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PROPOSAL OF THE INTEGRATION OF THE METHODS SADT AND GRAI IN THE ENTERPRISE

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ABSTRACT: The restructuring of enterprises constitutes a complex process allying various points of view that the conventional approaches don't manage to satisfy. Indeed, the restructuring of enterprises cannot be achieved only according to a global approach of analysis. In order to contribute to the restructuring of an enterprise, we present a proposal of the integration of tow systemic methods: SADT and GRAI. In fact, we interest in this paper to the use of the global approach that allows us to act not only on the organization and the management system of the enterprise but also on its information system.
KEYWORDS: Enterprise modeling, Global approach, Systemic methods, SADT, GRAI

❖ INTRODUCTION

The system approach enables us to analysis the complex process elements as components of a whole in reciprocal dependence relation. Its field of survey doesn't limit itself to the mechanization of the thought. In fact, the systemic analysis is a methodology that organizes knowledge to optimize an action. The objective of a system approach is to schematize a complex process, to lead to a modeling that enables to act on it, after we understand its architecture and its dynamic structure [1] [2].

The systemic analysis has for role to define the general strategy of the modeling survey to achieve. This strategy must enables to fix a way that specifies the limits of the modeling while defining the borders of the system to model and to specify among the data that are really exchanged between the different components of the system those that the modeling will cover [3][4]. Because of the complexity of activities of the enterprise and the interdependence of its various functions, its restructuring cannot achieve itself only according to a global approach of analysis based on the use of systemic methods [5] [6]. The use of systemic and participative approach facilitates the adoption of the strategy of restructuring of enterprises. It is therefore necessary to adopt a scientific gait based not only on the structured analysis but also on the modeling technique that will act not only on the organization and the management system of the enterprise but also on its information system (see Figure 1).

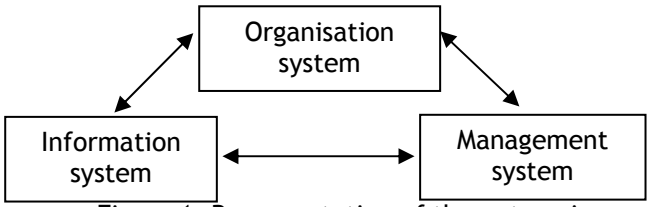

Figure 1- Representation of the enterprise

The principal objectives waited of the analysis of a system of the enterprise are: to offer a support of communication between operators of the system; to lead to a tool of performance analysis and to incline a tool of help to the decision making. The object of this work is to propose a global approach based on the use of two systemic methods SADT (Structured Analysis Design Techniques) [7] [8] and GRAI (Graphes et Réseaux d'Activités Inter-reliés) [9] [10] enabling to reach the aimed objectives. This approach requires a new and suitable tools conceptualization that would be used by the various actors in the enterprise.

❖ REVIEW ON PARTICIPATIVE METHODS

There are many methods that have been used to enhance participation in Information System (IS) planning and requirements analysis. We review some methods here because we think them to be fairly

representative of the general kinds of methods in use. The methods include Delphi, focus groups, SADT, OOPP method, multiple criteria decision-making (MCDM), total quality management (TQM) and GRAI. The objective of the Delphi method is to acquire and aggregate knowledge from multiple experts so that participants can find a consensus solution to a problem [11].

A second distinct method is focus groups (or focused group interviews). This method relies on team or group dynamics to generate as many ideas as possible. Focus groups been used for decades by marketing researchers to understand customer product preferences [12].

MCDM views requirements gathering and analysis as a problem requiring individual interviews. Analysts using MCDM focus primarily on analysis of the collected data to reveal users' requirements, rather than on resolving or negotiating ambiguities. The objective is to find an optimal solution for the problem of conflicting values and objectives, where the problem is modeled as a set of quantitative values requiring optimization [13].

TQM is a way to include the customer in development process, to improve product quality. In a TQM project, data gathering for customers needs, i.e., requirements elicitation may be done with QFD [14].

The SADT method represent attempts to apply the concept of focus groups specifically to information systems planning, eliciting data from groups of stakeholders or organizational teams [15]. They are characterized by their use of predetermined roles for group/team members and the use of graphically structured diagrams. SADT enables capturing of a proposed system's functions and data flows among the functions.

The OOPP method also referred to as Logical Framework Approach (LFA), is a structured meeting process [16]. This approach seeks to identify the major current problems using cause-effect analysis and search for the best strategy to alleviate those identified problems. OOPP method has become the standard for the International Development Project Design. Team Technologies have continued to refine the approach into TeamUP.

❖ PRESENTATION OF THE METHODS SADT AND GRAI

In this part, we present two methods of enterprise modelling [17-20] SADT and GRAI that we propose to use for restructuring approach of the enterprise.

THE SADT METHOD [7] represent attempts to apply the concept of focus groups specifically to information systems planning, eliciting data from groups of stakeholders or organizational teams. SADT is characterized by the use of predetermined roles for group/team members and the use of graphically structured diagrams. It enables capturing of proposed system's functions and data flows among the functions. SADT, which was designed by Ross in the 1970s, was originally destined for software engineering but rapidly other areas of application were found, such as aeronautic, production management, etc.

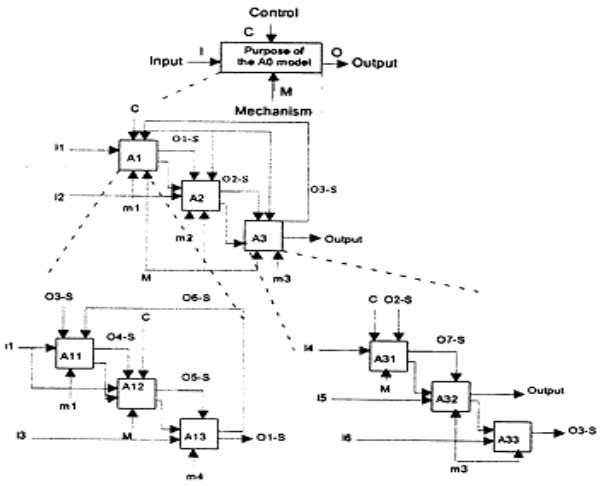

Figure 2- Top-down, modular and hierarchical decomposition of SADT method

SADT is a standard tool used in designing computer integrated manufacturing systems, including flexible manufacturing systems [8]. Although SADT does not need any specific supporting tools, several computer programs implementing SADT methodology have been developed. One of them is Design: IDEF, which implements IDEF0 method. SADT: IDEF0 represents activity oriented modeling approach (See Figure 2).

IDEF0 representation of a manufacturing system consists of an ordered set of boxes representing activities performed by the system. The activity may be a decision-making, information conversion, or material conversion activity. The inputs are those items which are transformed by the activity; the output is the result of the activity. The conditions and rules describing the manner in which the activity is performed are represented by control arrows. The mechanism represents resources (machines, computers, operators, etc.) used when performing the activity.

The boxes called ICOM's input-control-output-mechanisms are hierarchically decomposed. At the top of the hierarchy, the overall purpose of the system is shown, which is then decomposed into components-subactivities [15]. The decomposition process continues until there is sufficient detail to serve the purpose of the model builder. SADT: IDEF0 models ensure consistency of the overall modelled system at each level of the decomposition. Unfortunately, they are static, i.e. they exclusively represent system activities and their interrelationships, but they do not show directly logical and time dependencies between them. SADT defines an activation as the way a function operates when it is

'triggered' by the arrival of some of its controls and inputs to generate some of its outputs. Thus, for any particular activation, not all possible controls and inputs are used and not all possible outputs are produced. Activation rules are made up of a box number, a unique activation identifier, preconditions and postconditions.

GRAI METHOD - Developed by the laboratory for automation and production at the university of Bordeaux- France since 1970's [9]. Before developing the GRAI method, some existing works had been reviewed, notably SADT method. It was found that the decisional aspects were not very well taken into account in these methods. So, it was important for the GRAI method particularly to deal with the decisional aspects of manufacturing systems. Based on the GRAI models, two formalisms were developed to model the macro decision structure and the micro decision center; the GRAI grid and the GRAI nets. A structured approach was defined to show how to apply the method (See Figure 3).

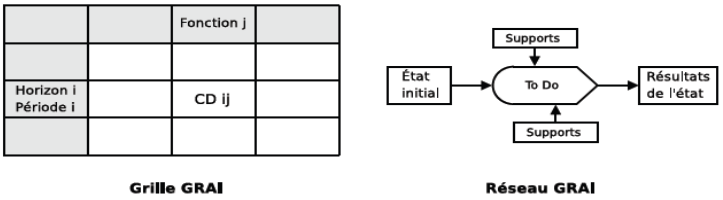

Figure 3- Formalism of the GRAI method

Another work performed at the GRAI laboratory was the extension of the GRAI method to GRAI-GIM (GRAI Integrated Methodology) [10]. GIM is composed of the following elements:

- GRAI conceptual model: a representation of basic concepts of a manufacturing system decomposed into three sub-systems: physical system, decision and information system.
- GIM modeling framework (RA) with three dimensions: views, life cycle, and abstraction level.
- GIM structured approach: guide to show how to perform analysis and design of the manufacturing system in three main phases: analysis, user-oriented design, and technical-oriented design.
- GIM modeling formalisms (languages): GRAI grid and GRAI nets for decision system modeling, IDEF0 and stock/resource for physical system modeling, ER for information system modeling, IDEF0 for functional system modeling.

The GRAI model is a reference through which various elements of real world can be identified. The macro conceptual model is used to express one's perception and ideas on the manufacturing system which is decomposed into a decision subsystem, an information subsystem and a physical subsystem. Particularly within the decision subsystem one finds a hierarchical decision structure composed of decision centers. Decision centers are connected by a decision frame (objectives, variables, constraints and criteria for decision making). The operating system is an interface between the decision system and the physical system. The micro conceptual model is used to represent the internal elements and structure of the decision centre.

GRAI-GIM contains a user-oriented method and a technically-oriented one. The user-oriented method transforms user requirements into user specification in terms of function, information, decisions and resources. The technically-oriented method transforms the user specification into technical specifications in terms of information and manufacturing technology components and the organization. The technical specification must allow the implementer to choose (buy, commission, or develop) all the components needed to implement the system. A computerized support tool knows as CAGIM (Computer Aided GIM) is being developed at the GRAI Laboratory within the framework of the IMPACS project on Unix systems with X-Windows, to support the GRAI-GIM method.

❖ METHODOLOGY OF INTEGRATION OF THE TWO METHODS

In order to establish a global approach for the restructuring of the enterprise (See Figure 4), it's necessary to proceed first of all to the instruction of the situation with the decision-makers according to a Brainstorming gait; thereafter, we exploit an analysis of the existing led by a support committees constituted to this effect. This analysis will be driven according to a participative gait while associating the various structures of an enterprise and while adopting an environment of Quality. It is necessary to organize different production workshops. These workshops are organized implying very well collectively all concerned by the various functions assigned in enterprise, either of a manner dedicated to a specific function.

1ST STAGE: FUNCTIONAL MODEL. The modeling oriented functions consist in describing processes of the enterprise. They must be capable to show interactions between these processes and to proceed to a decomposition of functions or activities. In the first stage, we proceed to the functional modeling of the organisation that is not other that the exam of the situation of the enterprise in order to better understand its working. This stage enables us to decompose the system of the enterprise in a hierarchical manner in order to lead it in to elementary situations. The first type of workshops enables to first of all to identify basis functions of an enterprise; it also enables to identify participants to the dedicated workshops and to establish a first work planning. Thereafter, it is during these workshops that various validations and various adjustments will be made and this thanks to the phenomenon of synergism of group and complementarities of functions. The dedicated workshops enable to exploit the

appraisal of People Resources to describe by a logical and hierarchical manner the various activities of every function. We exploit the formalism of SADT method witch represent a general method that tries to encourage the communication between claimants and users, on the one hand, inventors and producers, on the other hand.

2SD STAGE: INFORMATIONAL MODEL. The architecture of information is composed not only of a combination of structures fixed but also of objects that have some short life cycles. Methods of modeling are destined to model the information system of the enterprise. They permit to assure the circulation of information in the enterprise concerning processes, functions, resources, the organization etc. Once functions and activities of every function have been identified, the following stage of the methodology proposed consists in analyzing the informational environment of these activities using the SADT method. The performances of a system as complex it depends especially on the performance of its information system. This is why the development of the information system of the enterprise and the efficiency of its exploitability is important. It enables to adapt constraints of measure and collection of information to those of treatment and exploitation. The modeling of the information system of the enterprise offers the tools of analysis and help to the decision making. These elements contribute to illuminate the decision or merely to encourage the consistency between the evolution of the process, objectives and the system of values to the service of which one is placed.

3RD STAGE: DECISIONAL MODEL. This stage aims the detailed description of decisions to take in a very definite time horizon and according to activities. In fact, the decision is about an interfacing between the strategy and the operation in the enterprise. We propose to use the GRAI method. In fact, the GRAI modeling is the only existing modeling that proposes a representation of decisional structure of the enterprise. This representation is important to detect incoherencies in the coordination and the synchronization of decision makings and in the dynamics of evolution of the enterprise. Then, we propose to adopt the three element of this approach: models of reference, formalisms of modeling and structured approaches.

❖ CONCLUSION

The process of modeling of the enterprise is a methodological gait well structured aiming the representation of an enterprise while developing models or languages of modeling and with contribution of all actors of the enterprise to arrive to a well identified finality.

A proposal of the integration of two systemic methods SADT and GRAI is presented in this paper in order to contribute to the restructuring of the enterprise. This approach is developed according to three essential stages: functional model, informational model and decisional model of the organization system of the enterprise.

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