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Full Length Research Paper

Using an informational approach for the analysis of an industrial system: Case study

Taieb Ben Jouida

SEPE (Systémique, Energétique, Productique et Environnement), Tunis College of Sciences and Techniques (ESSTT), 5 Avenue Taha Hussein, BP, 56, Bab Manara, Tunisia.

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After a presentation of the cereal activities in Tunisia, we present, according to a systemic analysis approach, the grading system of cereals. A model describing the functioning of the complex system was established and was allowed the identifying of the information that ruled it. An information matrix was defined and elaborated, it enables the one hand to identify the produced and consumed information concerning each activity and on the other hand to determine the relations between the activities of the complex system.

Key words: Grading system, complex system, information system, OOPP method.

INTRODUCTION

The country alimentary security requires an efficient management of basic food resources that are necessary for the balance of its equilibrium socio-economic system. This management depends on the global environment constituted by the production, consumption and transformation system.

Because of its geographic context, climatic environment and social tradition and culture, Tunisia with its alimentary tradition based particularly on the consumption of cereals, shows an important deficit of the national production and cereal consumption.

The management of its cereal Resources must be efficient and the transactions between the cereal purveyor (farmers producers, importation, stokers at a delivery) and the clients (farmers for seed, stokers at a conservation, millers, transformation industry: baking, alimentary pastes, animal nutrition…) must be excised by a coherent and objective process based on the grading system of cereals.

In fact, it's the grading system that determines the price of transactions at the sales and at the purchases of cereals and consequently that excited the technical and juridical relations between the different interveners.

The object of this paper is to present the grading system at the Office des Cereals (OC) in Tunisia and to apply a systemic approach exploiting the Oriented Objective Project Planning (OOPP) method that allows us achieving a reliable information analysis.

GRADING SYSTEM OF CEREALS

The determination of cereal quality, on transaction on the organised market, is an indispensable operation to evaluate the cereal product and its aptitude in storage (Jlidi, 1998). But in spite its importance, this evaluation besides done with a simplest manner based on visual appreciation and on the manager good meaning, particularly at level of collection, only for the criteria relative to specific height and, in some cases, to humidity (DDQ, 2005).
Besides cereals like any other biological product, change during their storage when they are bad conserved, causing degradations of quality and loss in quantity.

The official circuit taken by cereals locally produced begin at the level of collection and lead to transform units passing by Silos and storage Units.

At every step, cereals undergo a qualitative evaluation allowing to check their loyalty and to determine its commercial value (OC, 2000) (OC, 2001) (ISO 950, 1979).This operation of quality evaluation of cereals is excised by a Grading scale (JORT, 1996) at the time of all operation of entrance or exit of cereals which principal points are: Basic Price (BP); Improvement (to add to basic price if cereals have higher quality); Reduction (to reduce from basic price if cereals have a low quality).
The cereal price is calculated:

Cereal Price = Basic Price + Improvement - Reduction

The different steps of the cereal grading process are: taking samples, samples analysis (specific weight, humidity and impurities) and price determination.

ANALYSIS OF THE GRADING SYSTEM

The model of the grading system of cereals that we propose means to describe the different activities of the process of cereal evaluation and to consider it like an information system (Annabi, 1998).

This model is characterised by quality specifications (specific height, Humidity, impurities ...) and management parameters (Reception, Analysis demand, Analysis results, Payment, Sampling...).

The number, the complexity and the interference of information exchange taken in the study of a model need a systemic approach (Annabi, 1999) defining the limits of the system (through establishing a communication between the outside environment) and identifying the principal activities and the parameters conditioning these activities.

The OOPP method, based on Zopp (Ziel Orientierte Projekt Planung) method was used (AGCD, 1991) (GTZ, 1991). This method identifies all the activities hierarchically classified and their associated parameters: responsible, resources (infrastructure, equipment, human resources, logistic resources, information resources…), timing, place, realisation indicators.

The OOPP analysis allows answering pertinent questions conditioning all establishing project (Gu and al., 1994; Peffers, 2005): What (result to achieve or activity to realise)? Who (responsible and his collaborators)? How (resources)? When (time)? and Where (place)?

We consider that the informational resources are determining on the strategic level and on the communication one. The determination of these resources constitutes the base of the information system (Cavelery, 1994; Jackson, 1995).

In fact, we reserve a particular importance to informational purpose and we consider all the parameters and all the functions like information that we must seize, treat and valorise. This information is evidently divided by the different activities taking into account their level.

Presentation of OOPP method

The OOPP method constitutes a tool of a global systemic modelling enabling to analyse a complex situation by a hierarchical decomposition until reaching an elementary level allowing an operational planning (Landry and al., 2000).

This method, widely used in the planning of complex projects, involves many operators and partners. In Tunisia, it was used in Development projects financed by bilateral or multilateral co- operation mechanism (with Germany, Belgium, Canada, World Bank…), in upgrading of different structures (Training and Employment through MANFORME project, Organisation of the Tunis Mediterranean Games, 2001…) and in restructuring private and public enterprises…

The two determining steps for an OOPP analysis are:

- The Scheme of Planning Project (SPP) that consist in establishing a global diagnostic of a situation by elaborating a Tree of Problems using a causal logic and by transforming it to a Tree of Objectives.
- The Scheme of Planning Activity (SPA) that, according to a logic « Medium - Detailed » lead to a hierarchic analysis of the results to achieve.

In fact, these steps constitute a preliminary action for establishing a Project that requires a global Piloting and Evaluation System (PES).

Information matrix associated to OOPP analysis

The identification and analysis of exchanged information by the activities indicate the dynamics and the communication between the elements of the system that we propose to study or to manage. So, we define an information matrix that establishes a correlation between activities and their information. The information concerning an activity can be classified in two categories (Souissi, 2002; Annabi, 2003):

- An imported information by an activity is supposed to be available: it is either produced by an other activity of the system, or coming from outside,
- The produced information by an activity reflects the state of this activity. This last information may be exploited by other activities of the project.

In fact, the produced information by an Activity can be considered like a transformation of imported information by this Activity.

In order to specify this information, we define an information matrix associated to OOPP analysis permitting to:

- Determine the relations between the activities or between the concerned structures,
- Identify the information sources,
- Determine the manner in which the information is exploited.

To make sure of the quality of information system, we define some logic-functional rules reflecting the coherence, the reliability and the comprehensiveness of the analysis by an information matrix in which the lines are relating to Activities and the columns to information. This matrix is constituted like this (Annabi, 2003):

- The first line is reserved to the first activity A1,
- The first column is reserved to the first information If 1 is

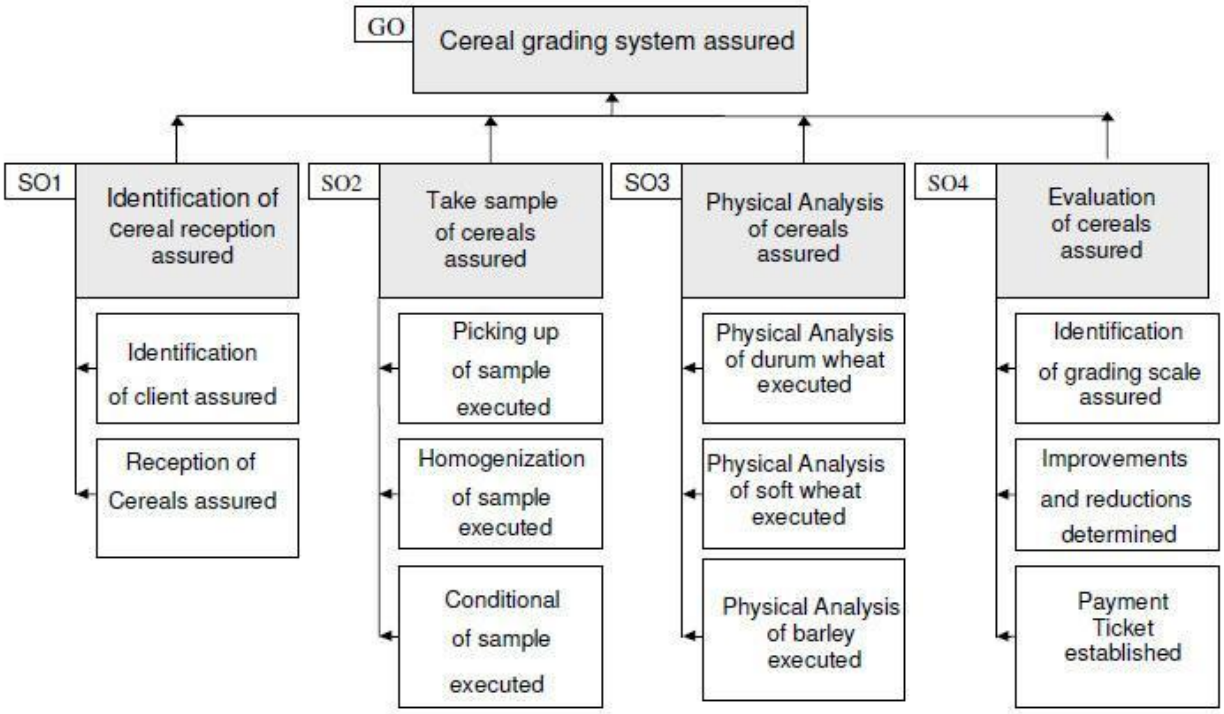

Figure 1. Tree of objectives of the cereal grading system

associated to this activity,
- If If1 is imported by A1, we inscribe « 0 » in the corespondent box, if it's produced by A1; we inscribe « 1 »,
- We pass after that to the second information If2 and we associate the corespondent binary character: « 0 » if the information is imported by the activity A1 and « 1 » if it's produced by the same activity,
- We proceed in the same way until all the information concerning A1 are exhausted,
- We pass after that to the second line corespondent to the second activity A2,
If If1 concern A2, we inscribe the corespondent binary number (0 or 1 according to this information is imported or produced), otherwise, we leave a blank in the corespondent box, then we add the new information that concern the current activity,
- We follow the same step as far as exhausting of all activities and of all corespondent information.

We finally construct progressively a matrix of big dimension if the system is complex; it's constituted of « 0 », « 1 » and « blank ».

OOPP model of the grading system of cereals

The model of grading system of cereals developed is complex. The OOPP method applied to this system has enabled, by its steps of analysis and planning, to understand better and better the description of this model and to facilitate after that the different expressions of relations constituting this model.

The global objective of the model: Cereal grading system assured lead to an analysis of the different steps proceeded in the evaluation system of cereals. A Tree of Objectives (Figure 1) modelling the cereal grading system is presented after validation by the experts.

An analysis of imported and produced information of cereal grading system was done and an associated glossary of this analysis was established.

Information matrix of cereal grading system

In our approach, we consider every element of cereal grading system (Grading Parameters, Cereal variety, Reception ticket, demand of analysis, Analysis ticket, Payment ticket, Cereal sampling ticket...) like an information that can be expressed according to other information (Number of order, date, quantity...).

By exploiting the precedent information matrix defined (Figure 2), we constitute an « Information Matrix of the Grading System of Cereals» (IMGSC) where we give in the last column the different relations excising this system.

The information matrix associated to the model of cereal grading system, allows first to determine the relations

N°	Code	Activity	If	If	If	If	If	If	If	If	If
1		A	0	0	1	1					
2		A		0	0		1	0			
3		A	1	0	0	0		0	0	1	
4		A									

Figure 2. Information matrix of the OOPP method.

Table 1. Analysis of the specific objective 4.

N°	Code of activity	Activity	Imported information	Produced information
1	SO4	Evaluation of cereals assured	N°AT	N°PT
2	R4.1	Identification of agreage scale assured	NatCer, N°LtCer, VPA, BPQl	
3	A4.1.1	Identify the grading scale of durum wheat		GSc_1
4	A4.1.2	Identify grading scale of soft wheat		GSc_2
5	A4.1.3	Identify grading scale of barley		GSc_3
6	R4.2	Improvements and reductions determined		
7	A4.1.1	Identify the improvements to add to basic price		CdImp, VImp,
8	A4.1.2	Identify the reductions to reduce from base price base		CdRed, VRed
9	R4.3	Payment ticket established		
10	A4.3.1	Cereal price determined		TotImp
11	S4.1.3.1	Determine the total of improvements		
12	S4.1.3.2	Determine the total of reductions		TolRed
13	S4.1.3.3	Determine the gross price		GP
14	S4.1.3.4	Determine the deduction		Ded
15	S4.1.3.5	Determine the net price		NP

between the activities defined in the descriptive table of tree of objectives, and secondly to identify and to exploit the information sources that constitute the different parameters of the model.

The complete OOPP analysis of cereal agreage system released 263 activities giving 279information. We distinguish various types of information source: declarative (name, N° Lot…), measure (Specific weight, Percentage of impurities, time…), data base (Grading scale, Sample protocol, Homogenisation protocol, Basic price…), valorisation (Improvement value, Reduction value, Net price…).

Table 1 presents, in a linear form, some parts of analysis of Specific Objective 4 (SO4) and precise the information field concerning activities and specifying the imported information (Imp.Inf) and the produced information (Prod.Inf).

Table 2 presents a part of the information matrix IMCGS relative to SO4. Every imported or produced information by an activity is codified: N°AT (number of analysis ticket), N°PT (N° of payment ticket), NatCer (cereal nature), N° LtCer (number of cereal lot), VAP (value of grading parameter), BPQl (basic price per quintal).

Conclusion

The complexity of the grading system of cereals and the important number of the information intervening in its constitution enables to elaborate a systemic method allowing the facilitating of system.

The OOPP method of analysis that we extended was permit to describe the information exchanges between

Table 2. Example of the IMGSC relative to the specific objective 4.

N°	Code \Inf	223	224	225	227	228	229	235	236	237	239	240	241	Relation
1	T4.1.3.1.1	1												$TotImp_1 = VImp_{1.1} + VImp_{1.2} + ...+ VImp_{1.14}$
2	T4.1.3.1.2		1											$TotImp_2 = VImp_{2.1} + VImp_{2.2} + ...+ VImp_{2.12}$
3	T4.1.3.1.3			1										$TotImp_3 = VImp_{3.1} + VImp_{3.2} + VImp_{3.3} + VImp_{3.4}$
4	T4.1.3.2.1				1									$TolRed_1 = VRed_{1.1} + VRed_{1.2} +....+ VRed_{1.14}$
5	T4.1.3.2.2					1								$TolRed_2 = VRed_{2.1} + VRed_{2.2} +....+ VRed_{2.12}$
6	T4.1.3.2.3						1							$TolRed_3 = VRed_{3.1} + VRed_{3.2} +VRed_{3.3}+ VRed_{3.4}$
7	T4.1.3.5.1	0			0			0			1			$NP_1 = GP_1 + TotImp_1 - TolRed_1 - Ded_1$
8	T4.1.3.5.2		0			0			0			1		$NP_2 = GP_2 + TotImp_2 - TolRed_2 - Ded_2$
9	T4.1.3.5.3			0			0			0			1	$NP_3 = GP_3 + TotImp_3 - TolRed_3 - Ded_3$

the different elements of the complex system and to define the different parameters intervening in the constitution of the model. An information matrix associated to this analysis was allowed to identify the information sources and to determine the relations between the activities, permitting then a cereal evaluation and a contribution on the first hand, to reduce the conflict or non objectively representatives situations and on the other hand to establish consensual and more objective support.

This kind of analysis allows us to specify the information system in order to elaborate a management and conduct tools of projects; then the development of the data processing supports will be facilitated.

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