sufficient knowledge of the financial models and of Personal Wizard to change the models on request. Of course they should also be able to perform "What if" and "Goal seeking" calculations and to do data entry. The handling of the group decision support software and recording is also their responsibility. In fact, the analysts perform partly the same function as without use of the GDSS. The main difference is, however, that with the help of the GDSS, the analyst does not provide his input by means of reports but on the public screen.

A second role is also of great importance: the role of facilitator. In our set up, decision process structuring is one of the dominant design characteristics. This approach is new, also for the decision makers with whom we currently cooperate. This implies that, at least in the implementation
phase, one of the participants needs to take care of structuring the
meeting. He should help the participants to put their point of view
forward when appropriate and not just as it comes to mind. In his role of
facilitator, the participant who takes this role should not so much
concentrate on the outcome of the meeting but more on the decision-making
process itself.

For the decision makers, also group support software should be available.
The following support facilities will be available in the decision room:

- **Listing and ranking of alternatives**

  This facility makes it possible to evaluate alternatives systematically
  in a short period of time. It might be used in determining the preference
  factors of Activity II.

- **Logging and recording facilities**

  This facility consists of a wordprocessor package to record any item that
  the group wants to record. Besides this, automatic logging facilities are
  available to log every iteration of the decision making process.

- **Computer aided judgement analyses**

  During group discussions, it often happens that group members continue to
  repeat their point of view and thus inhibit effective communication.
  Facilities are offered to help the decision makers to express their point
  of view by means of computer graphs. Comparison of the graphs as made by
  the various group members will provide better insight in existing dif-
  ferences and similarities.

The decision-making process takes place in a room in which the following
hardware is installed:

- **Two workstations connected to two public screens**

  Two computers are needed as the analysts should be able to work indepen-
  dently from each other. Another reason is that the session should be able
to continue in case one computer breaks down. The two computers should be
connected via a Local Area Network to facilitate a swap of data and/or
software. Speed is important as the participants should not be kept
waiting. We consider two IBM-ATs a good solution.

  A “public screen” is an electronic blackboard which displays the computer
screen to all participants of the meeting. As the number of participants
is limited, we do not think that a large video-gun is needed. A
“Transview”, which displays the public screen by means of an overhead
projector, should be sufficient.

- **Printer**

  To be able to hand out hard copies of certain screens, a printer should
be available. As printing may be required during the sessions, a quiet
printer (e.g. a laser-printer) should be chosen or the printer should be
installed in an adjacent room.

As the sessions should be rather informal, there is no strict layout of the
decision room. For an impression of a possible layout, see Figure 2.
Figure 2: Possible layout of the decision room
SECTION V: SUMMARY AND CONCLUSIONS

In this paper we presented the design characteristics of a group decision support system for international transfer pricing within the pharmaceutical industry. From the design process and the feedback which we received on our discussion drafts of the system, the following initial conclusions can be drawn:

- International transfer pricing is a good example of an area where multinational corporations are confronted with a "hostile, complex and turbulent" environment. Consequently, it should be a good test case for the approach to aid organisational decision makers as presented by Huber (1984, 1986).

- Based on a brief survey among experts, study of literature and the feedback on the "discussion drafts", we expect that group decision support and decision process structuring are two important concepts to enhance decision making in the area of international transfer pricing. However, it should be stressed that thorough knowledge of the application domain is necessary in order to provide useful support. We have the impression that the importance of application domain knowledge is not sufficiently stressed in current (Group) DSS literature.

- In international transfer pricing, careful attention should be paid to aggregation and disaggregation issues. The need to analyse transfer prices simultaneously on the aggregate and the disaggregate level requires a flexible and iterative decision making process. The decision-process structure and the offered support tools should be designed accordingly.

- In GDSS literature, the problem of "minimum frequency of use" of a system is usually approached by means of widening the scope of the GDSS: The design should be such that group decision making related to various organisational areas can be supported. Consequently, the GDSS should be of a general nature (Huber, 1984; Suchan, 1987, page 443). In our GDSS, however, another approach is taken. By using an easy to use DSS-generator (Personal Wizard), frequency of use should be guaranteed by use of the developed application domain support by small subgroups and individual decision makers. So support should be available for all those who are concerned with determining transfer prices, whether working individually or in a group. When using this approach, careful attention should be paid to interfaces with existing management information systems and integration of the (G)DSS in the organisation.

- When developing GDSS for use within organisations, it should be accepted that some decision makers are "computer illiterate" and wish to remain that way. So not every participant should be forced to provide (some) of the input for the meeting via a terminal. An alternative way of using GDSS is to have a junior staff member available who operates the computer in his role of "analyst". The use of Group DSS operated by an analyst can be seen as a gradual way of integrating group decision support in the organisation.

Above, some initial conclusions of our research were drawn. The coming years, the research project will continue. It will be clear that comments on this paper, from industry as well as from the scientific community, will be highly appreciated.
BIBLIOGRAPHY


