

# Modeling the Performance of Development Programs: The Case of a Human Development Program in a Public Administration in Morocco

Zaineb Chatibi<sup>a\*</sup>, Bouchra Lotfi<sup>b</sup>

<sup>a,b</sup>*Hassan First University of Settat, Faculty of Science and Technology, Laboratory of Engineering, Industrial Management and Innovation, Settat, 26000, Morocco*

<sup>a</sup>*Email: c.zaineb@gmail.com*, <sup>b</sup>*Email: bouchra.lotfi@uhp.ac.ma*

## Abstract

This paper presents the results of our research on the modeling and analysis of a development program to improve performance. Through our contribution, we intend to support the public managing entity to determinate the factors influencing the choice of measures to be put in place in order to improve the performance of the program for which it is responsible. Our systemic approach allowed us to take into account the multiple criteria and the complex aspect of our study object. This complexity is mainly illustrated by the multiple dimensions and the numerous interactions between entities and actors involved in these programs. We engaged in an analysis of the existing work by modeling the business processes in our case study using the Business Process Management Notation (BPMN). This step allowed us to visualize the progress of each process by highlighting their components, the actors involved, and the existing interactions. Next, we were interested in understanding the existing influence relationship between the components of our processes. This work was carried out to create a logical path to guide our approach for improving the performance of the development program studied.

**Keywords:** Modeling ; Systemic approach ; BPMN ; Public performance; Complex system.

## 1. Introduction

Improving the performance of development programs has been a concern raised as a result of numerous evaluations conducted by stakeholders in the field of development programs. The measure has an important role to determinate level of achievements and degree of fulfillment of development goals and in making all partners face their mutual responsibilities to achieve results [1].

---

\* Corresponding author.

This observation was also addressed by the World Bank, which highlighted the pressure on donors at the global level to justify the results of large aid expenditures for which they are responsible [2]. In this spirit, improving the performance of development programs has been at the heart of the commitments made in the Paris Declaration on Aid Effectiveness (2005), in the Accra Agenda for Action (2008) and in the 2030 Agenda for Sustainable Development, changing the way partners address global development challenges. Donors and recipient countries have committed to working together in a participatory approach to define concrete measures to enhance the “effectiveness” of development programs. In this sense, recipient countries are asked to strengthen the management mode of their public administrations, particularly through the use of new approaches and methods. In this sense, several scientific contributions insist on the role that public action can play in order to achieve the set development objectives. The anchoring of public action on development programs thus leads to a rethinking of the way in which public policies are implemented in order to achieve development objectives, and to a rethinking of collective action around future challenges [3].

Morocco has joined in this exercise, mobilizing its commitment to the process of improving its development results by integrating development objectives into its national strategies. These actions have been accompanied by the implementation of a series of measures to improve the management system and management of public actions within public institutions. These new orientations taken by Morocco aim at improving public governance, while emphasizing a management system based on performance measurement and evaluation [4]. At this stage, public administration is the object available to decision makers to implement the projects outlined. This is the managerial and aim dimension of public policy. It is the transition to implementation action that forms the practical or operational aspect of decisions.

Through our contribution, we intend to support a public administration in Morocco in the choice of measures to be put in place in order to improve the performance of a development program for which it is responsible. To contextualize our action perimeter, we placed our intervention at an operational level of implementing public action in development. Among the programs launched by Morocco to achieve its development objectives, we are interested in the National Initiative for Human Development (NIHD). Since its launch in 2005, the NIHD has presented itself as a framework for improving the living conditions of the poor population by adopting an action plan based on the principles of good governance, aiming at the broad participation of citizens, the integration and rationalization of public sector and institutional interventions, as well as continuous monitoring and evaluation. This exercise aimed, on one hand, to understand the functioning of each component of the NIHD program and to identify the existing interactions between the different components. On the other hand, this work sought, through the participation of all stakeholders in its realization, to start a relationship of trust and communication with and between the various stakeholders to facilitate the ownership of the results in a perspective of change management. The choice of modeling makes sense because of the complex nature of our field of intervention. In complex systems, individuals have to develop a common vision of the situation within the organization as well as its implications and meaning in order to overcome the lack of understanding of the dynamics of this type of system. In such an environment, the main emphasis is on the unpredictable and ambiguous nature of the context of intervention; on the importance of nonlinear relationships in organizational dynamics; as well as on the functions of self-organization, emergence, and co-evolution [5].

The choice of the NIHD was motivated by certain observations made during our interventions and studies as part of our field work over the last 10 years as NIHD program officers within a prefecture of Morocco. Among the findings raised during our participation in implementing projects set out in the annual action plans, there was absence of a measurement system to assess the results either during the implementation process of the projects/actions or at the end.

We divided this paper into three principal parts. The first part specifies the positioning of the research in the theoretical field and highlights the needs concerning the modeling and the specificities to be considered in the envisaged performance improvement work. We then present the methodological framework that served as a reference for the realization of our work by detailing the research approach that we used and the methods we used to develop our models. Then we present, in the third part, the results from the modeling and the analysis.

## **2. Literature Review**

### ***2.1. Performance: A Polysemic Concept***

Several researchers and organizations have been interested in proposing a definition of performance as a concept. An initial meaning considers performance as a sequence of measurable results that allow us to situate ourselves in relation to the achievement of objectives [6]. Another view approaches performance as a response to a need in terms of quality, cost, and time, where it can be linked to the effectiveness and efficiency of organizations [7]. Given the diversity of meanings attributed to this concept, it continues to be used without the existence of a consensus on its definition [8]. This difficulty arises particularly from its polysemic scope, a polysemy that signals a theoretical–practical field in movement, where each meaning must be linked to its field of action and validity. In the same vein, researchers represent performance as an encompassing and integrating concept that is very difficult to define precisely. This places us in an ambiguous situation in the sense that this word can have several meanings depending on the field in which it is used [7]. This ambiguity is touched upon in the words of [9], who considers performance to be a concept that is both encompassing and reductive. It is all encompassing in the sense that it includes everything that enables the company to improve the value/cost ratio. It is also reductive in the sense that it should only include those elements that allow the strengthening of this coupling. This situation confirms the polysemic and complex nature of the term. The source of this complexity is not only the diversity of its conceptualizations but also its multidimensional character. This multidimensional character qualifies the notion of performance as a “strange attractor in its ability to absorb multiple translations: economic (competitiveness), financial (profitability), legal (solvency), organizational (efficiency) or social” [10].

Faced with this ambiguity surrounding this concept, Bourguignon [8] proposed three categorizations of the term. The first describes performance as a success. This includes a value judgment, according to a frame of reference, which illustrates the success from the observer’s point of view. Here, performance depends directly on the context of the organization, its vision, and its actors. The second understanding attaches performance to the result of an action. Performance represents the level of achievement of objectives. In this second situation, the apparent objectivity of the measurement dominates the subjectivity of the actor. Finally, the third meaning emphasizes the action rather than its result. Action allows us to distinguish competence in terms of the ability to

act and to achieve a result. This understanding of performance would thus relate to the process and not just the result. Here, performance is a process, a set of activities to be managed by the organization, framed by individual and collective skills. In organizations, performance often combines two of these meanings. The most frequent pairing is the one that links results and success. However, by taking a more processual view, performance can also address the actions leading to success.

Our aim is far from being a work of evaluation and we do not seek to judge the success of development programs or the quality of the efforts deployed by the public administration in charge of their execution. Instead, this work tends toward the desire to understand the “how” and the “why”, so we place ourselves in a performance sense of “Action–Result”. In the rest of our document, we discuss the specificities of development programs and their relationship to the characteristics of public administration in order to situate ourselves in relation to their particularities and orient our approach to performance improvement.

## ***2.2. The performance of development programs in public administration: A complexification of a complex***

The notion of development is approached under multiple dimensions (economic, social, environmental and human) where interventions can take different forms (projects, actions, operations, and/or programs) and can equally be carried out by state services, national and international NGOs, as by the economic operators. In this context, we observe the use of the “program” approach by development organizations and actors. The principle of this approach comprises grouping projects together with common objectives, whether at a sectoral, national, or international level [11]. The interventions carried out in this framework mobilize a growing number of public and private, international, national, and local actors. Far from being isolated, these actors are linked by interdependent relationships and are part of a complex system of interactions where information, ideas, claims, know-how, and relationships are exchanged in multiple directions in order to contribute to implementing planned projects/programs [12].

The public structures responsible for implementing development programs are under particular pressure because of the complexity of their field of intervention. This situation creates close links between public action and development programs, particularly with the performance requirements announced by donors since the declaration of the MDGs and, subsequently, the SDGs. In this sense, implementing development programs represents a major source of change that is making public administration more complex. In this sense, [13] considers that the adaptation of organizations to their complex and changing environment is both a necessity and an opportunity. This creates a whole new framework of action for the public sphere and offers a new framework of reflection to public decision-makers to have their organizations equipped with adequate management tools to improve their performance and thus contribute to the achievement of development goals [14].

This issue is topical and is part of a widespread awareness of the complexity that arises from the dynamics of development. In this perspective, considering all the dimensions of development represents a real challenge for the choice of public management tools to be implemented [15]. One of the fundamental challenges in implementing such programs is operating in a highly complex context. It is a question of acting on a system with a multitude of actors and parameters that are constantly interacting. The result of this complexity is that,

very often, there is no obvious linear causality that allows us to attribute a change to an action by an actor. The changes observed almost always have several causes and acting on one variable can have uncontrolled effects on others [16].

In other words, to act at the level of a complex system is to perform an intervention in a context composed of many entities. These multiple components generate interactions which in turn produce a global behavior at the level of the system that cannot be easily explained from the individual properties of the constituents alone. Thus, the interactions of individuals with each other are superimposed on individual behaviors generating influences that cannot be explained by observation alone or by the analysis of linear causalities between actors. It is therefore necessary to understand dynamic and multi-actor phenomena.

However, seeking to understand the complex links and multiple causalities that characterize such a system often involves trying to identify the most influential parameters of the system in order to act as soon as possible from a holistic perspective. The use of the analytical approach in such contexts is gradually being challenged and complemented by a new form of approach called the systems approach.

### ***2.3. Modelling using the systemic Approach: A Reference Framework to Treat Complex Systems***

Systems thinking is an approach developed to understand complex transdisciplinary phenomena. It strives to design a framework and a methodology for the analysis of complex systems. The system is defined as a dynamic interaction between its components oriented according to a goal [17]. The multiplicity of the elements making up a system and the multiplicity of their interactions to which is added the diversity of its dynamic behaviors represent the sources of its complexity. All of these characteristics can only show the difficulty of dealing with complex systems in the sense that the global and local in such areas are intimately linked. Any intervention that is considered must be related to the global behavior of the system as well as to the specific context in which it is situated [18].

From this point of view, the systemic approach considers a problem in all its dimensions. Its application in public administration, and specifically in the implementation of development programs, could allow for a better understanding of the complexity of the problems related to this field of intervention, of the stakes involved in development, and of the need for all actors to take well thought-out action. Managing development programs is such a vast mission that understanding the links between them becomes easier to understand this entity and to know where and how to act at our level for this development.

Considering to act in a context of apparent complexity, we need specific instruments to represent our perceptions in order to facilitate the interpretation and analysis of our field of intervention. To do so, we model the system on which we intervene with a systemic and multi-level approach. In this sense, the use of modeling allows us to develop a representation that highlights the structure and functioning of the system studied. From a general point of view, a model is any representation of a real system, whether mental or physical, expressed in verbal, graphic, or mathematical form [19]. However, the structure of a model depends on the objectives that the modeler wants to achieve [20]. Thus, modeling consists of conceiving and then drawing an image that resembles

the system under investigation [21]. Such a representation allows both a better understanding of the complex system and a control of its management [22]. A model offers stakeholders a more complete understanding of the essential characteristics of a complex situation [23] and can direct the actions of managers [24]. Improving understanding of the existing situation and facilitating communication is one of the main concerns of a systemic modeling approach.

Our desire to build a representation that highlights the structure and functioning of the system under study motivated our recourse to modeling. To do this, we were initially interested in the functional or business approach. The aim of this approach was to describe and model the business processes of the studied system in terms of functionalities (tasks or activities) and behaviors (orders in which the tasks are executed) [25]. The challenge is to be able to understand the functioning of a complex social system. In addition, we also wanted our understanding to suggest how to intervene to generate or enhance performance at an operational level.

#### ***2.4. Business Process Modeling to Understand the Functioning of Development Programs***

A process is a series of interactive or interconnected operations that convert inputs into output items allowing a specific aim to be reached by the execution of ordered steps [26]. By integrating the notion of an actor [27], a process is described as a collection of activities completed by actors and involving entities. Generally speaking, a process is a series of executions of partially ordered actions that transforms input elements into output elements with the help of technical and human resources, in order to achieve an objective within the framework of a strategy [28].

From these definitions, we identified five notions that characterize a process: (1) the aim followed by the process; (2) the steps or activities necessary to achieve the objective; (3) the order in which these activities must occur; (4) the relationship of dependence and interactivities between the processes; and (5) the need for actors and resources for the execution of activities.

In order to improve performance, several authors [29-32] have suggested that organizations should adopt a process-oriented approach. This is an approach that places the customer at the heart of the analysis of the functioning of a system. The term “customers” refers to the beneficiaries, recipients, and users of the products and services provided by the organization. The internal customers are represented by an exchange of services that takes place within the process, and the external customers are represented at the end of the process [33]. In fact, the process approach can be used as a management method that allows the organization to steer its performance to direct all the actors on the results of their activities regarding customer expectations [26] by guiding the organizations toward major questioning and an extreme re-examination of operational processes [30].

However, business processes remain complex. Thus, any organization wishing to improve its performance must understand its processes. This exercise requires modeling [34]. Business process modeling is a term that appeared in the 1960s in systems engineering. It is presented as a practice that allows the description, analysis, and implementation of an organization’s business processes [35]. However, a process model is only considered

complete if it can describe all the dimensions of a process, which are who does what, how, when, and why [36, 37].

These dimensions are grouped into three interacting perspectives [36], each of which describes a different point of view of the modeling of a process. The behavioral perspective describes the “what to do” of a process, i.e., the activities and operations that make it up, and “how” these activities are coordinated with each other. The organizational perspective describes the “who”, i.e., the actors in the process. It structures the resources into functions and structural entities and allows them permission to perform the process tasks. Finally, the information perspective specifies the layout of data and documentation that each task in the process uses and/or generates.

These perspectives can be grouped into two fundamental and complementary views: orchestration and choreography [38]. Orchestration describes the sequence of activities and their connections and synchronizations. The choreography describes the interactions (i.e., collaborations) between the business partners. In the implementation of this approach, the AFNOR FD X50-176 standard [32] decomposes the organization into three main types of processes:

- Operational processes allow the direct realization of the product desired by the customer, from the identification of their need to its satisfaction. They include activities related to the product realization cycle.
- Supporting processes are essential to the functioning of all processes by supplying them with the required resources.
- Management processes include the determination of the policy, the deployment of the objectives in the organization, and the allocation of resources. They ensure the consistency of the implementation and support processes. They include measuring and monitoring the process system and using the results to improve performance.

Attempting a process modeling exercise requires identifying upstream the objectives of the modeling activity. Our approach focused mainly on three objectives: to understand the NIHD processes, to analyze them in order, and to propose possible improvements in performing the studied system. With this exercise, we wanted to seize opportunity to understand the development programs in their operational perspective differently. These programs, as a complex system, involve multiple actors and various forms of contributions, some of which may have unforeseen effects. It means that those responsible for implementing these programs should remain constantly vigilant about the impact of their actions. This requires a broad understanding of the field of action and a change in the models used [39].

In practice, there are several business process modeling methods and tools that develop models at different levels of abstraction. In our exercise we used the BPMN, which allows organizations to understand the realization of their business processes with the help of a graphical notation (we present this notation in the Methods and Materials section).

### **3. Methods and Materials**

#### ***3.1. Research Question and Context***

Our intervention takes place in the context of a public administration in charge of implementing a human development program in Morocco. We face the complexity of the context of the intervention (the public administration) to which is added the complexity of the field of study (the development programs). This complexity is shown through a delicate network of interests given the multiplicity of stakeholders, their heterogeneous nature, and their sometimes contradictory expectations. In addition, performance is difficult to master because of the multiple interactions to consider, the important stakeholders to integrate, and the various issues to identify. In such an environment, the managing entity seeks to position itself in relation to the expectations and roles of the stakeholders involved in the implementation process of the programs in question. Taking into account the complexity of the context of action was one of the major difficulties encountered in carrying out our exercise. The action is placed within the framework of a system composed of a multitude of actors and parameters that interact continuously. The consequence of this complexity is that acting on one variable of the system can have uncontrolled repercussions on others. This is one reason why it is particularly difficult to attempt any random intervention.

In such a situation, the problem is not only limited to the restricted rationality of the actors but also to the absence of an assimilation of the complexities specific to the structure under study. In this context, individuals must establish a common understanding of the situation, its scope, and its implications within the organization. Therefore, assigning meaning to a circumstance is a social construct that requires collaboration. The literature review that we have conducted has shown us the importance of understanding the context of action before any effective attempt to act on the system. Thus, understanding the dynamics that characterize development programs is one of the major challenges faced by organizations responsible for implementing this type of intervention to improve their performance. In this exercise, it is imperative for these organizations to consider the multidimensional and multi-actor nature of these development programs.

Starting our action with a modeling exercise allowed us to see the performance improvement work envisaged, not as a series of isolated initiatives disconnected from the environment but rather as an emergent or programmed process, allowing the environment to develop in a proactive perspective. At the end of such an exercise, we should be able to understand how and why dysfunctions arise and identify the dimensions to be taken into consideration in the definition of the envisaged performance improvement model. This leads us to ask: how can modeling guide the performance improvement exercise of a human development program in Morocco?

#### ***3.2. Research Approach***

Our approach consisted of associating our interpretations, according to the literature, with those of the actors in the field of study in order to combine our reasoning, building together the models that trace the observed reality, and seeking to improve an existing development program. With this approach we wished to achieve our initial objective, aiming to use a participatory approach to increase the success of our research project and at the same



time its appropriation by the actors taking part in its development.

This design model coincides with the research methodology that considers researchers as partners who assume, jointly with the actors, the responsibility of conducting the targeted mission [40]. Thus, action research represents a fundamental approach that links the desire for change and the intention of research by relying on joint work between all the people concerned and referring to an ethical structure that has been agreed and embraced by all [41]. It is an approach that aims not only to discover facts but also to help transform certain conditions that are felt to be unsatisfactory by the community [42]. Thus, we conducted our research in compliance with the fundamental characteristics of action research [43], namely:

- The will to change the reality: This research work aims to put in place practices to improve the reality, thus seeking to do better.
- The voluntary participation of field actors: Stakeholders play a key role in the conduct of research; they share the same goal of wanting to improve the performance of NIHD programs. They are solicited in all the activities carried out to formulate their observations, capitalize on their experiences, and express their proposals for improvement. The objective is to co-construct the solution to be adopted in order to facilitate its appropriation.
- The real intervention of the researcher in the field and equality and democracy in cooperation: The work carried out was based on field experience accumulated over ten years in the field. Our research consisted of proposing solutions for improving performance based on the analysis of the existing performance based on working meetings and interviews and sessions with the various actors.

### **3.3. Materials: Business Process Model and Notation (BPMN)**

Business process modeling is performed through models and languages that describe the basic elements of a process. The choice of the language to use depends on the specific needs and objectives of the modeler. To do this, we needed a method that allowed us to model graphs that are simple and easy to assimilate by users with varied technical knowledge. In this sense we wanted to have a graphical representation easily understandable by all actors (employees, program managers, external partners, members of technical committees, etc.) and to serve as a tool for dialogue and exchange while being intuitive to use.

With this perspective, we opted for the Business Process Model and Notation (BPMN) modeling method. BPMN, recognized as a standard by the Object Management Group (OMG) in 2005, is a method specifically intended for modeling business processes, unlike other methods whose original vocation is oriented toward information systems. This method has been adopted as an ISO standard and has since become a professional modeling practice [44].

The BPMN is proposed as a simple and visual means of communication between the different stakeholders responsible for implementing business processes in the organization. The designers of the BPMN sought to formally fill the gap between the definition of business processes and their implementation [45].

This language proposes a set of graphical elements and various diagrams. For our case study, we were interested in the collaboration diagram, which allows all the business-level complexity of the modeled processes to be captured. The BPMN collaboration diagram was used to represent sequences of activities and interactions between the different actors of a process or between processes. It is a diagram that is supposed to be simple enough to be understood by everyone, including business stakeholders. The distinct entities taking part in the process (companies, departments, etc.) are represented by pools, which are themselves divided into lanes that represent the participants (actors or tools). Within these lanes, activities are linked sequentially. Every process must begin with at least one start event and end with at least one end event. Branches can signify a condition (met or not) or a reunification [46].

#### 4. Results and Discussion

##### 4.1. NIHD Business Process Modeling with BPMN

To model the business processes of our case study, we began by collecting data through working meetings with officials involved in implementing NIHD programs (Head of Division, program managers, project managers, etc.). Each actor described their role and the stages of execution of the tasks for which they were responsible. This work was completed using our knowledge of the field and official NIHD documents (procedure manuals, bylaws appointing governance bodies, minutes of meetings of technical committees and governance bodies, etc.).

This was the first step to identify and classify the NIHD business processes. We began by developing a general mapping of the NIHD processes by classifying them according to the typology recommended by the standard FD X50-176 and distinguishing the management processes, realization processes, and support processes in order to distinguish the principal activities and the support activities. At the end of this stage, we were able to have a high-level view of the functioning of all NIHD processes based on the decomposition mentioned earlier in this paper, as presented in Figure 1. This Figure was created with Online Signavio’s Business Transformation Suite Trial.

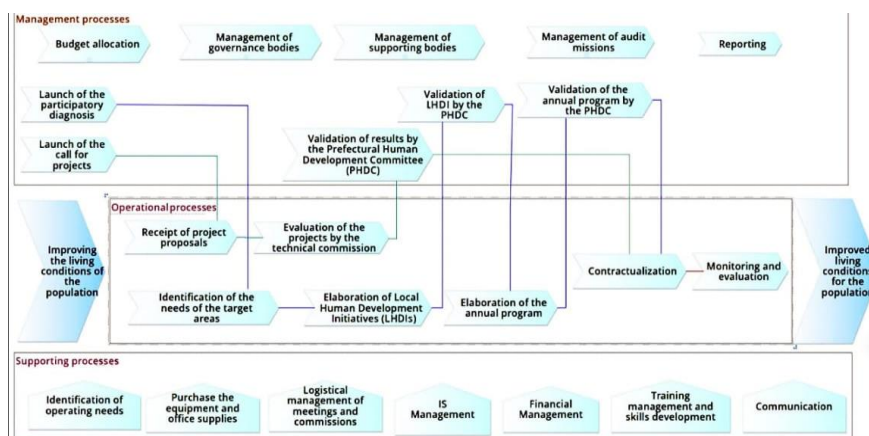
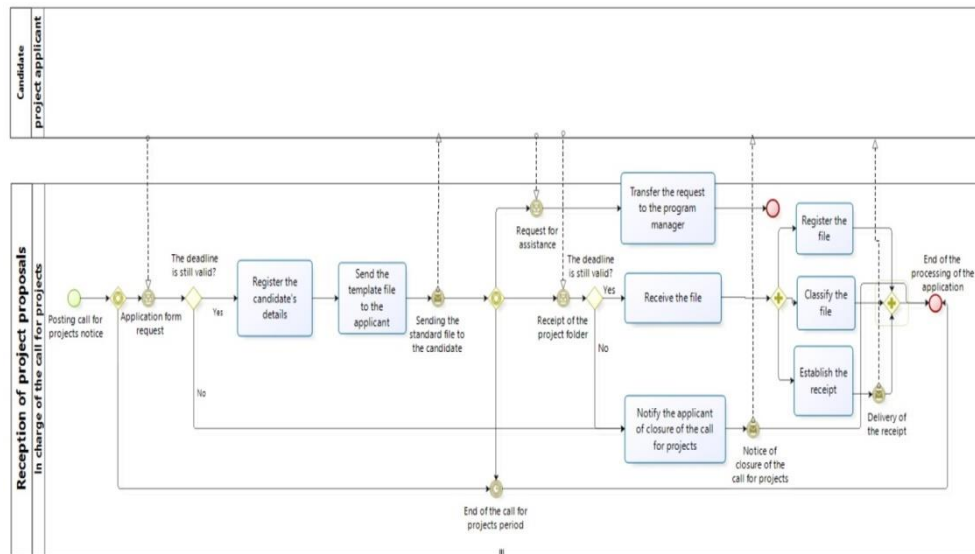


Figure 1: The NIHD macro-process map.

Based on the results of this phase, we carried out the modeling of each process, focusing mainly on the processes of realization. Each modeled process had a descriptive sheet. The modeling of the processes presented below was realized on BIZAGI Modeler 3.8, which is a free software tool that supports the notation.



**Figure 2:** Collaboration diagram for the reception of project proposals processes.

Once the process had been modeled, it was submitted again to the actors for validation. This validation comprised having each process reread and any corrections made by the actors concerned. The objective was to have a stabilized version of this mapping that was accepted by all. The completed models were used as a working support for the description and analysis stage, which ultimately led to a detailed mapping of the existing processes with a description sheet for each process and the malfunctions that hindered the smooth running of tasks. Figure 3 below shows an example.

Name of the process		Process code		
Reception of project proposals		001/APT		
Aim of the process				
Receive project proposals formulated by the target applicants in the framework of the call for projects				
Process Manager		Process category		
Mr, Mrs		Operational		
Input elements	Tasks	Actors	Interacting actors	Output element
Procedure manuals Financing conditions Eligibility Criteria Target categories Period of the call for projects Template file to the applicant	Register the candidate's details	In charge of the call for projects	project applicant	Project files received Register of received files
	Send the template file to the applicant	In charge of the call for projects	project applicant	
	Transfer the request to the program manager	In charge of the call for projects	Program Manager	
	Receive the file	In charge of the call for projects	project applicant	
	Notify the applicant of closure of the call for projects	In charge of the call for projects	project applicant	
	Register the file	In charge of the call for projects	project applicant	
	Classify the file	In charge of the call for projects	project applicant	
	Establish the receipt	In charge of the call for projects	project applicant	
Resources and facilities				
<b>Human resources</b>	Program Manager In charge of the call for projects	<b>Material Resources</b>	Computer; Printer; Internet connection; Supplies and consumables; Smartphone with fleet	
<b>Related documents</b>	Notice of Call for Projects Template file Register of received files	<b>Problems</b>	Incomplete filings; Projects submitted that do not comply with NHRI requirements; High workload; Lack of human resources; Difficulties to satisfy the accompanying requests;	
Indicators				
Number of incomplete files;	Number of projects that do not meet NHRI requirements;	Number of coaching sessions per candidate;	Number of candidates transferred to the "Training" support process;	

**Figure 3:** Example of a process sheet.

The modeling of the processes allowed us to have an unfolding image of all the activities of each process at different levels of granularity. This image illustrated the set of links connecting the activities performed in terms

of existing interactions and the flows exchanged between the actors of these processes. This representation offered the possibility to all the actors to understand the general functioning of the existing processes and to use it as a communication tool. Following this phase, we held a series of meetings where individual sessions were organized with each stakeholder of each process. By proceeding with individual sessions, we wanted to be able to discuss with each stakeholder, without influence from the other participants, the dysfunctions that they had found during the exercise of their functions. Each actor was then invited to link the dysfunctions to causes and consequences by creating links with other processes. At the end of this work, we were interested in grouping all the dysfunctions by family, while attaching to them the causes and consequences cited by the actors interviewed.

#### **4.2. Discussion**

Our results show that by using the process approach, it is possible to propose a distinct way to intervene in the treatment of complex problems. In this case, we were able to visualize, through the modeling of business processes, the sequence of all tasks and their interactions, thus facilitating the interpretation and identification of dysfunctions by source. This exercise simplified the understanding of the functional reality of the NIHD system by all participants. The analysis of the diagrams was a step that placed us, with the actors, at another level of visualization. It gave the actors the opportunity to visualize the overall structure of the NIHD system and to understand the influential relationships between all the components of the system. This approach allowed us to actively reveal and shape the mental models or perception systems that people use to perceive, contextualize, and make sense of the NIHD system, thus facilitating a shift from action based on a partial view (based on individual perception) to action based on a holistic view of the system as an object of action. This approach represented a process of sense-making by paying attention to individual perspectives and valuing them in a collaborative way to develop a global vision, share the global vision and thus try to anticipate the consequences, repercussions and side effects on the system studied through the co-construction, negotiation and development of action plans for the improvement of performance according to a global vision. This way of thinking has led to an awareness of the need to take into consideration multiple dimensions (human, organizational, financial, external environment) in the definition of measures to be adopted in order to achieve the desired level of performance. These dimensions influence each other and generate relationships that play out between actors, including cooperation and/or conflict. The model developed has made it possible to represent how the main activities carried out in the implementation process of the program studied interact with each other and with the environment in which the different actors interact. The development of the model is carried out in an iterative team work, which has generated a collective view of the group on the operational environment of the studied program. The incorporation of the points of view of all the actors increases the chances of success of the improvement process by the appropriation of the different actors of the co-defined actions. Thus, we have demonstrated the value of adopting a performance improvement system from a multi-dimensional perspective as an approach that aligns with the theoretical recommendation. However, the results of this study are inevitably limited due to the mainly static constraints of the business process model. Indeed, the relationships identified in this conceptual framework are limited to the assumed effects of the potential determinants of the systemic intervention on the system under investigation. The introduction of the temporal aspect through dynamic modeling is a new perspective of our research (which will be the subject of other articles) to promote an

understanding of the effect and influence of the behaviors of the different components of the system on the identified performance dimensions, thus moving from a static to a dynamic view.

## 5. Conclusions

The original intention of our approach to improve the performance of development programs led us to adopt a systemic approach, using modeling. The results achieved by using the process approach allowed us to achieve our objectives. Thus, we could clearly visualize the functioning of our system and facilitate the comprehension of the relationships of dependence between its elements. In addition, by adopting a systemic approach, our work favored dialogue and exchange with people of different backgrounds and functions, using different languages. This multidisciplinary character has allowed us to enrich and adapt our research work and to bring new knowledge corresponding to the expectations of all parties. We confirmed through our experimentation that the application of a systemic approach to the study of our development program highlights the mechanisms of its implementation and the relationships of dependence between its elements, thus improving the understanding of our field of intervention. We can show this through our models by the existence of dependency relationships between several dimensions that influence each other. This led us to think of a way of acting that allowed us to put in place the conditions that favor the emergence of the desired performance by working on all the factors while, at the same time, respecting this relationship of dependence. In this sense, we propose to adopt the Balanced Scorecard as a performance measurement system, which will allow us to visualize this dependency relationship between the various dimensions. In the continuation of our research, we plan to develop the Balanced Scorecard model that we presented during our participation in the International Symposium ISEOR in 2018 [16].

## References

- [1] Programme des Nations Unies pour le développement (PNUD), Rapport mondial sur le développement humain. Paris, Bruxelles: De Boeck & Larcier s.a., Département De Boeck Université, 2001.
- [2] K. R. Mackay, Comment mettre en place des systèmes de S & E pour améliorer les performances du secteur public. World Bank Publications, 2008.
- [3] P. Bance, « Action publique et Développement durable. Une perspective post-nouvelle gestion publique », 2019.
- [4] M. AMEDJAR et A. AMEDJAR, « L'implémentation des outils de management modernes au sein des établissements publics marocains », La Revue Marocaine de Contrôle de Gestion, n° 8, 2019.
- [5] R. R. McDaniel et D. J. Driebe, « Complexity science and health care management », in *Advances in Health Care Management*, vol. 2, Emerald Group Publishing Limited, 2001, p. 11-36. doi: 10.1016/S1474-8231(01)02021-3.
- [6] « ISO 9001:2015(en), Quality management systems — Requirements ».

<https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-5:v1:en> (consulté le 29 avril 2021).

- [7]P. Voyer et P. Voyer, Tableaux de bord de gestion et indicateurs de performance, 2e éd. Sainte-Foy, Québec: Presses de l'Université du Québec, 1999.
- [8]A. Bourguignon, « Peut-on définir la performance?[Can We Define Performance?] », Revue Française de Comptabilité, 1995.
- [9]P. Lorino et J.-C. Tarondeau, « De la stratégie aux processus stratégiques », Revue française de gestion, vol. 41, n° 253, p. 231-250, 2015.
- [10]Y. Pesqueux, « La notion de performance globale », Tunis, 2004, p. 14.
- [11] Coopération EuropeAid, Manuel Gestion du Cycle de Projet. Bruxelles - Belgique: Commission Européenne, 2001.
- [12]Z. CHATIBI, B. LOTFI, et E. A. SEMMA, « Analyse multicritère pour l'amélioration de la performance des programmes de développement : cas de l'INDH du Maroc », présenté à 6ème édition du colloque AIRMAP, « Un management public universel? », Nice, FRANCE, 2017.
- [13]D. Roy, « La gestion de la complexité à travers les approches de développement durable dans les organisations: analyse de l'approche BNQ 21000 », PhD Thesis, Université de Sherbrooke, 2018.
- [14]J. Espey, G. Lafortune, et G. Schmidt-Traub, « La concrétisation des Objectifs de développement durable au bénéfice de tous: les priorités de l'action publique pour ne laisser personne de côté », 2018.
- [15]E. Leroux, « Le SCOT: un outil de Management public territorial au service du développement durable des territoires? », Gestion et management public, vol. 1, n° 1, p. 38-52, 2012.
- [16]Z. CHATIBI, B. LOTFI, et E. A. SEMMA, « Le tableau de bord prospectif pour la mesure de la performance des programmes de développement: cas des programmes INDH au Maroc », présenté à Colloque international ISEOR 2018, Lyon, France, 2018.
- [17]D. R. Joël, « Le microscope, vers une vision globale », Seuil." Points Essais, vol. 80, p. 346, 1975.
- [18]C. B. Keating, P. Kauffmann, et D. Dryer, « A framework for systemic analysis of complex issues », Journal of Management Development, 2001.
- [19]B. Walliser, Systèmes et modèles: introduction critique à l'analyse de systèmes. Editions du Seuil, 1977.
- [20]J.-L. Le Moigne, Le Constructivisme: Tome 1: Des fondements. Montrouge: Éditions Sociales Françaises, 1994.

- [21]J.-L. Le Moigne, *La théorie du système général: Théorie de la modélisation*, 1ère Ed. Paris: PRESSES UNIVERSITAIRES DE FRANCE, 1977.
- [22]P. Checkland, *Systems thinking, systems practice*. New York: John Wiley & Sons, 1981.
- [23]M. Lyons, I. Adjali, D. Collings, et K. Jensen, « Complex Systems Models for Strategic Decision Making », *BT Technology Journal*, vol. 21, p. 11-27, 2003, doi: 10.1023/A:1024419706667.
- [24]J.-L. Le Moigne, *Les systèmes de décision dans les organisations*. Paris: PRESSES UNIVERSITAIRES DE FRANCE, 1974. Consulté le: 30 avril 2021. [En ligne]. Disponible sur: <https://learninghub.em-lyon.com/EXPLOITATION/Default/doc/SYRACUSE/28956/les-systemes-de-decision-dans-les-organisations>
- [25]F. Vernadat, *Techniques de modélisation en entreprise: Applications aux processus opérationnels*. Economica, 1999.
- [26]AFNOR, *Management des processus, Fascicule de documentation FD X 50 176*. France: AFNOR Editions, 2005.
- [27]C. Morley, « La modélisation des processus: typologie et proposition utilisant UML », in *Actes des Assises 2002, Paris, 2002*, vol. 13.
- [28]F. Theroude, « Formalisme et système pour la représentation et la mise en oeuvre des processus de pilotage des relations entre donneurs d'ordres et fournisseurs », *Thèse de doctorat, Grenoble INPG*, 2002.
- [29]T. H. Davenport, *Process innovation: reengineering work through information technology*. Boston: Harvard Business Press, 1993.
- [30]M. Hammer et J. Champy, « A manifesto for business revolution », *Reengineering the Corporation*, 1993.
- [31]K. P. McCormack et W. C. Johnson, *Business process orientation: Gaining the e-business competitive advantage*. Crc Press, 2001.
- [32]R. Burlton, *Business process management: profiting from process*. Pearson Education, 2001.
- [33]A. Rakotondranaivo, « Contribution de la modélisation à l'évaluation des performances des organisations de santé: application au réseau régional de cancérologie Oncolor », *Thèse de doctorat, Institut National Polytechnique de Lorraine*, 2006.
- [34]W. Wang, H. Ding, J. Dong, et C. Ren, « A comparison of business process modeling methods », in *The proceedind of the 2006 IEEE International Conference on Service Operations and Logistics, and Informatics, Shanghai, China, 2006*, p. 1136-1141.

- [35]M. A. Ould, Éd., « Business Processes: Modelling and Analysis for Re-Engineering and Improvement », The Journal of the Operational Research Society, vol. 47, n° 4, p. 595-596, 1996, doi: 10.2307/3010738.
- [36]W. M. van der Aalst, M. Weske, et G. Wirtz, « Advanced topics in workflow management: Issues, requirements, and solutions », Journal of Integrated Design and Process Science, vol. 7, n° 3, p. 49-77, 2003.
- [37]M. A. Chaâbane, « De la modélisation à la spécification des processus flexibles: une approche basée sur les versions », Thèse de doctorat, Université Toulouse 1, France, 2012.
- [38]OMG, Business Process Definition MetaModel (BPDM), Version 1.0. OMG, 2008.
- [39]Z. CHATIBI, B. LOTFI, et E. A. SEMMA, « Modélisation de processus dans le cadre d'une évaluation de la performance d'un programme de développement : cas de l'INDH », présenté à 2ème édition du Colloque du laboratoire LIMII, Settat, Maroc, 2016.
- [40]M. Liu, « La validation des connaissances au cours de la recherche-action », Etudes et Recherches sur les Systèmes Agraires et le Développement, p. 183-196, 1997.
- [41]M. Liu, « Présentation de la recherche-action: définition, déroulement et résultats », Revue internationale de systémique, vol. 6, n° 4, p. 293-311, 1992.
- [42]A. Curle, « A theoretical approach to action research », Human Relations, vol. 2, n° 3, p. 269-280, 1949.
- [43]E. Jouison-Laffitte, « La recherche action: oubliée de la recherche dans le domaine de l'entrepreneuriat », Revue de l'Entrepreneuriat, vol. 8, n° 1, p. 1-35, 2009.
- [44]R. Braun et W. Esswein, « Classification of domain-specific bpmn extensions », in The proceedings of the 7th IFIP WG 8.1 Conference on the Practice of Enterprise Modeling, Manchester, United Kingdom, 2014, vol. 1, p. 42-57.
- [45]P. Briol, Ingénierie des Processus Métiers, de l'élaboration à l'exploitation. Lulu. com, 2008.
- [46]J. P. Davis, K. M. Eisenhardt, et C. B. Bingham, « Developing theory through simulation methods », Academy of Management Review, vol. 32, n° 2, p. 480-499, 2007.