

THE 'LABORATORY FOR COOPERATION TECHNOLOGIES' AND ITALIAN INITIATIVES ON COMPUTER-SUPPORTED COOPERATIVE WORK

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ABSTRACT

The 'Laboratory for Cooperation Technologies' is the first Italian activity in forthcoming cooperation technologies. It has the aim to observe, evaluate and test technologies in this area of research and company-developments. A group of private and public Italian organizations participates in this circle which was founded in 1988. Promoters of the initiative are a consultancy company, a service-company for information and communication technologies and a software-house. Other subscribers for the laboratory are, at present, producers and suppliers of information technology, banks, regional governments, service-companies for information and communication technologies, research centres, manufacturing, chemical and consultancy companies. The program consists of seminars, workshops, study tours and product tests. An Electronic Workgroup is going to be started based on a geographical network with 'The Coordinator'. The Laboratory is actually addressing Italian companies. Future plans are to develop relationships at European level for the 1990s.

Some members of the Laboratory have started with projects on cooperative work. One of the developed applications is a hypertext-based management reporting system. Another member of the Laboratory is using hypertexts for the accumulation and presentation of information, especially on Artificial Intelligence. Beside the more editorial applications for the creation of documents and information by a group of persons, there are projects to support the communication. In an Italian industrial group the communication technology is re-defined in the project 'Message Handling System' to support groupwork. A geographical network should support the communication and coordination of regional departments in a European project for the economical development of the territory. A consultancy company has developed a methodology to analyse and understand cooperative networks and to design them by choosing supporting tools and defining the required skills of human beings.

Introduction

In recent years some innovative software companies (mainly in the United States) have proposed the first groupware tools to the market, creating great expectations and some skepticism. It is difficult anyhow to evaluate and compare the groupware tools already proposed because we lack a criterion to classify them on the basis of their functionalities, their social and organizational implications and their performances. It is not always possible to know if an announced product really exists (there is a lot of 'mystery-ware' among the groupware tools). The principal software and hardware suppliers have anyhow begun (or at least decided) to include in their offer new paradigms and new tools coming from academical and industrial research within the field of computer supported cooperative work. At the same time network software and services have improved and allow the creation of local and geographical networks.

In Italy there is a notable need to understand developments, new products and projects on computer-supported cooperative work. The open European market will enforce Italian companies to develop strategies and an understanding of the overall development. They have, however, to make their own experience and to evaluate the benefits of forthcoming technologies under the conditions of the Italian cultural, political, technical and organizational context.

The 'Laboratory for Cooperation Technologies'

The 'Laboratory for Cooperation Technologies' is the first Italian activity in forthcoming cooperation technologies. It has the aim to observe, evaluate and test technologies in this area of research and company-developments. The activity is open to companies which want to develop knowledge and experience in this newly emerging field of information technologies. The Laboratory is a panel to discuss possibilities, projects and experiences with representatives from different companies on these issues. It is the opinion of its promoters that interested companies will have a deeper understanding of a new technological field exchanging their experiences within a well informed and cooperative group.

A group of private and public Italian organizations participates in this circle. It was founded in 1988 by RSO Futura, a consultancy company, together with a large service-company for information and communication technologies

(Datamont). Promoters of the initiative are at present Andersen Consulting, the Italian subsidiary of the international management consultancy company and Metos Group, a software and service company. Other subscribers to the laboratory are, at present, producers and suppliers of information technology (Bull Italia, Hewlett Packard, Olivetti), banks (Istituto Bancario San Paolo di Torino), regional governments (Regione Toscana), service-companies for information and communication technologies (G.I. Informatica/Gruppo IRI-Fin-siel), research centres (Centro Comune di Ricerca Ispra/EEC), manufacturing and chemical companies (Bassani Ticino, CPC Italia, Himont).

The program consists of:

- Seminars: Every year two seminars are held. The titles for the activity 1988/89 are 'Cooperation in the working process and supporting technologies' (March '89, Prof. Giorgio De Michelis, University of Milan) and 'Cooperation Technologies to handle goals and results' (September '89, Mauro Pacelli, former NCR's software factory manager).
- Study Tours: The Laboratory's members went on a 10-days tour to the United States in September 1988. Besides the participation at the International Conference on Computer-Supported Cooperative Work in Portland (Oregon), they visited three sites working on such themes: they met Thomas Malone (Massachusetts Institute of Technology) who develops Information and Object Lens, and Anatol Holt at Coordination Technologies; the group saw the installation of 'The Coordinator' at EDS (the software company of General Motors), and spoke with representatives from Digital Equipment Corporation (Paul M. Cashman) and Hewlett Packard (James H. Bair).
- Reports: The Laboratory's experiences are collected in a report on the study tour [4]. Furthermore, the Laboratory has produced a 500 pages survey report about cooperation technologies [5]. It is a unique report covering cultural, organizational and technological aspects on that issue. It covers the historical background of Cooperation Technologies, a theoretical background to analyse the working process as cooperation and gives an analytic overview of general characteristics of products, main research projects and case studies.
- Product Tests: Each year a software product is selected out of the range of available CSCW-technologies. The members test that software and discuss the

results and different experiences in a two-days workshop. Office Workstations Ltd.'s product Guide was the choice for 1989. Beside the experimentation other hypertext-software and experiences in such environments were presented during a workshop.

- **Electronic Workgroup:** An Electronic Workgroup is going to be started based on a geographical network with 'The Coordinator'. This network will be the media to develop relations among the associated members, to coordinate the Laboratory's activities and to distribute information on groupware.

Some members of the Laboratory have started with projects on cooperative work - described below - which are periodically discussed within the Laboratory. This gives designers and project-leaders an occasion to rethink what they have done. The other members of the Laboratory get a first knowledge of the problems arising within the development of Cooperation Technologies and the achievements which can be expected.

Bassani Ticino: A Hypertext-based Management Reporting System

Bassani Ticino (Varese) produces electrical equipment for private and industrial use. The company has been one of the first Italian organizations using Hypercard for industrial applications. Graphics data bases have been created to manage documentations for the Test Department and general information concerning the company. It is possible to consult the company's information system from the individual work station with Hypercard as a navigation system. The interface created has three types of graphical buttons for different use: one for the local elaboration, one for the access to the Infocentre and another to the mainframe. Every work station has various features, e.g. electronic notebook, calendar and phone directories of different company sites.

Based on that experience Bassani Ticino decided to develop a management reporting system. A first introduction of a navigator-system for that application, called "Tableau de Bord", was carried out by the Information Systems Department and the software was installed on all work stations. The company gained a good experience with the prototype and the system. More complex applications are under development in Bassani Ticino.

Today the monthly report of the company's development is created with spreadsheet elaborations. The connection of different information, e.g. retrieved from the company's data base, cross references and remarks, might be very useful. Printed reports or the use of spreadsheets do not provide any tool to browse transversally. Managers reading a report 'navigate' through it following personal but not expressed rules. It has been thought of a representation of the information with hypertexts involving the users in the system design.

The solution is a system of reporting on three layers: at the first level, the nearest to the user, is the navigation system based on Hypercard, a system for data and graphic table presentation (Wingz) manages the second layer, on the third layer a file manager system is installed, which is able to access directly the company data bases. The supporting system on the second level is carried out with an experimental hypertext software which allows a dynamic representation of the company data. The navigation system based on Hypercard manages the report summary and the addresses of the various items. It allows three different user-methods: reading, what-if simulation and direct access to data. The reading mode has been already completed, while the others are under development.

Different tables are presented, containing in the lines the items (industrial costs, commercial costs etc.) and in the columns the time references. In these tables there are buttons for logical links and buttons which allow to zoom the windows. Every line heading is also a button, whose activation links to a more detailed table. There are other buttons offering the choice between different representations of the account. Every screen has a help-on-line button, one for a graphical representation of the data in the tables and a "go-back" button. The system has about 50 tables.

Montedison: A 'Message Handling System' for the Group

In 1972 a Message switching System, based on proprietary software and architecture, was installed for the Montedison Group.

Due to the growing interest of users for the service provided by a store-and-forward system and the need to cope with new services, which were also needed to participate in significant European projects (e.g. the EDI/CEFIC

project), Montedison started the project 'Message Handling System'. It has the following aims:

- improvement of the existing architecture and up-dating of the operating procedures with a better support to the services;
- global integration in order to improve message exchange among units;
- support of an open interchange of messages with third party organizations, both at national and international level;
- adoption of a common communication standard;
- networking with national and international V.A.N.s, because of the increasing importance of Electronic Data Interchange (EDI) services.

The system configuration is based on 2 DEC/VAX computers, interconnected in a VAX-cluster architecture, in order to provide CPU and mass memory redundancy, and to take advantage of the architecture of the DEC Message Router. The Message Router allows either the use of existing gateways or the implementation of new ones, which can be customized with respect to different User Agents and, therefore, to different application services.

The implementation of the functional specifications will be performed in two phases. The first phase corresponds to the substitution of the old system. In this phase all the existing functionalities, like message switching, access to public telex network, electronic mail box and gateways to the DISOSS environment, will be covered. However, the most significant functional feature of the first phase is the user interface structure, which is based on an intelligent workstation (PC with hard disk), that supports all kinds of document management. The first phase will be completed within 1989.

The second phase mainly involves the development and implementation of functions which are not available today. The most significant are the access to public teletex networks, Electronic Data Interchange (EDI) and fax switching. The time schedule for the implementation and delivery of services related to the second phase is about one year after completion of the first phase.

European Research Centre ISpra: Knowledge Representation with Hypertext-Systems

The Joint Research Centre Ispra of the Commission of the European Communities tested two hypertext products for knowledge representation. They are discussed in terms of features and of practical experience the Research Centre gained using them.

The following overview deals with applications developed at the Joint Research Centre using the hypertext systems Guide and Knowledge Management System (KMS). The aim of the study was to identify the various capabilities of such a system concerning the organization of information coming from different sources in a structured way.

- Software documentation: Software documentation has always been one of the nightmares of software developers. Indeed, the time taken by such a work is almost twice the one used for code development and this work is often considered to be boring and moreover useless. Anyway, this kind of task is very important in order to have a good management of the software development activities.

Hypertexts offer the possibility of integrating in a quite efficient way the two fundamental tasks of software developers, that is, code development and related documentation. Moreover, it also gives the capability of building a very powerful software development environment that fits the requirements of software developers. In other words this environment is made of the usual tools of development, i.e. editor and compiler where the former is expanded to support hypertext structures. Comments and more general information about code can be embedded into the code itself and hypertext structures. Hence, user documentation, software specifications, reference manuals can be seen as different viewpoints based on the same textual structure. This general approach makes also easier the maintenance task of the whole software system. This approach combines in a very appealing way the various phases (specifications, coding, testing, maintenance) of the software life cycle. The Joint Research Centre plans to introduce the intensive and extensive use of such a tool in the daily work of their software developers in order to improve the quality assurance of the software developed.

- Project documentation: Due to the intrinsic nature of European Research Institutes, partners involved in the same project are often spread over various countries. There is a need to communicate information about the current state of project developments in order to improve the cooperation among the partners. It is also important to have an electronic standardized tool in order to produce homogeneous technical documentation and the way of organizing and managing the large amount and variety of documents produced. In that sense, this also reduces the load of the project managing work. In the future, a hypertext software will be used in a specific context of a single partner in order to verify whether it satisfies the needs expressed above.

- Paper production: Writing and distributing papers is one of the most fundamental task in scientific communities. A typical paper has a well-defined structure (abstract, keywords, contents, introduction, conclusion, bibliography, etc) that fits well in an hypertext system. Cross-links can be made easily between articles dealing with the same arguments or written by the same authors. The hypertext approach is also useful in taking notes the author makes during the writing process. This improves the flexibility of writing articles. Due to the electronic nature of the work and the increasing network capabilities, the distribution process of papers becomes easier to manage, especially when references or related topics have to be consulted. A hypertext software could implement the paper framework just described and copes with the author's way to organize his paper.

In general, hypertext systems are a very powerful tool for documentation development. Criteria to design structured integrated documentation (text, graphics and others sources coming from scanner) have to be considered for using the system. Furthermore, hypertexts could be a concrete step towards the integration of various phases of the software life cycle in developing complex software systems (a possible tool for CASE).

Regione Toscana: Cooperation Technology in the Project PIM

The Regional Administration of Tuscany wants to develop an information-technology architecture considering CSCW-technologies in the project PIM (Piani Integrati Mediterranei - integrated plans for the Mediterranean area). PIM is an initiative of the European Community to promote the economical development (industry, agriculture and tourism) in Southern Europe. Regional and national organizations participate in the project as well as local public bodies.

In Tuscany the aim is mainly to promote activities concerning the protection of the forests and the development of industrial, agricultural and touristic activities. The participating organizations are the Regione Toscana (Regional Administration of Tuscany), the city councils, the Comunità Montane (Mountain Districts) and the provinces. The project is split up into sub-programmes. This allows better control of the single operation in the specific area. A specific 'measurement' is defined for the evaluation of the sub-programmes.

The Region of Tuscany is defining a system based on information technologies to support the information-flow of the whole project during the implementation of the project, supervision and progress reporting. The information and related data collected will be send directly after the requested elaboration to the national government. For this purpose the Region of Tuscany will use an application which was developed for the European Community by Price-Waterhouse-Associates.

The functional specification for the information system foresees an architecture at two levels: a system to support coordinated activities and data collection and at the second level data processing by the Region.

For the first level the Region of Tuscany wants to define an electronic mail system which supports cooperation, especially coordination, between different organizational units and persons. The Coordinator by Action Technologies is a reference for the project-application. The mail-system has to support cooperative work in the sense of communications related to activities in the project, deadlines, data retrieval, group calendars and meetings, etc. The transfer of data bases concerning special items in the project has to be done by the same

tool. This data transmission will be activated by the local units which address the Programming Department of the Regional Administration. They control the single phases of the project.

Every sub-programme leader and the supervisors for the evaluation will get a personal computer with the specifically required software-applications. The second regional level has a local area network with a dedicated workstation to manage the information and its retrieval.

The information-system will be tested in a first phase by the main project partners (local authorities). The experience gained by these participants will be beneficial for the following introduction of the system for the whole project. Training problems and other results will help to make it a strategic tool for PIM after the extension to all people involved. Hardware for the sub-programme leaders is to be chosen. The project will end in 1990.

West80: Hypertext-Applications

West80 was one of the first Italian companies which developed hypertext applications on the national market. West80 has created its own product 'HyperBoard'. This software package was designed and realized in West80's laboratories in two years. The product is designed for a quick and efficient consulting of reports which consist of tables, graphics, images, films, programmes, etc. HyperBoard has two basic elements: the single information source and the links between information nodes to move from one report to the other.

There are three main areas of HyperBoard-applications: the group of Reporting Systems to the Management (Decision Support Systems), Visitor Information Systems which help persons to orientate themselves by using publicly available information, and Hypertext Training Systems which are especially made for self-training.

Reporting systems for the management and staff persons have been developed by West80 for some large Italian companies. 'Panigal Marketing', e.g., has an on-line application to analyze the situation of the company. This can be done on different levels (for single products) concerning turnover, sales, budget, forecast, benefits, etc. The administration in 'Agip Petrol' uses hypertexts to

organize information about suppliers, on-going projects, budget and availability. 'CMC' analyzes the distribution of shares held in other companies. This is combined with information about the representation of CMC-personnel in the boards of those organizations. The report of the development in the largest national chemical group 'ENI' to its president is also done with this technology. The same aim has the application in IVECO, concerning the production of automobile parts.

The Visitor Information System allows a person to orient himself in an unknown environment or situation. The user might look for a special service or wants to locate himself. The place might be a town, a sporting camp, a hospital, a business centre or a big office which is open to the public.

The hypertext system has two main parts to satisfy the user's demand: a map of the location with different scales and levels of detail, and the information concerning the service of the location. The interface has to be as easy as possible. It should not need special training. Therefore it is based on iconic graphics. The visitor has only to indicate on the screen what he wants to know and activates the computer to search the answer to the request. Some applications use the keyboard, others mouse or touch-screens. One of the most recognized applications is 'TuttoBologna'. This system was developed for Bologna's 900th anniversary and provides information about exhibitions and other events in the city. There are 20 information points around Bologna. 'TuttoBologna' has been already installed since some months.

RSO Futura: A Methodology for Cooperative Networks

Cooperative Networks will be an emerging pattern for the enterprises in the nineties. Innovative companies are observing with great attention the psychological, organizational and sociological theories and the (computer-based) tools emerging in that field in order to find better ways for orientation and strategies for their organizational change. Nevertheless, still missing are: (1) a theoretical framework to analyze and understand the cooperative networks that are active within the organizations; (2) a method to design cooperative networks, choosing the tools supporting them and defining the skills of the human beings so that their effectiveness can be maintained in time.

RSO Futura proposes an approach facing the above two points [7]. Its guide-

lines to design cooperative networks are based on the consonance of the organizational and technological environment. A conceptual framework is introduced where cooperation emerges as a fundamental phenomenon in human work, and it can be analyzed from its subjects' point of view, the relations binding its actors together and the communication patterns exhibited. Three main types of cooperation are identified: (1) Coordination as a cooperative process where the actions of a group are coordinated among the persons; (2) Collaboration which is working together in the execution of a single action; (3) Co-decision which leads to the formulation of a group-decision [3].

The methodology is based on two guide-lines of the sociotechnical approach which has been developed at RSO Futura: the first considers the design of a system within the never ending innovation process of an enterprise. It is composed of planning, design and experimentation [2]. The second supports technological choices on the basis of the enterprise's model, its organization and the skills of the involved persons [1].

Each Cooperative Network is firstly characterized by its main commitment. Other components are its nodes, their relation in the specific Cooperative Network and the organizational structure. Synthetic models help to identify the type of cooperation in groups. The final result is the evaluation of the space for improvement by technological and organizational means. After the definition of the components by means of a tree structure, the network's performance is defined by the traditional model of message transfer. Further categories are considered in order to 'discipline' the communication and the resulting networks, as it is proposed by C.A. Petri [6]. Supporting technologies or organizational means for cooperative work are identified according to the characteristics of the specific Cooperative Network, required performance and proposed types of cooperation.

The methodology was successfully applied in two Italian companies. The first one is a manufacturing company where four current development projects were analyzed and about 30 persons participated in an active learning program. The second company develops software and offers services in automation and information technologies to the Bank of Italy (Banca d'Italia) and the other Italian banks. There the methodology was applied to develop commonly used documentation and to improve communication in the teams working on software design and developments.

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