

# ANALYSIS AND EXPLOITATION OF A PLATFORM FOR DISTANCE EDUCATION

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**Abstract:** *The aim of this paper is to present firstly the context of distance education, and secondly to present a platform for teaching technology based on three components: a remote handling platform for automatic devices and regulation, a numeric supports in electronics and computer science and a virtual university platform. The paper briefly discusses an approach of specification based on the use of systemic method OOPP (Objectives Oriented Project Planning) in order to analysis the project of development of a remote handling platform and on the other hand to specify the composition of different numeric supports used in the education of technology.*

**Key-words:** *Systemic analysis, Distance education, Platform, OOPP method.*

## 1. Context of the Distance education

The actual economic context, characterized by internationalization and competitiveness of markets, generated the emergency to form a labour not only qualified but also autonomous and capable to improve and to retrain by itself.

Thanks to the New Technologies of information and Communication (NTIC), the distance education becomes today a solution since it can reconcile economy and answer to constraints and efficiency [1, 2]. More than one fashion or an answer to simple geographical problems by an extensive diffusion of the distance education is a whole of methods that answers for manner adapted to all types of needs [3].

The distance education requires efficient techniques that reconcile the industrial approach and the flexibility of solutions. These technical means concern supports of training as well (multimedia supports), that means of management of trainees and their progression or means to communicate with them (data processing and telecommunications) [4-6].

Currently immaterial investments grow more quickly than materials. To know, Ability, Expertise becomes the main wealth of

enterprises, regions and nations [7-12]. We live a numeric revolution. In this context in perpetual change there is not anything of astonishing to note a demand increased concerning formation.

The formation must raise several challenges:

- to answer to the growth of the demand.
- to face the acceleration of changes.
- to increase the number of formed.
- to reduce the deficit chronic of expertise.
- to reduce the increasing unsuitability between the educational device and the market of work.
- to raise the general expertise level.
- to reinforce the ability of enterprises and to optimize their fashion of organization.

## 2. Presentation of the platform proposed for distance education

In the setting of the modernisation of the superior teaching and its opening to all Tunisian and of the development of NTIC, the distance education has been generalised in view to improve the quality of the study process [13].

The goal of this work is to present the interest of the utilisation of a teaching platform of technology. The experience is located in the formation of High technician in Electronics and in Informatics; this experimentation could be led at the level of the other higher establishments in Tunisia.

While leaning on three components of the platform proposed: the first component constitutes an experience of remote handling platform developed by our research team (SEPE), the second component is composed of various numeric supports for an educational vocation developed in the ISSAT (High Institute of Applied Science and Technology) and the third component concerns the exploitation of the virtual university platform in Tunisia [14].

We present in Figure 1 the different components of the platform proposed for distance education.

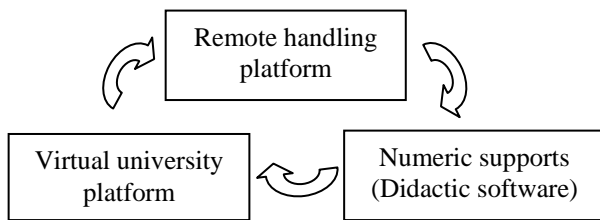


Fig. 1. Components of the platform proposed for distance education.

It seems in fact important to specify on the one hand the composition of various numeric teaching supports [15, 16] and on the other hand the planning of the activities in order to develop a remote handling platform [17, 18]. To reach this objective, Systemic analysis [19-21] seems to be a promising research method.

The objective of this paper is to show interests of the use of systemic analysis methods such as OOPP (Objectives Oriented Project Planning) for the specification of a platform for distance education. This platform for teaching technology imposes itself today like one of bases of the evolution of the formation of three years cycle.

### 3. Using a remote handling platform

The first component of the proposed platform is a remote handling platform. It is composed of several convenient manipulations in automatic devices and in regulation. A first experience of remote handling on an industrial system of regulation of level and debit has been developed and then has been exploited by the ISSAT students [25].

In fact, machines and other devices are usually controlled by computers which are used to display measures and command of installation. So, we developed the same concept but from a distant computer via internet network. In fact, we developed an interface assuring at the same time the video coverage of the experimental apparatus, the transmission of sound and the display of measurement and figures. The students have the impression that they are effectively under the presence of an experimental device. Thus, the students can also modify the conditions and react on the installation, thanks to a virtual reproduction of the machine.

Distant command of machines offers a bigger flexibility for practical work, a program of updating professional training (MANFORM) will serve eventually as general frame of this project. Indeed, the MANFORM program [13] aims the improvement of the quality while forming better, more and to the just cost. It

requires a better various available resource exploitation that they are material, human or educational. This is why the sharing of resources between the main operators of the formation becomes a necessity what asks for a logical approach different of the one in application. This approach is based on a Network methodology developing in synergy all operators and their means in an objective of optimization of the exploitation and valorisation of knowledge. The material and educational resources are to situate according to this methodology and this through an operational communication. It can be concretized in an environment of NTIC and according to one adequate organization fashion.

For this first component of the platform proposed, we used one fashion of communication and sharing of the material formation Resources and available documentaries in a space of formation.

The objectives waited for the exploitation of this remote handling platform are [25]:

- to reduce and to facilitate the access to the professional formation.
- to provide a supplier formation (permanent formation, better management of the space and the time).
- to optimize the material and human resource exploitation (generally expensive).

The advantages of the remote handling platform are: the delocalization of practical work; the autonomous management of the time; the liberty of rhythm and the restraint of the course of learning it.

The remote handling platform must take into account the educational dimension, the technique and the organizational and lean on the expertise of engineering of distance education.

#### 3.1. Methodological approach

In a first stage, a favourable communication environment interns is developed first by the institution of a communication intranet network. It is about installing a network can be studied and achieved by trainees in formation to the "Sectorial Center of Formation in Telecommunications" and to provide some benches of computer manipulation provided of communication interfacing with their environments physics (being able to also be study and developed by trainees in formation with the collaboration of some schools and institutes of the teaching technical superior. With the development of this basis infrastructure there is place to constitute data bases and the

educational sites web: programs, supports of courses and exercises, battery of assessment test...

This stage will constitute the soft aspect of the educational organization. There after, and still on an internal plan to the Center of formations, the exploitation of numeric environment will enables:

- to arrange a large data base enabling to follow the dynamics of the training as referring to the referential previously establishes. These physical referential can be established very well of a pragmatic manner, either by the exploitation of models validated.
- to manage a structured manner the training by a better individualization enabling to generate a traçabiliy of activities of learning it and a better control from afar of the physical manipulation enabling of to secures the manipulation according to an adequate protocol and to intervene at all times to bring information and useful commentaries or to generate an any disruption for example.
- to make cooperate manipulations between them while proceeding to associations and couplings or to a comparative gait.

In the second stage, an environment of communication telephone - center is developed according to a logic network where operators can reach, in addition of their internal resources to the resources of the other center of network. This is how the formative and administrators of the formation can consult themselves from distance to share their experiences and the available information on the one hand and to reach the physical manipulations on the other hand. This access can consultative being as well that operative to make vary a parameter or to adjust an order for example. It will be able to spread to an environment of exploitation from afar for example to an industrial ladder and this in the setting of a formation partnership for the purpose of the continuing education.

This cooperative approach telephone - center enables us to optimize the exploitation of resources on the one hand by a better complementarities and an intelligent diversification and by a reasoned investment on the other hand. Besides, and considering the rarity of men resources having an expertise proven so much on the scientific and educational plan that on the technological and economic plan, it is recommended briskly to valorise their knowledge and ability so that the formative

others more young and less experienced can benefit some; it can lead to a real forum of appraisal enabling to generate circles of formation quality.

### **3.2. Material and software architecture**

For every laboratory, a local network will be installed. This network will assure the interconnection of the PC and automatons. Some models and didactic benches will be ordered very well directly by their own PC (or automaton) either by another PC through the internal network of the laboratory [17]. It will constitute the initial phase of the solution proposed.

The local network within the institution of formation will permit to experiment the concept of remote handling between different laboratories. It will constitute the second phase of the solution proposed.

The different Center, institutions of formation, industrial enterprises, and foreign institutions... can manipulate, from afar, via Internet of the didactic machines. It will allow training / students, either to individual title, either in the setting of cooperation between different structures of formation in Tunisia or abroad, to do practical work without needing to come in the laboratory where models of experimentation.

A user-interface, based on techniques dynamic web, will be studied and will be developed enabling the communication on the one hand between the training and the machine and the management individualized of the educational courses of learning it on the other hand.

A material resource modeling will enables to visualize the behaviour of the machine and the transfer of commands and measures. A tentative data base will be established then to simulate manipulations offering so the possibility to achieve practical work in off-line on a virtual laboratory.

So that it is veritably coherent with the innovative educational project that it gave itself, the remote handling requires the development of a suitable engineering distance formation (supports of formation, organization of the formation, assessment, and adaptation of formation organizers...).

### **3.3. Environment of the remote handling**

The initial phase of this project has been launched to the laboratory of automatic device and regulation of the Sectorial Center of

Formation in telecommunications that served a platform of test of this project [17].

Seen the importance and the elevated cost of the two benches of regulation of level and debit, we chose to develop a composed remote handling platform, in a first stage, of these two benches, that have been conceived for the survey and the experimentation on a buckle of regulation, they cover a number important with themes that can be developed: Measure of level, Measure of debit, Initiation to the control and the regulation, Answer of processes, Simulation of shortcoming,...

Software centred on the regulation enables the supervision of the process and the fast setting up of pages regrouping all visual animations of process control (Curves, values, Sliders, Buttons, Alarms, and Tabular). It enables also, the clarification of returns personalized and the registration of all data acquired at the time of a test (Measures, Messages of alarm, and Changes of button states).

The remote handling enables to consider using better and to distribute some complex and expensive facilities between researchers, teachers and formative. Profits are on the one hand material: fewer models are necessary if training / students can exploit them from afar. There are profits on the other hand at the level of the framing. Finally there is an educational profit for students. Indeed, they can achieve to either take an experience just as they wish it. The success of such a project requires the setting up of a suitable engineering and as an efficient technical-educational reorganization.

#### 4. Using numeric supports and the virtual university platform

The second component of the proposed platform is composed by various numeric supports of teaching technology for the ISSAT students in Electronics and Informatics, on the one hand and the exploitation platform of the virtual university in Tunisia, on the other hand.

##### 4.1. Development of numeric supports

A didactic software is generally a classic software of computer-assisted teaching enabling to put in situation, more interactive, a student and a problem to solve [15,16]. This software is specialized and treats a specific content (industrial data processing, electric Machines, Technology...).

This software is considered therefore as of the specialized environments in the particular themes.

The conception of these applications rests on the interactive dialogue and the training generally consists for the topic to memorize and to drag sequences of procedures associated to certain concepts. They are now distributed enough frequently by packets to cover a particular domain associated to an environment of work that also understands some specialized tools (word processor, data base,...).

The didactic software is a convenient tool, not only for authors while sensitizing them to stakes of the scholarly computer edition and while giving them tools to improve their restraint of the classic tools of word processor, but also for services and administrative structures that will be solicited more and more to distribute and to valorise the scientific production while proposing them appropriate of models and tools in work of computer projects.

The construction of didactic software is considered as the creative research of a solution of a problem. It must follow some predefined stages and essential: choice of the topic; choice of the programming language that constitutes the starting point; definition of the operational objectives of the didactic software; scheduling of the didactic software; programming and the test of the didactic software [26-28].

The experience of development of numeric supports is under development in order to exploit tools and techniques more evolved in the conception of didactic software.

In order to contribute to the formation of the ISSAT students, we developed didactic software. For example, we present didactic software for Structured Analysis (Fig.2-3); for industrial programmable automatons (Fig.4).



Fig. 2. Main menu of didactic software for teaching Structured Analysis.

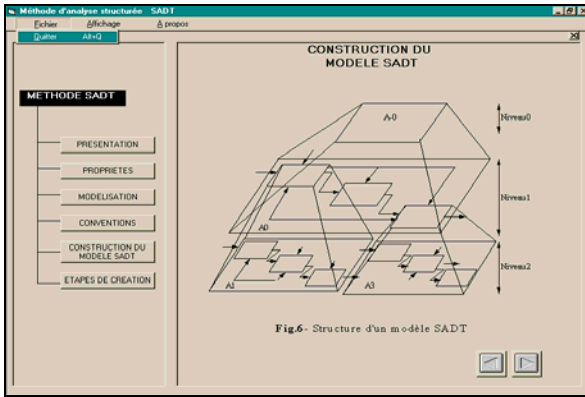


Fig. 3. Module on SADT method of didactic software.

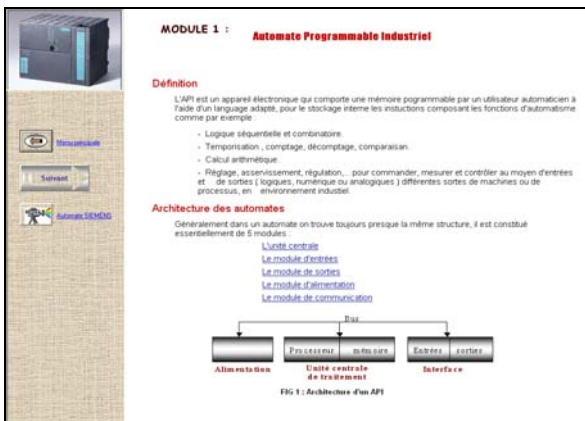


Fig. 4. Module on industrial programmable automats.

## 4.2. Exploitation of virtual university

After developing various numeric supports for distance education, we proposed to in this part to integrate these tools in a virtual university.

In fact, the virtual university in Tunisia (UVT) [14] is called to concretise a project of an open formation and cantered from afar fundamentally on the exploitation of possibilities offered by the NTIC and covering a part planned of the initial formation, the continuing education and the training all along life.

Following a first action of formation at the ISSAT using the platform of the virtual university in Tunisia, the exploitation of this platform is integrated in the formation of the high technicians. In fact, the ISSAT has reserved a classroom for teaching data processing in order to be exploited either by teachers and students and various numeric contents are achieved.

## 5. Methodology of analysis

The specification of the different numeric supports developed and the exploitation of the remote handling platform has exploited the systemic method OOPP.

### 5.1. Presentation of the OOPP method

The OOPP method (Objectives Oriented Project Planning) is a structured meeting process.

This approach is based on four essential steps [22-24]: Problem Analysis, Objectives Analysis, Alternatives Analysis and Activities Planning. It seeks to identify the major current problems using cause-effect analysis and search for the best strategy to alleviate those identified problems.

The first step of “Problem Analysis” 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.

In the step of “Objectives Analysis” the problem statements are converted into objective statements and if possible into an objective tree. 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.

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.

After defining the objectives and specifying how they will be measured (Objectively Verifiable Indicators: OVI) and where and how that information will be found (Means of Verification: MOV) 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.

## 5.2. Application of the OOPP method

The approach proposed is based on the OOPP method which enables us to specify the content of the various numeric supports and to plan the activities of exploitation of the platform proposed.

According to the methodology of analysis using the OOPP method outlined above, we identified four Specific Objectives (Table 1) in order to reach the Global Objective (exploitation of a remote handling platform). These Specific Objectives are decomposed in Results and Activities.

Table. 1. OOPP Analysis of the exploitation of a remote handling platform.

N°	Code	Designation
1	OG	Exploitation of a remote handling platform
2	OS1	Identification of manipulations in automatic devices and in regulation
3	OS2	Development of the interface assuring the video, the transmission of sound and the display of measurement and figures
4	OS3	Testing of the remote handling platform
5	OS4	Evaluation of the remote handling platform

After an OOPP analysis, eight Specific Objectives are identified corresponding to the different contents of the didactic software developed (Table 2). The analysis of these Specific Objectives enables us to identify different Results and Activities.

Table. 2. OOPP Analysis of the formation.

N°	Code	Designation
1	OG	Formation in industrial data processing
2	OS1	Formation in language and in management
3	OS2	Formation in mathematics
4	OS3	Formation in data processing
5	OS4	Formation in electromechanical
6	OS5	Formation in industrial automatons programmable and in industrial process command and robotics
7	OS6	Formation in electronics and command of electrical machines and in treatment of signal and filtering
8	OS7	Formation in real time systems and in microprocessors and interfacings
9	OS8	Formation in projects

## 5. Conclusion

The distance education becomes a solution today since it can reconcile economy and answer to constraints and efficiency. In this paper we presented a platform for teaching technology based on three components: a remote handling platform for automatic devices and regulation; numeric supports in electronics and computer science; a virtual university.

The systemic analysis based on the use of the OOPP method was adopted and is a promising research method. The analysis and the exploitation of the platform proposed enable us to contribute to the project of distance education fundamentally by the exploitation of possibilities offered by the NTIC.

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