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Modeling of an intelligent computer system for the choice of investment project

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Abstract

Investment funds and actors of the venture capital (Emmanuelle.D, 2006; Zopounidis.C,1990) are brought to handle a large number of projects to make a good investment and reduce the risk of a decision which can be fatal. Also, companies are brought to invest in a project of equipment or development to insure their sustainability. To guarantee the choice of the most profitable project it is necessary to consider all the factors which can influence on this choice. The statistics show that the projects refused and accepted by the competitors give good results. On the other hand some choices turn out catastrophic. The scientific absences of method and tools which can help to choose well increase the risk of a bad decision. This one can be stressed by the following factors: 1) The deficiency of competences, the Prejudice arising from beliefs, problem of knowledge extraction, etc,2) Overload work caused by temporal lack of the qualified human resources, by pressure and stress, etc., and 3) Inexistence of a reliable process and an effective business rules. In this paper, we first give a classification of parameters involved in analyzing an investment project (Palcice.I & Laclic.B, 2009). Subsequently we propose an organization of these, on the basis of neural networks in order to contribute to the construction of an investment project model.

Keywords*: Investments, neural network, make decision*

1. Introduction

Due to globalization, opening of borders and technological developments, the contemporary business must face a significant increase in competition and a significant change in to customer behavior. All these changes have produced concerns, complications and sometimes crisis in business. These are forced to change their ways and their decision-making, innovating, being more responsive and integrated tools and smart solutions to maintain their competitive position and work for their development.

The business intelligence (Rejeb.L, 2005) provides a set of specific information that support and facilitate effective decision-making that enables the identification of opportunities and forecasts. Research in the field of business intelligence plays an important role in promoting the competitive position of companies. This is the only way to survive and continue, given the urgent need to adapt to a changing environment, and cope with the increasing volume of information.

In this context, we try to provide investment funds a tool for decision support to optimize the selection of good projects for a creation or a development company. This ambition, which part of our research area involves the development of an effectively mathematical model. Therefore, we present in this paper a step of our research, which introduces in the selection of investment projects using neural networks.

2. The evaluating process for business project creation or development

As shown in Figure 1, the evaluation process involves three steps namely:

Figure 1: evaluating process for business project creation or development

a. **Identification Step: t**his step include the initial formulation of ideas for each project and identify its objectives and their consistency with the investment fund strategy, its type of investment and its priorities.

b. **Filtering Step :** this step is an extension of the previous one it allows the classification of projects pre-selected according to quantitative and qualitative approaches. These are often quantified in an arbitrary manner without relying on a scientific approach.

c. **Selection Step :** after the preparation phase, which includes, substantially the economic feasibility studies, comes the stage of differentiation in which the company can choose the best projects, which guarantee the achievement of specific objectives.

In the following we present an approach which consists in evaluating a project based on an evaluation grid of the criteria identified in the study and analysis of a business plan.

3. Criteria for evaluation of a business project creation or development

The business plan (Riad.S, 2005; Lantz.J-S, 2004) shows vision of entrepreneurs about their company and gives, if done well, a clear idea of the project creation and development. To invest in a business, investment funds make a projection of the elements identified in a business plan on a kind of grid that represents the criteria taken into account to evaluate the quality of a project (Figure 2 summarizes some of the organization by category hierarchical evaluation criteria).

Figure 2: symbolic representation of the hierarchy of axes considered in the evaluation of business plan

We note that investment funds rely more on qualitative and quantitative criteria. Figure 3 shows the criteria categories that are taken into account in a qualitative study of evaluation projects.

Each investment fund has its own evaluation grid that classifies the categories of criteria according to their level of importance. However, the majority of them usually take into account, with great care, the quality of the management team. Investors prefer teams well established, more experienced and already knowing the commercial area of the business.

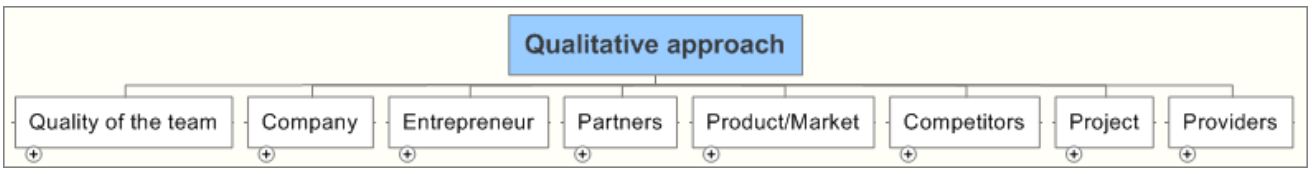

Figure 3: the qualitative approach

To evaluate a project, some investment funds established three grids:

- One to evaluate the criteria against each studied case by giving a rating or qualification. The evaluation at this level is often qualitative:
  - a mention type: Excellent - Very Good - Fair - Very bad
  - an evaluation type : ++, +, -, --
- Another grid to the degree of importance given to a set of criteria such as "Very Important", "Important" or "Few Important".
- One more grid which classifies the differents categories by a priority coefficient

Of course, it is not here a rule or standard but an existing practice.

Note that the importance and the choice of priorities differ from one investment fund to another.

4. The impact of the human dimension in the choice of an investment project

According to (Herbert A.S, 1983) the decision making focuses on the human element and psychological aspects.

4.1. The subjective nature of investment decisions

The decision making process is a judgment made by one or more persons (Harrison E.F, 1987). The value of each judgment may be influenced by several factors:

- The socioeconomic context
- Situation of the evaluators relative to their professional environment and also family.
- Evaluation performed individually or collectively
- Quality of relationships between makers.
- …

The quality of the evaluation grid of an investment fund may be poor:

- The systematic application of a winning model to others areas where is not necessarily applicable.
- No continuous revision of their grid to correct the supposed quantifications of qualitative values, from the analysis of the situation of the company in post-funding.

Result, the choices are not always objective. Hence the need to correct the data values initially with a learning method.

4.2. Capital entrepreneur

Performance figures and statistics alone can not always make a good decision, so the manager's biography, resources and profit-sharing, for example, are all important to get an idea about the management and functioning of one the company. Similarly, the majority of investment funds take into account very carefully evaluating the quality of the management team. Investors prefer teams well established, more experienced and already knowing the commercial area of the business. And it is in this axis we chose to study the postman "entrepreneur" and its role in the selection and evaluation of an investment project.

5. Criteria Analysis related to the entrepreneur

The framework of this article does not allow us to make an assessment of all categories of the criteria taken into consideration in the investment decision (Tarek.M, 2006) in a business project creation or its development. We have chosen to illustrate our approach through evaluation of the entrepreneur. We begin by highlighting and sort criteria for the evaluation of a entrepreneur and we propose a reformulation subsequently constructed based on neural networks.

5.1. Criteria identification and classification related to the entrepreneur

The importance of the factor "entrepreneur" is highlighted when projects are rejected immediately if the management team of a company is devoid of managerial competence or experience in the areas specified by the project studied. To do this we developed a detailed study to determine a set of criteria and indicators to be considered in an evaluation process.

Figure n°4 summarizes the main types of criteria that are taken into account during the evaluation process of an entrepreneur.

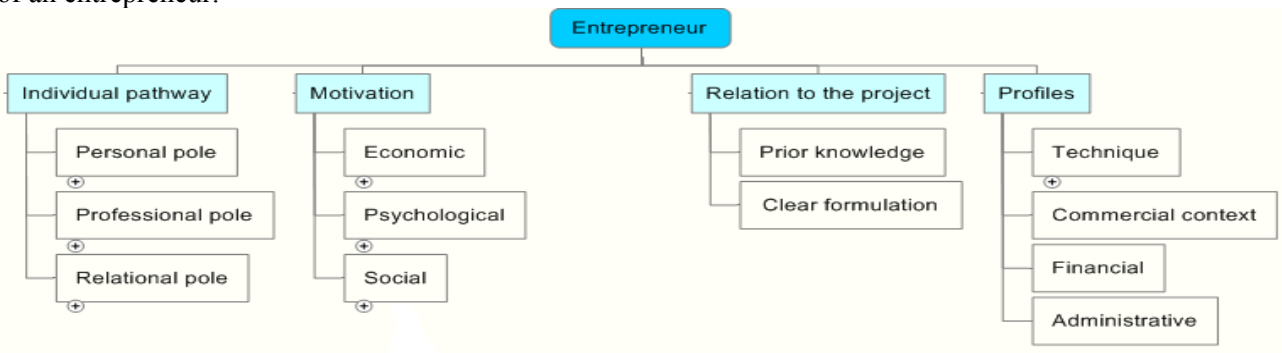

Figure n°4: categories of criteria for evaluating an entrepreneur

5.2.Neural networks application in an entrepreneur's evaluation

Since the beginning of the 1990s, the artificial neural networks that are commonly used in applied physics, were added to the management sciences as a method of quantitative prediction, next to classical statistical methods. They are particularly used in the finance field (Gérald.P, 2006; Ali.I & A.Abran & Mbarki.S, 2004).

We begin by showing in the form of networks of neurons (Figure n°7) the main criteria reflected in the evaluation of a entrepreneur.

- **Implementation by neural networks:**

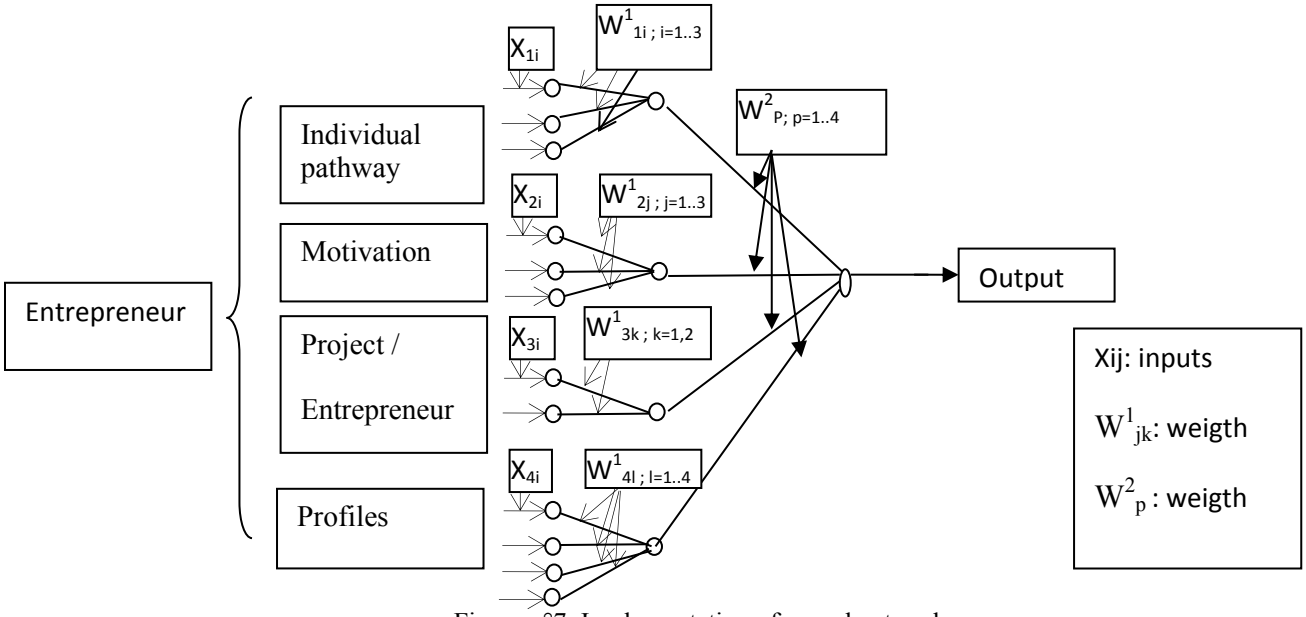

Figure n°7: Implementation of neural network

- **Parameters Meaning**

Criteria		X_{ij}
individual pathway	Personal Pole	X_{11}
	Profesional Pole	X_{12}
	Relational Pole	X_{13}
Motivation	Economic	X_{21}
	Psycological	X_{22}
	Social	X_{23}
Project / Entrepreneur	Prior knowledge	X_{31}
	Clear formulation	X_{32}
Profiles	technique	X_{41}
	Commercial	X_{42}
	financial	X_{43}
	Administrative	X_{44}

The values X_{ij} are determined using the following scale:

0	Mediocre
1	Medium
2	Good
3	Very Good
4	Excellent

The values W^1_{ij} are determined using the following scale:

1	Unimportant
2	Important
3	More important

The values W^2_{ij} is determined using the following equation:

$$W^2_P = \text{Average}\,(W^1_{ij})$$

Figure 8 : Setting Mismatched of the neural network of Figure 7

- **The method principle :**

We will consider each subcategory constituting the entrepreneur as a criterion in neural network whose output becomes the input of a new sub neural network until obtaining a result supervised or unsupervised.

(1) : $Y_1 = f(\Sigma W^1_{1i\,;\,i=1..3}\ X_{1i})$ with $W^1_{1i\,;\,i=1..3} = W^1_{1i\,;\,i=1..3} + \Delta W^1_{1i\,;\,i=1..3}$

(2) : $Y_2 = f(\Sigma W^1_{2i\,;\,i=1..3}\ X_{2i})$ with $W^1_{2i\,;\,i=1..3} = W^1_{2i\,;\,i=1..3} + \Delta W^1_{2i\,;\,i=1..3}$

(3) : $Y_3 = f(\Sigma W^1_{3i\,;\,i=1..2}\ X_{3i})$ with $W^1_{3i\,;\,i=1..2} = W^1_{3i\,;\,i=1..2} + \Delta W^1_{3i\,;\,i=1..2}$

(4) : $Y_4 = f(\Sigma W^1_{4i\,;\,i=1..4}\ X_{4i})$ with $W^1_{4i\,;\,i=1..3} = W^1_{4i\,;\,i=1..3} + \Delta W^1_{4i\,;\,i=1..3}$

The last equation is: $S = f(\Sigma Y_{i=1..4}\, W^2_{P;\,p=1..4})$ with $W^2_{P;\,p=1..4} = W^2_{P;\,p=1..4} + \Delta W^2_{P;\,p=1..4}$

- **In our example:**

S = Average $(\Sigma Y_{i=1..4}\, W^2_{P;\,p=1..4})$

In our example, we will treat only one iteration, ie there will be no ΔWi. This corresponds to a pre-funding evaluation. We will subsequently treated, in another article, the general case with the integration of the corrections of initial quantifications by the use of machine learning technics in post-funding business situations.

- **Application**

For example, we show three examples (see Tables 1, 2 and 3), respectively with high, medium and low quantization.

Criterias		Xij	W^1	f(∑Xi*W1) = ∑Xi*W1	W^2_P	Output
individual pathway	Personal Pole	4	2	**20**	2,00	**56,25**
	Profesional Pole	3	3			
	Relational Pole	3	1			
Motivation	Economic	3	3	**30**	3	
	Psycological	3	3			
	Social	4	3			
Project / Entrepreneur	Prior knowledge	4	2	**16**	2	
	Clear formulation	4	2			
profiles	technique	4	1	**28**	2,25	
	Commercial	3	2			
	financial	3	3			
	Administrative	3	3			

Table 1: an evaluation example with a good quantification of an entrepreneur's criteria.

Criterias		Xij	W^1	f(∑Xi*W1) = ∑Xi*W1	W^2_P	Output
individual pathway	Personal Pole	3	2	**17**	2,00	**46,13**
	Profesional Pole	3	3			
	Relational Pole	2	1			
Motivation	Economic	3	3	**24**	3	
	Psycological	2	3			
	Social	3	3			
Project / Entrepreneur	Prior knowledge	2	2	**10**	2	
	Clear formulation	3	2			
profiles	technique	2	1	**26**	2,25	
	Commercial	3	2			
	financial	3	3			
	Administrative	3	3			

Table 2: an evaluation example with a medium quantification of an entrepreneur's criteria.

Criterias		Xij	W^1	f(∑Xi*W1) = ∑Xi*W1	W^2_P	Output
individual pathway	Personal Pole	2	2	**11**	2,00	**12,00**
	Profesional Pole	2	3			
	Relational Pole	1	1			
Motivation	Economic	0	3	**3**	3	
	Psycological	0	3			
	Social	1	3			
Project / Entrepreneur	Prior knowledge	2	2	**4**	2	
	Clear formulation	0	2			
profiles	technique	2	1	**4**	2,25	
	Commercial	1	2			
	financial	0	3			
	Administrative	0	3			

Table 3: an evaluation example with a low quantification of an entrepreneur's criteria.

To generalize this method for the different categories of criteria (see Figure n°3), decision makers can thus set a limit that allows them to declassify the poor projects or to classify the attractive projects in two classes. For example:

- Projects are derated if their score is < 30
- The less successful projects have a score between 30 and 50
- The project most convincing are those whose score is higher than 50.

This technique also allows identifying the deficiencies of some project, which are constructed on the basis of a very innovative idea or a potentially attractive market in order to strengthen them.

6. Conclusion

We have through this article; show some aspects taken within the analysis and selection of candidate projects for investment participation by investment funds in the creation or development of a business. We also showed an aspect of the implementation of neural networks in the process of evaluating cases studied. Of course, in this article we give, without any generalization, the principle of our search work which will continue with the following guidelines:

1. Expanding the application of neural networks in all categories of evaluation criteria (identified in the figure n°3) with demonstrations of their interactions.
2. Establish a machine learning system that allows you to make corrections of quantifications, decided arbitrarily or randomly, from the analysis of the position of the post-financing company.
3. Combine this method with the application of the method Analytical Hierarchy Process (AHP) (**P**alcic.I & **L**aclic.B, 2009; Url.B & Leroy.D & Naoum.A, 2011) and fuzzy logic Analytical Hierarchy Process (FAHP) (HUANG Chi-Cheng, 2000; Chang.D.Y, 1999) to better classify the priorities of parameters in function of temporal and contextual criteria.

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