



Study of Information Technology (IT) capacity as a decisive vector for the organizational performance of Moroccan Education & Training Information Systems

-Development of a conceptual framework for research-

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Abstract: *This paper aims to provide an answer to the problem of deploying the information arsenal available to the Moroccan Ministry of National Education, Vocational Training and Scientific Research (MNEVTHESR) such as: (MASSAR, MASIRH, ESISE, GRESA GPEC PSTS, CARTESCO: "E-School Card", E-applications of Staff Movement, SAGE +, GRESA, GALY, GEXAWIN, etc.). The question that concerns us is to understand how these technologies and information systems (IS) could imbibe with the strategy and the organizational structure of the department (in the light of a new reform based on a so-called strategic vision elaborated by the Higher Council for Education, Training and Scientific Research (HCETSR) spanning the period 2015-2030), and what would be the modes of intervention of these technologies and IS in the process of the improvement of the organizational performance of the whole sector. To approach this problematic question, we consider it necessary to address the Moroccan educational system and its IS, as a complex system, taking as a frame of reference LeMoigne's complex systems theory, Morin's complex thinking, the theory resources and its twin sister the theory of information processing. The top-down systemic approach and the qualitative approach, allowed us to develop a theoretical model to explain the impact of IT on the organizational performance of IS in organizations in charge of the public service of education and training.*

Key Words: Education System, Information System, Information, Technology Capability, Organizational Performance.

1. INTRODUCTION

Ever since 2000, the Moroccan educational system (SE) has been the subject of reforms aimed at responding to the aspirations linked to the evolution of Moroccan society. However, the Educational Reforms do not enjoy a flourishing past in our country. Indeed, several attempts at reform (in 1975, 1978, 1981, 1984-1985, 1995, 1999 and the emergency plan in 2008-2012) were unsuccessful, or at least did not reach the objectives expected (Berdouzi, 2012; Chkili, 2015; Souali, 2004).

The evaluations carried out between 2013 and 2015 have shown that the system's results and performances have remained modest, given the resources mobilized (CSEFRS, 2014). In light of these findings, the Higher Council for Education, Training and Scientific Research (CSEFRS) promotes a new strategic vision for the education sector covering the period 2015-2030. This is how it was recently put in place by the Ministry of National Education, Vocational Training, Higher Education and Scientific Research (MENFPESRS) a new breath of reform aimed at alleviating dysfunctions of the education system. This plan, which aims to be very ambitious in its various areas of operational intervention, revolves around 3 main areas and 16 integrated projects including the Strengthening of the education and training information system.

Currently, the ministry has a considerable informative arsenal, which can be used as a database for our study, namely: MASSAR, MASIRH, ESISE, GRESA, CARTESCO (E-CARD SCHOOL), E-APPLICATIONS OF MOVEMENT OF STAFF, SAGE and SAGE-PLUS, GALY, GEXAWIN, TAYSSIR (SI Social support), ... etc.

The importance accorded by MENFPESRS to the development of these information systems as a lever for the development of the Moroccan educational sector, presents significant growth potential according to professionals in the sector, whose operation remains however conditioned by the availability of human resources competent. This problematic therefore promises to be a new test in the discipline of information systems management; and a key issue for government. Indeed, the object of this research work is to take stock of the question of the impact of the capacity of information technologies (IT) on the organizational performance of IS both at the theoretical, methodological and operational (that is to say, to better understand the factors influencing this capacity in Technologies on the organizational performance of IS (Henderson and Venkatraman, 1993; Kéfi and Kalika, 2004; Tsai et al., 1994), and the various explanatory variables and contextual factors (moderators and mediators) likely to have an influence on this correlational relationship. We thus focus our attention, in this paper, on the presentation of our conceptual research model, resulting from the literature and different results of the qualitative phase, as well as the hypotheses which result from it.

2. ORGANIZATION AND ADMINISTRATIVE STRUCTURING OF SE IN MOROCCO

2.1. Evolution of the administrative structure of the Moroccan SE

The Moroccan education system is under the tutelage of MENFPESRS, It is composed of the following sub-systems:

- ✓ The school subsystem comprising preschool, elementary, secondary (college and qualifying) and post-secondary (BTS and CPGE);
- ✓ The Professional training sub-system;
- ✓ The non-formal education subsystem (second chance schools).

The administration of the Moroccan education system corresponds to the new national administrative division and evolves with the latter. Decentralized units: a Regional Academy of Education and Training (AREF) by Region and a Directorate by prefecture or by province. Currently, the Ministry intervenes on four levels:

- ✓ First level: central administration;
- ✓ Second level: 12 AREF;
- ✓ Third level: 82 Provincial directions;
- ✓ Fourth level: more than 11,000 schools and training establishments (MENFPESRS, 2018)

The education system exists as a real, responsive and intelligent entity to which we can attribute a national identity based on the moral and political principles of the state. As a result, the performance of the education system is observable and measurable through indicators of effectiveness and efficiency (Essaffani & Benaissa, 2013).

2.2. IS in education and training: state of play

Within the framework of the study of the strategic diagram of the information system, the field "Teaching and Pedagogy" is at the heart of the concerns - profession - of the Ministry and covers the following functionalities by type: Education of the pupils (Management of the schooling , Educational evaluation, Educational supervision, School life, Information and educational guidance, Digital content and E-Learning); Private education; Non-formal education; Social support for students. The MENFPESRS has information systems which cover a good part of the functionalities required by the beneficiaries through localized systems adapted to Moroccan specificities covering all of the following functionalities: The national education database (MASSAR): education management ; The school management system (ASM - AeLSchool Manager) -GRESA-; The Decision Analysis and Help System (SBA - SIVICO Business Analyzer); The computer-assisted learning system (AeL) -formation: e-learning; The SIE portal developed on a Share-point technology (containing dematerialized online services); MASIRH / HR Management; ESISE: School and educational census and statistics; GEXAWIN and SAGE +: Exam management; CARTESCO (E- school card): Management of the school card.

Indeed, we believe that the use of IT specifically of the integrated IS type (MASSAR for example) seems to be a real contribution to the profound changes in the functioning of public administrations responsible for national education. These software packages refer to information systems (IS) implemented to integrate information flows throughout the organization (Almajali et al., 2016; Bürkland and Zachariassen, 2014) related to the sector.

As a result, we see that information technologies and systems are all the more concerned with the need to explain the value they create (Reix, 2002; Rivard et al., 2008) and that these constitute one of the main investment positions of the administrative bodies responsible for the sector.

3. THEORETICAL AND PROBLEMATIC FRAMEWORK OF RESEARCH

3.1. Complexity of the education and training system in Morocco

The Moroccan education system is described as a complex dynamic system (Morin et al., 2018; Morin & Le Moigne, 1999). In this type of system, it is futile to try to model it using classic modeling methods and approaches (Morin, 2014). Rather, it is about recognizing the complexity of the problem and taking it to the next level of investigation by focusing more on how changes occur within the system (Forrester, 1992).

The theory or science of complexity is considered to be the result of the interaction of sciences from various fields, including physics, mathematics, biology, economics, engineering and computer science (Chu et al., 2003; Tribondeau, 2013) and which stipulates that complex systems are characterized by non-linear dynamics which can switch from simple behavior to complex behavior and vice versa (Limburg et al., 2002). This science offers a modern vision of organizations and makes it possible to apply to many complex organizational phenomena, a set of concepts and principles originating from systemic thinking (Maguire et al., 2006; Von Bertalanfy, 1968).

3.2. Information technology and complexity management

It goes without saying that the complexity of the information system reflects the growing complexity of the education sector. The cause is therefore twofold: on the one hand, information systems gradually cover an increasingly large part of the perimeter of the administrative entities responsible for the public education service, and on the other hand, these organizations have a more more complex linked to globalization, to the increasing requirement of their clients - administered (pupils and parents), to the shortening of time and the integration of services.

The aim of the use and adoption of technologies and IS by the Moroccan education sector is therefore not to get rid of this complexity, but to reduce it and above all to master it. Based on these observations, the implementation of any technology and IS in the public administration responsible

for the management of this sector should take into account at least three fundamental data, namely:

- ✓ imperative integration in a given socio-technical environment (this is the characteristic of any IS);
- ✓ constraints related to the legal framework in force;
- ✓ the profession and the processes to which the information system applies (school management, statistics and planning, social support, human resources (HR) management, exam management, drawing up of the school map, etc.).

This last variable defines the intrinsic, non-reducible complexity of the IS in question (Hammoumi, 2014; Rivard et al., 2008).

3.3. IS performance measurement problems - IT and IS capacity articulation

The concept of performance is widely used by management theories, although its original use is rather linked to sports activities. Thus, its evolution is strongly marred by that of these theories. (Amslem, 2013; Autissier and Delaye, 2008; De La Villarmois, 2001; Jomaa, 2009).

The Organization for Economic Cooperation and Development (OECD) classifies the indicators for evaluating education systems in three categories:

- ✓ the quality of the teaching offer and the learning performance,
- ✓ Equal opportunities in education,
- ✓ the adequacy of resources and the efficiency of their management.

In the same perspective, and in the area of education and training management (CSEFRS, 2015), the OECD has set up indicators to assess, using a comparative approach, the education systems of OECD member countries.

We considered it useful to draw up models for studying the impact of information technologies and systems on the performance of organizations, namely:

- ✓ causal or variance models: This type of model attempts to establish a statistical correlation between investments in Technology and IS, and organizational performance (Jomaa, 2009; Uwizeyemungu & Raymond, 2010);
- ✓ procedural or temporal models: who tried to explain and understand the process of using information (IS product) and its strategic value within the organization (Melville et al., 2004a; Missaoui, 2009), instead of focusing on the independent predictors of IS usage (Markus & Robey, 1988);
- ✓ Contingency models (steering and strategic alignment (Henderson and Venkatraman, 1993)): which have demonstrated that IS performance depends on the alignment or adequacy of these technologies and IS with

other dimensions of management and other organizational resources (Kéfi and Kalika, 2004) (Uwizeyemungu, 2008).

Furthermore, the difficulties of analyzing the relationship (Technology-organizational performance), justified the emergence of another approach to the problem based on the notions of complementarity of resources in a perspective of combining two major management theories namely: information processing theory (Weik, 1979), and resource theory (Brulhart et al., 2010), thus making it possible to clarify some of these points, with particular emphasis on the "stakeholder" dimension of performance, by insisting on the integration of ad hoc processes and by considering technologies and IS as an integral part of organizational capital (Bounfour, 2008) in the same way as managerial resources (Garrity et al., 2005; Wade and Hulland, 2004).

3.4. The information capacity of organizations

3.4.1. Information processing theory

Systemic analyzes of organizations and their management all start from the assumption that organizations can be considered as open systems with properties identical to those of living systems (Reix et al., 2011). In many ways, it is often more useful to think of the organization as a unit as part of a whole. It is generally agreed that this whole constitutes the environment (Le Moigne, 1973; Louadi, 2012), which is generally uncertain for the organization.

According to the followers of the theory of information processing, organizations, which face an uncertain environment, (Tribondeau, 2013) must solve a greater number of problems and must, consequently, ask themselves a greater number of Questions.

The answers to these questions require greater knowledge and therefore generate a greater number of information needs. In this case, information is sought for its value in the planning and decision-making process. These responses agree on the premise that the more the uncertainty increases, the more the need to know increases. This is reflected in the fact that the more uncertainty humans perceive, the more information they seek in the hope of reducing this uncertainty. Indeed, according to Galbraith (1973), the IT management literature and practices define the purpose of an organization's information system, whatever its nature, (operational or strategic), in the terms retained by LeMoigne (1973): "the problem is not to circulate all the information systematically, but to make it economically accessible on demand, without forcing all the actors of the organization to consume it in spite of themselves", vision which brings us to deduce the following:

- ✓ The information that feeds the strategic process is information that relates as much internally as externally, as much to the environment as to the techno-strategic operations that concretize the strategy;

- ✓ Information on environmental dynamics will relate to all of the variables likely to affect environmental conditions;
- ✓ The information on the internal relates to the various information of a functional nature (personal information on the students, test result, on the school infrastructure and the HR workforce, etc.). It will also, and above all, focus on monitoring the key processes that condition the success of the strategies chosen

The process of forming a strategy, collecting and processing information, therefore invites us to master information processes allowing, on a more continuous basis, the convergence of goals, decisions and actions. Therefore, mechanisms for coordinating, connecting actors who continually allow us to think that the organization behaves in accordance with the requirements of its choices and its environments (Figure n° 1).

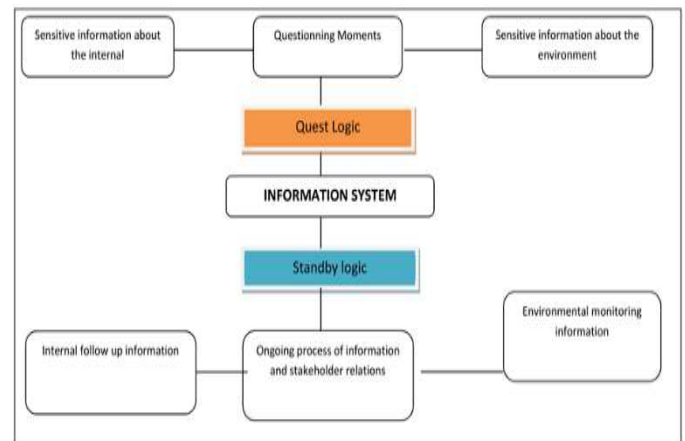


Fig 1. Logic of information processing by source organizations : (Brechet, 1996)

3.4.2. Resource-based-view (RBV)

It should be noted, firstly, that the concept of resource stems from the desire to describe, with precision, the entire potential of the organization; resources constitute the elementary entities enabling this potential to be defined (Barney, 1991; Wernerfelt, 1984). It is also "organizational specific assets that are difficult to imitate" (Teece et al., 1997). Resources are sometimes equated (Barney, 1991) with "strengths" of the organization. Consequently, the essential attribute of a resource consists in its capacity to exploit an opportunity or to ward off a threat (Koenig, 2004). By analogy, and in the IS field, several researches have been interested in the identification of resources particularly interesting for the development of managerial and technological skills, which thus allow the improvement of the performance of the information processing process within organizations (Bharadwaj, 2000; Davern and Kauffman, 2000; Dutot et al., 2009; Itami, 1989; Mata et al., 1995; Melville et al., 2004b; Mendelson, 2000; Peteraf, 1993; Vargas et al., 2004; Zhang et al., 2008).

3.5. Reference models

As we have shown in the previous lines. Complexity is not a complication. A complicated or very complicated

system can be explained, made intelligible by simplification. Indeed, in the perspective of looking for a link between what is happening in the steering and management system of the public administration responsible for education and training, we focused on the objective of building a conceptual model research focused on the trilogy: IS, Performance, and education system.

We also took into account a relevant definition of performance, namely that of Igor Ansoff (1988), who distinguished 3 criteria which allow an organization's performance to be judged:

- ✓ Efficiency criteria;
- ✓ Criteria of possibility (feasibility);
- ✓ Quality of information and decision.

As such, it would be appropriate to point out that, for us, the framework mobilized for the theoretical modeling of IT capacity intervention in the process of organizational performance of education and training IS, can be constituted by a combination between the information model of organizations of (Galbraith, 1973) and the IT capacity model of (Anandhi Bharadwaj 2000 and De Vaujany, 2009; Morin et al., 2018).

3.5.1. The information model of organizations

The information model of organizations, as developed by (Galbraith, 1973) takes into account two important variables: Information needs and the capacity of organizations to meet these needs. According to the author, three elements determine these needs:

- ✓ the nature of the complex functions of the organization taking into account a whole range of factors and events and dynamics (here the difficulty arises of foreseeing and consequently of arranging the appropriate alternatives). To function, each organization is called upon to process a multitude of information
- ✓ the nature of the environment;
- ✓ the interdependence of management units.

Within this general framework, it is necessary to ensure consistency between the choices of strategy and the choices relating to the use of information technologies in the organization. This second imperative of coherence is translated by the model of strategic alignment (strategist alignment process (Galbraith, 1973)).

The theoretical reference model adopted in this work (inspired by the work of de J. Galbraith, (1973) is represented as follows (figure n ° 2, source (Reix et al., 2011)).

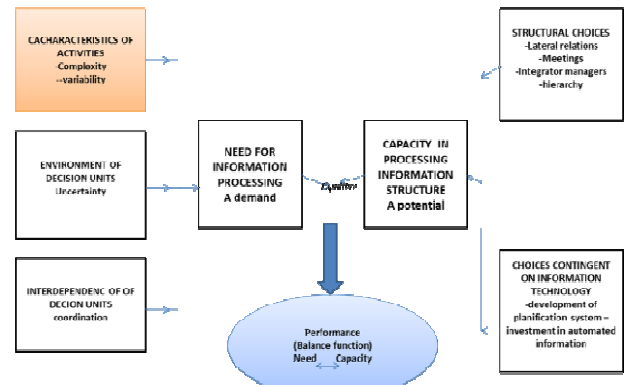


Fig 2. Analysis model of the balance between need and information processing capacity according to J. Galbraith

From this perspective, it can be deduced that the organization which perceives its environment as being uncertain and which, consequently forms additional information needs, is called upon to respond to these needs by the availability of information satisfying them. This availability is the combined effect of the ability of members of the organization to communicate, the ability of information technology to manage information, and the ability of organizations to use that technology. If the organizational structure constitutes one of the responses that the organization brings to environmental uncertainty, today, information and communication technologies, in particular information technology, are also used for the two purposes of reducing the and information management. These technologies are supposed to increase the information capacity of organizations which until then was only supported by human and structural mechanisms.

Indeed, the organization is a space where information is processed and used. The effectiveness of its operation will be determined by the conditions of a balance between its information processing needs on the one hand, and its information processing capacity, on the other. Therefore, the extension of this reference model in a hybrid context will confirm the need to respect a constraint of consistency between the choices of a strategic nature, the choices relating to the design of the organization and the choices relating to the use of technologies. of information and their evolutionary framework, which is electronic administration (St-Amant, 2015) (figure n ° 3)

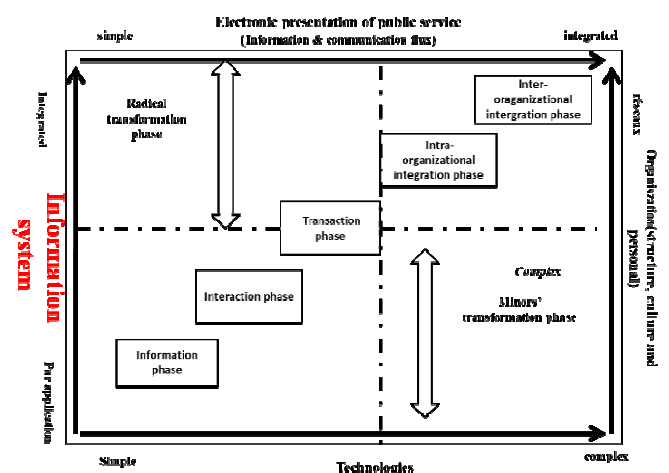


Fig 3. The dynamics of the transformation of electronic administration

In the same logic, the model developed by Galbraith (1973) is quite similar. It presupposes a vision that is deeply rooted in the memorization of information that is subject to rational processing. However, it is more geared towards managerial objectives. For Galbraith, the processing of information in the organization is not obvious and must be the subject of a permanent rebalancing (De Vaujany, 2009; Louadi, 2005; Mnif, 2010; Reix et al., 2011).

3.5.2. The IT capacity model (Anandhi Bharadwaj, 2000)

Although alignment (coherence or "fit") (Goodhue and Thompson, 1995; Henderson and Venkatraman, 1993; Miles and Snow, 1984) has been sufficiently debated and its role confirmed, little research has convincingly demonstrated the tracks which can make it possible to reach it. In fact, the majority of research takes a static approach. However, recently, a new approach still in its embryonic state evokes the dynamic aspect of the question of alignment and has tried to scrutinize the devices and the mutations which generate its extension over time. Each organization has its own specificities which allow it to capitalize its resources, in order to create value. As noted in previous sections, Bharadwaj (2000), points out that it is investment in IT that enables the development of these capabilities and their integration into a process of continuous performance improvement. It defines an information technology (IT) capacity as the capacity to adapt its technological resources to the other means at its disposal "its ability to mobilize and deploy IT resources in combination or in co-presence with other resources and capacities" (Reix et al., 2011). He sought to empirically demonstrate the relevance of the resource theory framework, focusing his analysis on the concept of IT capacity. The author has mainly distinguished three types of resources: physical IT resources (technological infrastructure), IT human resources and intangible IT resources (knowledge assets, synergy) (Bounfour and Epinette, 2006; Dutot et al., 2009).

This capacity, the basis of specific skills, directly translates a complementarity, synergy effect, between the different resources it combines. The contribution of IT to performance is therefore assessed through the capacities they allow to develop, in conjunction with other resources.

3.6. Research issues and questions

Technology, information, decision-making, communication and knowledge are at the heart of the dynamics of complex systems. It is through them that meaning and coherence can emerge from complexity. Therefore, the major responsibility in steering complex organizations is the search and expression of meaning. This responsibility requires reflection and vigilance. Thus, a large number of performance indicators applied to the information system already exist in the frameworks of IS governance standards such as COBIT, ITIL and in the offers of consulting firms or design offices. Availability,

performance, security, breakdown of IT costs, progress of projects, user satisfaction, etc.

The study of the impact of IT capacity is central to measuring the performance of the information system. Indeed, the efficiency of the organization to build and maintain the system is not a sufficient criterion if the quality of the public service produced (education and training) is poor.

The performance of an information system will be all the better as the quality of resources and in this perspective, our research problem is stated as follows:

What are the factors that make it possible to transform the capacity of technologies and IS into a real strategic tool, and an accelerating vector of the organizational performance of the Moroccan education system?

To do this, several sub-questions can be asked:

- ✓ What are the determinants of information processing needs that lead the education and training sector to develop its IT capacities?
- ✓ What is the interaction effect between the environmental uncertainty (source of complexity) linked to (student flows, the impact of politics, the social dimension of the Public Service - Education & training) and the use of IT?
- ✓ What are the different resources and skills developed through the use of information technologies (IT capabilities), which positively influence the organizational performance of education & training IS?
- ✓ What are the business process configurations implemented by MENFPESRS in its complex information system?
- ✓ To what extent do contextual factors (organizational structure, climate & organizational culture) affect the interrelation of IT capacity developed and the organizational performance of the Education & Training IS?

Formulated in this way, our research questions emphasize the need to understand what is necessary for the development of a model or measurement tools that meet our objective of understanding the mechanisms by which adoption and exploitation of the information system affects performance in a well-defined context such as the Moroccan national education sector.

4. THE METHODOLOGICAL FRAMEWORK

The theoretical framework mobilized, allowed us, by opting for a methodological, systemic top-down approach (Von Bertalanfy, 1968), and relying on a qualitative approach, to consider the modeling of capacities based on the use of technologies of information as essential to master the dynamics of the information system within the Moroccan education system, and therefore identify the various parameters and indicators of its performance.

To this end, our methodology first proposes an analytical approach aimed at summarizing these links,

before suggesting a data collection approach which must ultimately lead to interpreting the analyzed and collected data from a perspective of confrontation. This will lead us to the production of a model. It is in this sense that our research methodology will take as a basic line: the qualitative survey phase and the data collection phase.

4.1. The qualitative pre-survey

In this sense, it would be essential to confirm that the preparation of the qualitative survey for this work was preceded by a planning stage. Certainly, knowledge of the terrain was essential, so field visits seemed necessary to us to at least award the route to follow, the different administrative structures to explore, access to the various documents and sources of information to cross. The interview guide to be prepared should be tested beforehand to detect any ambiguities and make the necessary modifications before embarking on the investigation.

4.1.2. Solving complex problems: structured analysis - SADT

It should be noted, firstly, that decisional analysis of complex systems is a discipline which aims to provide methods and tools for piloting complex systems (Genelot and Le Moigne, 2017) or for modeling chaotic environments (Reix, 2004). Deterministic modeling is more focused on the interior of the system (Bérard, 2009; Le Moigne, 2007). Indeed, the SADT (Structured Analysis and Design Technique) approach is a method of analyzing complex systems. It provides analysis by activities and data and defines a means of expression favoring, through the rigor of syntax, a quality dialogue minimizing interpretation problems. (El Oualidi, 2013). The SADT method uses a standardized graphic communication language (Ross, 1997). The analysis of the system is represented in the form of a collection of hierarchically organized flow charts containing a limited number of elements. Figure 4 below illustrates the principle of hierarchical decomposition and the formalism of the SADT activity diagram. The symbolism used is that of the box representing, depending on the approach, activity or data, and the arrow defining the flows or actions according to the view considered. The SADT method mainly allows the physical system view and the process view to appear.

4.1.2. Closed loop representation of the management system

The analysis of the attributions of the ministry and its various services, allows to draw up a synthetic diagram in the form of a control loop, highlighting the structures and their functions in the loop; another modeling alternative consists in considering the activities and the material and information flows in a representation by the S.A.D.T.

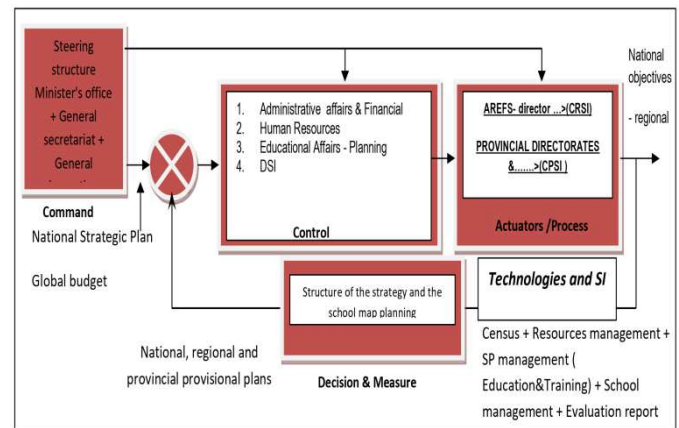


Fig 4. The administrative information command loop of the education system

4.2. The qualitative survey

4.2.1. The method of data collection

Generally, qualitative research uses three main modes of data collection: surveys and projective tests, group meetings and individual interviews (Evrard et al., 2009). Ultimately, within the framework of this research, we will opt for the method of convergent interviews (CI) (Dick, n.d.; Jepsen and Rodwell, 2008; Roehrich, 1993). It is an interview technique with a structured data analysis process. It is about collecting, analyzing and interpreting qualitative information on the knowledge of the interviewee, his opinions, his experience, his attitudes and his beliefs through the realization of a certain number of interviews which converge towards important questions (Dick, 2017; Giordano, 2003; Wacheux, 1996). Our analysis thus proceeds, at the same time, to a confrontation of our hypotheses and theoretical propositions with the empirical context for the purposes of corroboration or falsification, while leaving the possibility for new constructs or theoretical propositions to emerge. In the light of these reasons in favor of the implementation of a qualitative study, we continue our reasoning with an exposition of the main objectives assigned to the realization of this study, namely:

- ✓ an assessment of the feasibility of the problem posed in relation to the study context,
- ✓ a better understanding of the IT capacity phenomenon and its impact on IS performance: definition of the determinants, factors explaining the consequences, mediating and moderating elements ...

Support for the development of a finalized conceptual framework and the specification of hypotheses. The preparation of the questionnaire planned for the quantitative phase, in particular, through the generation of items (Kaplan and Duchon, 1988).

It should be noted that some interviews were carried out in several work sessions and the interview is carried out on the basis of an interview guide whose general outline of development (header, body and conclusion)

retraces the highlights of the interview. However, and for the sake of relevance of the analysis of the investigation data, the interviews were conducted with a sample of 23 people: the Director of the DSI (MENFPESRS) and 2 officials within the DSI at central level, 5 heads of regional IS centers at the AREFS level and 8 heads of the provincial IS center of the provincial directorates to which we have added 2 directors of AREF and 3 central directors (planning, HR, and school life) and 2 CSEFRS members.

The introduction of some people from the academic world "CSEFRS" in our study sample is motivated by the fact, that in addition to a fairly specific knowledge concerning the theoretical developments of the sector which surround our research subject, these people are involved in particular in consultancy work with organizations on questions of the education and training information system, which makes their contribution very important at this stage of study

It should first be noted that our qualitative empirical research took place between November 2017 and September 2018. The length of the process is explained by the fact that we were led to go back and forth between theory, field and analysis.

4.2.2. Analysis of qualitative data

In our research, the analysis of qualitative data began with the text transcription of the audio tapes recorded during the interviews and the notes taken on the survey grids. They were entered into the qualitative data analysis software Atlas'ti5.0 (Scientific Software Development GmbH, Berlin, Germany). The data thus collected are analyzed by theme and their meanings are summarized by assigning a code to each theme. The codes (or data) were compared and the relationships between them were established (explanations, problems, comments, etc.).

This software package allowed us to manage the form and analysis of qualitative data. It provides security by storing the database and combining the files into one and allows the researcher to use several languages.

To analyze and interpret the content of our interviews, we used a diagnostic analysis of the thematic content (Evrard et al., 2009). This allows us to "undo, in a way, the singularity of the discourse and to cut transversely what, from one interview to another, refers to the same theme" (Blanc et al., 2014).

Starting from this analytical framework, our work essentially consisted in dividing the discourse of the respondents into units of meaning to bring out the underlying themes.

All in all, this study will not only allow us to compare and enrich the data in the literature thanks to the new information that we will have collected, but will also help to formulate a definitive analysis framework (research model) from which our research hypotheses will flow.

5. RESULTS AND DISCUSSION

We will expose in the following pages the results of our analysis that we have deduced from its different themes. For each theme, the analysis is centered on the progressive interpretation of the results obtained based on a

comparison between the literature review and the respondents' comments. As this confrontation deepens, a clear vision gradually emerged and allowed us to build a finalized analysis framework (conceptual research model) as realistic and coherent as possible.

D'après les résultats qualitatifs obtenus à travers les interviews effectuées, ou d'après l'analyse des données institutionnelles (observation participante), que nous avons amassés durant notre travail sur le terrain, nous avons conclu que la capacité TI dans le système éducatif marocain s'articule autour de quatre fondements clés à (variables médiatrices) à savoir :

- ✓ technological infrastructure (IS used);
- ✓ ICT leadership or E-leadership (IT human resources);
- ✓ business processes: education & training;
- ✓ the degree of knowledge sharing.

We tried to understand what factors (environment of the educational system - information needs -) lead the Moroccan educational system to develop its IT capacity, and we detected three essential variables at this level: the socio-political dimension of the public education service & training, the mobility of student flows and the interdependence of institutional decision-making units

It should be noted that the variables "organizational structure" and "climate & organizational culture" were two moderating variables within this analytical framework.

For our research, two questions of openness were initially considered: (1) Let me start this discussion by asking you to tell us about the experience in the use or exploitation of the different platforms and IS established, adopted by the Moroccan education system. (2) Why does the Moroccan education system need to develop its information technology capacities? This is a central question that we tried to raise from the first interview, but with a progressive degree of precision.

Thus, at the beginning the interlocutor was invited to freely reveal his own conception to us, given his hierarchical position and his experience in the sector. This resulted in a very varied, sometimes even controversial, discourse.

5.1. Presentation of the conceptual research model

Indeed, the existence of a suitable IT infrastructure (or at best an ERP solution), as well as an organization oriented towards monitoring and developing the administrator-administered relationship will make it possible to reinforce the efficiency of the correlational relationship (capacity of IT-organizational performance) and therefore, to support the links of the model. By adopting a mediating and moderating perspective in this way, we will try to examine the effects of interaction between the variables of the model. We thus arrive at developing the following research model (figure n° 5):

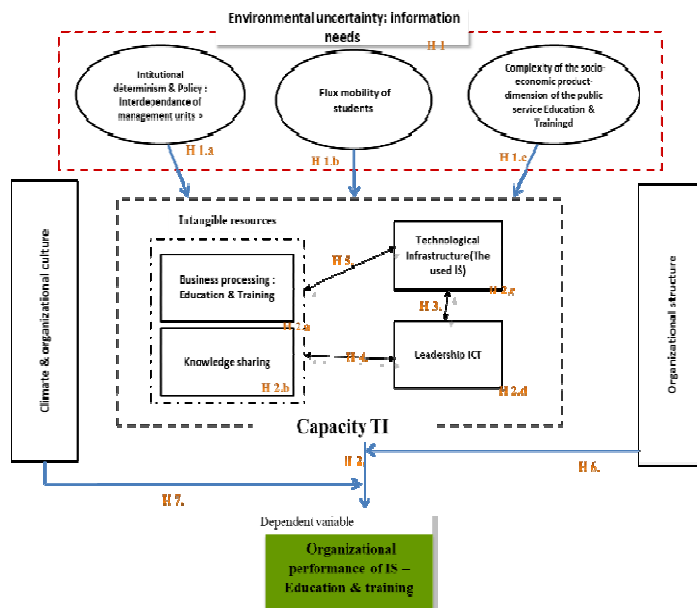


Fig 5. Conceptual research model

5.2. Research hypotheses

The formulation of research hypotheses represents for the researcher, the culmination of his conceptual reflection. It is a statement of verifiable proposals, answering the specific research questions raised in the problematic.

Within the framework of this research work, we support the central idea which consists in saying that the effect of technology and IS on the organizational performance of the educational system will be all the greater as the MENFPESRS manages to develop and strengthen its potential of IT resources (General Assumption). This hypothesis leads to the formulation of underlying hypotheses and partial hypotheses of direct dependencies, hence:

H1	the information requirements on the environment of the education system have an impact on the development of IT capacities.
H1.a	the level of effort deployed in IT capacity development is positively linked to the degree of information needs on the level of interdependence of institutional decision-making units
H1.b	the level of effort deployed in terms of IT capacity development is positively linked to the degree of information needs on the level of mobility of student flows.
H1.c	the level of effort deployed in terms of IT capacity development is positively linked to the degree of information needs on the education and training output service or product.
H2	the capacities developed by the use of technologies and IS positively impact the organizational performance of the Moroccan education system.
H2.a	IT capacity improves the organizational performance of education and training IS by

	strengthening the education & training business process.
H2.b	the degree of knowledge sharing is positively linked to the level of IT capacity development available to the Moroccan SE.
H2.c	Appropriate technological infrastructure (Quantity and Quality of Hardware and software adopted by the SE and Shared Information Platform) is positively linked to the IT capacity available to the SE.
H2.d	an appropriate ICT leadership style (positive, dynamic, optimistic, enthusiastic) ensures the development of an IT capacity in the ES.
H3	E-leadership capacity has an influence on the choice of technological infrastructure in Moroccan SE.
H4	ICT leaders have a positive influence on the various explanatory processes for knowledge sharing.
H5	the technological infrastructure chosen is positively linked to the education & training business process and to the system's strategic intentions.

Furthermore, in the context of this research, the impact in terms of IT capacity on the organizational performance of education & training IS is of a contingent nature and presupposes the existence of two moderating variables that can reinforce it or on the contrary weaken: organizational structure and organizational climate & culture.

These two variables are placed, in our model above, in such a way as to respect the continuous process aspect of performance improvement in education & training. Consequently two other hypotheses are announced in order to answer the question "under what conditions can there be performance IF education & training?

H6	the impact in terms of IT capacity on the organizational performance of the ES will be all the stronger as the organizational structure is better suited to an organic approach.
H7	the impact in terms of IT capacity on the organizational performance of the ES will be all the stronger since the MENFPESRS has a (good) climate and a culture shared by the majority of the members of the system.

6. CONCLUSION

In conclusion, we wish to emphasize throughout this work the impact of IT on the organizational performance of the Moroccan education system, by referring to the existing and to foresee perspectives that the actors of the sector can glimpse to improve it.

It emerges from this study that the qualitative study played a decisive role in the context of the construction of

our conceptual research model, since it was used for two purposes:

- ✓ Upstream, it allowed us first to generate new reflections or rather to frame our reflection on the subject in question. With a view to triangulating the data (Thiétart et al., 2014), certain key proposals in the literature have been confirmed by the results of this qualitative phase;
- ✓ Downstream and sequentially, it precedes the quantitative phase and makes it possible to prepare it.

For many researchers, developing a research model that is theoretically founded and as close as possible to the reality of the phenomenon (impact of IT capacity in our case), is often more complex work than we imagine. For example, for Pedhazur and Schmelkin (1991), the Formulation of a research model is one: "long difficult process, involving a lot of critical thinking, creativity, insight and learning".

First, it is a work that asked us for a lot of theoretical readings is often updates, a great effort of synthesis, an arrangement of the questions debated to finally arrive at a certain theoretical formalization of the phenomenon studied. Then, the conduct of an exploratory qualitative study following the SADT methodology and convergent interviews required very special attention for each interview. It was thus necessary to insist on the need to choose the right interlocutor and to arouse his interest to remove from him the maximum of information directly or indirectly affecting our research subject. The gradual pooling of qualitative data was also a particularly important step since it is the time for interpretations, the verification of our initial reflections or the launching of new perspectives. Finally, a common thread, the fruit of a long process of reflection proceeding back and forth between the qualitative data pooled and theory, allowed us to build and shape this end product which is the research and define the underlying assumptions.

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