OPTCHOICE - Web Enabled Optimal Choice

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Abstract – ***OPTCHOICE* is a package consisting in: a software capable to define and solve in remote regime, using the Internet, optimal choice problems, a technology to enclose, in e-business applications, the ready-made modules for optimal choice of a decisional alternative, and finally, a library containing technology's applying samples. The optimal choice is based on a multiple attribute decision-making model. The model is general, with more than one decision-makers and states of nature, the attributes being of cardinal, ordinal, Boolean and fuzzy type. It benefits from knowledge-based computing for inconsistency avoiding. Regarding the problem solving, there are five generalised solving methods and one rule-based procedure to get a unique optimum. In order to prove the efficiency in using this technology, the paper focuses on the samples built.**

I. INTRODUCTION

Advanced e-applications have a large set of characteristics that individualize very well this class of *e-applications* [1]. The most important discriminating characteristic is the embedding of the mathematical modeling and artificial intelligence. This paper will present thee practical results in using a technology for developing advanced e-applications that use optimal choice over a set of decisional alternatives, namely: *Tele-SUPPLY*, *Tele-AUCTION* and *Tele-PROCESSING*. Moreover, at the beginning of the paper, the *OPTCHOICE* software and the *OPTCHOICE* technology will be lightly sketched because these components are stilling under final testing and improvements.

II. *OPTCHOICE* SOFTWARE

The *OPTCHOICE* software will be the product capable to define and solve in remote regime, using the Internet, optimal choice problems. It will be the promoter of the package with the same name because it will be free to access it from every corner of the world. So, this service will educate a large category of *e-applications* developers to increase the quality of their production by using mathematical modeling and artificial intelligence. The power of this product will be revealed by shortly presenting its "engine".

A. Decisional Mathematical Model

The decisional process is a multitude of human activities consisting mainly in the realization of the existence of more than one possible course of action in a certain given context, the analysis of their consequences with respect to the envisaged goal, the choice and implementation of the action that is considered optimal in the axiological perspective that has been adopted.

In this section will be briefly presented the Multi-Attribute Decision Making (MADM) mathematical model and the Optimal Choice Problems (OPCs) generated over this. The OCP can be easy handled in the MADM theory. The MADM framework involves the following elements: a set of decision-makers (whose elements are the persons with assignments in the process of defining and solving the OCP), a set of states of nature (each one of them synthetically signifying the totality of circumstances that determines for a specific OCP variations in its formulation), a set of objects (containing the decision alternatives), a set of attributes (consisting in those characteristics which are evaluated for every decision alternative). An attribute may be expressed in a Boolean, cardinal, ordinal or fuzzy manner (by triangular membership functions), but this expression must be unique for a fixed attribute. Each attribute has an associated variation interval (according to its type) and an associated interval of standard values. Also ones consider an indicator which may take two values, "max" or "min", depending on the fact that the attribute the greater it is the better is considered or the smaller it is the better is considered respectively. Considering the above four sets as support, two functions are constructed. First, the absolute importance of each decision-maker / state of nature / attribute, considered in the multitude of decision-makers / states of nature / attributes. The absolute importance has the property that summed upon all existing elements gives one. Second, the evaluation of all attributes for every object, in every state of nature and in the opinion of every decision-maker. This function is usually known as characteristics matrix. It has a hybrid character, being divided, intuitively speaking, into two areas: the first is the "well-defined area" of the matrix, in which every attribute has a well-defined value for every object, for every state of nature and in the opinion of every decision-maker; the second is the "ill-defined area", meaning that the values of certain attributes in relation to certain objects in certain states of nature are unknown or that they cannot be expressed by some of the decision-makers, possibly, by most of them. Ones can speak of a well-defined area and an ill-defined area because it is up to the human factor to give the matrix elements. Taking the above structured information as factual base, a productions set P (expressed in the general format) for unstructured information modeling, is also considered.

The alternative goals of OCP are:

1) To determine an optimal object, without providing reporting information to other objects;
2) To achieve an objects hierarchy;
3) To evaluate each object in von Neumann - Morgenstern sense. From a practical point of view, these goals are equivalent but the quality of global information increases from the first goal to the third goal.

B. OCP Generating and Solving, Main Drawbacks

A particular OCP problem, automatically generated starting from the MADM model, may be solved by using one or more MADM methods (there are more than 25 different methods or methods classes [2] applicable in conjunction with several normalization methods). It has been chosen five of them, namely: the scores / Pareto / Saphier-Rusu / Topsis / Todim methods. They had been extended for more states of nature and decision-makers. These methods obviously work with the well-defined area of the characteristics' matrix and so no entire information is used. It is also possible that part of the processed information contradicts the reality and the respective methods do not perform any model validation. On the other hand, since every method is based on a different point of view of the OCP solving, it is clear that applying different methods to the same set of data, will often lead to different solutions. Therefore, potential drawbacks of traditional OCP [3] generating and solving technology, namely inconsistent (incomplete / incorrect / incredible) definition and multiple solutions respectively, were overcome using a specific rule-based computing technique.

C. Knowledge-based Computing for OCP

Two Knowledge-based Computing (KbC) modules, distinct as functionality but unitary as achieving technology, solved the problems of the inconsistency and multiple optimum. The KbC modules use the CLIPS ("C" Language Integrated Production System) expert system shell, tailored to the requirements of the OCP. In the first module, domain specific production rules expressed by experts can emphasize, for certain objects, the existing non-concordances between the values of their attributes and can also extend the well-defined area in the prejudice of the ill-defined area by filling up gaps with values computed on the basis of the current existing data. This way the model gains in completeness and correctness. In the second module, the procedure of determining the global optimum is, in its turn, based on a system of production rules that adequately deals with the initial factual context enriched with new facts supplied by the mathematical solving methods.

Facts Accumulation

A first category of facts is implicitly supplied by the mathematical model, pre-eminently emphasizing those facts defined by the characteristics' matrix and by the importance of the model entities. The second category of facts is generated by the OCP solving mathematical methods. These methods can be separated into two categories. First, methods that produce explicit objects' evaluations / rankings, and as a result determine an optimal solution (those methods remembered in the above paragraph). By running a set of such methods, every object has an associated evaluation vector. Second, methods that produce objects' characteristics without determining an explicit optimal solution. These analysis methods associate with every object a new characteristics' matrix. So, this category of facts may occur during the repetitive optimization process upon end-user's request, or by facts' accumulation, automatically started by the intimate mechanisms of KbC module, in the view of supplying information required by productions processing.

Productions System

The productions system is structured in built-in classes of rules. In a simplified presentation, the generic rules classes that make up the KbC modules are: validation, filling-up, elimination, and discrimination rules. For each of these rules, there are syntax validation and type-checking procedures. This procedure behaves like a 'compiler', flagging syntax errors and signalling contradictions in the type of the attributes. The experts have on line and context sensitive help.

Rules System Processing and Control Mechanism

Forward chaining performs the productions system processing guided through the hierarchy just defined in the rules classes' presentation. The underlying strategy controlling the order in which the rules are fired is the default depth strategy. The user can change this strategy by choosing one of the other six implemented in CLIPS: breadth, complexity, simplicity, LEX, MEA and random. When solving an OCP, the choice of the strategy should be irrelevant (the optimal decision should be the same under any strategy governing the firing of rules of equal salience). Therefore, in this case, changing the strategy is not a method of exploring new solutions, but rather of validating the robustness of the choice made.

III. *OPTCHOICE* TECHNOLOGY

The model with its associated database, the modules for automatically generate and solve the choice problems and the transferable IT knowledge in this field belongs to the technology developed to enclose in e-business application a such kind of mathematical tool. The technical platform was defined as follows: PC equipped with Windows NT / 2000, SQL Server 7.0/2000 Enterprise Edition, MSVC 6.0, CLIPS and ASP.

A. Standard Modules and Database

Regarding the software components developed in *OPTCHOICE* technology, they must have two functional blocks. The first block addresses the owner, consequently works on the Intranet and its modules are written (must be written) in SQL Server 7.0 Enterprise Edition, MSVC 6.0 and CLIPS. A first category of modules in the first block is considered ready-made and is used as such by the e-applications designers. The second category is to write starting from the main application modules. It contains the modules for database loading, The second block addresses the worldwide users, therefore works on the Internet and its modules must be written in ASP / PHP / etc. according to the specific of the e-application made. Writing some modules for database loading and optimization results displaying is not a big deal for a good team of programmers.

An automation block, whose role is to exclude the enterprise specialists' intervention in the computing and communication process, links these two blocks. The technology provides a supervisor program, developed in the dormant technique that automatically runs, at a given

tact, the software optimization modules upon a predefined schedule.

B. Standard User Registration and Security

This is also ready-made software. Using the standard "Registration", the potential suppliers can register in the system. Only thus, they become beneficiaries of the e-application' mechanisms. Full access to specific application may be given to any Internet user, either business partner or visitor, but only having in mind that "submit" command with respect to visitor is not operable. This interesting idea of "clicking open" on the enterprise it makes the enterprise be better known worldwide.

The security is a very serious problem, solved in an elaborate manner. For exterior, there is the PKI component that assures access control, user authentication, non-repudiation, integrity of data transfer, digital signature, etc. For interior, a special component manages the database integrity. Every unauthorized access, even those made by programmers directly on the database tables, provoke system blockage until the system automatically regains its integrity. The supervisor also runs this function. Therefore, the business partners can trust that they work in an environment characterized by correctness and loyalty.

Having available this technology, the software presented below was realized in four months each!

IV. *Tele-SUPPLY* SOFTWARE

Industrial enterprises can better realise the horizontal integration with their business partners by *reengineering the supply chain* [4]. This section will therefore refer to approaching this field with methods specific to information and communication technologies (ICT) [5]. First, an industrial enterprise must have, in its information system, a modern component dedicated to supply activity. Second, because the supply is currently an activity that encounters difficulties due to the absence of competition among the possible suppliers, the information system must be open, via the Internet, to all suppliers' offers. In the case that, for the same time level and horizon (a specified decade, month, quarter, year), there are multiple offers for the same buying object (raw material / material / tool kit / device / spare part / protection equipment / etc.), the enterprise must accept the best offer(s). Only for chosen offers the corresponding suppliers will be invited to sign the economic contracts. For these purposes, ICI has developed the software named *Tele-SUPPLY*.

A. Main Features

As *Tele-SUPPLY* is not a *business to consumer* but *business-to-business* software and its applicability is with industrials enterprise, some particularities individualise the manner of doing electronic trade with this software. The main features of the software are: a) For all possible suppliers, the system can handle remote-made offers; b) Offers quantities may be from stock inventory or production plans (provided one supplier works with both types of quantities, he / she must know that they are considered separately); c) For planned quantities, it is possible to select time levels and horizons (the time levels may be month / quarter / year, the time horizons may be present / next). One remarks that for quantities from the plan, every level supports sub-intervals of time, namely decades, months and quarters correspondingly, and the quantities set maintains coherent over time levels and horizons. Assistance for editing offers is provided, with information about necessary quantities and cumulated offers at a given moment.

It is to notice that *Tele-SUPPLY* works as a shell over the *Supply Component* of the enterprise information system whose database contains end products, raw materials / materials and their necessary characteristics, technological data regarding specific consumptions, production plans / programmes / schedules, repair programmes, stocks etc. The information system is responsible for the necessary buying objects' computing. Ones must consider this necessary in a certain time level. Even for the same time level, in various time horizons, the necessary can be very different because the production plans and supporting activities can differ. Adding, to this back-office, structured information about enterprise suppliers (companies and their banks), the offers for every buying object and their personalized characterization attributes ones obtains the information framework for *Tele-SUPPLY* software well functioning.

B. Working with Tele-SUPPLY

The enterprise makes public on the Internet only the data referring the buying objects with their necessary characteristics and quantities according to the production process and side activities. The information is structured by categories of buying objects. Therefore, the suppliers have the possibility to know the offer request of the enterprise. The quantities specified may not always represent the whole quantity which production will take in, but only the quantities purchasable via this modality. Suppliers will be notified about the amount of transactions that each category of buying objects was subject to in the previous year. As quotations are not part of the enterprise request, vendor companies will do their best for showing price competitiveness. In accordance with the rules of dynamic offers' management, a supplier is free, in producing his offer, to choose any time level or any time horizon.

An offer, submitted at one given time, is going to update the database of the enterprise. It is the Supply Department staff of the enterprise that will process the bulk of offers to eventually decide on their acceptance as such, on their amendment, postponement or on their rejection. Following the submission of more offers for one buying object, selection of the best one is done through optimization that is via mathematical methods. An OCP on consistent defined offers classes set is solved every time when the price is not the unique discriminator. An analysis of the set of suppliers identified is done. Sometime there where an object may seem to be mathematically optimal, for personal reasons in decision-making or for reasons of never wishing to abandon a traditional partner, a lower-level object is picked out. Usefulness of such an analysis reveals in carrying on negotiations for making a deal with a supplier. Practically, competition in such a field may, if benefiting useful information, lead to mutually advantageous business. Price negotiations between

supplier and buyer, done after the optimization, are computer assisted and are carried on in full confidentiality. Upon concluding the purchase analysis, the results are communicated to the competing suppliers. They may be dismissed, summoned to discussions or directly ordered their buying objects. To fit the necessary quantity, will frequently appeal to more than one supplier. A statistical record of the offers, accepted or not, makes it possible that the marketing department conducts market surveys. To be able to clearly understand the way the business runs, some information will be done: a) The flow of bought objects starts only when the supplier's bank certifies that the payment has been made (by cheque / bank transfer); b) Large amounts and high value transactions are allowed to be carried on only on regular economic contracts signed after a special organized auction; c)For beginning, a part of enterprise supply can remain in traditional manner.

V. *Tele-AUCTION* SOFTWARE

The production supply chains can be well served by regular *e-procurement* tools but a special one must assist the supply chain involved by significant investments. *Tele-AUCTION* software is designed to fulfil this special need [6]. The staffs of Investments and Commercial Departments create the information base necessary for developing auctions. In the following, the steps sequence for an electronic auction (preparation, registration, bidding, re-bidding, closing and deciding) using this software is presented. Will be obvious for everybody that *Tele-AUCTION* supports auctions organized upon a mixture from the Anglo-Saxon and Dutch methods.

A. Auctions Preparation

Auction preparation is a process developed at two levels. The first level is represented by the investment objectives definition, made by the managing staff of the Investments Department. The second is represented by the statement and definition of object classes that will be purchased for each investment objective. The technical staffs from different departments accomplish this task.

An investment objective is well defined if and only if the following information is presented: objective code and name, allowed money amount and financing mode, announcing date and deadline. In response, the system will calculate and / or visualize, at any moment belonging to the interval defined by the objective announcing date and the objective deadline plus a month, the amount of money resulted, from all pending auctions, as necessary to accomplish the investments objective. This is very important information for decision-making.

An object class, belonging to a fixed investments objective, is well defined if and only if the following information is presented: first, object code and name, measure unit, planned price, planned quantity, auction announcing date and auction deadline, and second, all object attributes, specified by attribute name, measure unit, min / max (the good choice sense), lower and upper admissible limits, weight (the importance in the framework of all attributes set). It is to notice that, for every object class, the attribute "price" automatically appears at the top of the attributes' table, being always the first attribute. It cannot be erased. Therefore, every object class has at least one attribute, the implicit one. Always it is specified whether the quantity must be equal to planned quantity or can be a part of it. In response, the system will calculate and / or visualize, at any moment belonging to the interval defined by the auction announcing date and the investments objective deadline plus a month, the bidden quantity and the amount of money necessary to buy the bidden objects, as resulted from the auction.

B. Bidding and Re-bidding

At this moment, for the potential suppliers it is possible to access the site. The competition procedure is very simple. The investment objectives and the object classes to buy, with their required quantities and attributes, are shown by *Tele-AUCTION* in a friendly manner. A competitor must fill-in: his object name, the bidden quantity and all required object attributes. He must pay great attention to his object description. Every attribute must be specified with accuracy because the mathematical model for competitors dynamic ranking will be constructed from this kind of information. A facility to guide the attributes' description is present. On the Internet, every attribute is sensitive; by clicking on it, a descriptive text, prepared by specialists in the field, does not allow any involuntary mistake. The incredible situations are pointed out. On the Intranet, at any time, it is possible to visualize the values of current attributes for every proposed object.

During the auction, for a fixed object, the system gives information about its attributes in comparison with the attributes of the first three ranked objects, other than the fixed object. Therefore, the competitor can improve the object attributes, hoping that his object increases its competitiveness. This facility is not valid for the attribute "price". Only five sessions with attributes updating are allowed, but the bidden quantity and the price are free for unlimited re-biddings. One day before the auction closing, for the proposal that has the bidding price greater than the planned price (considered as an upper limit price), an e-mail informing about this situation is launched and from now a single price updating, is permitted. In the case that, during the auction, the organizer has stated new limits for the object class attributes, some object attributes may become out of limits and, in order to stay in competition, the attributes must be updated. Updates made in response at organizer demand are not counted. Retiring from the auction is possible at any moment. This fact is a normal one and does not influence the competitor credibility for other / future auctions. In conclusion, the auction procedure is very stimulent and a true fait between competitors is expected to take place.

C. Auction Closing and Deciding

When the auction status becomes "closed", no more updates are possible. For the bidden object, its final competition characteristics are done. The competitor must wait for the auction result, which appears when the auction status becomes "decided".

Investments Department managing staff known, at any auction moment, the objects' (competitors') ranking. For a pair of investments objective - object class: the planned

values (therefore the planned expenses) and the resulted values (therefore the real expenses) are presented. In this context, the current ranking is given in a table containing: object name, offering company, merit, price, bidden quantity, value and ordered quantity. With one exception, all the fields are read-only. During three days, the period that is allowed for "closed" status, ordered quantities column is set free for human intervention. In order to make some corrections, considered of great importance, the managing staff from Investments Department can intervene in the automatic given results. Therefore, it is possible to ignore the automatic auction decision and make a human one, but the price paid for this action is revealed by the system. It is to notice that all human corrections are registered in a special guarded database table, the envisaged elements being: operator name and position in firm, partner company, bidden good / service / work, quantity and price, auction time and code.

When the auction status becomes "decided", the competitors are informed about final auction results. A complete panoramic view is given. The winner or winners are invited, by automatically launched orders, to sign the economical contracts. It is possible that some potential suppliers, although invited as auction winners, ignore this fact. The next ranked suppliers are called. However, the lack of earnestness is penalized. A sophisticated penalty will be computed. This penalty depends on the value of the ignored auction weighted with the amount and value of transactions carried on in the past, the promptness in making due payments, and other elements that prove the competitor's reliability. For the next auctions, their merit will start from a negative value. Only new winning auctions will erase, in time, this handicap. Wrong specifications of object attributes, in flagrant with the reality, will exclude for good the competitor from the partners list.

VI. *Tele-PROCESSING* SOFTWARE

Nowadays, for a petrochemical enterprise (a large scale system [7]) becomes harder and harder to buy the crude oil and ingredients necessary to the production process and so it must process the other business partners' crude oil. These partners are called "processing partners". They buy the crude oil, process it in the petrochemical enterprise, and sell, in their benefit, the end products. The enterprise avoids working below its capacities. It seems to be a mutual advantage. It is, but there is also an enterprise's drawback namely, the enterprise bombarding with lots of unacceptable processing demands. One hundred fifteen processing demands per year, consequently three per week, one demand taking two or three days of discussions at high level of management, it is a serious problem for the petrochemical enterprise. The solution is a dialogue, via the Internet, between the potential processing business partners and the enterprise's computer.

The dialog between a partner and the enterprise computer consist in two steps namely, the "processing demand" and the "enterprise response", performed repeatedly until the business makes sense from the partner point of view or it shows unacceptable for him. In the case that, for the same time level and horizon (a specified decade, month, quarter, year) there are multiple acceptable processing proposals of about same quantities, the enterprise must accept the best proposal(s). Only for chosen processing proposals the corresponding partners will receive the "final enterprise response" and will be invited to sign the economic contracts. For all these purposes, ICI has developed the software named *Tele-PROCESSING.*

A. Tele-PROCESSING General Functioning

It is to notice that *Tele-PROCESSING* works as a shell over the PIMS software whose database, containing crude oils and their characteristics, raw materials, ingredients, on-flow products, end products, capacities, technological data (regarding efficiency transformation coefficients, specific consumptions, blending recipes, inputs / outputs inter-conditions relations, stocking capacities, functioning regime etc.), repairs, system timetable, is available. Ones must consider a processing demand only for a crude oil that the production system can process it and only for the free capacities in a certain time level (decade, month, quarter, and year). Even for the same time level, in various time horizons, free capacities map can be very different because the regular production plans can differ. Adding, to this back-office, structured information about enterprise partners (users, companies and their banks), associated simulated processing plans and a set of their characterization attributes ones obtains the information framework for *Tele-PROCESSING* software well functioning.

B. Processing Proposals

It is now possible to access the e-processing site. As a rule, the mathematical models data are the enterprise "know-how" and are secret. To protect them, the enterprise makes public on the Internet only the data referring the ingredients and end products. For a partner it is normal to give the quantity of crude oil to be processed with its physical-chemical properties, the data levels associated with the desired products and the processing time level and horizon. These are the data that the business partners find to be of paramount importance and only they are taken into consideration.

The business partner can make a "processing demand" by specifying: processing demand's name, crude oil name, measure unit, price and quantity. To describe the crude oil it is also of outer importance. Ones can do this job by filling up the table containing: attribute name, measure unit and level for each physical-chemical characteristic. Shipping cost is information of low importance. It is necessary only to compute the partner profit. A simple pushing on submitting button triggers the taking over of the processing demand by the *Tele-PROCESSING* supervisor. In order to decide whether the crude oil can be processed or not, the supervisor checks the crude oil pattern. If it is technologically unacceptable, the partner is invited to give another crude oil with characteristics that fits to the enterprise production system. If it is acceptable, the characteristics are frozen, they cannot be after worlds changed, and the processing proposal is passed, for optimizing as a Multicriteria Linear Programming (MLP) problem, to the scheduling mechanism. This inserts the

demand into the waiting queue. The insertion is made according to a priority coefficient computed taking into account the value of the business and the number of the previous optimizations. Even a powerful computer cannot efficiently solve more than five optimizations at the same time. So, the launchings in executions are made gradually in time. The partner is informed about the enterprise response by consulting the optimization status. Once the optimization is finished, ones offers three categories of information: a) Inputs (ingredient name, measure unit, quantity, price and value); b) Outputs (end product name, measure unit, lower limit, optimal quantity, upper limit, price and value); c) Economic indicators (crude oil value, shipping cost, ingredients cost, processing cost, end products value and profit). At this moment, the business partner can establish some conditions for the end products, maybe influenced by the market, and ask for a new optimization. The number of the optimizations, as well as the time allowed for negotiations, is limited. As it is shown before, the business partner analyzes the results of any optimization work, i.e. the end products levels attained through production optimization and the value of the potential profit. The partner may consider it necessary that the enterprise computer must make the iterations of the business optimization for as many times as it takes to reach the best result, or otherwise he may wish to get out of "business".

C. Best Processing Proposal(s)

Taking into account that a multitude of potential processing partners can concurrently make tempting proposals for the same time level and horizon, *Tele-PROCESSING* software arranges the proposals, for each time level and horizon, into three classes: big, medium and small businesses. Every business class benefit from an OCP optimization. If in the MLP problem there exist only ten objectives, in the OCP problem are stated over two hundred attributes, expressed by more than one expert (technologists, economists, bankers, ecologists etc.) in more than one state of nature (economic stability, inflation, deflation etc.). Therefore, the enterprise managers can appreciate on solid basses, which is the best proposal(s). The practice shows that is it possible to exist one or many winners for every business class. They are invited for a last discussion and contract signing.

VII. CONCLUSIONS

Extending worldwide the business of the enterprises is one of the globalisation commandments. Another, very important too, is to promote mutual advantageous business. To support these, the Internet created the base for a new range of applications. In our days, *advanced e-applications* undergo a fast development. Web enabled optimization is a new trend in treating the practical problems. In the authors' opinion, elaborate electronic applications will soon become facts on the ITC market.

OPTCHOICE package belongs to the software developed for I.C.I.'s new line of products for industrial enterprises. It will be able to encourage the mutual advantageous business. As it was shown, this is possible by making use of advanced optimization techniques. The strong point of *OPTCHOICE* package consists in the fact that promotes a very good MADM mathematical model.

Tele-SUPPLY, Tele-AUCTION and *Tele-PROCESSING* software are ready to implement but *OPCHOICE* software and technology is under last finishing and testing. The package launching is thought to be a real event and to have a significant impact. In all three cases the interface is very "human"; people without a special training in mathematics and informatics can easily use the application software resulted through the *OPTCHOICE* technology. Please remark that although the mathematical model shows high complexity, Internet developed interface is a narrow one, because it concerns reasonable demands.

For each software, delivery conditions and services included are: software and documentation on CD, auto-demonstration, on-call / on-site assistance in use and short time training course for initiation in electronic business.

Further developments for *Tele-SUPPLY, Tele-AUCTION* and *Tele-PROCESSING* refer to extensions for other kind of enterprises. Ones suppose that the Internet modules and the optimization mechanism will be the same, only the Intranet modules will change. Therefore, a lot of programming work will be saved with good consequences for delivery time and software cost. Moreover, the designing team preoccupation is to extend the facilities of treating the concurrent optimizations by using GRID solutions.

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