

From Retrospective to Predictive: Risk Analysis in Algerian Agricultural Development Projects

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ABSTRACT

Today, investors want a larger visibility on the validity of time limits and on potential financial losses. The study concerns the risk analysis of agricultural projects. On a sample of project achieving enterprises working in wilayas belonging to three zones: mountain, steppe and desert, a qualitative analysis made to assess the severity of the causes of risks and a quantitative analysis made on several simulations during the achievement of the project by random edition (type Monte Carlo simulation leading to cumulated probability distributions, it will result a classification of potential risks and an assessment of contingency reserves for risks (time limits, cost) for parts of works of the project. These results highlight the importance of the risk analysis in the full success of the project management

INTRODUCTION

A study about the projects financed by the World Bank (1974-1988) showed that 63% of the projects among 1778 had known a significant increase of costs (BALOI). For the same period upon 1627 finished projects, the delays had been sometimes from 50 to 809% (Lam) if a finished project can be abandoned (Didier). These figures justify by themselves an increasing need for the mastery of project risks.

The project risk corresponds to an event or a situation where the uncertain achievement would have a positive or negative impact on at least one objective of the project such as the time limits, the cost, the content or the quality. A risk can have one or several causes and if achieved it can have one or several impacts. (Briault ET Dumont, 2004.),

The project management has known three levels of the project conduct according to G.Garel (2003), those where the project conduct is lead from the referential built on the basis of what we want to get, those where this referential starts from returns of experiences concerning then assessments (duration, load) and those which assess what can happen and consider the risks.

In order to anticipate project risks this work considers the third level of maturity which takes into account the potential risks. For this purpose, an assessment ex post of projects will be the work basis of classification and risk assessment encountered to enrich the assessment ex ante.

Risks consideration interests various fields such as entreprise management, insurance field, This work concerns the risk management in the framework of the conduct of project activities of the agricultural development in three zones, mountain, steppe and desert

For this purpose, specific methods are used to analyze the risk: identification and classification of risks, modelisation based on stochastic processes and finally assessment.

MATERIALS AND METHODS

1. Risk analysis selected methods

The academic research and professional or normalized institutions (PM Book...) identify two large categories of approaches to study risks project in various sectors; analytic approaches and symptomatic approaches

Analytic approaches: are interested by the identification of events and the characterisation of their possible effects on the project forwarded to actors in charge of the operational and tactical conduct of the project (project head, risk manager)

Many authors have worked on the analytic approaches mostly described as a process of risks management (courtot, 1998), (chapman ET ward, 1997), (carter et al, 1994), (Gautier, 1997), (Simon 4997), (Blaison, 1992), (Cooper et al. 1987), (Layouyot, 1997), (Lopez Monsalvo, 1998). These authors present in a detailed way the stages of the risks analysis process identification, hiearchisation, classification, response plan to risks. For the assesement of the impact of the risk the project will be calculated on the basis of the impact of each objective

of the project in a separate way, that is to say, the objectives of the project are independent from each other. After that, it gives to each risks its probability to occur and the impact which results if it would happen (Hullet, 2007). In this way, the procedure helps to classify the risks according to the strongest severity in listing from a noting table established by PMBOK (see table 1). The calculated severity will be classified in the right way in order to establish after that, the response plan; they can be worked with the identification of condition which should start the execution. According to (PMBOOK...2009), three strategies usually deal with the threats or risks which if they come to happen can have negative impacts on the objectives of the project. These strategies can help to: avoid, transfer or reduce risks.

The Symptomatic Approaches: focus on a global risk analysis in finding out the symptoms, visible occurrences of risks on project indicators. These approaches are particularly sent to external managers of the project (financial directors, project fund managers, investors....).

The using of the MONTE CARLO method is based on a numerical calculation working through random choice. In choosing to perform K simulations of project achievement, the frequency of occurrences of events is proportional to respective probabilities of each risks, this in relation to a series of numbers generated in random by the machine.

- Risks $1, \dots, i, \dots, n$ occurs, or does not occur in relation to the random number $1, \dots, i, \dots, n$
- Costs impacts $1, \dots, i, \dots, n$ are totalised (or respectively not taken into account)
- This for j from 1 to k

For each loop, the total of the most probable costs is classified in a histogram of frequencies. We obtain the number of cases of pickings obtained by interval of costs. In gathering the values of frequencies on the axis of costs, we obtain the points allowing to draw the curve of gathered probabilities. In doing several successive calculations, we can notice that the curve of gathered probabilities obtained varies slightly beyond $k = n$ iterations.

Consequently, the curve of gathered probabilities on the criterion of time limits (giving the probability of delay of the project) can't be drawn as easily in such a way that all the delay undergone by a combination of risks is not equal to the sum of impacts on delays of these risks.

This is essentially explained by the mechanisms of the project planning.

- Some tasks impacted by the risks are on the critical way;
- Other tasks impacted by the risks have spaces which fortunately have no impact on the time limits of the project.

We maintain the two approaches to identify the project risks of the agricultural development.

2. Data

The study is based on the assessment of project risks of the development obtained from the program NPAD (National Plan d' Agricultural Development) (1999-2009).

The study of areas is devoted to the National office of the Rural Development (N O R D). The concretisation of the investment of structuration of areas is realised according to technical notes furnished by several enterprises selected by ... Agricultural General concessions (A.G.C)

The analytic approach was based on interview of achieving enterprises working in different wilayas visited during our investigation in 2015. On a random sample of 15 wilayas situated in three ecological zones: mountain, steppe, desert.

The symptomatic approaches in applying the MONTE CARLO method through the software of risks management PERTMASTER V8 (chevassu, 2003). The data are based on the exploitation of the report bidding which has allowed us to see that the assessment, of the bids for costs vary more or less between 20% and 30% in relation to those of the designed enterprise; for the time limits they between 20% and 40%, so an average of cost of 25% and 30% for time limits.

RESULTS AND DISCUSSION

1. Identification of problems:

The identification of problems is a very important stage in such a way that it defines the efficiency of all the others.

This work has resulted in a first registration of problems encountered during the past projects through their different stages

2. Qualitative risks analysis

After the calculation of the medium probability the average impact for each we obtain the severity a comparison of results of those in charge of the follow-up of works and the enterprises to have a better subjectivity of interviewed, the strongest severity are considered and the results are shown in table 01

Hierarchy of risks

A classification of risks on the basis of their severity leads to three categories of risks; risk demanding a short term response, risk demanding a middle term response, unknown risk to be followed up

Risk	Summary 15 Companies and 15 Monitoring Charges	Average $\sum p_i \cdot x_i / n$	Average $\sum l_i \cdot y_i / n$	severity
Quality Risk	Launch of the specifications without prior studies.	0,55	0,31	0,17
	Lack of qualification of staff.	0,71	0,22	0,16
	Lack of competence.	0,55	0,28	0,15
	Poor quality of the plants.	0,46	0,27	0,12
Cost risk	Lack of maturity of the project.	0,63	0,33	0,21
	Under evaluation of the volume of the stain.	0,54	0,36	0,20
	Absence of soil study.	0,50	0,21	0,11
	Failure of the Client.	0,43	0,19	0,08
Risk delay	absence or insufficiency of delegation of powers	0,73	0,35	0,25
	weak financial means, delay in payment	0,74	0,33	0,24
	Absence of prospection of the material.	0,73	0,32	0,23
	Establishment of planning without methodology.	0,73	0,30	0,22

Table 02: List of risks requiring a short-term response

ID	Description of risks	criticality
02	incorrect assessment of the duration of tasks	0,25
13	weak financial means, delay in payment	0,24
03	Late intervention of controls	0,23
10	Short time imposed difficult to control	0,22
07	Lack of background of roulemet of beneficiaries	0,21
01	No schedule update	0,20
05	lack of tools and methods	0,19

Table 03: List of risks requiring a short-term response

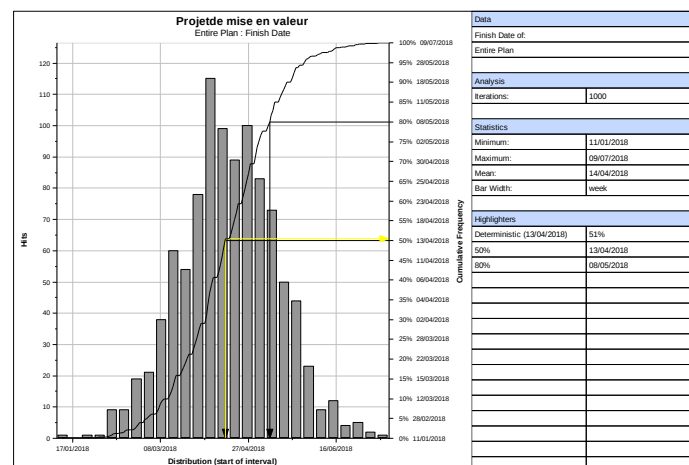
ID	Description of risks	criticality
08	Launch of the specifications without studies	0,17
07	Lack of staff qualifications	0,16
03	Unexpected difficult terrain conditions	0,15
04	Absence of prospection of the material	0,11

3. Quantitative risks analysis

The results of the Monte Carlo simulation show that the date in which the tasks are finished with the most probable duration (the ending date CPM/ generally shows with a yellow arrow which gives the percentage of probability. The probability to respect the assessment of time limits is of 51% (probability registered in front of the deterministic date). The reserve of time limit to reach 80% is 19 days which is about 5% of time limit corresponding to the most probable assessment

Table 07: Summary of Provisions

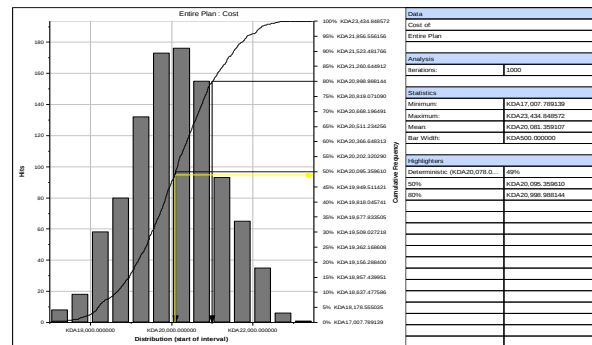
Probability	date	Provisions in days
Deterministic : P-51%	13/04/20010	
P-80	08/05/2010	19 jours

**Graph 01: results of Monte Carlo simulations on project deadline**

The probability to respect the assessment of cost (total cost) 20.095.000.00 DA is 45% (deterministic cost). The reserve of cost to reach 80% is 20.998.000.00 DA which is about 4% of the sum of 20.095.000.00 corresponding to the most probable estimates.

Table 08: simulation results (cost)

probability	Amount	reserve
deterministic : P-49%	20.095,35 KDA	
P-80	20.998,98KDA	903.000,00DA



Graph 02: results of Monte Carlo simulations on project cost

For the development project, the initial assessment of 20078800 DA had been reassessed in 2004 to 21.190.800 DA with a difference of 1.112.000 DA representing a percentage of 5%. The result given by the Monte Carlo simulation had given a provision of 903.000 DA representing a percentage of 4%

4. Response Plan

Once the risks are classified in order of priority going from the strongest severity to the weakest one in the qualitative risk analysis (risk demanding a short term responses and meeting a supplementary analysis, registered the watch list). These responses are inspired on the combination of the responses received by the interviewees and are summarized in the following tables:

Table 09: Answers to risks demanding a short term answer

ID	Risks/ answers	severity
RM13	Late intervention of controls	0,23
	Review of the clauses of the control agreements. And diversify the control partners.	
RT17	Under estimation of the complexity of the tasks	0,20
	Improve the quality of the studies and the implementation of a device of contradiction in the study	
RM09	Financial fragility of the company	0,19
	Handle the causes of the delays in the payment	

Risk mitigation implies a reduction in the probability and/or impact of an adverse risk to be within acceptable threshold limits

Table 10:: answers to the risks requiring an additional analysis

ID	Risks/ answers	severity
RT13	unforeseen ground conditions	0,16
	Improve the quality of the identification of needs and avoid as possible launching works without preliminary prospecting of equipment bids.	
RT4	Absence of prospecting of plants and equipments	0,15
	Improve the quality of the identification of needs and avoid as possible launching works without preliminary prospecting of equipment	
RT02	Absence of soil studies	0,11
	To improve the quality of the identification of needs and to avoid, as far as possible, starting work without prior soil studies	

Table 11: Low priority risks on a watch list

ID	Risks/ answers	severity
RT1 1	Appearance of new needs not identified at first to	0,07
	Improve the quality of the identification of needs.	
RT0 6	Under evaluation of the volume of the task	0,06
	improve the quality of specifications	
RT9	Change of the initial design	0,05
	improve the quality of identification of needs, feasibility and technical solutions	

It is difficult to associate for each risks answer strategy (avoid, reduce, transfer, accept) a monetary value as it appears on another risk. Also, it is very difficult to experiment it for the first time, nevertheless, it is possible to proceed to analogies with realized projects experiments and so to determinate from one project to another one the monetary value affected to the risk and the answer strategy for this risk. Lastly, when this is possible, it is easier to not make allocation and to keep the global amount. This amount is spent during the going on of the project, during the occurrences of the risks as identified by the analysis and the occurrences of unforeseen risks which were not identified by the analysis.

CONCLUSION

The mastery of risks in the development process is only feasible in terms if the risk is detected in the preliminary stage of the development.

The analysis, lead during the launching of the development project permit to record clearly the amounts of money allocated to finance the risks which come to appear. During the project this risks analysis based on this predisposition to risks, becomes an aid to decision particularly during the coordinating meetings. In this way, the catter will complete the S curve (initial budget) for piloting the financial amount of the means over the tasks of the project.

The development through the creating of agricultural groups has lived potential risks (environmental, technical, organisational) after the assessment of the severity of the prevailing causes; it is obvious that a large part of potential risks result from technical and organisational aspect. The reduction of these potential risks is in need of a short term answer which will be covered by the Monte Carlo simulation

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Table 01: severity of the causes of the risks



Probability	Threats					Opportunities				
0.90	0.05	0.09	0.18	0.36	0.72	0.72	0.36	0.18	0.09	0.05
0.70	0.04	0.07	0.14	0.28	0.56	0.56	0.28	0.14	0.07	0.04
0.50	0.03	0.05	0.10	0.20	0.40	0.40	0.20	0.10	0.05	0.03
0.30	0.02	0.03	0.06	0.12	0.24	0.24	0.12	0.06	0.03	0.02
0.10	0.01	0.01	0.02	0.04	0.08	0.08	0.04	0.02	0.01	0.01
	0.05/ Very Low	0.10/ Low	0.20/ Moderate	0.40/ High	0.80/ Very High	0.80/ Very High	0.40/ High	0.20/ Moderate	0.10/ Low	0.05/ Very Low

Impact (numerical scale) on an objective (e.g., cost, time, scope or quality)

Each risk is rated on its probability of occurring and impact on an objective if it does occur. The organization's thresholds for low, moderate or high risks are shown in the matrix and determine whether the risk is scored as high, moderate or low for that objective.