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INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Team SITE

Modeling and Development of Economic Intelligence Systems

Lorraine

THEME COG

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2. Overall Objectives

2.1. Introduction

The problematic of this team is to study the **modeling** and **development** of **strategic information systems** in the context of **economic intelligence (EI)**.

Definitions of EI

1. It is a set of coordinated actions of search, processing and distribution for exploitation, of useful information for economic actors. These actions are carried out legally with all the necessary protection for the safeguard of the company's patrimony, and with the best quality, delay and cost[1].
2. It is the process of collection, processing and distribution of information with the goal of reducing uncertainty in taking strategic decisions[2].

[1] Martre, H., "Intelligence Économique et stratégie des entreprises", Rapport du Commissariat Général au Plan, Paris, La Documentation Française, 1994, pp. 17,18

[2] Revelli, C., "Intelligence stratégique sur Internet", Paris, Dunod, 1998, pp. 18,19

For us, these two definitions characterize our research objective. In fact, the increasing predominant role of information in socio-economic sectors or in organization in general is evident.

Communication and information technologies, particularly data processing and Internet, make it possible to manage information of different nature: primary information, secondary information, tertiary information, information with added value. Whereas primary information is the direct product of authors, secondary and tertiary information is a transformation into reduced models of the primary information to feed data bases. Information with added value is the product of analysis and synthesis of these various types of information. Information is used more and more as object of reference and aid tool for strategic decision making. The concept of EI becomes indispensable for the production of interpretable indicators for decision making based on the use of the company's internal and external information.

The process of EI is based on the **process of watch**. We distinguish here two types of watch: **tactical and strategic watch**. The tactical watch feeds the company's actors with information, and the studied temporal horizon relates to the present and the very short term (information on the economic situation). The strategic watch is characterized by the distribution of information to the entities of management of the company (Directorate-General, Direction of Plan, Direction of Strategy...). The studied temporal horizon is the present, the very short term, medium term and long term.

In order to consider EI as a research object, we believe that it should be considered as a process. This process can be defined as follows:

a) Identification of the problems to solve in terms of threat, risk and danger.

b) Transformation of decision-problem into information search problem.

c) Identification of relevant information sources.

d) Validation of the information sources.

e) Collection and validation of information.

f) Processing the collected information for the calculation of indicators.

g) Interpretation of the indicators.

h) Decision making for the resolution of the problem.

The stages (a), (g) and (h) are of particular importance because they determine the success of an EI project. Indeed the EI process is a global process where the orientation chosen in each stage will determine the type of the final result. For example, if a company decides to make decisions in offensive manner towards a competitor, the information to use, the sources of this information, their processing and the interpretation of the final result will determine the effect of the company's decision. It should be noted that information used is not only factual as in corporate data bases but heterogeneous by nature as well by their source and by their validity or their range. It is also informal because it might not have been published.

2.2. Brief presentation of our problematics as related to Information Systems

Figure 1 shows the importance of an information system (IS) in the process of EI. We present the figure by the arcs which connect the elements of the diagram with the associated problematics:

- **Selection:** It makes it possible to constitute the company's IS which can be (i) the data base of production (that which allows the day to day exploitation), (ii) the whole set of information that supports the information retrieval system (in documentation for example) or (iii) a strategic information system based on a data warehouse. This IS is made up of heterogeneous data sources, by filtering the world of information.

The problems that are raised here for our research objective is to know how to make information collection as efficient as possible: what are the models that can be used? what are the methods to use for implementing the models? The results that we have obtained so far will be presented in section 6: the results concerns the models WISP and MIRABEL.

- **Mapping:** The mapping makes information access possible for any type of user of the IS. Two principal information access methods are currently proposed to the user: access by exploration and access by query. Exploration is based on the technique of hypertext. Queries are expressed using boolean operators. The result of the mapping is a set of information.

  The problems that we are facing here concern how to explicitly define a decision problem so as to be able to obtain the most relevant information from the information system. The problems concern also the study of the necessary functionalities that should be implemented so as to make the use of an information system as adaptable as possible to the users cognitive evocative habits. The detail of this concept of cognitive evocative habit is presented in section 3.1. The results that we have obtained so far are also presented in section 6. The results concerns the models MEDDP (Model for Explicit Definition of Decision Problem) and $EQuA^2te$.
- **Analysis:** In order to add value to the information collected, techniques of analysis are applied to the result. For example, the assistant of a head of department, referred to as "watcher" in our context, will be able to establish a benchmark for his head of department. Thus, the reports provided by the assistant who knows well the wishes of the head of department will be a good base for decision.
- **Interpretation:** Here the decision-maker or generally the customer of the system is allowed to make good decisions. The idea is that the decision-maker is not necessarily the customer of the system such as a watcher. One then sees all the interest to capture knowledge on the decision-maker and to integrate it into the data mart produced from the data warehouse in order to build a specific base for a group of decision-maker or better still for a particular decision-maker.

  Our hypothesis is that the better we understand the decision-problem, the better the information to be collected, processed and interpreted for the most appropriate decision.

2.3. Highlights

1. The creation of GDR-IE, a research group on Economic Intelligence by French National Center for Scientific Research (CNRS).
2. Amos DAVID was nominated as director of the collection "Information, Evaluation, Strategy" with HERMES SCIENCE PUBLISHING
3. Three Phd dessertations were accepted for publication as books by three scientific editors

3. Scientific Foundations

3.1. Personalization of response in Information Retrieval Systems (IRS)

The objective of modeling the user is to be able to personalize the system's response. User modeling is the way of representing a user and his behaviors. That also relates to the way of exploiting knowledge available on the user. Three categories of model are proposed:

(a) User profile: where to a user is associated his query that represents his need. In this context, the user's need is relatively stable. The profile is applied to new information in order to propose the most relevant information to him.

(b) The implicit model: where the user's behavior and his preferences are represented implicitly. For example the visualization of a document by the user can be interpreted like an adequacy of the document compared to his request.

(c) The explicit model: where user's behavior and his preferences are also represented but according to user's specifications. For example, even if the user visualizes a document, it is necessary that he indicates his opinion on the degree of relevance of the document compared to his request.

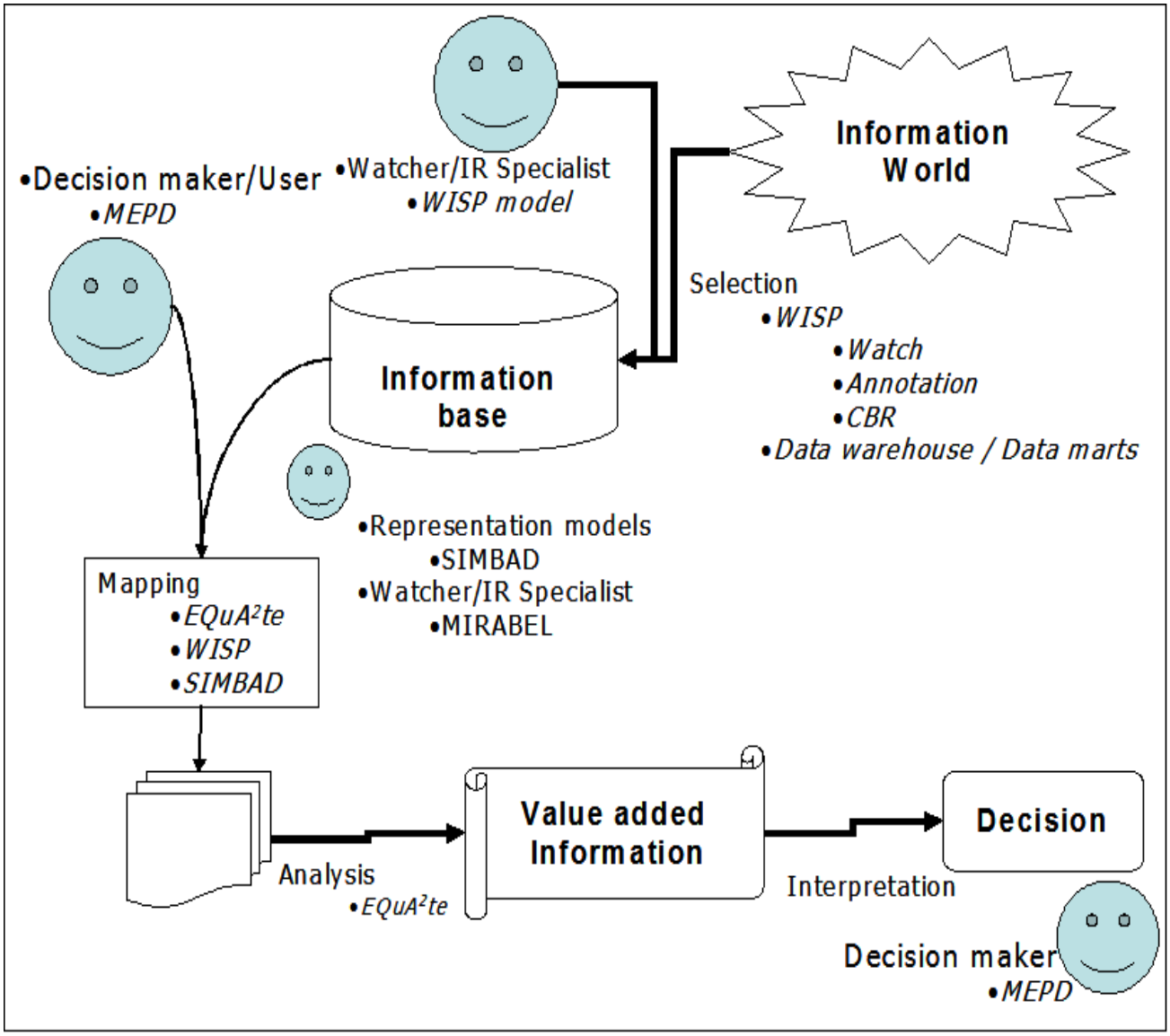

Figure 1. Economic Intelligence and Information Systems (actors and problematic)

The exploitation of a user profile (a) is generally individualized. The implicit or explicit model, (b) and (c), can be individualized or processed using the method of stereotype. By the technique of stereotype, the users are grouped into classes and an interpretation applies to all the users of a class.

The representation of the cognitive parameters on the users, for example the parameters necessary to know their levels of knowledge for a better interpretation of their request, requires the safeguard of the user model through sessions and individualized.

Our work on the personalization of the answers in IRS began within the framework of our work on Computer-Assisted Learning (CAL), by student modeling, in a context of training using images. We proposed an explicit model represented by cognitive parameters for each learner. The cognitive representation is based on the cognitive phases identified in a process of human training. Four phases, which correspond to levels of evocative habits, were integrated into the model:

- **The phase of observation:** the learner takes note of his environment by the process of observation;
- **The phase of elementary abstraction:** the learner designates the objects observed by names, which also corresponds to a phase of acquisition of vocabulary;
- **The phase of symbolization and reasoning:** the learner employs specialized vocabularies which concern a level of abstraction of high concepts. For example, somebody on a low level of abstraction can say " I see a fish ", but cannot say " I see a piscivorous bird" (i.e. a bird that feeds on fish, implying a form of abstract classification and specialized vocabulary);
- **The phase of creativity:** the learner discovers and adapts knowledge which is not presented in an explicit way in the system. For example, during the experimentation using our prototype BIRDS, a pupil identified the fact that all the carnivorous birds have short legs, which was not explicitly presented in the system.

As a result of these studies, we developed a functional model that we believe should be implemented in an IRS in the context of economic intelligence. This model is called $EQuA^2te$, meaning Explore, Query, Analyze and Annotate. The four functional characteristics represent the four levels of evocative habits.

3.2. Collaborative work and information retrieval

Collaborative work is already initiated in the field of **groupware**, where the objective is on designing models for collective management of tasks. Systems' architectures available make it possible to share data and to work in virtual spaces. This approach is becoming increasingly important for maximizing the capitalization of knowledge in organizations in order not to lose it with time. This is currently called **knowledge management**.

In the field of information retrieval, collaborative work does not relate to only automated knowledge management but also to the interaction between the human actors in the process of information retrieval. The most frequent situation is that of interaction between a user and an expert in the methodology of information retrieval, for example a researcher and a person in charge of a library. Knowledge to be exploited in this context relates to knowledge on the researcher, his current needs and the history of the current need. Studies in information retrieval show that the knowledge of the experts in methodology of information retrieval on the users accelerates obtaining the solutions to the user's needs.

Amos David proposed for prototypes STREEMS and METIORE three modes of use:

- Autonomous mode where only the user uses the system.
- Observation mode where one user observes another user while carrying out a process of information retrieval without being able to intervene.
- Collaborative mode where two users intervene together to carry out the process of information retrieval.

3.3. Design and exploitation of data warehouse

3.3.1. From the design of IS to the design of S-IS

Current evolution of information systems (IS) in companies towards client-server architectures requires adapting the traditional methods of IS design. Indeed, in these new architectures, the client-server applications appear as components of various types: storage components, processing components, dynamic components of execution. The basic idea of our proposals is that it is possible to use the same model throughout the successive stages of this design, to obtain the whole software components constituting the automated information system. This is the model OOE, standing for Object Operation Event. We introduced it starting from our research on REMORA method and of the study of commercial MERISE method in France.

Presently, the standard in company's data processing remains the MERISE method even if the tendency is towards object method design such as OMT or UML or at least based on more advanced models such as that of MERISE/2. Without occulting the merits and achievements that MERISE method allowed in company's data processing, it should be recognized that multiplicity of levels of design and realization of IS, the multiplicity of models at various stages and maybe especially the lack of rules for passing from one level to another, or from a model to another seriously handicap the use of the method. This is why we are trying to define not only one single model but also the set of rules for passing from conceptual modeling to logical-physical modeling which will lead to the list of software components to be programmed. We present here briefly this model and its bases:

- The OBJECT category represents the concrete or abstract system elements and its environment i.e. the organization. For example an order.
- The OPERATION category represents the actions within the system or its subsystems. For example, analysis of the order following its entry which will modify the quantity in stock of the ordered product.
- The EVENT category represents the events occurring in the system in the course of time. For example, the arrival of an order which starts the analysis of an order, out-of-stock condition characterized by the fact that the quantity in stock became lower than a certain stock, etc.

In this approach, the state of the system is defined at a given time by the state of the objects which belong to it at that moment. The system evolves in the course of time following the execution of operations which are triggered by the system's internal or external events. The operations act on the objects and cause changes of state which in turn can be events.

This proposal is called causal dynamics because the same cause always produces the same effects. The origin comes from the method REMORA which was popular world wide in the domain of IS design methods. This is because, well before becoming obvious since 1975, we proposed a modeling method based on simple concepts which then not only make it possible to build data bases almost automatically but also to build transactions on the data base by transformation rules using the conceptual solution (starting from the events and operations).

The idea that we retain is that the strategic information systems are particular information systems and that the modeling technique that we proposed previously can adapt to these new IS.

3.3.2. Data warehouses and strategic information systems

Data warehouses have become not a phenomenon of mode but an essential instrument for a good management of an organization. They are at the base of any strategy and decision making of a company. The followings are some definitions of the basic concepts.

A *data warehouse* is a data base organized to meet the specific needs for decision making. This base contains historical information on the company, its operation and its environment. It is fed from production data bases and from external information of the company. It is thematic, related to a field that interests the decision-maker, having a temporal reference, sure i.e. whose quality was checked, easy to access, non volatile and regularly updated. In fact, a data warehouse is an integrated view of the organization. It is the core of Strategic Information Systems (SIS).

Information systems (IS) can be strategic from two angles. On the one hand all the current IS of organizations comprise strategic information and allow the automation of the organization as well as making it possible to satisfy the strategic objectives of the direction (example: an IS for improving the inventory control, development using accounting incomes of summary tables in a Speadsheet). This is called S-IS (Strategic "information system"). In addition, more and more of IS are dedicated only to decision making (example: IS as aid for market choice). This type of IS is called SI-S ("Strategic information" system). In this case, it is the IS in its entirety that is devoted to strategic decisions and comprises only information of strategic nature (example: the results of sales turnovers by country over several years). We are interested here in SI-S i.e. IS of the second type, those which are directly of concern of researchers in EI field. A data warehouse serves as a link between the two types of IS. The company's IS are the first built. They are various and divers, and comprise strategic information. It is necessary to extract from it information necessary for decision making and also their structure (called meta data). This constitutes the relational warehouse (so called because it is currently managed by a relational DBMS). From this data warehouse are extracted multidimensional data bases, so called because they make it possible to view the organization from various angles or dimensions (example: from axis of time, sold quantity of products or sales turnover). These multidimensional data bases constitute what is called strategic information system. Indeed they are made up only of data suitable for decision.

This data warehouse gives rise to, by filtering in terms of user profiles (or finally a user model), to data marts. These are the smaller dimensions of the data warehouse designated to a department or a function of the organisation: Marketing, Finance ... They are updated periodically, based on a multidimensional view of data, and are non modifiable by the users.

We are well aware that the design of SIS requires a particular design steps and a complex modeling methodology. However the related idea of modeling based on the minimum of reusable concepts at each stage appears completely realistic to us. This research orientation has already been started within the framework of a previous DRT project with SNVB Bank.

4. Application Domains

4.1. User-actor modeling

Keywords: *User-actor modeling*, *information retrieval problem case indexing*.

The objective of this research orientation is to allow the taking into account of the characteristics of the actors in the process of EI by user modeling. Our goal is to propose models and methods making it possible to produce results as relevant as possible by the system, in response to the user's information need. This should be applicable to traditional information retrieval and also in a context of strategic information systems where the concept of data mart corresponds to the modeling of the end user of the system, for example the director for whom such a system is essential for a good decision making.

The foundation of personalization techniques of the answers is based on the concept of relevance. The relevance of a solution is often measured compared to the user's query. As the query does not necessarily represent the user's information need, the user judges the relevance of the response compared to his need, which does not correspond to the measurement of relevance by the system. The technique which consists of the evaluation of the proposals of the system to indicate their degree of relevance is integrated into certain IRS. Thus, the system has knowledge on the adequacy of the answers of the system to the user's need. Nevertheless, the system obtains this need only by an estimate based on the queries. **Instead of calculating this need, we propose to integrate its representation in the user model**. This constitutes the originality of our proposal. This amounts to storing in the SIS, among the meta data of the system, an explicit representation of the structure of various dated marts. These orientations of taking into account the actor during development and then during the exploitation of data warehouses is a major field of our research. Indeed nothing really exists currently in the field, neither in the companies' systems (including in the tools of CRM or personalization of the E-business), nor in research in SIS. We hope to extend our studies on the concept of user model (cf) as regards this orientation. A thesis started on this topic at the academic year 2003-2004 after an MPhil in 2002-2003.

4.2. Modeling of the interaction between the user and a mediator

Keywords: *modeling of interaction in information retrieval*, *status of the cooperating actors in EI*.

The objective of this research topic is to propose models of interaction between a user and a mediator, or between two users. In relation to user modeling, the problems of this orientation relate to the determination of the status and the knowledge of the collaborating actors. In a context of EI, the taking into account of the status of a collaborator is essential because it is necessary to check his competence and the degree of confidence that one can have in him. This last point shows the relation of the studies in user modeling and collaborative work. We hope to refer on the one hand to the results of the studies on protection of patrimony, in particular the concept of misinformation, and on the other hand to the results of studies on interactions between users of information resources centers[3].

The specificity of this axis relates to the introduction of the concept of interpersonal communication which implies two users in an information retrieval system. The results of this axis will allow the sharing of domain knowledge as well as human competences. The community of information and communication sciences is very interested by the studies of this axis because the results will make it possible to try out interpersonal communication models in a precise context of information retrieval. There are currently forums of discussion and chats but these tools do not allow the coordination of the dialogue and the process of information problem solving.

4.3. Design and exploitation of data warehouse

Keywords: *data marts*, *data warehouse*, *strategic information systems*.

The objective of this axis is to propose an architecture, a model, a methodology making it possible to design a SIS of high quality and meeting the needs of the various actors of an organization. This axis is close to the problem of user (or customer in the broad sense) modeling. In addition, the current market tools (the most known being Cognos and Business Object) propose not only to build the multidimensional cube i.e. the multi layer views and in the space of the data warehouse (and by so extracting the data necessary for its update) but also to exploit it intelligently i.e. allowing an extraction of knowledge (primarily by reporting tools). By experience this software although based on a relatively elementary intelligent module already make it possible to discover rules and concepts of which we would not have thought of. In this sense they are better than the simple spreadsheets and statistical tools which primarily make it possible to answer questions which one does not know the exact answer but of which one has an idea. We want to add here a module which really does data extraction, in order to improve the functionalities of these tools at two levels: at the level of data extraction to build the warehouse and at the level of exploitation of the multidimensional data base. Another of our objectives, originating from a work completed within the framework of DRT SIO, is to install tools making it possible to check, even a posteriori, the quality of the data of a warehouse. For the moment we focus our work on the construction of the warehouse and the data marts obtained from heterogeneous data sources. The idea is to find the warehouse's meta base automatically and to integrate into it the meta data on the user. This work is already started on the design of data bases within the framework of a DRT at NetlorConcept and an MPhil in 2002-2003. Another DRT project was on the specification of a frame of warehouse with Business Human Resources Management. This work was in collaboration with the company BDC Multi-media. In the field of data warehouses, risk management is considered as a project management issue. We believe however that it is worth taking it into account at each stage of the overall IE process. To list potential risky situations in IE stages, we propose to analyse these stages using the triplet « user - information - process » as a scheme to identify risks, and we adopt a two-fold approach: structural and dynamic. At the structural level, we add to the warehouse metadata the need to support risk management. At the dynamic level, we refine interactions between the end-user and the system by adding risk detection and management rules. Our purpose is to design a « risk-aware » data warehouse over its entire lifecycle, namely: design, exploitation (and supervision), and utilization by end-users.

[3] David, Amos and Bueno, David. "User modeling and cooperative information retrieval in information retrieval systems". International journal of Knowledge Organization. 1999. vol 26. n° 1. pp.30 - 45

The various software that we are developing implement the models that we have defined as results of our studies.

5. Software

5.1. METIORE

The system METIORE is the core system that we are using to experiment the integration of the various models and methods of our team. Two versions of METIORE are presently under experimentation: METIORE and METIORE-Wisp

5.1.1. Functional characteristics

METIORE is a system used for the management of bibliographic references: bibliographic references of LORIA since 1980. It is used as test base to implement our proposals on user modeling and the functional model $EQuA^2te$. It is now implemented using Java programming language (we are presently testing the JAVA version) so that the scientific community (LORIA and outside) can try out the system.

The functional model $EQuA^2te$ implemented in METIORE is an acronym:

- Explore: Allow the exploration of the data base to discover the content of the information base;
- Query: Allow information retrieval by query;
- Analyze: Allow a global analysis of the data of the system;
- Annotate: Allow the user to annotate the proposed results either to express his evaluation of the proposed solution or to attach some other personal information on the proposed result.

In addition to these functions, the system:

- allows collaborative information retrieval by two users, for example between a person in charge of information resource center and a researcher;
- permits the submission of documents by individual users. These submitted documents can be analysed along with existing documents;
- alerts users of updates on the information base.

5.1.2. Data model

The behavior of the user is represented by his activities: exploration, query, synthesis, and evaluation of the answers of the system. Each activity is regarded as a document (cf. paragraph 3.1): personalization of response in IRS

The objects managed in the system are regarded as documents. Each bibliographical reference is represented as a document.

XML format is used to represent the objects: users behavior and bibliographic references.

The document representation and the search engine in the current version of METIORE is entirely in XML.

5.2. METIORE-WISP

This prototype implements the wisp model and takes up fundamentally, original characteristics of the ealier METIORE. The goal of this software consists in helping the watcher in his information retrieval process by recording search activities for supervising, understanding and future reuse. The new architecture is composed by different modules surrounded by a data warehouse:

- A GUI that includes in one hand, a full web browser to navigate between web pages and documents stored in the database and in other hand spaces for annotation and metadatas layers.
- A full text index spider for retrieving documents with any information elements.
- Additional modules for visualisation, information mapping, cross-analysing and data mining.

METIORE-Wisp is created with Windev IDE for RAD and its 5GL. Some module, like the cross-analyzer is developed in C language to optimise the processing speed of co-occurrence analysis. Others are DLL or ActiveX objects. Our approach considers that all objects are treated as documents so the prototype uses entirely XML and DOM.

5.3. DIMS PORTAL

This software was developed by NetLor-Concept, a young company created by old students from Miage (Computer Science methods applied to Management), Nancy. The objective is to propose to the customer a software for the creation of Web site, convivial and easy to use. This tool is generic i.e. it applies to all the cases of traditional data processing of an organization. Very quickly these young undertakers noted that the essential problem is on the fact that small and medium scale enterprises (SME) wanted to recover their data. The data is generally in heterogeneous form, from heterogeneous sources, files, old data bases or at best old relational bases under Access 1. Consequently they proposed a tool for extracting data which, starting from a " flat " relational table i.e. without really established structure, constitutes a data base of multiple tables after having carried out a "classification" of the attributes and having thus built a whole relational tables, for example Access. Of course the algorithm of classification used is still rudimentary. Thus we think of introducing research results in data mining and classification to make the methodology still more generic.

5.4. SIMBAD

SIMBAD (Multimedia Indexing System based on Documentary Analysis) developed by Sahbi SIDHOM is a system integrated into a natural language analysis, auto-indexing and information retrieval platform from a textual description of multimedia contents (summaries, bibliographic descriptions and/or annotations). In the general functioning of this platform, various systems, tools and modules of treatment work in coordination to synthesis in order to find pertinent information in the documents during analysis, indexing or information retrieval.

6. New Results

6.1. Watch and Economic Intelligence (EI)

Keywords: *modeling of interaction in information retrieval*, *status of the cooperating actors*.

6.1.1. Understanding the decision problem

Participants: Najoua Bouaka, Philippe Kislin.

EI is mainly an activity of decision-problem solving. This activity is carried out by the decision maker who must formulate exact description of the decision-problem in collaboration with the watcher who must locate, supervise, validate and emphasize the strategic information needed for solving the problem. In order to optimize the sharing of knowledge between the decision maker and the watcher, we tried to establish a bridge between two models: the model of the decision-maker and the model of the watchers information search problem. These linked models can help to increase the precision of the representation of the various parameters of the problem and to allow a greater performance and an optimization of the resolution to the decision-problem.

6.1.2. Representing EI activities

Participants: Stephane Goria, Philippe Kislin.

The first part of this section is specially oriented towards Information Retrieval Problem expression between the person requesting for information and an expert charged to resolve the problem. For this, we defined a set good expression principles (notably inspired from Tauli and Grices pragmatic conversation principles). These are three principles: Adhesion principle; Reformulation principle; and Memorization principle. In addition, to resolve the problems of interpretation of the sense to accord to a subject of Information Retrieval question, we created a graphical formalism: Hyperspective. Which helps to show the interpretation variations that exist between two persons about the expression of a concept.

The MIRABEL model (Model for Information Retrieval query Annotations Based on Expression Levels) presents, like its name indicates, an Information Retrieval Problem from its expression point of view. It is centred on Information Retrieval Problem formulation. This model presents itself as a set of parameters for descriptions linked with the understanding and archiving of an Information Retrieval Problem. These parameters are hierarchically ordered and propose a double description of problem expression as a sum of templates: firstly as a function of a number of contextual data and secondly as a function of a group of components of an Information Retrieval Problem expression. All of these templates help to question the problem and to generate complementary information in form of write-ups that helps in understanding the problem, that we name annotations. This model and a tool called HYPERSPECTIVE (used in the clarification of ambiguous concepts and ideas) were defended in a thesis[4] in January 2006.

The second part is representing the activities of the person charged with looking for the information to use in resolving a problem. We developed a model called WISP (Watcher's Information Search Problem). It is an extension and an application of a EI metamodel to describe and help the user to formulate his information needs during a consultation of bibliographic references. It is tridimensional and multifaceted integrating: 1) analytical dimensional view; 2) methodological dimensional view; and 3) operational dimensional view.

6.1.3. Functional characteristics of an EI system

Participants: Odile Thiéry, Amos David.

The EI system is a tool used within the EI process as defined by our research team (cf. 2.1.), preceded by the phases of problem definition and decision problem transformation into information problem, and followed by the phases of interpretation and decision. In this light, we have defined a functional model that an EI system should implement. The functions are as follows, represented by the abbreviation $EQuA^2te$ where the letters stand for:

- E : Explore : allows the discovery of the information base by exploration
- Q : Query : allows the access of the information base by the use of already acquired knowledge
- A : Analyse : allows the global analysis of the information base
- A : Annotate : allows the annotation of the results obtained from the information base

The functional model is implemented for exploiting the information base as well as the knowledge gathered on the users, as can be seen in figure 1. These functional characteristics allow the user to discover, interrogate, analyse and annotate the content of an information base.

6.1.4. Management of an EI project and services

6.1.4.1. The animator-coordinator:the manager of EI process

Participant: Audrey Knauf.

The object of this research is the clarification of the roles and the competences of the infomediary to the EI process in order to determine his place in the DRIE (regional action plan for EI) by using the DECiLOR action plan and those of other regions. Our objective is to elaborate a system of reference for job and training that permits the formalization of aptitudes, functions and competences of the infomediary job, an essential actor in EI within the region. Earlier resluts from this work are being tested at the regional level (see [Knauf, 2006]).

[4] S. Goria., "L'Expression du problème dans la Recherche d'Informations: Application à un contexte d'Intermédiation Territoriale", Thèse, Université Nancy 2, 2006

6.1.4.2. The success factors for the management of an EI project

Participant: Chedia Dhaoui.

The major undertaking relates to the identification of success factors of Business Intelligence System (BIS) to the strategic piloting of an enterprise. We identified six factors classes: Strategic Factors relating to ensuring adapted actors behaviour in order to realize a good strategy in a competitive environment. Cultural Factors relating to the opening of the firm and its adaptation to cultural changes. Individual factors relating to the competences of actors in taking good decision. Informational Factors relating to information relevance evaluation. Organisational Factors translate the BIS organisational structure. Lastly, Technological Factors are summarized in the conception of a knowledge based information system which provides a personalized and adaptive help to the user profile.

6.1.4.3. Collaborative work in EI process

Participants: Patrick Nourrissier, Victor Odumuyiwa.

This relates to the analysis and the installation of collaborative tools meeting the needs of managing and sharing information in a medium scale enterprise. We study the interest of having model of the user's needs as well as the perception of a collective role of each individual of a group. We are also interested in how to collect and treat the increasingly many and heterogeneous sources of information and present a concrete implementation of the various concepts approached.

6.2. Data base administration: management, extraction and structure

Keywords: *Data base administration*, *data base design*.

Participants: Odile Thiéry, Patrick Nourrissier.

The problem of data base design remains crucial and central for the majority of companies. It is the core of IS, itself preceding SIS in the process of development. Our proposals in IS modeling naturally fit into this problem. That covers work currently undertaken at NetLor-Concept. As developed in paragraph 7, various research projects are already engaged in this field.

6.3. Data warehouse design

Keywords: *data marts*, *data warehouse*, *strategic information systems*.

6.3.1. EI process for data warehouse design

6.3.1.1. Rubicube

Participant: Frédérique Peguiron.

Our working method shows that the consideration of the user when designing a data warehouse of document resources applied into a teaching framework, that integrates the user modeling, has consequences on the design of the information system. For a good representation of the retroactive effect between user and the information system, we illustrate our ideas using a "fractal image": the user model "$RUBI^3$", taken as an upstream in the design of a data warehouse induces a summarized dynamics through the model "RUBICUBE" specific to the data warehouse. "$RUBI^3$" (Representation of the User's needs at the time of Interrogation of an Information system after Identification) highlights a typology of the users, whose activities and functions vary according to their needs. "RUBICUBE" reveals a model of data warehouse design revolving around 3 levels: applications, modeling, metamodeling. The process of Economic Intelligence does not only support the passage of an Information system into a decisional Information system, but it also constitutes the link of its integration into an Economic Intelligence System.The resulting thesis[5] was defended in September, 2006.

6.3.1.2. Architectural image

Participant: Marie-France Ango-Obiang.

[5] F. Peguiron. "Application de l'Intelligence Economique dans un Système dInformation Stratégique universitaire : les apports de la modélisation des acteurs", Thèse, Université Nancy 2, 2006

The architectural image plays a significant role in the exchanges of information between the actors (the architect, the customer, the entrepreneur) of whom the goal is a good follow-up of a project. Our study aims at setting up a methodology of indexing of architectural images, allowing a better exchange of information by the actors through the means of the economic intelligence. For earlier results see [Ango-Obiang and David, 2006], though major results not expected until 2007.

6.3.1.3. Audiovisual

Participant: Hanène Maghrebi.

User studies focusing upon multimedia information needs, its uses and representation are still very limited in the information retrieval world. Our goal is to provide an empirical basis to acquire information that can help user in his retrieval; to better satisfy his information needs. From where the following problems arises: how to reduce the distance between multimedia information representation (using the case of cinematographic documents) and the user's needs? This is an on going work with results expected in 2007.

6.3.2. Adaptive data warehouse

6.3.2.1. Dynamic model integrating a user-model

Participant: Babajide Afolabi.

The aim of this research is to develop a dynamic information system model that is based on the use of an efficient user model. In most of the existing systems, the data structures are such that they cannot be changed. Our interests lie in dynamically looking up a system and verifying the availability of data that could respond to a user need, if not available then look for the data that can respond to this need from the sources either within the organisation or outside of it (pulling information from sources). We are also interested in redundancy, i.e. picking up data available in the system and verifying the kind of needs they can respond to, using a user need profile that is based on the user model. This can be used in pushing information to the users. This work resulted in model $MORPRI^2E$ (Model for the representation of Information Search Problem in Economic Intelligence) based on user's activities and is actually being tested using LORIA's publications base (See [Afolabi and Thiery, 2006a], [Afolabi and Thiery, 2006b] and [Afolabi and Goria, 2006]).

6.3.2.2. Annotation

Participant: Charles Robert.

Our contribution is distinguished by differentiating an annotation as value added to content, the content itself and the information obtained in an IRS. Our objective is to present concurrent models in order to facilitate the pairing of requests and document sources in an information retrieval process by taking into account the pertinence of the results obtained. The validation of the pertinence of the results and their reliability are weighed with the needs and the interests of the user. The resulting model AMIE (Annotation Model for Information Exchange) is at the stage of implementation and testing (See [Robert and David, 2006] and [Robert and Tao, 2006]).

7. Contracts and Grants with Industry

7.1. Institutional partnerships

In addition to collaborations with various teams of LORIA and its organizations to which it is attached, the partnerships which we envisage are:

- The INIST-CNRS: We are working on a research agreement between the INIST-CNRS and Université Nancy 2 in order to officialize a collaboration between the research teams at INIST-CNRS and our team. Two research subjects at masters level were jointly defined by our research team and two units at INIST-CNRS in 2005 as well as in 2006.

- The CRCIL[6]: We are collaborating with the CRCIL for technology transfer by publication of the results of research in the field of EI, by training in form of central internship offer management thereby putting our students in contact with the companies. We are also studying other means of collaboration. For example The CRCIL has made a formal request to use two models defined by our research team within companies[7].
- The Ministry of Foreign Affairs: We develop our international relations with the French Ministry of Foreign Affairs. Indeed, by collaboration with the ministry, we were able to organize two conferences in Nigeria and obtained 3 PhD study grants in 2003-2004.
- This last collaboration with the Ministry of Foreign Affairs is evolving towards the proposal of a joint masters degree in Economic Intelligence and in Computer Science that will involve Université Nancy 2 on Economic Intelligence and 4 Nigerian Universities (University of Ibadan, Obafemi Awolowo University, Lagos State University and University of Lagos) on Information Systems.

7.2. Contracts and industrial actions

We took part in three European projects with industrial partners in the field of research. Also within the framework of DRT SIO, we supervised about ten applied research projects with some forms of technology transfer. Similarly, within the framework of Master ISTIE (a professional course on Scientific and Technical Information - Economic Intelligence), technology transfer projects are carried out.

7.2.1. CIFRE contracts and research agreements

We currently have five contracts with companies relating to the applications of our proposals for the development of strategic information systems used in the contexts of EI:

- CIFRE contract with COM-MEDIC, 2006-2009.
- A collaboration agreement was signed between the Université Nancy 2 and University of Ibadan, Nigeria. Two PhD scholarships were obtained within the framework of this collaboration, 2003-2006.
- Research agreement with the Company HAYET, Tunisia, 2002-2006.
- Research agreements with CVCE, Luxembourg, signed in 2006.

7.2.2. Projects within the framework of DRT

We have supervised or currently supervising the following applied research projects related to technology transfer with companies through DRT. These collaborations are subjected to ANVAR[8] conditions for financial support and each company contribute 1 525 euros per annum.

- Projects with the Company NetLor-Concept: The project relates to the design of a set of tools making it possible to put on line an unspecified but standard data base on Internet. The problems relate to the ergonomic design of interface of interrogation on the Web, the automated extraction of the structure of data base (the conceptual diagram to store in a meta base already defined) and the checking of the coherence of the data accessed on the Web. This concerns the definition of a framework of specification of a warehouse having as application field the Human Resources management. A DRT had already taken place previously in this company with the subject of competences management on intranet and Internet.
- Project with BDC Multimedia: This project relates to the design of a data warehouse on human resources management. During this project a methodology for data warehouse design was developed.

[6] CRCIL: Chambre Régionale de Commerce et d'Industrie de Lorraine
[7] DMP (Decision-Maker Problem) model and WISP (Watcher's Information Search Problem)
[8] Agence nationale de la Valorisation de la Recherche

8. Dissemination

8.1. Animation of scientific community

Members of the team are members of several associations. They take part or are responsible for the organization of several scientific conferences.

- Amos David was nominated as member of the National University Commission (Conseil National des Universités - CNU) section 71 of Information and Communication Sciences.
- The research team organized ISKO 2005 conference on "Knowledge Organisation in Utilisation oriented Information Systems: Watch and Economic Intelligence Context", April 2005, Nancy.
- We take charge of the teaching and evaluation of a master course at the University of Ibadan, Nigeria, since 2004 on "Advanced Data modeling and development". The program involves three other universities/institutions in Nigeria.
- Amos David is a member of the scientific committee of ISKO (International Society for Knowledge Organization), french chapter.
- He is a member of AFDIE (French Association for the Development of Economic Intelligence).
- Odile Thiery is a member of AIM (Association of Information and Management).
- She is regularly member of the program committee of the congress INFORSID which comprises a session on SIS.
- Sahbi Sidhom is a member of the administrative council of ISKO-France.
- We have collaboration with the University of Malaga, Spain, on user modeling in the context of information retrieval.

8.2. Teaching

We participate in teaching at second and third cycle. The modules we teach relate primarily to the fields developed in this project: economic intelligence process, data modeling and design of traditional and strategic information systems. We intervene in the following degree programmes:

- Master's Degree
  - Domain: Information and Communication sciences, Economic Intelligence
  - Domain: MIAGE (Computer Science methods applied to Management)
  - DRT SIO
- Bachelor's Degree
  - ICN (School of Management) Organisational Information System option
  - Elective courses in Documentation

In all these contexts of teaching, which are most of the time vocational trainings, we are brought to define training courses and internship (up to 5 months in second year of master in Miage and STI-EI[9]). This allows us to have many industrial contacts and collaboration opportunities, for example in the definition of DRT subjects.

[9] Scientifique and Technical Information - Economic Intelligence

8.3. Administrative loads

- Odile THIERY is responsible for DRT SIO and director of UFR MI, Nancy 2. She is also in charge of the committee local buildings of the University. She has some additional responsibilities at LORIA (adviser for information and scientific communication) and since the 1st October, 2005, she is the director of the Pole Lorrain de Gestion.
- Amos DAVID is director of studies for Master's in STI-EI. He is the coordinator of an agreement between University Nancy 2 and University of Ibadan Nigeria. Within the framework of this agreement, a session of summer school is organized each year. And for this specific action of summer school, we drew up a tripartite agreement (Nancy 2, University of Ibadan, and the French Ministry for Foreign Affairs), over 3 years (2004-2006). This programme is under evolution to arrive at a joint Master's degree in STI-EI and subsequently in Computer Science.
- Sahbi SIDHOM is responsible for the elective courses in documentation at bachelor's degree level.
- Gérald Duffing is the head of department 'Management Information Systems' at ICN School of Management. He is also in charge of the 'Information Systems in Organisations' option of the ICN Master's Degree.

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