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FINANCIAL PERFORMANCE INDICATORS OF TUNISIAN COMPANIES: DECISION TREE ANALYSIS

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ABSTRACT

The article at hand is an attempt to identify the various indicators that are more likely to explain the financial performance of Tunisian companies. In this respective, the emphasis is put on diversification, innovation, intrapersonal and interpersonal skills. Indeed, they are the appropriate strategies that can designate emotional intelligence, the level of indebtedness, the firm age and size as the proper variables that support the target variable. The "decision tree", as a new data analysis method, is utilized to analyze our work. The results involve the construction of a crucial model which is used to achieve a sound financial performance.

Keywords: financial performance, diversification, innovation, emotional intelligence and decision tree.

INTRODUCTION:

The concept of performance has been the focal point of many researches for many decades. In other words, corporate performance has become a very important concept in management sciences. Bouquin (2004), Bourguignon (1995) and Bessire (1999) have done their utmost to define it. According to Bourguignon (2000), "the highly efficient is the one who achieves his objectives". Lorino (2003) also defines performance as performance in the company is everything that contributes to achieving the strategic objectives .... Performance in the company is everything that helps improve the duo cost-value. . Corbel (2003) thinks that every company must have its own performance indicators that go along with the shareholders' objectives. The business performance can be developed, according to Vankatraman and Ramanujam (1986), financially and operationally. The researches focus on the variables that are related to performance. The strategic choice affects the business performance, the level of indebtedness, the investment decisions, the business size and age, the growth opportunities as well as the skills of the leader and other indicators can explain financial performance. In fact, Bergeron (2000) states that the performance indicators "allow the managers to determine whether the company reaches the desired performance and motivation; thus, they influence the workers to maintain, improve, correct or anticipate performance." Furthermore, Lorino (2003) says that "the performance indicators are the meeting point between the strategic objectives and the operational activities and are supposed to drive the share price toward achieving a goal or to allow it to evaluate the results." Several theories have highlighted the performance relationship with these variables; in this context, one may hint to the theory of resources and skills, the strategic approach, the cognitive theory, the agency theory... For instance, according to the cognitive theory, the leader must use his emotions in order to achieve a better business performance. In this theory, we can perceive the positive effect of emotions on the leader's decision-making; i.e., we talk about a new concept which is "emotional intelligence". Performance is not only related to skills and to the working team skills, but also to the internal skills called "emotional intelligence". Here, we mean a trend in psychology, behavioral finance and management sciences. Our paper aims to present, through the "decision tree" which is a recent data analysis, the financial performance indicators of Tunisian companies.

FINANCIAL PERFORMANCE INDICATORS:

The topic of performance remains a hot one. Indeed, the researchers have strived to find an explanation to this concept by seeking its sources, its relations with the various strategies, how to achieve it ... Our major goal is to know the financial performance indicators. Accordingly, we can mention:

DIVERSIFICATION STRATEGY:

The diversification strategy plays an important role in explaining the financial performance. Indeed, many researchers are inclined to study the relationship that may exist between the diversification strategy and financial performance. This relationship can be positive or negative. Rumelt (1974.1982) came up with the fact that diversification has a negative impact on the business performance. According to the researches of Lang and Stulz (1994) and Berger and Ofek (1995), the diversification strategy is destructive to the business value. Fleming and al (2001) also believe that the sector diversification, for the shareholder, is a source of destruction to the value. Such explanations are based on the agency costs (Doukas and Pantzalis (2003)) and the managerial opportunism (Partridge 2000). Geographical diversification can affect the agency problems since the distant activities are very difficult to control by the shareholders Campa and Kedia (2002) .This type of diversification increases the number of competitors. Again, the study of Partridge (2000) came to the same conclusions (the study was carried out in the French context for the years between 1991-1997 by assessing performance by Tobin's Q): the diversification strategy is negatively related to the financial performance. The negative effect may depend on the leader's skills and abilities, the used resources and, also, the internal and external environment of the company. The researches of Geringer and Osler (2000), Gourlay and Seaton (2004), Lee, Hall and Rutherford (2003), and Nachum (2004) show that the diversification strategy could be used to improve the business performance. Additionally, Chang and Hong (2000) found that diversification has a positive influence on the business performance. Jung and Yu (2012) also find that diversification is significantly and positively related to the business performance. Equally important, Chang (2014) showed that technology has a positive moderating effect on the relationship diversification-performance.

INNOVATION STRATEGY (R & D):

The innovation strategy is a key strategy for financial performance. In this context, several studies have been all in favor of this topic so as to better understand the relationship that may exist between innovation and financial performance. Generally speaking, such researches generally corroborate the positive effect of investment in R & D on the business performance. In fact, this relationship has been considered by several researchers; as such, Schroll and Mild (2011), Van de Vrande and al (2009), Börjesson and Löfsten (2012), Colombo and al (2012), and Parida and al (2012)).

THE LEADER'S EMOTIONAL INTELLIGENCE:

The intrapersonal or interpersonal skill of the leader, who designates emotional intelligence, is a vital indicator of financial performance. In recent years, indeed, emotional intelligence has become a fundamental topic in management. In this, George (2000) avows that an emotionally intelligent leader is the one who is able to manage other people's emotions. This type of leader can create a positive working condition and a climate of cooperation and trust. In fact, organizational performance manifests and allows the company to achieve a positive result. Jordan, Ashkanasy and Hartel (2002) deem the leader's emotional intelligence as a "moderator of the negative effects of stress. In the same context, Mayer and Salovey (1997) ascertain that emotional intelligence can settle the disputes between workers. Effective communication between them also increases their productivity. Consequently, the sales increase, the product quality improves and the business scope expands by diversifying the products or the market. This leads to a very high profit margin and, thus, a higher financial return (Chermise and Goleman 2001).
Despite the growing importance of innovation and diversification strategies and the leader's intrapersonal and interpersonal characteristics in determining the business performance , the latter can also depend on other factors; as such, the level of indebtedness, the size and age of the company

INDEBTEDNESS:

Many studies have highlighted the important role of the capital structure in explaining the corporate performance. According to Nickell and al (1997), for example, debt can improve the business productivity and growth. In 1985, however, Ullman found out that indebted companies pay more attention to the needs of the stakeholders. Nevertheless, Jensen (1986) shows that debt can reduce the leader's discretionary power on the company-resources since debt compels him to be engaged in profitable projects so that he can redeem the debt as well as the interest bills resulting from that debt.

THE COMPANY SIZE:

The researches that address the issue of performance comprise the company-size as a control variable. These researches include the works of Demsetz and Lehn (1985) and Morck and al (1988). In fact, large companies may have enough resources to invest in costly and profitable projects in order to achieve better performance. According to Mintzberg, "The larger an organization is, the more elaborate its structure will be: the more specialized its tasks are, the more differentiated the units and the more developed its administrative component will be. The larger the organization is, the larger the mean-sized units will be. The larger the organization is, the more it is formalized. ". Hence, large businesses can have multiple resources that enable them to be engaged in profitable projects and achieve a better performance.

THE COMPANY AGE:

The company-age is a very important variable in explaining the corporate performance due to the fact that the level of performance varies according to the business lifecycle and age since the means, the objectives and the competence vary throughout the business lifecycle.

METHODOLOGY:

Our study aims to determine the financial performance indicators, Our methodology consists of two parts, the first is used to identify the data collection method and the second is devoted to the result of interpretation.
Sample:
Our sample involves 96 Tunisian companies divided into 10 industries which are: chemistry, distribution, food

processing, transportation, industries, computer, other consumer goods, consumer services, buildings, and services. Companies belonging to the financial sector are excluded (banks, insurance company ...) because they have a unique financial structure. The following table summarizes the distribution of the sample by industries:

Table 1 :sample distribution

Industry	Number of business	%
Chemistry	5	5,2%
Distribution	2	2,083%
Food Processing	15	15,625%
Transportation	2	2,083%
Industries	15	15,625%
Computer	9	9,375%
Consumer Services	31	32,291%
Other Consumer Goods	3	3,125%
Buildings	2	2,083%
Services	12	12,5%
Total	**96**	**100**

COLLECTION AND DATA SOURCES:

Our purpose is to try to explain the financial performance indicators in Tunisia, was chosen diversification strategy, innovation strategy, emotional intelligence, Debt, Age and Size. Regarding diversification and innovation we gathered the needed data from the annual reports of the listed companies on the Tunisian tustex site, accessed the web-sites of the unlisted companies and contacted them by mail, fax and telephone to find out the necessary information to measure this variable. By using a questionnaire, we measured emotional intelligence (the questionnaire is sent to diversifiable and innovation Tunisian companies in different sectors; for example, food industry, chemical industry, services,). Data collection was carried out in 2013. We used several methods to gather information: personal investigation (by appointment), telephone survey, fax inquiry and internet survey. The Ministry of Tunisian industry as well as several business centers, namely the business center of Sfax, helped us.

VARIABLES:

We have two types of variables, the first characterized the target variable and the second is that all variables related to performance, begin with the target variable is the financial performance

TARGET VARIABLE:
FINANCIAL PERFORMANCE:

It is measured through several methods such as ROA, ROE (detailed in the first chapter). To measure financial performance, we used Return On Equity (ROE) which is used by many authors such as Brown and Caylor (2004).
The "return on equity" or "equity return rate " or the "equity return is the ratio between the net income and the shareholders' equity. It measures the ability of a business to generate profits from its net equity .The data is extracted from the income statements of the sample firms for the years from 2009 to 2013. According to these data, we calculated the ROE for each year. On this basis, we calculated the average ROE 2009-2013.
ROE = Net income / equity

EXPLANATORY VARIABLES:

We will present the variables that explain financial performance:
Diversification:
Most authors use the specialization ratio, the index of Berry-Herfindahl, the entropy measurement, Utton index and Rumelt classification (1974) or the number of sectors as diversification measurements. The problem is that all these measurements assume to have data by activity. The entropy measurement requires knowledge of the sales of each strategic business area and the total sales of the group. In our case, it is difficult to know the sales of each

area of activity of Tunisian companies. Therefore, we used an approximation of the specialization ratio (R.P Rumelt 1974). The specialization ratio is the ratio of sales of the core business and the total sales of the group.
In our case, we assume that the parent company is the principal company's activity (in terms of sales). This is the same approach used by Stephany and Ngobo (2001) in their study of the French context. According to their study, we can calculate diversification as follows:
Diversification = (1 - (the parent company turnover / the group turnover)) * 100.

INNOVATION STRATEGY: R&D:

Innovation is measured by the research and expenditure ratio total sales (Sumeonidis 1996)
Research and development=Research and development expenses/total sales

EMOTIONAL INTELLIGENCE:

There are many approaches to measure emotional intelligence; for example, Mayer and al.)2000); Zeidner and al. (2004), measurements based on skills (eg, Mayer-Salovey-Caruso Emotional; Intelligence Test, MSCEIT, Mayer, Salovey, and Caruso, 2003) .The mixed measurements (eg, Emotional Competence Inventory, ECI, Boyatzis, Goleman 2002).
In the second part of our questionnaire, we generated a group of 17 items (the most representative concept of emotional intelligence obtained from Schutte and al, 1998, SSREI test) based on the theoretical model of emotional intelligence developed by Golemen (2002) .The responding leaders used a 5-point scale, from "no agreement" to "total agreement"

Emotional Intelligence = Σ points collected in the questions
debt (DEBT)
Hovakimian and al (2004) utilized the total debt ratio, but Myers (2001) used the long-term average debt ratio. Nevertheless, ION measured this variable by using the financial leverage which resides in the total debt divided by the total assets. This measurement is also used by Kochhar and David (1996), Barker and Mueller (2002), Lee and O'Neill (2003), Koh (2003), Demaria and Dufour (2007), Jarboui and Olivero (2008), Ben Kraiem (2008), and Sahut and Gharbi (2008).
DEBT= (total debt / total assets) in percentage

Size:

According to Hovakimian and al (2004) and Dufour and Molay (2010), the size of the firm affects its financial policy. Indeed, larger companies have higher performance and are more diversified than small and medium sized ones (Booth and al 2001) .The company size, in fact, is calculated by several methods; namely, the log total assets , the workforce and turnover. According to Bahagat and Black (2001), Durnev and Kim (2003), Andres and al (2005), and Hergli and al (2007), the size is measured as follows: "log (sales)." Others, like Brown and Caylor (2006), Ben Cheikh and Zarai (2008), Bauer and al (2007), and Adjaoud and al (2007) used the value "log (the total assets)."
We used the (Ln (CA)) as a size-measurement in this research. It is identified by the logarithm of the group turnover. This same measurement is used in several studies such as Bujadi and Richardson (1997) ,Barker and Mueller (2002) and Chen and al (2008).
SIZE=Ln(CA)

Age:

The company age has a very significant effect on performance. It is expressed by the logarithm of the number of working years (Brown and Caylor (2006) Ben Cheikh and Zarai (2008)).
Age=Ln (number of years)

QUESTIONNAIRE VALIDATION:

Our objective is to test the validity of 17 items about emotional intelligence. The internal consistency validity test of our questionnaire is achieved with Gronbach alpha (a measurement of the internal consistency between the different items of measurement) equals ($\alpha = 0.831$).
This means that each item is the equivalent measurement of emotional intelligence and that they are consistent.. The

Principal Component Analysis suggests a structure of 7 factors with a percentage equal to 68.405% of the total variance of the emotional intelligence. The factor solution of emotional intelligence is summarized in the following table:

Table 2: The leader's emotional intelligence factors: 17 items

Items	**Factor1 :** personal awareness **(15,454% VE)**	**Factor2 :** empathy **(12,789%VE)**	**Factor :** personal management **(10,876%VE)**	**Factor4 :** Report management **(8,282% VE)**	**Factor5** emotional awareness **(7,420% VE)**	**Factor6** Motivation **(7 ,174% VE)**	**Factor7** Relation management **(6,411% VE)**
My colleagues are not communicative	,914						
I do things that I regret	,853						
I communicate well with each of my co-workers	-,841						
It is unpredictable how my colleagues feel in any given situation		-,931					
I can interpret nonverbal messages		,906					
I can describe exactly what I feel		,575					
I can stay calm even in difficult circumstances			,786				
The things that happen in my life are meaningful for me			,774				
I appreciate other people's feedback			,532				
I feel excited when I think of my goals				-,683			
I get impatient with incompetent people				,678			
I'm influenced by other people's opinions				,561			
I can explain my action					,777		
I comfortably talk to anyone					,687		
I imagine that the corporate performance will be good						,870	
Others do not see me as I see myself							,764
I am aware enough to achieve my future goals						,4	

DATA ANALYSIS VIA THE DECISION TREE:

This is an explanatory artificial intelligence method. It was first applied by Morgan and Sonquist (1963) when they used the regression trees in a process of prediction and explanation (AID - Automatic Interaction Detection).

DEFINITION OF THE DECISION TREE:

This is an explanatory artificial intelligence method. It was first applied by Morgan and Sonquist (1963) who used the arborescent tree. The decisions were based on testes associated with attributes. Each internal node (decision node) denotes a test on an attribute, each branch represents a test result and each leaf node (terminal node) holds a class label. The highest node in a tree is the root node. A decision tree is a decision-making system that assigns a probability to each possible choice based on the decision-context: P (f / h), where f is an element of the future attributes (all choices) and his story (the decision-context). This probability P (f / h) is determined by asking a series of questions from q1, q2 ... qn about the context in which the n^{th} asked question is uniquely determined by the replies to question n -1 of the previous questions. Each of the questions asked by the decision tree is represented by a node in the tree and the possible answers to this question are associated with branches from the node. Each node defines a probability distribution over the space of the possible decisions. The leaf node is a node in which the tree stops asking questions. The decision tree uses a Bayesian algorithm for the total probability procedure. This principle is based on probability and the text is part of a class of a prior probability. The text will be assigned to the posterior probability. Simply speaking, a naive Bays classifier assumes that the presence (or the absence) of a particular characteristic of a class is not related to the

presence (or the absence) of any other function. This is a basic result in the probability theory. It stems from the work of Thomas Bayes (1702-1761). The decision tree allows us to aggregate and analyze the different forms of the variables of different nature (they can be historical, equations, ratios ...) in the same model .It is a graphical representation that enables us to place the links precisely and comprehensibly in order to analyze the relationships and to interpret them easily.

TRANSFORMATION OF THE CONTINUOUS VARIABLES INTO DISCRETE VARIABLES:

Before presenting our results, all the variables must be discret The following table summarizes this transformation:

Table3: Description of the Variable Terms in which Financial Performance is the Target

variables	Type	Classification
Financial performance	Discret [1 : low ; 2 :medium ; 3 : High level]	1 if FP<0,5 2 if FP=0,5 3 if FP >0,5
Emotionnel Intelligence	Discret [0 :low; 1 :High level]	0 if EI < 30 1 if EI >30
Diversification	Discret [1 :low ; 2: medium ; 3 :high level]	1 if Div<0,5 2 if Div=0,5 3 if Div >0,5
Research and development	Discret [1 :low ; 2 :medium ; 3 :high level]	1 if R&D<0,5 2 if R&D=0,5 3 if R&D >0,5
Debt	Discret [0 :low ; 1 :high level]	0 if Debt<0,5 1 if Debt>0,5
Age	Discret [0 : not aged ; 1 :aged]	0 if âge<15 ans 1 if âge >15 ans
Size	Discret [1 : small ; 2 : medium ; 3 : large]	1 if Ln (CA) <3 2 if Ln (CA) ε [4 ; 10] 3 if Ln(CA)>10

THE GRAPHICAL MODEL OF FINANCIAL PERFORMANCE:

The second step is devoted to identifying the relationships between the variables. In fact, Orange Canvas software paves us the way to make a decision tree apprenticeship by taking the discrete data. The different relationships are shown in the following graph (Figure 1)

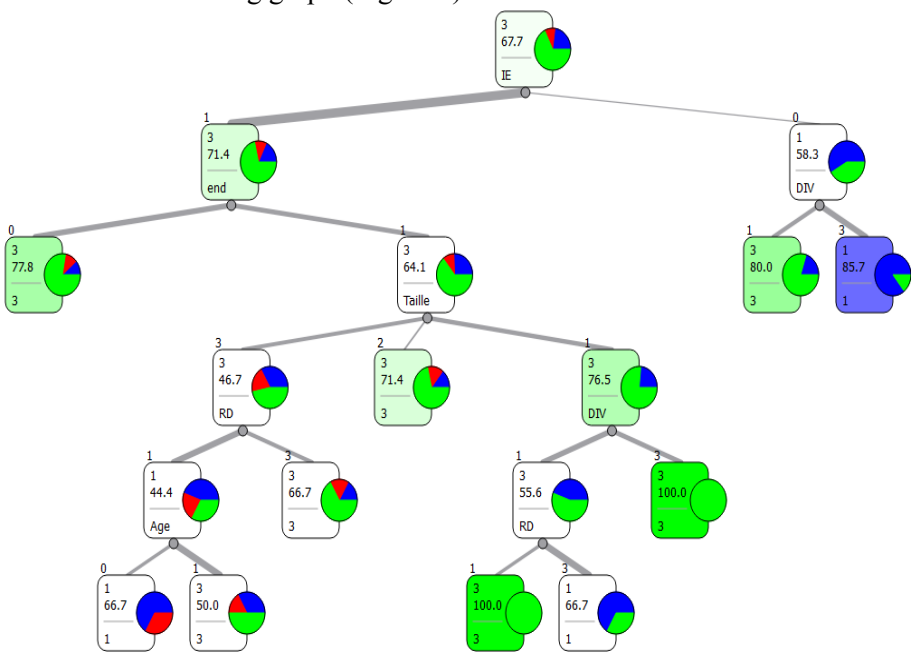

Figure1: Decision Tree of Financial performance

The probability distribution of the various variables is presented in the following table:

Table 4: Probability Distribution of the Various Variables

Variables	Categories	Total value	Percentage
Debt	0	53	55,2%
	1	43	44,8%
diversification	1	48	50%
	3	46	47,9%
	2	2	2,1%
Size	3	46	47,9%
	1	35	36,5%
	2	15	15,6%
Age	1	62	64,6%
	0	34	35,4%
EI	1	77	80,2%
	0	19	19,8%
RD	3	58	60,4%
	1	36	37,4%
	2	2	2,1%
FP	1	58	60,4%
	3	34	35,4%
	2	4	4,2%

• The first variable to be used is "emotional intelligence". It is the most important variable explaining financial performance. This segmentation variable consists of 2 terms (1: high level of emotional intelligence; 0: low level of emotional intelligence), It produces 2 sub-summits. The frequency distribution shows that emotional intelligence is correlated with a high level of financial performance (p = 0.677). This result is explained by the fact that Tunisian emotionally intelligent leaders can solve the conflicts between the stakeholders. The strong communication between them increases their productivity. As a result, the sales increase and the product quality improves. This, in turn, leads to a very high profit margin and a high financial return (Chermise and Goleman 2001).

• The first edge (branch) on the right of the second level is produced from the modality "0". The resulting summit covers 2 observations "1: low; 3: high, Such a distribution shows that the diversification strategy with a low level of emotional intelligence is correlated with a low financial performance (the probability is equal to 0.583). This is explained by the fact that a leader with a low level of emotional intelligence is not able enough to get established in various activities and on a number of markets so that he can develop a strong financial performance since the right situation, whether it is work, communication, cooperation, productivity, or quality, results in a good performance.

• The second branch is the modality "1" of the variable "emotional intelligence" .It shows that indebtedness covers two observations "1; 0 ". This distribution indicates that the leader who has a high level of emotional intelligence seeks to borrow (positive correlation with financial performance with p = 0.714) since indebtedness helps improve the business productivity and growth (Nickell and al 1997) .The indebtedness variable is segmented by using the size variable which corresponds to the modality "1" .The companies with a high debt level and an emotionally intelligent leader have a high financial performance with p = 0.641.

• The size variable is transformed into a segmentation variable on the third level of the tree. It is made up of three modalities "1: small; 2: Medium; 3: Large " and produces 3 branches. The first branch on the left is produced from category "3" of the size variable; it is the research and development strategy. Large companies adopt the innovation strategy and are eager to borrow at a high level to improve their financial performance. According to Jensen (1986), the high level of indebtedness requires the leader to be engaged in profitable projects in order to redeem the debt as well as the interests resulting from indebtedness to achieve better performance. The second branch on the right is produced from the category "1" of the size variable. Diversification strategy is positively correlated with the small business financial performance (Jung and Yu 2012) with a level of indebtedness. Small Tunisian businesses seek to improve their performance through the diversification strategy which enables them to improve their borrowing capacity. Many studies have come to the result that diversification is advantageous in terms of improving the debt capacity (Lewellen, 1971), reducing the risk (Amihud and Lev, 1981) and operating the surplus specific assets (Bodnar et al, 1997). So, an emotionally intelligent leader tries to improve the effectiveness of his work and his choices, to be aware of the

financial situation of the company and to choose sound strategies that are liable to make better performance by extending the scope of his business since Jung and Yu (2012) find that diversification is significantly and positively related to the business performance.

• The diversification variable is then segmented using the research and development variable which corresponds to the modality "1" .The strategy of research and development with a low level of diversification in small indebted companies helps attain a strong financial performance. The companies that focus on research and development, with a low level of diversification, can increase financial performance since, according to Lin and Chang (2014), research and development has a positive moderating effect on the relationship diversification-performance.

• On the fourth level, the research and development branch is segmented using the age variable which corresponds to the modality "1". The frequency distribution indicates that the company-age is correlated with a low level of financial performance (p = 0. 444). The company age together with a low level of research and development have an impact on the business performance.

CROSS-VALIDATION:

After constricting the tree and interpreting probability, data must be classified through the cross-classification method. Classification is a data exploration technique that assigns a target class to each element of a group. Classification aims to accurately predict the target class for each case in the data. In our study, we used the naive Bayesian classification to explain the business performance. The Naive Bays classifier is a simple probabilistic classifier. It rests on the application of the Bays Theorem with strong independence assumptions. It presumes that all the features are independent. Cross-validation is shown in the following table:

Table 5: Cross-validation of Financial Performance

Faible						
Methode	**Classification accuracy**	**Sensitivity**	**specificity**	**F-mesure**	**Precision**	**Matthews correlation coefficient**
Naive Bayes	0,6674	0.1364	0.9459	0.2069	0.4286	0.1331
Moyenne						
Methode	**Classification accuracy**	**Sensitivity**	**specificity**	**F- mesure**	**Precision**	**Matthews correlation coefficient**
Naive Bayes	0.6674	0.0000	1,0000	N/A	N/A	N/A
Forte						
Methode	**Classification accuracy**	**Sensitivity**	**specificity**	**F- mesure**	**Precision**	**Matthews correlation coefficient**
Naive Bayes	0.6674	0.9385	0.0968	0,7922	0.6854	0,0634

CLASSIFICATION ACCURACY:

In this part, we talk about the correct classification percentage. Accuracy is the overall accuracy of the model. It is calculated as the sum of correct classifications divided by the total number of classifications. Our financial performance classification is correct (CA = 0.6674). This value is very important. It signifies that the classification of financial performance as low, high and medium is the most used classification. So, Tunisian companies can classify their financial performance as low, medium and high performance.

SENSITIVITY:

Sensitivity identifies the classes adopted in the variable segmentation so as to better explain the model to be studied. We note that financial performance is distributed in the following two conditions.

• High financial performance, (the rate is equal to 0.9385)

• Low financial performance (the rate is equal to 0.1364)

Tunisian companies have a high or low financial performance. They lack a medium financial performance. Hence, they can achieve, through their strategies, whether a high financial performance or a low financial

performance.

SPECIFICITY:

Specificity measures the proportion of not to adopt such a classification. The percentage of the firms that have not adopted the low and high classification of financial performance ranges between 0% and 1%. This percentage is low; therefore, it may confuse our obtained results.

F- MEASURE :

It corresponds to the margin of error around the exact solution. We note that the financial performance preferences of the Tunisian companies are divided into the following two conditions with a small margin of error between 0.2069 and 0.7.

• Low financial performance
• High financial performance.

CONCLUSION:

To sum up, the major goal of the paper at hand is to identify the indicators of financial performance and to present its ideal classification within Tunisian companies. The obtained results, based on the decision tree, show the significant effect of the different variables on financial performance. In this respective, an important model is found to explain financial performance and the high level of emotional intelligence with a strong diversification and innovation strategy. In fact, financial performance is deemed to be very high in large, indebted and aged companies. Equally important, cross-validation prompted the classification of financial performance into three types: low, medium and high. Ultimately, one may say that, according to this article, the determination of financial performance indicators within the Tunisian companies is a very important experiment. In other words, it explains the extent to which these strategies influence financial performance and it, also, shows the growing importance of the leader's emotional intelligence in establishing a high financial performance.

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