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The Importance of Behavioral Factors: How Do Overconfidence Affect Entrepreneurial Opportunity Evaluation?

SALIMA TAKTAK*, MOHAMED TRIKI

Sfax University, Tunisia Unity of research GOVERNANCE
*Corresponding author: Salima.taktak@yahoo.fr

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Abstract Even though the entrepreneurship literature places much emphasis on opportunity recognition, little is known about how entrepreneurs actually evaluate opportunities. This study uses a cognitive approach to examine opportunity evaluation, as the perception of opportunity is essentially a cognitive phenomenon. We present a model that consists of four independent variables (overconfidence, risk perception, creativity, Relational networks and environmental factors, experience, education and opportunity identification), two control variables (demographics and age), and the dependent variable (opportunity evaluation). We find that overconfidence and risk perception are related to how entrepreneurs evaluate opportunities. Our results also indicate that entrepreneurial individual factors affect opportunity evaluation.

Keywords: *opportunity evaluation, overconfidence, risk aversion, BayesiaLab*

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1. Introduction

To date, the entrepreneurial phenomenon has lacked a conceptual framework, because of difficulties in defining the field. Entrepreneurship has become a general label under which a piece of research is taken in. [1] listed 77 different definitions of the concept of entrepreneurship, analyzing more precisely the scientific literature on the field of entrepreneurship. Besides, according to [2], the common point between these definitions is related to the process of emergence. This point of view is shared with [3,4] who argue that the notion of creation is a fundamental characteristic of entrepreneurship and research devoted to it. According to these authors, the notion of creation is articulated in terms of value creation, creation of a new business, new organization, new market, or, new product or service. In their research, [5,6] note that these kinds of creation affect the entire domain of entrepreneurship. They, then, suggest a more "global" vision of entrepreneurship, by putting creation of activities at the heart of this area of research. Thereby, the creation of an organization- for example - would only be a kind of creation of activities. Its study falls into the domain of Entrepreneurship, but may not be central to it. In fact, [5] argue that research in Entrepreneurship «does not require, but may include the creation of new organizations» [5] highlight that entrepreneurship consists of two related processes: discovering and exploiting entrepreneurial opportunities. According to the definition proposed by [7], «entrepreneurship is the creation of new organizations». Yet, [5] point out that the creation of activities is the result of a process of discovery, evaluation and exploitation of a given opportunity. Therefore, they suggest focusing on the process, rather than the result. They, also, propose to include the concept of opportunity at the heart of any entrepreneurial approach. As a result, the field involves the study of the sources of opportunities; processes of discovery, evaluation and exploitation of opportunities, as well as, the set of people who discover, evaluate and exploit them. Most entrepreneurs do not have problems generating ideas, as there are numerous sources of ideas of what they can sell, and *evaluation* is the key to differentiate an idea from an opportunity. As such, it is important to understand how entrepreneurs evaluate the alternatives presented to them. We term this process Opportunity Evaluation.

The role of the entrepreneur is, then, summarized in his ability to judge the value of the opportunity, on the one hand, and to make the choice concerning exploiting it, on the other hand. This presupposes a specific ability of making decisions related to the exploitation of opportunity. Thus, the competences identified in this stage are, decision-making skills that involve abilities of choice and commitment.

The evaluation phase addresses the entrepreneurial sense, when the solutions sought involve creativity or innovation. They address the managerial sense, when solutions are sought through optimization and effective management of existing resources. In fact, the choice is based on a spirit of enterprise, and also implies taking

risks or using a managerial logic when the choice is based on the value of existing resources.

In this article, we study how various cognitive processes affect opportunity evaluation, as opportunity evaluation is essentially a cognitive phenomenon [8]. Such a cognitive approach can help explain why some people start business ventures while others do not ([5,9,10]).

The flow of our study is as follows. First, the theoretical background and research framework are presented. This is followed by the development of testable hypotheses.

We then describe the research methodology and conduct the empirical analysis. Finally, the findings, implications, and limitations of the study are discussed.

2. Literature Review and Research Framework

A study conducted by [11] identified the cognitive factors that influence the choice of evaluating the opportunities. It is all about «the illusion of control», «belief in the law of small numbers», «risk perception» and «overconfidence». The illusion of control is defined as the situations in which the individual overestimates his capacity in increasing performance, while it is all about luck that dominates his decisions. Belief in the law of small numbers deals with individuals who use a limited amount of information to reach firm conclusions. These individuals have heuristic presentations that make someone believe that small samples may be representative of the whole population. Overconfidence is about overestimating the entrepreneur's abilities. [11] note that these cognitive factors affect the perception of risk and, consequently, the evaluation of the opportunity. The results of this study are matched to the conclusions of [12], [13].

[12] designs a theoretical model which deals with the relation between positive emotions and entrepreneurial process with its different steps. In their empirical researches, [14] study the impact of emotions on the entrepreneurial process of 146 participants: 40 German start-ups. In fact, these authors found that positive emotions have positive effects on the evaluation and exploitation of the entrepreneurial opportunity. Also, the negative ones have a significant negative effect on the entrepreneurial process. Actually, their empirical results, concerning the role of emotions in the entrepreneurial process, validate the works of [15] and [16]. Based on the study conducted by [17], on a sample of 245 students of MBA and Entrepreneurship, we notice that emotions affect the entrepreneurial process, mainly, in the phases of evaluation and exploitation. Concerning the relations between these emotions and the phase of evaluation, authors find that fright has a negative effect, whereas joy and anger have a positive effect on the evaluation of entrepreneurial opportunities. Thus, entrepreneurs should know that their emotions systematically, affect their decisions, as well as their own evaluations. Moreover, concerning the educational spirit of entrepreneurship, this study focuses on teaching emotional awareness and cognitive aspects of business plans and other entrepreneurial techniques.

2.1. Overconfidence

According to the methods of evaluating entrepreneurs proposed by [18], the evaluation of new entrepreneurial opportunities is a key cognitive process for the success of any business. Several research studies have examined the varying effects of different psychological biases in the evaluation of entrepreneurial opportunities [17]. These studies include the work of [10] who examines the impact of overconfidence on the evaluation phase of entrepreneurial decision-making.

Therefore, an entrepreneur with a strong confidence level in his own knowledge overestimates his ability to recognize a profitable entrepreneurial opportunity. In addition, [19] showed a positive correlation between the assessment of an entrepreneurial opportunity and the willingness to invest in it. This result is confirmed by studies in neuroeconomics [20].

It may be assumed that entrepreneurs will invest in opportunities where they feel that the task is easy to forecast, and for which their perception of uncertainty is low. In fact, the more an individual is confident about his abilities and skills, the less complicated he would estimate the prediction task to be. This hypothesis is supported by the research of [21,22], who observed a negative relationship between overconfidence and the difficulty of evaluation.

H 1: Overconfidence is positively correlated with the evaluation of entrepreneurial opportunities.

2.2. Risk Perception

[23] analyzed three cognitive biases on the entrepreneur: overconfidence, the illusion of control and the law of small numbers, along with their relationship to the perception of risk and the desire to create a business. In their study, they demonstrated after testing on 191 Master of Business and Administration degree holders, and using the "case ODI - contact lenses for Chicken"(Harvard Business School Case), that the perception of a low level of risk was closely associated with the decision to start a business. But only the illusion of control and the law of small numbers explain the decrease in risk perception. Overconfidence has not proven to be an explanation for the decrease in risk perception, and therefore the creation of business. The authors suggest two reasons. First is that overly confident people have greater confidence in the accuracy of their predictions. Second, these predictions may not lead to optimistic conclusions. The second reason is a problem in the measurement tool used to evaluate overconfidence, which is not directly connected to the case study. The difference in perception of risk would depend on the level of cognitive biases of an individual. Biases help individuals overcome their cognitive limitations. The result of the use of bias is a less rational decision in its treatment [24].

In his research, [11] confirmed the results of [23]. In fact, they found that these cognitive factors influence risk perceptions, which consequently affects the assessment of the opportunity.

H 2: Perceiving a lower level of risk is associated with more positive opportunity evaluation.

2.3. Education

Research has provided empirical evidence for a major factor influencing the chance of the individual to have an

early access to information, and in turn increases the probability of correctly evaluating business opportunities. This factor is: the level of education of the entrepreneurial individual.

According to a study by [25], education has an impact on the ability of individuals to identify business opportunities.

The level of education may affect the opportunity identification at two levels of analysis. At the first level, the rank of education affects the business frame of mind. The higher the level of education which is available in society the more the people commit to improving products and services using innovative techniques. The level of education of an entrepreneur also affects the appearance of the potential resources. Previous research has shown that the when the level of education is lower, the less chance an entrepreneur will obtain concessions from the government or acquire aid funding [26].

H 3: The higher the level of education among entrepreneur, the better equipped he will be to evaluate new business opportunities.

2.4. Experience

Experience has often been mentioned as the most distinctive way in which entrepreneurs acquire entrepreneurial skills. [27] state that in addition to experience, entrepreneurs gain knowledge through experimentation. This increases the confidence level of the entrepreneur, promotes certain actions, and improves the content of his stock of knowledge.

According to [28], the entrepreneurial experience is shown to allow the acquisition of tacit knowledge, and to facilitate decision making in a context of uncertainty and pressure. Managerial experience facilitates access to priority information, and can be used to recognize the opportunity. This same experience also helps develop entrepreneurial capabilities to meet the constraints of novelty such as negotiation, decision-making, organization, communication,...

H 4: The more the individual has a varied experience, the more likely he will evaluate new opportunities.

2.5. Creativity

Creativity is the raw material for innovation. Creativeness influences the methods and the results of solving dilemmas which arise during the innovation process. Creativity is achieved at all levels of analysis (individual, group, organization, market), and during different phases of the process of innovation. Defining creativity in terms of process and outcome requires that the components of creativity be examined at an individual level. The psychological process of the individual, his skills and motivation, must all be examined. [29] was the first to propose the idea of creativity. In their studies, [30] showed that creativity is an oriented commitment.

In their research work, [31] found that 90% of the study subjects think that creativity is very important for the identification of opportunities. However, entrepreneurs believe that creativity is even more important when entrepreneurs are connected to a network. [31] conclude that entrepreneurs who are networking opportunities with the sources do not need to be as creative as those who are not.

H 5: Creativity is positively associated with the evaluation of entrepreneurial opportunities.

2.6. Environmental Factors and Access to Social Networks

Alongside the psychological and non-psychological factors of an individual, entrepreneurial culture appears as one of the environmental factors most likely to influence the recognition, evaluation and exploitation of opportunities.

Several authors emphasize the importance of cultural factors. [32,33] argue that the majority of previous researches in entrepreneurship have been used to evaluate the contractor, his traits and characteristics. However it would not be useful to focus on his attributes without considering the social and cultural environment. The characteristics of the entrepreneur are very important, but a positive and innovative cultural environment also has an influence.

Several authors such as [34,35] indicate that an individual's culture, values, motivations and beliefs influence the decision to undertake risk.

H 6: Relational networks and environmental factors are correlated with entrepreneurial opportunities evaluation.

2.7. Opportunities Identification

In general, the decision-making process includes all activities from the time a stimulus for action is perceived until engagement in the action is performed. This series of actions represents the elements related to the research and treatment of the information. In fact, the actions come from verifiable information, and/or sources which are cognitive processes of the entrepreneur, and information sources that they may have difficulty in verifying. Dynamic factors correspond to the contractor and the environment or the process itself, with the identification of the stimulus, and his perceptions of opportunities or any other triggers.

In the study, [36], 1250 investment choices are possible. The results show that only 165 were selected, or about 13%. This observation reflects the fact that a judgment will not necessarily lead to action in the sense of investing. The analysis of investment choices is interesting because it shows that the subjects chose 69% of the forecast for which they had a 90% confidence, 27% for which they had a 70% confidence and 10% of the forecasts for which they had a 50% confidence. In reading these results, it seems intriguing to observe that investors do not focus on all forecasts with a degree of judgment including only 0.9 to 0.7. Another particularly interesting result highlights that 16% of individuals have made no investment, which confirms once again that the judgment does not always result in decision making.

H 7: The ability to identify entrepreneurial opportunities has a positive and significant effect on evaluations.

3. Methodology

3.1. Sample

The research sample is composed of 320 small and medium sized entrepreneurial Tunisian companies. SMEs were chosen, as they constitute a significant potential factor in the process of economic and social development. The flexibility of their structure, their ability to adapt to market fluctuations, and the ability to ensure economic integration and regional development, are all qualities which give them a prominent place in the industrial policy of the country which is concerned with development, and especially preserving, employment.

Our sample consists of 320 Tunisian entrepreneurs. Table 1 presents descriptive statistics of these entrepreneurs.

Table 1. Descriptive statistics of the sample

Characteristic										
Gender	Male= 79.38%					Female= 20.63%				
Age	<25	5.62%	25-35	28.43%	35-45	45.31%	45-55	16.87 %	≥55	3.75%

In this context it is necessary to separate those exogenous variables endogenous.

3.2.1. Endogenous Variable

Opportunities evaluation

The role of the entrepreneur in the entrepreneurial opportunities evaluation is summarized on the one hand, by his/her ability to make a judgment in relation to the value of the opportunity, and subsequently make the choice to exploit. This requires a certain ability to make decisions relating to the implementation of the opportunity. Competencies identified in this stage are decision-making skills that involve abilities of choice and commitment.

In their research, [37], along with [6], indicate that the perception of risk, the potential profit and the probability of success are the determinants of entrepreneurial evaluation factors. In their empirical studies, participants must choose between different scenarios ([37,38,39]), or they need to assess the risk level of one scenario. These scenarios have been greatly simplified, and may not capture specific psychological biases that determine the evaluation stage in the entrepreneurial process ([40,41]).

In our study, we adopted the proposed measure by [11] and [42] case study. This method allows each of the respondents to have the same information.

Three criteria were established to indicate whether the entrepreneur perceives the opportunity, presented in the case study, as a business opportunity. These items represent a general assessment of the situation.

This is done by utilizing a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree". The mathematical average of the responses allows us to obtain a score evaluation. The higher the score, the more it indicates that the contractor evaluates entrepreneurial opportunities in a positive way.

3.2.2. Exogenous Variables

Overconfidence

The questionnaire aims to measure the confidence of the contractor. This variable is measured by psychological issues of general knowledge [43]. This methodology was widely replicated by other researchers ([23,44]).

Indeed, participants must indicate confidence intervals at 90% which is they believe are the correct answers to each series of 10 questions. For example, the question of general culture,

"The length of the Nile (in kilometers)?", They must indicate two terminals so that the answer does not exceed the upper limit with 95% chance. A good answer to this question can be [6490-6510] as the correct answer is 6500. A calibration score (number of correct answers) is computed from these confidence intervals. A subject is considered well "calibrated" if he gets 9 correct answers out 10. Insofar another good answer to this question could be [0-7000], we measure the relative magnitude of the interval, that is to say the width of the given interval relative to the mean value this interval.

Risk aversion

The risk aversion variable is based on the methodology of [45]. The subjects had to allocate an amount ranging from 0 TND to 100,000 TND between a risky and a safe investment. A participant was considered as very risk averse with a high amount in a safe investment[1].

Experience

Entrepreneurial experience is recognized to allow the acquisition of tacit knowledge and to facilitate decision making in a context of uncertainty and pressure. At the same time, managerial experience facilitates access to information that can be used for priority evaluation' of the opportunity.

For the selection of items, we are inspired by the work of [46,47].

Creativity

The entrepreneurial process of opportunity is associated with the creative abilities of the individual, as outlined by several authors ([48,49]). In fact, these authors believe that the opportunity identification phase is a form of the creative process. [49] also observed an increase in the number and level of innovative opportunities identified by students trained in creativity.

Measuring the variable "creativity" is performed using four items on a scale of 5 points Likert, adapted from [50], and validated by [51].

Identification opportunities

Identifying opportunities presupposes two conditions: firstly possession of a research oriented information behavior, and secondly, the possession of a mind which is alert to the perception of opportunity. I fit is based on the contribution of authors dedicated to learning, it might be necessary to refer to the identification of an opportunity as general skills, abilities called reception or perception skills that match in the first phase of the processing cycle of the information. According to studies by [42,52], the variable identifying entrepreneurial opportunity was operationalized in terms of the number of opportunities identified. The measurement of this variable is to pose the question "During the past year, how many business opportunities you identify?" The answers to this question have faced eight identification results opportunity (e.g. 0, 1, 2, 3, 4, 5, 6 to 10, or more than 10 opportunities). The eight results identifying opportunities have been grouped

[1] A transformation in percentage is made to have the same base of comparison. In our conversion process percentage, an entrepreneur who is risk taker have a score of 1, otherwise a score of 0.

into three categories. Therefore, the number of respondents in each category was better distributed [53]. In our research, we have given the score "0" to the first category in which respondents did not identify business opportunities.

Regarding the second category, we assigned the score "1" for respondents who identified one or two business opportunities. While those who identified more than three opportunities, form the third category, with a score of "2".

Relational networks and environmental factors

In recent years, several authors have made the link between environmental factors and the entrepreneurial process ([54,55]). This link has a positive influence on creative abilities and entrepreneurial alertness, which includes environmental factors that favor the identification, evaluation and exploitation of entrepreneurial opportunities ([54,55]).

For the selection of elements, inspiration was found in the work of [56], and the work of [58]. On the first issue, we discussed the current situation of our post- revolution Tunisian context.

3.3. Methods of Data Analysis

The methodology is to present the different correlations between the financing decision and the above variables with the help of a probabilistic graphical model called Bayesian network. Bayesian Networks are graphical models that represent the probability relations between a set of variables. Each variable is a node of the graph and takes its value in a discrete or continuous set. The graph is always directed and acyclic. The directed arcs represent direct link dependence (most of the time it comes to causality). An arc from variable X to the variable Y, expresses that Y depends directly X. The lack of arc informs only on the non-existence of a direct dependency. Parameters expressing the weight given to these relations are conditional probabilities of variables knowing their parents (e.g. P(Y|X)), or priors if the variable has no parents.

In their research work, [59] define the Bayesian network: a directed acyclic graph (that is to say, without loops) and oriented G, consisting of nodes (the variables Vi) and oriented arcs (Aij), a finite probability space (Ω, Z and p), where Ω is the universe of potential, Z is a tribe of events and p an application Z →R with the image domain [0,1] for which p (Ω) =1, a set of random variables corresponding to the nodes of the graph and defined by (Ω, Z and p), such that the overall probability of the network is the product of the probabilities of each node Vi conditionally all its parent nodes C(Vi):

$$P(V_1,V_2,\ldots,V_n)=\prod_{i=1}^{n} p(V_i \mid C(V_i))$$

Where C (Vi) is the set of parents (or causes) of Vi in the graph G. Bayesian networks are based on Bayes' theory. This theorem is a basic result in probability theory, based on the work of reverend Thomas Bayes (1702-1761).

3.4. Model Construction and Parameterization

The objective of this paper is to show the effect of overconfidence on the entrepreneurial opportunity identification. Thus, it has been shown theoretically that the evaluation of the entrepreneurial opportunity depends on:

- Opportunity identification
- Confidence level of the entrepreneur
- Risk aversion
- Experience
- Creativity
- Education
- Relational networks and environmental factors
- Age
- Sex

To facilitate the construction of Bayesian network variables for this model, are the following conditions:

Table 2. The variables of the conceptual model and modalities

Variables		Modalities
Entrepreneurial Process	Opportunity Identification	1 if the entrepreneur can identify one or two opportunities 2 if the entrepreneur can identify three opportunities and more
	Opportunity Evaluation	1 if the entrepreneur has a high score 0 if no
behavioral factors	Overconfidence	1 if the individual has a greater than "0" score, it is overconfidence. 0 if no
	Attitude against Risk	1 if the individual has a greater than "0.5" score, it is risk taker. 0 if no
Individual Factors[2]	Creativity	1 if the entrepreneur has a high score 0 if no
	Experience	1 if the entrepreneur has a high score 0 if no
	Education	1 Primary 2 Secondary 3 University (1st ou 2nd cycle) 4 University (3rd cycle) 5 professional Training
Relational Networks and Environmental Factors[3]		1 if the entrepreneur has a high score 0 if no
Control variables	Age	1 « Under 25 year » 2 « [25, 35[« 3 « [35, 45[«, 4 « [45, 55[«, 5 « 55 year and over »
	Sex	1 « man » 2 « woman»

[2] The scores of variables "individual Factors" is determined on the basis of an analysis in principal component.
[3] The scores of variables "Relational Networks and Environmental Factors" is determined on the basis of an analysis in principal component.

3.5. Identification of Variables and their Modalities

The first step in building a Bayesian network expert is to list the variables recursively, starting from the target variable to the causes. It is in this order that the variables are presented in the following table:

Table 3. The Modalities of variables in the entrepreneurial opportunity evaluation and causes

Variable Name	variable Type
Entrepreneurial Opportunity Evaluation	Discrete [yes; no]
Entrepreneurial Opportunity Identification	Discrete [1;2]
Overconfidence	Discrete [yes ; no]
Attitude against Risk	Discrete [yes ; no]
Asymmetry of Information and Prior Knowledge	Discrete [yes ; no]
Experience	Discrete [yes ; no]
Education	Discrete [1;2;3;4;5]
Relational Networks and Environmental Factors	Discrete [yes ; no]
Age	Discrete [1;2;3;4;5]
Sex	Discrete [1;2]

4. Analysis and Interpretation of Results

4.1. Graphical Model

The second step of constructing a Bayesian network is to express the relationships between the different variables. BayesiaLab the software can perform learning of a Bayesian network in the database discretely without entering the process of data sampling. The Bayesian network when completed is the collective result obtained for the totality of the data.

The graph below shows the existing relations between the variables of our conceptual model.

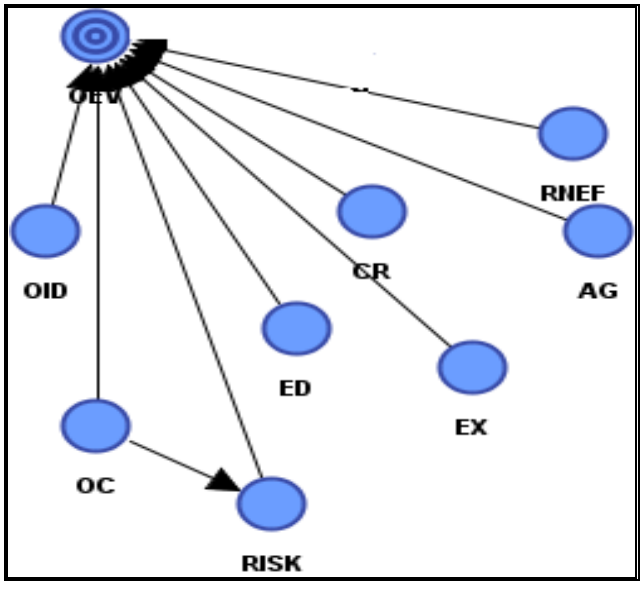


Figure 1. Bayesian network of entrepreneurial opportunity evaluation

This chart explains the Bayesian network model evaluating business opportunities of Tunisian entrepreneurs. This phase of the business process is affected by individual behavioral factors (overconfidence and risk attitude), (education, experience, creativity) and environmental, two control variables (gender and age) and the first phase of the entrepreneurial process (opportunity identification).

What follows, is a detailed description of the different correlations between these variables and their effects on the target variable (Opportunity Evaluation: OEV).

4.2. Analysis of the Relationships Discovered

The relationships between the variables in the database are directed to the parent node and child node. Every relationship consists of three different measures: the distance Kullback-Leibler divergence, the relative weight and the Pearson correlation (direction of the relationship). The Kullback-Leibler divergence and the relative weight[4] are two measures indicating the strength of relationships and the level of correlation between the variables, while the Pearson correlation measures the direction and significance of the relationship. Therefore, the following table shows the analysis report of the relationship between the variables of the network through the Pearson correlation.

Table 4. Analysis of the relationship of our model

parents nodes	childs nodes	kullback-leibler divergence	relative weight	Pearson correlation
ED	OEV	0,2355	1,0000	0,0019***
AG	OEV	0,1518	0,6444	-0,0254**
OID	OEV	0,1251	0,5311	0,0405**
RISK	OEV	0,0615	0,2610	0,4322
OC	OEV	0,0451	0,1914	0,0483**
RNEF	OEV	0,0305	0,1293	0,0647**
EX	OEV	0,0250	0,1061	0,0772*
OC	RISK	0,0091	0,0388	-0,1122*
CR	OEV	0,0060	0,0255	0,0323**
Kullback-Leibler close to 1: important correlation between the variables.				
Relative weight: converges to 1: strong correlation between variables.				
Pearson correlation coefficient: the sense of correlation between variables: *, **, *** respectively significance at 10%, 5% and 1%.				

The results in this table show the presence of a strong relationship (Kullback-Leibler = 0.2355/relative weight = 1) and positive (β = 0.0019) between the variable education and evaluation of entrepreneurial opportunity (H 3 confirmed). In fact, entrepreneurs who have a high level of education can evaluate accurately their business opportunities.

The age variable has a negative and significant impact on the evaluation of entrepreneurial opportunity (β = -0.0254).

The results show that the first phase of the entrepreneurial process affects the second. In fact, there is the presence of a positive and significant relationship between entrepreneurial opportunity identification, and evaluation of this opportunity.

The perception of risk has no effect on the second phase of the entrepreneurial process. In fact, contractors, during the evaluation of business opportunities, make judgments based on experience and not on an immediate impression.

The results indicate that the presence of the psychological bias “overconfidence" has a significant positive impact on the evaluation of entrepreneurial opportunity (β = 0.0483). The current findings confirm those of Weber and al. (2005). Therefore, a contractor will be more confident about their abilities and skills, the more the task is estimated to be an easy prediction (H 1 confirmed).

Past experience has a positive and significant impact on the evaluation of entrepreneurial opportunity (β = 0.0772).

[4] The scale of the relative weight is from 0 to 1.

In fact, previous experience is an important individual factor influencing the probability of early access to information, and subsequently increases the chance for entrepreneurs to identify and evaluate opportunities (H4 confirmed).

Creativity is positively correlated with the evaluation of entrepreneurial opportunity (β = 0.0323). Therefore, the creative spirit helps businesses assess business opportunities after completing the trial (H5 confirmed).

The results of the above table show the presence of a positive correlation between relational networks and environmental factors, and the second phase of the entrepreneurial process (β = 0.0647). In fact, relational networks and environmental factors are important resources for the entrepreneur, since they provide access to useful information for the evaluation of entrepreneurial opportunities (H 6 confirmed).

4.3. Analysis of the "Entrepreneurial Opportunity Evaluation" Phase

To analyze the second phase of the entrepreneurial process, choose the variable assessment opportunity (OEV) as a target variable in the Bayesian network. Then, you can use the function that generates the analysis report of the target evaluation opportunity. In this report, the relationships of the "OEV" variable with the other variables are measured by mutual information, and bit binary relative importance.

In probability theory and information theory, the mutual information is the information provided by several sources of information simultaneously. Its existence is related to the following question: Given an event, how does it change the amount of information provided by another event? The mutual information of two random variables is a quantity measuring the statistical dependence of these variables. It is measured in bits.

The table below shows the importance of the variables in this study, in terms of providing information on the value of the variable "evaluation of entrepreneurial opportunity."

Table 5. Importance of nodes in terms of providing information on the knowledge of the entrepreneurial opportunity evaluation

OEV= Yes (75,0020%)				
Nodes	Binary mutual information	Binary relative importance	Modal value	
ED	0,0342	1,0000	University (1st cycle and/or 2nd cycle)	35,5574%
AG	0,0169	0,5377	[35;45[	48,6189%
EX	0,0075	0,1232	Yes	98,7297%
RNEF	0,0034	0,0885	Yes	98,3590%
OC	0,0021	0,0529	Yes	92,6374%
RISK	0,0012	0,0445	No	52,1937%
OID	0,0009	0,0383	Identification 1 or 2 opportunities	78,4765%
CR	0,0008	0,0214	Yes	99,7916%
OEV = No (24,9980%)				
Nodes	Binary mutual information	Binary relative importance	Modal value	
ED	0,0303	1,0000	University (1st cycle and/or 2nd cycle)	52,0791%
AG	0,0163	0,5377	[35;45]	35,3922%
EX	0,0037	0,1232	Yes	96,3107%
RNEF	0,0027	0,0885	Yes	96,1727%
OC	0,0016	0,0529	No	89,5875%
RISK	0,0013	0,0445	Yes	57,1692%
OID	0,0012	0,0383	Identification 1 or 2 opportunities	74,5701%
CR	0,0006	0,0214	Yes	99,3753%
Mutual information: This is the amount of information given by a variable on the target value.				
Relative importance: The importance of this variable with respect to the target value.				
Modal value: The average value of the explanatory variable for each the target value.				

The analysis of the second phase of the entrepreneurial process shows that 75.0020% of Tunisian entrepreneurs have the ability to evaluate entrepreneurial opportunities, while 24.9980% of entrepreneurs are unable to evaluate business opportunities.

The table above shows that the second phase of the entrepreneurial process, node education (relative importance = 1), is the most prominent in terms of providing information on the knowledge of node evaluation of entrepreneurial opportunities. Concerning the other variables, there is the presence of a relative importance of 0.5377 for "age", 0.1232 to "experience", 0.0529 to "overconfidence", 0.0445 to "risk", 0.0885 for relational networks and environmental factors, 0.0214 to "creativity", and 0.0383 for "opportunity identification".

The results show that entrepreneurs who have the ability to assess entrepreneurial opportunities have an overconfidence level of 92.6374%, risk perception of 52.1937%, creativity of 99.7916%, experience of 98.7297%, relational networks and environmental factors of 98.3590%, a university level (1st and/or 2nd cycle) of 35.5574%, with an age range between 35 and 45 years of 48.6189%, and an ability to identify one or two opportunities to 78.4765%.

When entrepreneurs cannot evaluate entrepreneurial opportunities, they have a level of under-confidence 89.5875%, risk aversion of 57.1692%, creativity of 99.3753%, experience of 96.7282%, relational networks and environmental factors of 96.1727%, a university level (1st and/or 2nd cycle) of 52.0791%, with an age range between 35 and 45 years 35 3922% and an ability to identify one or two opportunities to 74.5701%.

The results in this table confirm these theoretical findings. In fact, the presence of behavioral elements of order "overconfidence" and "attitude to risk", affects the entrepreneurial process in the second phase "evaluation" as outlined in the work of [11,17].

4.4. Maximization of the Average of the Target (OEV)

After presenting the set of explanatory variables for each category of the target variable, it is necessary to introduce the variables maximizing each category of the

target variable. Therefore, the dynamic profile of the target features will query the software about a posteriori maximization of the average of the target variable assessment opportunity. This test presents scenarios to maximize the value of the target variable. In other words, he seeks all modalities of variables that must change (increase or decrease), in order to maximize the modality of the target variable. The table below shows the dynamic profile of the variable “opportunity evaluation".

Table 6. Dynamic profile of the target "Opportunity Evaluation"

OEV = No			
Nodes	Optimal modality	Probability	Joint probability
A priori		25,5715%	100,0000%
ED	University (1st and /or 2nd cycle)	32,9975%	39,6875%
RISK	Yes	27,3303%	53,4375%
AG	55 year et over	47,3512%	3,7500%
OID	Identification 3 opportunities and more	28,7262%	22,5000%
OC	No	34,0076%	8,1250%
EX	No	49,1719%	1,8750%
RNEF	No	43,8547%	2,1875%
CR	No	49,9796%	0,3125%
OEV = Yes			
Nodes	Optimal modality	Probability	Joint probability
A priori		74,4285%	100,0000%
ED	Secondary	85,9562%	26,2500%
AG	[35 ; 45[	80,0684%	45,3125%
RISK	No	76,4469%	46,5625%
OID	Identification 1 or 2 opportunities	75,3443%	77,5000%
OC	Yes	75,1745%	91,8750%
EX	Yes	74,8794%	98,1250%
RNEF	Yes	74,8373%	97,8125%
CR	Yes	74,5050%	99,6875%
Optimal modality: modality is maximizing the traget value.			
Probability: the prior probability of each variable.			
Joint probability: the probability that the target variable takes the value n given that the explanatory variable takes the value p[5].			

The analysis of the dynamic profile of the target "opportunity evaluation" shows an increased level of confidence in Tunisian entrepreneurs 75.1745%, with risk -taking 76.4469%, an increase of individual factors (experience and creativity) of 74%, an improvement of relational networks and environmental factors of 74.8373%, the presence of a secondary education 85.9562%, and the ability to identify one or two opportunities 75.3443% are all positively correlated with the probability of entrepreneurial opportunity evaluation of 74.4285%.

This result shows the effect of psychological factors on the assessment of opportunities. In fact, the presence of the psychological bias “overconfidence” in Tunisian entrepreneurs leads them to evaluate business opportunities. In addition, entrepreneurs as risk takers have the ability to evaluate opportunities.

Concerning the second method, there is a decrease in the level of confidence 34.0076%, increased risk aversion of 27.3303%, a decrease from the experience of 49.1719%, the creativity of 49.9796%, relational networks and environmental factors of 43.8547%, the presence of a university (1st and/or 2nd cycle) of 32.9975% and the identification of opportunities more than 3 of 28,7262% are positively correlated with increasing inability to evaluate business opportunities with a probability of 25.5715%.

The results of the above table show that the identification of one or two entrepreneurial opportunities allows a better evaluation, while the identification of a large number of opportunities blocks the second phase of the entrepreneurial process. Therefore, a significant amount of information in the first phase of judgment makes entrepreneurs unable to assess opportunities. In addition, the low level of trust and risk aversion of entrepreneurs stops the entrepreneurial process in the evaluation phase.

5. Conclusion

We are hopeful that this study will spur a program of research that will enrich the conceptual foundations of opportunity recognition and evaluation based on a cognitive approach. The end goal, of course, would be that entrepreneurs have a better-developed body of knowledge from which to draw in order to effectively and efficiently make decisions.

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