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APPLICATION OF THE SYSTEM APPROACH FOR THE AUTOMATION OF A PRINTING SYSTEM

T. BEN JOUIDA[1,3], M.N. LAKHOUA[2], M.ANNABI[3]

[1]ISSAT, Route de Tabarka 7030, Mateur, TUNISIA
[2]Laboratory of Analysis and Command of Systems, ENIT, TUNISIA
[3]ESSTT, 5 Avenue Taha Hussein Montfleury 1008, TUNISIA

Abstract
The automatism represents an important gap in the command of new technical systems. This function has become much practiced either by the designers or by operators of technical systems. For this purpose, same older systems have also become an application domain of the automatism. Indeed the problem of an automation project resides in how to respond in a clear manner the two essential questions following: Do what hardware use for a project Automation given? What are the scenarios that must ensure the project Automation?
In this paper, we adopt a systemic approach of analysis to respond to issues of automation projects and we present a project automation of a printing system by exploiting the OOPP method (Objectives Oriented Project Planning).
Keywords
Automation, printing system, System approach, OOPP method

1. GENERAL CONTEXT

The printing is a set of technologies to reproduce written and pictorial bulk on materials plans, usually paper. Three large techniques are now represented in the field of printing: typography, the rotogravure and offset. That product is the largest volume of print (stamps, magazines, newspapers, packaging, books, catalogues, presses...). There are two types of the offset press: rotary offset press and offset press sheet.

We are interested in this paper to scan one rotary press. In fact, a rotary offset is a press for printing logs or documents long draw. It is electrically by a spool paper, unlike the-sheet press that prints directly on a sheet of paper.

The requirements of quality, the number of copies, of the need to reduce the cost of production, the flexibility of the number of pages, colors per page as well as the drafting closing time (loopback) led various conceptions of rotary.

In fact, systemic analysis, or approach-system, belongs today at scientific aware that scanning process items complex as components of an ensemble where they are in dependency reciprocal. His field of study is not limited to the mechanization of thought: systemic analysis is a methodology that organizes knowledge for optimize an action [1] [2] [3]. The objective of the approach- system is to map any complex, lead to a modeling to act on him, after it has understood its hardware configuration and dynamic structure.

Other known systemic analysis tools (AMS) (Analysis causal, SADT...) adopt an approach scanning tiered and to meet the relevant to issues lead a project: What? Who? How? When? Where? Depending on the method and the tool you use, other parameters can be defined.

In order to model the activities of the project of the automation of a printing system, we used primarily the OOPP (Objectives Oriented Project Planning) method.

2. PRESENTATION OF THE OOPP METHOD

There are many methods that have been used to enhance participation in Information System planning and requirements analysis [4] [5] [6]. 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 (Structured Analysis Design Technique), OOPP method, multiple criteria decision-making (MCDM), and total quality management (TQM).

The OOPP method [7] [8] [9] also referred to as Logical Framework Approach (LFA), is a structured meeting process. 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.

The design methodology of the OOPP method [7] [10] [11] is a rigorous process, which if used as intended by the creators will impose a logical discipline on the project design team. If the process is used with integrity the result will be a high quality project design. The method is not without its limitations, but most of these can be avoided with careful use of ancillary techniques. Many things can go wrong in the implementation phase of a project, but if the design is flawed, implementation starts with a severe handicap.

The first few steps of the LFA are [12] [13]: situation analysis; stakeholder analysis; problems analysis.

The document of “Situation Analysis” describes the situation surrounding the problem. The source could be a feasibility study, a pre-appraisal report, or be a compilation done specifically for the project design workshop. Typically, the document describes the problem situation in detail, identifies the stakeholders and describes the effects of the problems on them.

The stage of “Stakeholder or Participation Analysis” is an analysis of the people, groups, or organizations that may influence or be influenced by the problem or a potential solution to the problem. This is the first step to understanding the problem. We might say, without people or interest groups there would be no problem. So to understand the problem, we must first understand the stakeholders. The objectives of this step are to reveal and discuss the interest and expectations of persons and groups that are important to the success of the project.

If there is no agreement between participants on the statement of the problem, it is unlikely there will be agreement on the solution. This stage of “Problem Analysis” therefore seeks to get consensus on the detailed aspects of the problem. The first procedure in problem analysis is brainstorming. All participants are invited to write their problem ideas on small cards. The participants may write as many cards as they wish. The participants group the cards or look for cause-effect relationship between the themes on the cards by arranging the cards to form a problem tree (Fig.1).

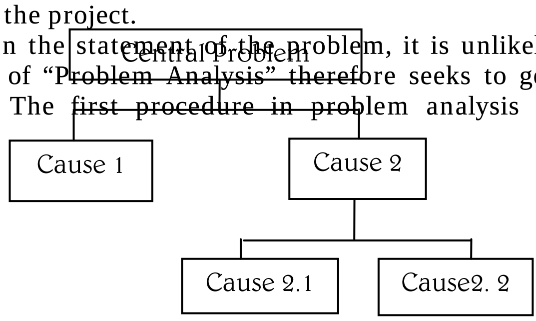

Fig.1- Problem tree of the OOPP method

In the step of “Objectives Analysis” the problem statements are converted into objective statements and if possible into an objective tree (Fig.2). Just as the problem tree shows cause-effect relationships, the objective tree shows means-end relationships. The means-end relationships show the means by which the project can achieve the desired ends or future desirable conditions. Frequently there are many possible areas that could be the focus of an "intervention" or development project. The next step addresses those choices [7].

The objective tree usually shows the large number of possible strategies or means-end links that could contribute to a solution to the problem. Since there will be a limit to the resources that can be applied to the project, it is necessary for the participants to examine these alternatives and select the most promising strategy. This step is called “Alternatives Analysis”. After selection of the decision criteria, these are applied in order to select one or more means-end chains to become the set of objectives that will form the project strategy.

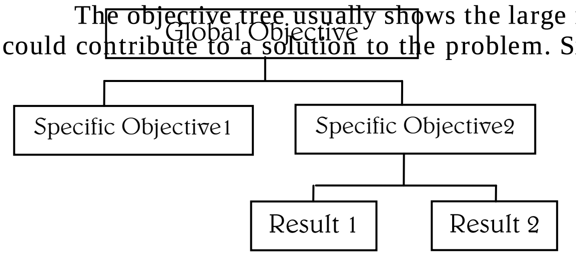

Fig. 2 - Objective tree of the OOPP method

After defining the objectives and specifying how they will be measured (OVIs) and where and how that information will be found (MOVs) we get to the detailed planning phase: “Activities Planning”. We determine what activities are required to achieve each objective. It is tempting to say; always start at the situation analysis stage, and from there determine who are the stakeholders [7].

We present some studies of the OOPP method in Information System planning that have been presented in various researches:

Researchers, P. Gu & al. [14] have presented an object-oriented approach to the development of a generative process planning system. The system consists of three functional modules: object-oriented product model module, object-oriented manufacturing facility model module, and object-oriented process planner.

Researcher, Peter S. Hill [15] has question the appropriateness of highly structured strategic planning approaches in situations of complexity and change, using the Cambodian-German Health Project as a case study. He has demonstrated the limitations of these planning processes in complex situations of high uncertainty, with little reliable information and a rapidly changing environment.

Researchers, Peffers K. & al.[16], have used information theory to justify the use of a method to help managers better understand what new IT (Information Technology) applications and features will be most valued by users and why and apply this method in a case study involving the development of financial service applications for mobile devices.

3. ANALYSIS OF A ROTARY PRINTING SYSTEM

Before beginning the analysis, a block-diagram of the studied process has been developed (Fig.3) in order to represent the different phases (P1, P2, P3, P4 and P5) of the system and to specify various possibilities waypoints which is evidenced by the various forms of lines.

After the OOPP analysis of the printing process, five specific objectives (SO) have been identified to achieve the global objective (GO): "Automatic control of a chain of printing assured". Tables 1-4 present the analysis of the different SO.

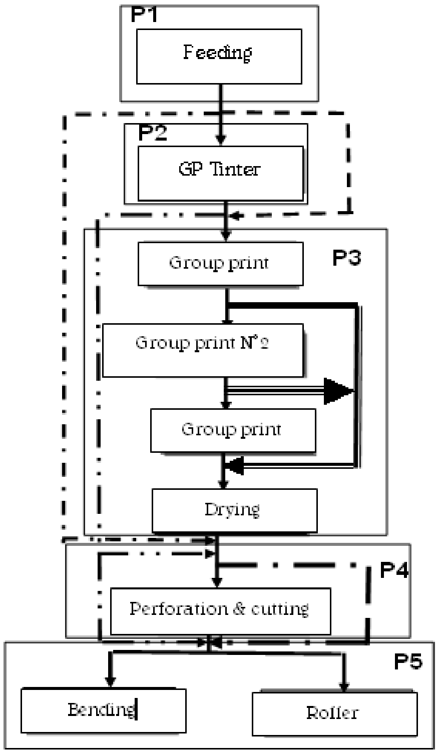

Fig.3. Block-diagram of the printing process

Tab.1. OOPP analysis of SO1

Code	Designation
OS1	Command of the feeding system assured
R1.1	Feeding in paper assured
A1.1.1	To position the roller
A1.1.2	To tighten the roller of the paper
R1.2	Topple of the roller assured
A1.2.1	To raise the roller initially
A1.2.2	To raise the roller incrementally
R1.3	Introduction of the paper provided
A1.3.1	To position the paper
A1.3.2	To press the paper
A1.3.3	To assure the introduction

Tab.2. OOPP analysis of SO2

Code	Designation
OS2	Command of Gp tinter assured
R2.1	Operation of rings done
A2.1.1	To assure the continuous of the passage of the paper
S2.1.1.1	To adjust the speed of the passage according to the nature of the paper
S2.1.1.2	To measure the effective speed
S2.1.1.3	To compare the speed
A2.1.2	To assure the conformity of the operation of rings
R2.2	Drying of the paper provided

This analysis has enabled clearly to answer questions "what?" and "who". Among other things it could allow to identify for the pneumatic part, 44 logical actuators and 59 sensors command which 17 analogue sensors and 42 logical. For example, we present a structural schema (Fig.4), according to the analysis of the SO1 to set sensors and actuators necessary for the normal operation of the system.

The identification and analysis of the information exchanged by the activities allows us to analysis the dynamics and the communication between the system components.

The information governing an activity can be classified into two categories [17] [18] [19]:

- Information imported by activity and who are assumed to be available; they are either produced by other activities of the system, either from sources external,
- Information produced by activity and that reflect the State of this activity. This last information will be used and shared by other activities of the project.

Tab.3. OOPP analysis of SO3

Code	Designation
OS3	Command of the printing assured
R3.1	Command the Group print N°1 assured
A3.1.1	To command the system of introduction
S3.1.1.1	To adjust the race of moving
S3.1.1.2	To assure the moving of closing of the roller
S3.1.1.3	To assure the moving of the opening of rollers
A3.1.2	To command the system of anchorage
S3.1.2.1	To adjust the race of the moving
S3.1.2.2	To assure the moving approach
S3.1.2.3	To assure the backward
A3.1.3	To command the ink transfer
S3.1.3.1	To adjust the race of the moving
3.1.3.2	To assure the moving approach
S3.1.3.3	To assure the backward
A3.1.4	To command the system of print
S3.1.3.1	To adjust the race of the moving of cylinder pressure
S3.1.3.2	To assure the moving approach of the cylinder of pressure
S3.1.3.3	To assure the moving of the backward cylinder of pressure
A3.1.5	To command the system of output
S3.1.5.1	To adjust the race of the moving
S3.1.5.2	To assure the moving of closing of rollers
S3.1.5.3	To assure the moving of the opening of rollers
R3.2	Command the Group print N°2 assured
R3.4	Command the Group of drying performed

Tab.4. OOPP analysis of SO4 and SO5

Code	Designation
OS4	Command the system of punch and cutting assured
R4.1	Command of cutting assured
R4.2	Command of perforation assured
OS5	Command of the output assured
R5.1	Command of the output in the mode roller
A5.1.1	To position the roller empty initially
A5.1.2	To tighten the roller
A5.1.3	To take the roller empty incrementally
R5.2	Command output in the mode bend
A5.2.1	Command of the system of bend to go
A5.2.2	Command of the system of bend in return

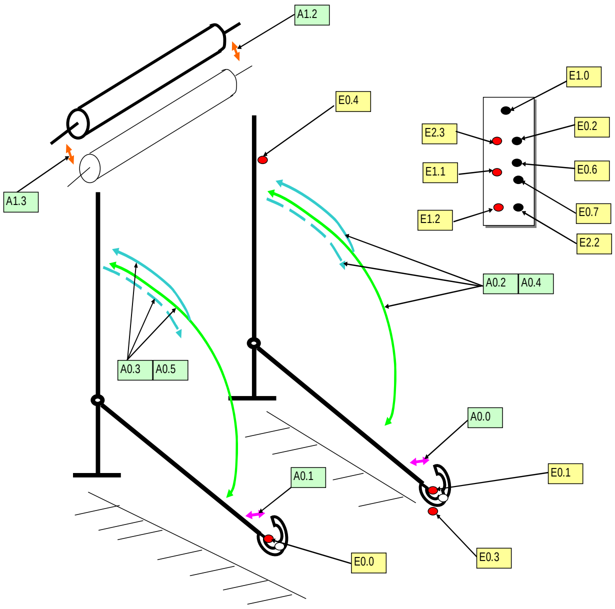

Fig.4 - Structural diagram of the feeding system

This analysis has enabled clearly to answer questions "what?" and "who". Among other things it could allow to identify for the pneumatic part, 44 logical actuators and 59 sensors command which 17 analogue sensors and 42 logical. For example, we present a structural schema (Fig.4), according to the analysis of the SO1 to set sensors and actuators necessary for the normal operation of the system.

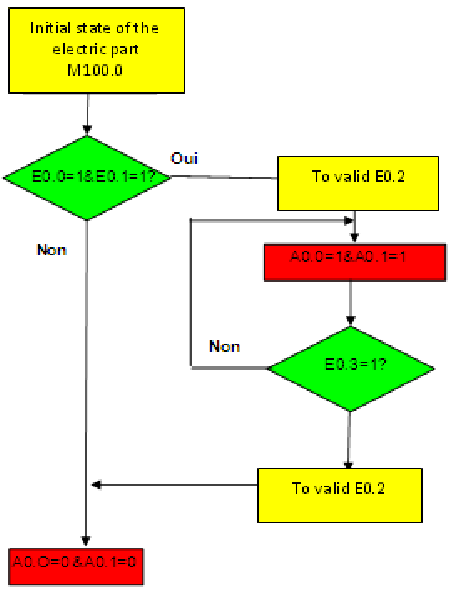

Fig.5 - Example of an algorithm

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- Information produced by activity and that reflect the State of this activity. This last information will be used and shared by other activities of the project.

In fact, the information produced by an activity may be considered as information imported by this same activity transformation. This way of transformation has allowed us to develop algorithms allowing the passage to the programming phase (depending on the environment of) (programming adopted). Figure 5 shows an example of an algorithm.

4. CONCLUSION

In this paper, we presented an application of systemic approach in order to analysis the project of the automation of technical systems. A case study of a printing system is presented.

Overall, the production of this work helped us to identify the borders of the continuous printing system. Among other things, it is possible the development of an automatic control system of the printing process. Then, the identification of the various activities enables to establish a reliable informational process and a transparent management of the system.

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