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DESIGN PROCESS FOR DECISION MAKING CONCERNING THE ESTABLISHMENT OF THE (OBJECTIVE, ACTOR) COUPLE IN PROJECT MANAGEMENT ORGANIZATION

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1 Introduction

In Project Management, we are interested in the control of the decisions. Decisions are processes which involve, in term of consequences, state changes of the project itself and\or the result of the project and consequently impact the cost. This kind of process, as it is of decision, has the particularity to be realized by women and men and that it cannot be completely clarified (otherwise it would become activity) because of the incompleteness of the data, the alternatives, the criteria of choice. So that two individuals or two groups of individuals, resolving by decision(s) the same problem, have no chance to arrive at the same solution. This puts in evidence the interest to isolate this flow of decisions resulting from this process so particular, because connected to the human factor.
We distinguish the process of decision from the decision itself (the result). These two aspects are simultaneously but distinctly treated. That justifies both coupled following approaches:

- a systemic approach of the project which will allow a structuring of flows and also the isolation of decision flows.

- an approach by the processes of project management which will allow the isolation of the decision contents.

2 Methods

We considered "the process of project actors' selection", as an object, a product which we wish to design. For this, we applied the logic of products design to the design of the process of actors' selection. The paragraphs of this article are thus inspired by stages necessary for the product design:

- Project structuring: allows fixing the environment of the studied object. Because it is about decision processes of actors' selection in a project, we define the project with three main characteristics (the initial objectives, the processes and the deliverable).
- Functional Analysis of the process of affectation of an actor to an objective: allows to clarify needs and services to be satisfied by this process (detailed in an other ICED 2005 paper, [3]).

- AMDEC (Analysis of the Modes of Failings, Effects and their Criticality): allows, for every function stemming from the Functional Analysis, to analyse and to detail the failings, their effects, their causes and their consequences.
- Chains of Markov: allows to put in evidence the dysfunctions of the functions.
- Realization of the tool: decision-making tool based on the treatment of the chains of Markov.

3 Structure of a project

We propose here to structure a project either by its flows or by its contents.

3.1 Structure of a project by its flows

A systemic flow structure helps to clarify project relations with environments. Starting from Jean-Louis Ermine's proposal [4], figure 1, of distinguishing, for any productive system, the operating system (activities) from the information and the decision systems, the project and company systems, the market system and the shareholders/investors system are represented and illustrated in figure 2.

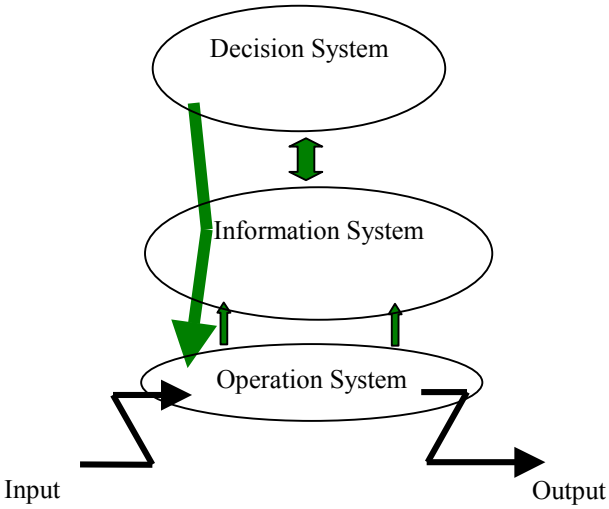

Figure 1. OIDC System, from Jean-Louis Ermine.

Flows circulating between these systems are also represented. 3 types of flows are shown on figure 2:

- Activity flow which circulates mainly from project actors to company actors who will take project results to meet the market.
- Information flow which circulates mainly in opposite direction, which means from market information gathered by the company who decides and who transfers it to the project.
- Decision flows which allow to drive each system's activities by the overhead system and by using available information of the information flow.

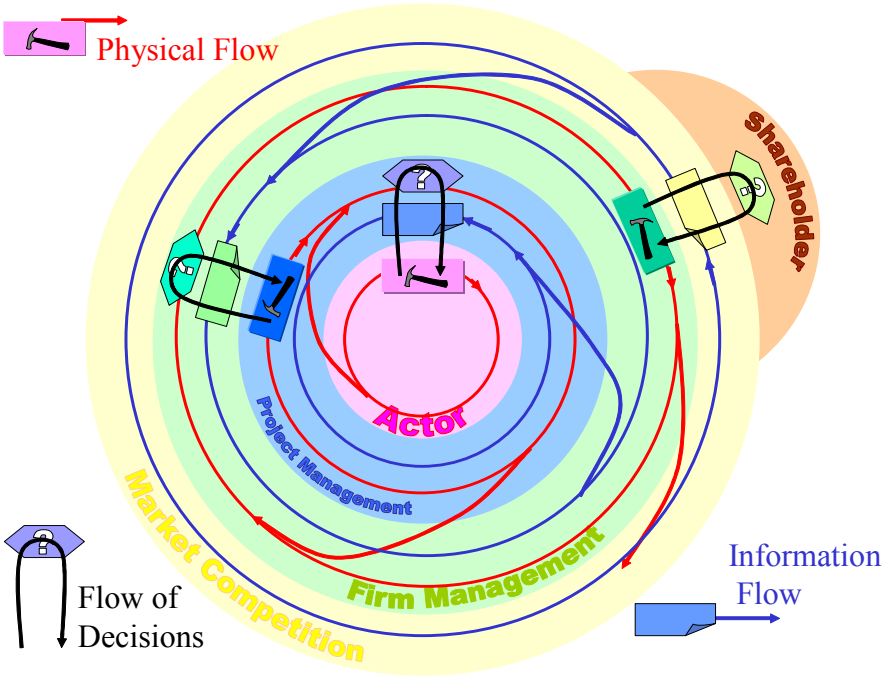

Figure 2. The different activity flows.

3.2 Structure of a project by its contents

Each action in a project aims to participate at the fulfilling of a known objective. In the opposite case, it would have no meaning. Action realises the awaited added value of the project. It contributes at obtaining a visible result by creating a project deliverable. In order to specify, start and realise an action, its utility must be proven by an objective to fulfil and an identified deliverable. However, there is no need of total bijection between action and objective, action and deliverable and even between objective and deliverable. An action can, by example, contributes to several objectives or on the contrary an objective may need several actions to be fulfilled.

Actions are evaluated by comparing results found in deliverables and specifications given in objectives.

The Project Management Institute [10] presents a structure for project scope management (figure 3). In the process of “scope definition”, WBS (Work Breakdown Structure) is a fundamental key because it structures all project activities. It is here proposed that this structure breaks down into three inter-related structures: an objective structure, an activity structure and a deliverable structure.

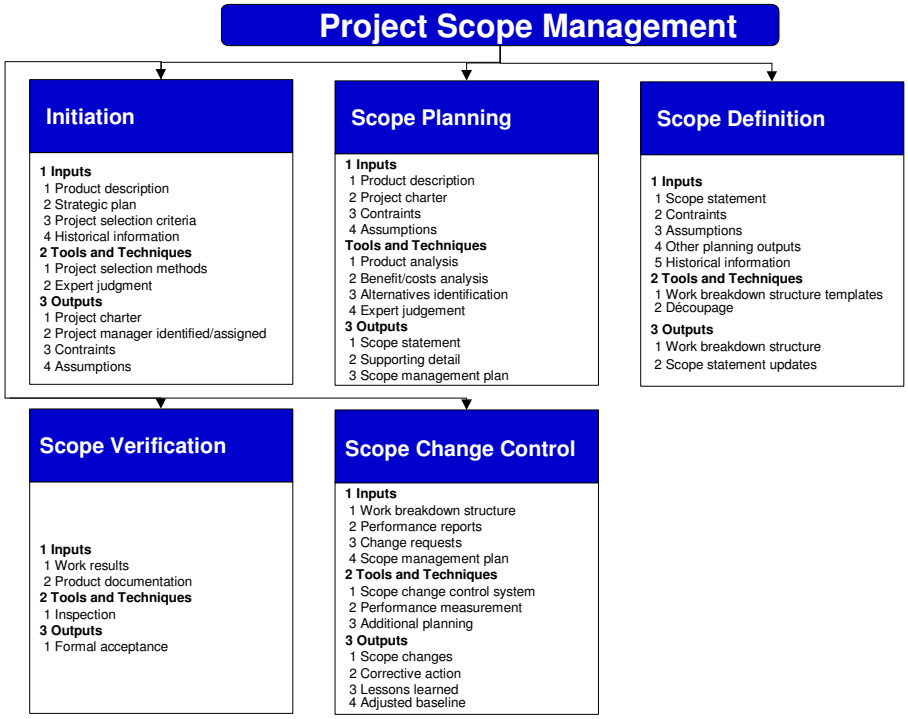

Figure 3. Project Scope Management Overview, extract of the PMBok.

3.3 Crossing between flows and contents

Table 1. Crossing between flows and contents.

Flow / Content	Activity	Decision	Information
Objective	objectives validation	objectives specification and monitoring	mapping of objectives
Action	project process	process monitoring	process model
Deliverable	deliverable realisation and validation	deliverable specification and monitoring	mapping of deliverable

The dynamic of putting contents through the flows insures the project well evolution. In the opposite Table 1 explains the flow/contents cross-over.

Decisions taken during hierarchy meetings due to their overhead system's belonging aim at specifying and monitoring project objectives, monitoring (resources, planning, control) processes and specifying and monitoring awaited deliverables.

Information are then under processes models forms and objectives and deliverables maps forms. For decisions of who is responsible, information receivers are then explicit.

Activities realise project deliverables, processes (of conception, transformation…) are activated or stopped, deliverables are obtained and objectives can be controlled and validated by difference between deliverables embedded results and decision specified objectives.

This structure constitutes in itself the creation of a knowledge ontology in terms of project scope management. It is the knowledge necessary to realize project results.

This paper is about processes of decision of actors' selection in establishing the couple objective/actor in project management. A focus on decision flow contents has to be made, on flow of decisions relating to project objectives (their specification, their monitoring), to management activities (project processes monitoring) and to deliverables, to results of the project (their specification, their monitoring).

Table 2 matrix can be made:

Table 2. Matrix.

	Why	Aim	Space / referential	Consequences	Risk	State
Objectives specification and monitoring		■	■	■	■	
Process monitoring		■	■	■	■	
Deliverable specification and monitoring	■		■	■	■	

■ means that the cells are full (the matrix is detailed in following pages).

In this paper, we present the method used only on objective monitoring specifications. This general method can be used on process monitoring and deliverable specification and monitoring.

We are interested here in key actor selection. Our reference is the project repository inside which a risk analysis has to be done.

We define the project repository as criteria of decomposition of a project in "sub-projects" (or in "sub-objectives") with sharing of the responsibilities. It has to take into account two other spaces of expression :

- Space of expression of an objective (Specifications, detached-service warrant for the responsibilities). There are two types of objectives, those of projects (expected deliverable) and those of the process of choice (typologies of the objectives of a project).

- Space of expression of an actor (expected role, competence, curriculum vitae, previous experiences…).

We present then only the risks concerning the specification and the monitoring of objectives. We have listed four categories of risks: organization and skills, suppliers, planning / resources and industrialisation.

- Organization and skills:
  - Choice of the key men (the people in charge of the objectives).
  - No responsibilities clearly defined on the work packages.
  - Disappearance of a person in charge or a director of project.
  - Bad definition of the roles.
  - No training of the procedures of project management.
  - Conflicts in the allowance of the resources, in the choice of priorities.
  - Slowness of decision-making.
- Suppliers:
  - No supplier answers the need.
  - Planning / resources.
  - Under estimation of the needs of audit and evaluation process.
  - Under estimation of the needs of validation.
  - Difficult evaluation of the strategic impact of the plan of development on the resources, the methods.
- Industrialisation:
  - Transfer of knowledge.

4 Functional Analysis

This step is detailed in the article [3] named Definitions and Temporal Positioning of the Concepts linked to Decision Making in Industrial Project Design – DIKCORAC, Jean-Claude Bocquet, Julie Stal-Le Cardinal, Melbourne, ICED'05.

For the following, we will take one function issued of this analysis, as an example:

FP1: The system has to let the one who Makes Doing (MD) identifying the objective.

5 AMDEC

The table 3 illustrates the way we proceeded to detail the failings, the effects, the causes and the consequences of every function from the Functional Analysis. We take here only one characteristic function of our subject of studies but the AMDEC concerned all the functions of the Functional Analysis.

A synthesis of the complete table highlights the modes of failing the most frequent, the most important effects, the gravest consequences for the project, the most frequent causes.

Table 3. Extract of the AMDEC on the functions from the Functional Analysis.

Function	Mode of failing	Effect	Consequence on the project	Cause
FP1: The system has to let the one who Makes Doing (MD) identifying the objective.	The objective is not expressed	Stop of the corresponding project activities Activities are not monitored	Project is planted Or Important perturbations Or Acceptable drifts (stops, delays, non quality…)	Non treatment by MD _____ No transmission _____ Treatment has been done too late compared to the need _____ The state of knowledge does not allow the expression
	The expressed objective is fuzzy	Lack of visibility for the realization of the objective	Difficulties In the management of the objective	Incomplete knowledge to clarify fuzzy information _____ Rigorous lack of MD

The dysfunctions on the functions can pull six types of main consequences:

- a conflict between the project and the company: the project is incompatible with the stakes in the company.
- the project loses in quality and in time.
- M (the one who Makes) makes nothing.
- a lack of motivation of certain actors of the project who have no legibility face to face of the management of the company.
- the project is planted.
- the objectives are not reached.

The main causes of dysfunction are:

- incomplete information or insufficient state of knowledge.
- bad choice of M (the one who Makes):
  - forgetting of MD (the one who Makes Doing).
  - MD has badly chosen M.
  - M is too shy.
- fault of MD:
  - rigorous lack of MD.
  - Ignorance, incompetence of MD.
  - MD badly expressed himself.
  - MD badly chose D.
  - MD is too authoritarian.

Helped by the works done by J. Le Cardinal in her PhD Thesis [11], we so obtain a base of generic dysfunctions. Indeed, [11] tried to obtain a list, non exhaustive, of all the dysfunctions that may appear in a decision process. This large list enriches considerably our study. The chains of Markov allow then to make the link between a potential drift and a dysfunction which can ensue from it. We are then capable, as illustrates it the figure 4, of making a diagnosis, that is, foresee the dysfunction which risks to arrive.

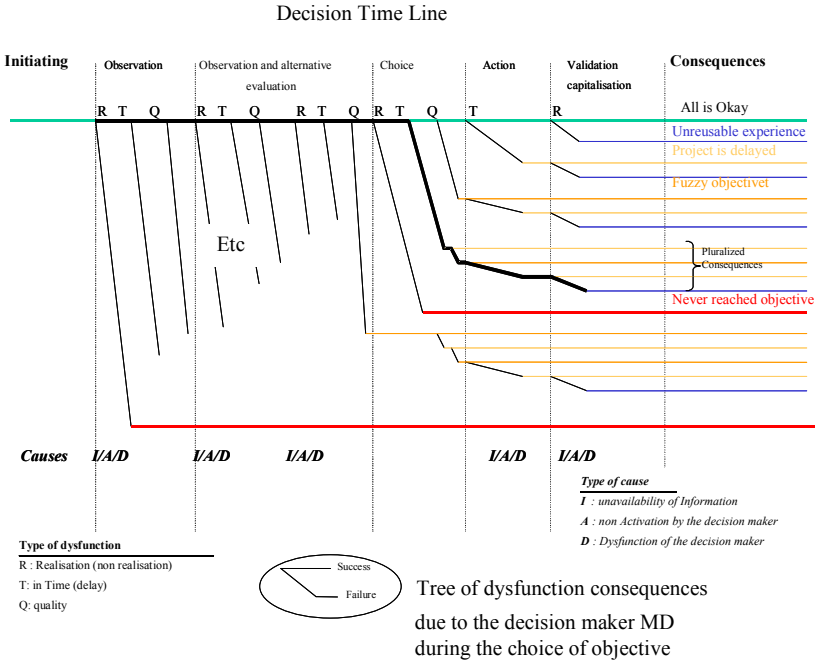

Figure 4. General principle of the diagnosis with the chains of Markov.

6 Chains of Markov

For FP1, the system of objective/actor selection participates in the interaction between two sub-systems: the Decision-maker sub-system (MD) and the Objective sub-system.

We have to be interested thus here in the consequences of the dysfunctions of MD and in the chain 1 of the dysfunctions of the system of objective/actor selection in phase of creation of objective (we limit ourselves, here, to FP1).

The figure 5 illustrates all the dysfunctions which could pull the non-identification of the objective.

FP1: The system has to let the one who Makes Doing (MD) identifying the objective.

Two information variables
Four control variable of the Chain of Markov:
V: Boolean variable: the couple (MD,O) is validated (O Global Objective)
Ip: The given information on the state of the project is correct and sufficient
Ie: The given information on the project environment is correct and sufficient
Oi: Identifiable objective

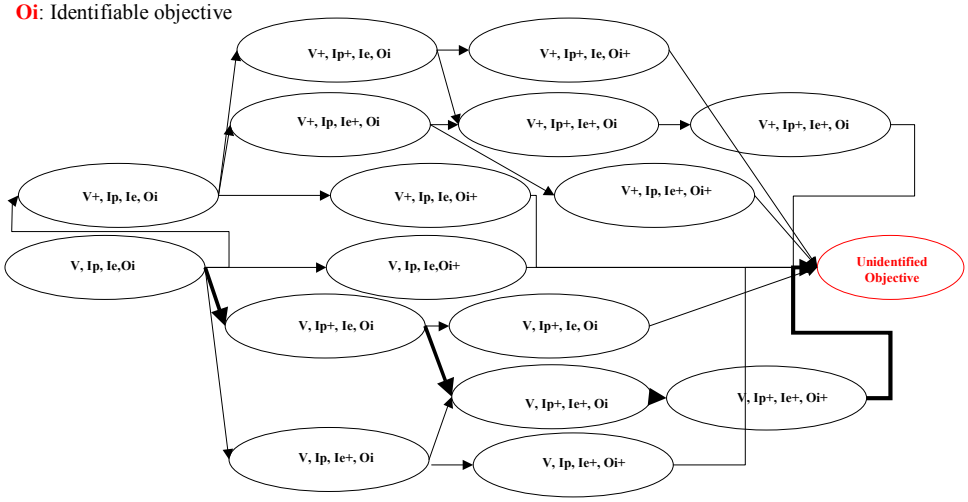

Figure 5. Chain of Markov for FP1.

For the identification of the need (objective), statistical analyses can be led on the follow-up of the dysfunctions by follow-up of the operational variables:

VaO: added value for the project by the aimed Objective (in Euro).

CO: supposed total cost (to realize the objective) Objective Cost (in Euro).

No time t (in hour / day / month / year).

VAR: added value really made by the objective at the instant t, acquired value (in Euro).

CR: how much the VAR really costs? Real cost spent at the instant t (in Euro).

S: predictable contribution to the Strategy (on a scale S from 0 to 10 for example).

K: predictable contribution to the Culture (on a scale K from 0 to 10 for example).

Cs: capacity to control the strategy (number of levels on scale S).

Ck: capacity to control the culture (number of levels on scale K).

V: Boolean variable: the couple (O,MD) is valid. Automatic validity come from the previous affectation(Yes / No).

Ip: the supplied piece of information about the state of the project is correct and sufficient Yes / No).

Ie: the supplied piece of information about the environment of the project is correct and sufficient(Yes / No).

Oi: Recognizable Objective (Yes / No).

The limit of the chains of Markov is the quasi-manual treatment of the information. That is why, we propose afterward a dynamic model of treatment of the information to automate the diagnoses when an actor in the company detects a possible failing.

7 Dynamic Model

The implementation of the general model was made in support of the analyses that we had supplied previously (analysis of the need and the analysis of the modes of failings), by looking especially for to describe a metrics allowing the analysis. We thus based ourselves on all the

functions which we had described in Functional Analysis to create the generic road of reflection, then on the analysis of the modes of failings, AMDEC, to remove in solution the effects of the failings of validation in the process.

The model created is thus a succession of process of validation having as inputs sets of controls recovering from factors which were beforehand estimated, and which lead to an analysis using a simple metrics, leading finally to a validation or a non validation of the process. This process gets organized in the following way:

- The first process is the validation of the objective:
    - The validation of the cultural and strategic factors.
    - The validation of the contribution of the objective to the project.
    - The validation of the global coherence with the implemented activities.
- The second process is the validation of the couple (Objective - MD) and which results of:
    - The validation of the information on the project (or the objective) with consideration of the result of the first process of validation.
    - The validation of the information inherent to the actor .
- The third process confirms the couple (Objective - M) by using a control with the second process. It also results of:
    - The validation of M's capacities.
    - The validation to convince the actor M.
    - The validation of the firm constraints in the choice of the actor M.
    - The validation of the compatibility of the actor with the resources.

Naturally all this last validations appeal to a backward control process at the level of the validation of the second process that is the validation of the couple (Objective - MD).

Finally, the fourth and last process is the validation of the expression of the non stabilization of the couple (O - M) by MD. This process allows in fact the revealing of the potential ability of MD to react in case of failing of the couple he chose. The process takes into account:

- The validation of the stabilization of the couple (Objective - M).
- The validation of the respect for the project.
- The validation of the respect for the company.

It also exists in this process of validation, the intervention of backward control process, notably at the level of the second and third processes with:

- The validation of the couple (Objective - MD).
- The validation of the couple (Objective - M).

However, this validation does not intervene alone, and are subjected to the stake in confrontation of several factors. So, we have create, for the needs of the model and in coherence with the definition of the notions which we had described in our scientific location, micro dynamic models allowing the establishment of a principle of " scoring " which will allow the future analysis. Naturally, the entities constituting these micro models have dynamic properties by attributing them control buttons corresponding to the evaluation of the user on the entities.

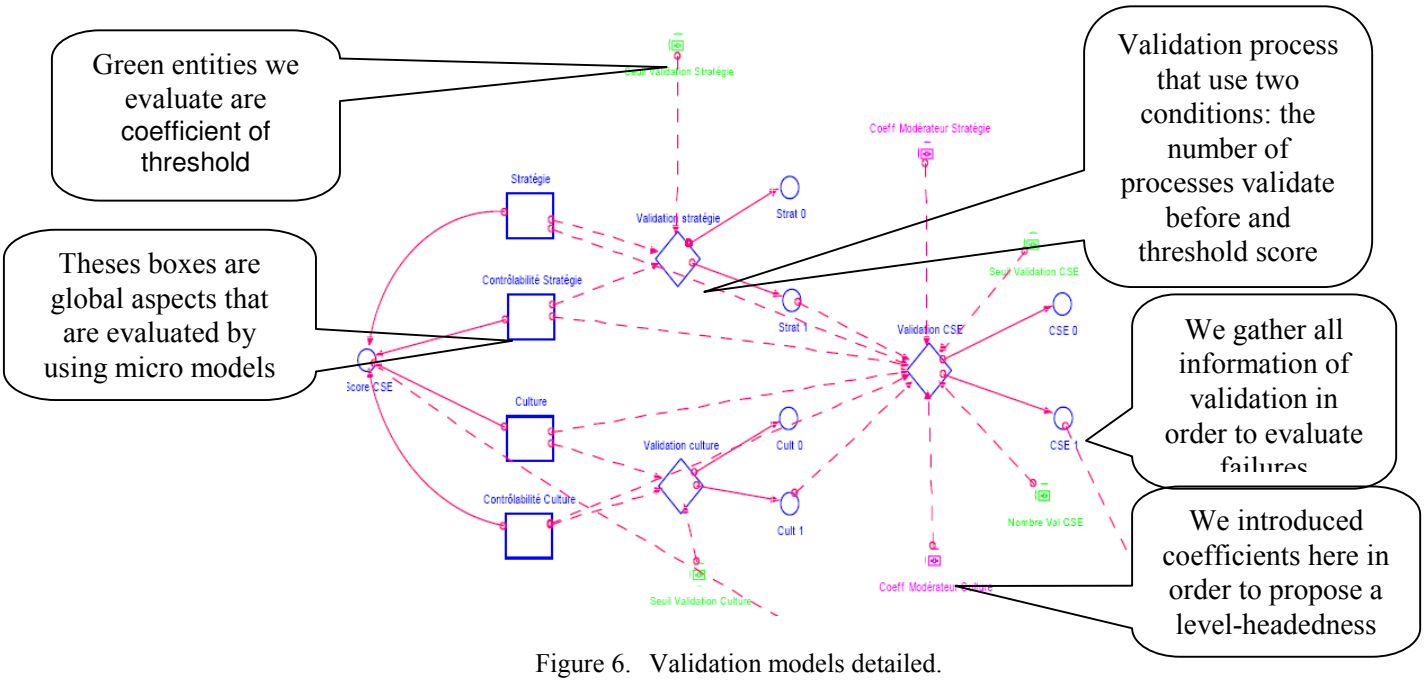

Figure 6. Validation models detailed.

We also set up coefficients of control allowing to validate the relative importance or at least the reliable rates granted to what we have just estimated. This allows to have a more objective opinion concerning given results that must be estimated.

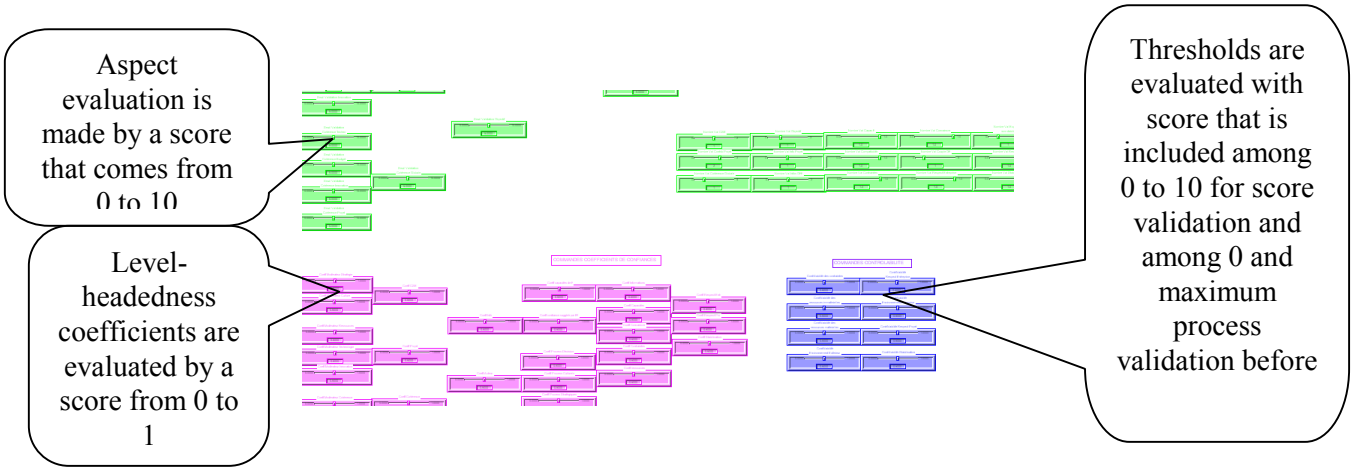

Figure 7. Evaluation and control boxes detailed.

Finally, our system was to be controllable that brought us to put indicators and factors giving validation or control thresholds. These thresholds have a double function, at first, they allow to appreciate the relative importance which we wish to grant to an entity, and in a second time, they allow to fix the importance of a process. They also allow to determine how many failings are acceptable to validate a process. Another principle was introduced, the "forced passage" showing a potential "human error" or at least the will of the actor to advance his desire to pursue the complete process even if a validation or a condition was not performed.

7.1 Details of construction of the model

Please, consult the article of Thomas Nguyen Van IDMME 04 [9].

7.2 Interests of the dynamic model

This model thus takes place as an advantage of two levels support:

- It allows especially and above all a dynamic analysis of the phenomena allowing to quickly simulate and re-simulate according to the modification or to the restructuring of factors. So, it allows to become aware quickly of actions to be envisaged.

- It allows to supply evaluations according to the characters felt by the project actor, and thus allows to supply him the most objective evaluation according to the uncertainties we can have on what we estimated.

8 Conclusion

Our dynamic model appears more particularly as a global tool of analysis allowing to feign failings and to target them, than a clear answer to dysfunction that appear. Indeed, this last possibility of answering to the dysfunctions cannot be made because of the generic aspect of the model as well in the principle of reflection as in the field of activity.

This model has five operational advantages. At first, it allows having a global vision and obliges the user to estimate all the characters inherent to his task. Then, it allows a logical organization of the constitution of the (Objective, Actor) couple by introducing every time the influential factors on the current process. Moreover, it allows feigning errors and thus dysfunctions so as to be able to target in advance the particular points which will have to retain an attention more supported on behalf of the manager. It also allows estimating the dysfunctions from a generic analysis which was made within the framework of the analysis of the failing modes, and thus to analyse first the important factors to be watched or to be modified. It allows finally involving several activities inherent to the management of the (Objective, Actor) couple by introducing the notions of project management (by means of a global coherence introduced throughout the model), of management of the decisions (by means of the successive evaluations and of the presented models of validation), and finally notions of management of the risks (by means of the awareness of the results supplied with the model simulation).

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