CREDIT SCORING IN THE SERVICE OF ENTREPRENEURSHIP IN MOROCCO: PRAGMATIC APPROACH FOR THE SELECTION OF PROMISING PROJECTS

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Abstract

The different policies adopted at the national and international level aimed at investing in the youth to accelerate their development on all socio-economic, political and cultural sectors. This orientation is based on the considerable growth of this population of youth from 15 to 29 years old representing about one third of the total population of the MENA region (Middle East and North Africa) (Approximately more than 100 million). However, lack of direction and support needed to fully contribute to the development of their communities, this potential can turn into frustration, as demonstrated by the "Arab Spring". In this sense and to promote the opportunities with these young people, Morocco has launched several employment programs like “Moukawalati” directing them to the world of entrepreneurship. From the perspective of successful operational deployment of these programs, this paper presents a practical approach of selection of the promising projects through the implementation of a highly predictive scoring approach adapted to the specificities of this segment of young micro-entrepreneurs.

Keywords: Credit Scoring, Entrepreneurship, Small Business

1. INTRODUCTION

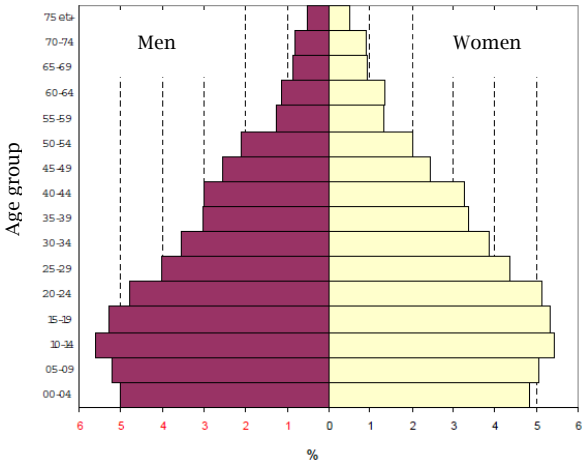
Many countries in the MENA region have actually the largest youth cohort. The youth population aged between 15 and 29 years old has grown considerably reaching in 2015 over 100 million person which represent nearly 30% of the MENA region population Vs 67 million in the 90s [1].

In Morocco, young people represent about one tenth of the youth population in MENA region. In 2014, youth aged between 15 to 20 includes one third of the total Moroccan population and 44% of the working age population (those aged 15-64 years) [2]. The figure 1 presents the current pyramid of the Moroccan population.

This demographic situation brings both opportunities and challenges to Morocco. Young people are an important asset, both for individual State and for the world economy. They can contribute to innovation, consumption and increasing productivity, insofar as they actively participate in the economic process [4].

An important and growing youth population is an asset for economies that are developing where employment are created to absorb new entrants to the labour market. This should alleviate budgetary pressures from the State and, with an important working age population, present opportunities for fast economic growth - an effect that has been well documented with the rise of the Asian Tigers [5]. At the same time, empirical evidence shows that large youth cohorts are more likely to experience higher unemployment and pressure on wages.

Figure 1. Pyramid of Morocco’s population by age group [3]



Alerted by the events of the Arab Spring, the Kingdom of Morocco has anticipated the calls of social and economic inclusion expressed by young Moroccans people, in particular after February 2011 and has set up many institutions and programs that offer to the youth a wide range of services [6]: employment, training opportunities (e.g. professional training, skills development, personal development, basic literacy, self-employment, micro-finance and leadership), community involvement, sports, recreational activities, which form the basis of all programs for young Moroccans people.

Our article focus on government programs to promote small business and proposes a statistical approach for the selection of promising projects.

We will present in Section 2 a description of the entrepreneurial ecosystem in Morocco. In section 3, we will carry out an overview of credit scoring models and in the section 4; we will present a pragmatic approach to select the best micro-entrepreneur projects which fit well with Moroccan case. The section 4 gives the conclusion.

2. PRESENTATION OF THE ENTREPRENEURIAL ECOSYSTEM IN MOROCCO

2.1. Economic overview

The World Bank classified the Kingdome of Morocco as middle-income economies. The country is characterized by great potential growth through economic diversification relatively developed compared to other countries in the MENA region. Despite the global financial crisis and political agitation in the region, the Moroccan economy showed steady growth in its average real GDP, 4.6% between 2008 and 2010 and 5% in 2011. However, it slowed significantly in 2012 at a rate of 2.7% (table 1).

Table 1. Morocco: main macroeconomic indicators, 2008-13 [7]

Indicators	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*
GDP (current US $, billion)	88.9	90.9	90.8	99.2	96.1	104.8
GDP growth (real)	5.6	4.8	3.6	5.0	2.7	5.1
GDP per capita (current USD)	2851	2885	2850	3082	3956	3190
Current account balance (% of GDP)	-5.2	-5.4	-4.1	-8.1	-9.9	-7.2
The general government's net borrowing or net lending	0.7	-1.8	-4.4	-6.7	-7.6	-5.5
Unemployment rate (% labor force)	9.6	9.1	9.0	8.9	-9.0	8.9
Inflation, consumer prices (average annual increase, %)	3.5	1.0	1.0	0.9	1.3	2.3
Net flows of fforeign direct investment (current US $, billion)	2487	1952	1574	2568	2836	5.0
Gross debt (% of GDP)	48.2	48.0	51.3	54.4	60.5	61.8

The economy presents one of the highest investment rates in the region reaching 35.7% of GDP in 2012, thanks to the many government initiatives to improve the business climate and investment. The unemployment rate dropped to less than 9% in 2012 against 13.4% in 2000. However, this rate is still twice as high for the young and educated population, and over half of 15-29 year olds in Morocco are out of school and are unemployed, according to the World Bank [8].

Like other economies in the region, the external and fiscal position of Morocco has deteriorated due to political uncertainty in the region and the global economy slowdown. The impact is particularly pronounced because of the close links between Morocco and Europe in the field of international trade, remittances and investment flows. The current account deficit that reached the high rate of 10% in 2012, slowing growth and high levels of public spending, including subsidies for food needs and fuel prices, have increased the fiscal pressure. The net borrowing increased to 6.7% of GDP in 2011 and 7.6% in 2012. However, public debt is relatively subdued, amounting to 60% of GDP in 2012, and net inflows of foreign direct investment (FDI) increased to USD 2.8 billion (3% of GDP) in 2012 against USD 1.6 billion (or 1.7% of GDP) in 2010.

2.2. Business environment

The political transition in the region had a little effect on the business climate in Morocco. Instead, the government has been very eager to put in place reforms to boost business environment. Important steps have been taken to attract investors, such as the creation in 2009 of the Moroccan Investment Development Agency (AMDI), strengthening of regional investment centers, simplifying and improving the transparency of administrative procedures and the creation of the National Committee of the business environment (CNEA). In terms of foreign trade, Morocco has shown more openness, especially through negotiations with the European Union on the Agreement on Deep and Comprehensive Free Trade Area [9].

Morocco is 87th class of 189 countries in the index of "ease of doing business" of the World Bank [10] winning 10 position compared to 2013, and a total of 30 places between 2011 and 2013. The country is performing rather well in terms of "border trade" (37th) and "business creation" (39th). The greatest challenges that remain are the "transfer of ownership" (156th) and "protecting investors" (115th). Although the World Economic Forum cites "inefficient government bureaucracy", "corruption" and "access to financing" as the three most salient issues for the conduct of business [11], efforts have been made in these areas. Regarding access to funding, the Moroccan government has passed new laws that expand the scope of securitization and financing alternatives to companies. However, Morocco remains ranked 77th of 148 countries in the index of global competitiveness 2013-14, when he was 70th out of 142 in 2011-12.

2.3. Overview of the SME sector

According to a report prepared by Moroccan securities regulator (CDVM) (based on data provided by INFORISK[2]) in 2011, SMEs account for 40% of GDP and 31% of total Moroccan exports. The majority of SMEs are active in the areas of trade (41%) and industry (37%). According to a survey conducted by the International Finance Corporation in 2011 [12], there had a total of 750,202 micro, small and medium enterprises (MSMEs) in Morocco that employed only 21.6% of the total workforce. As in other economies in the region, most SMEs are micro-enterprises namely 97.8% of the total.

[2] TheINFORISK, a subsidiary of Finaccess Group, is THE specialist business information on Moroccan companies

The rate of new business creation is relatively high in Morocco. On average, between 2004 and 2009, 0.96 limited company per 1000 people of working age was created [13], which is above the average of the MENA region (0.6 company) [11].

In a systematic and continuous way, Morocco has developed an institutional framework for SME policy, improved the quality of its institutions and developed several support programs covering all sectors of the SME population, especially new entrepreneurs established companies and high-growth small businesses.

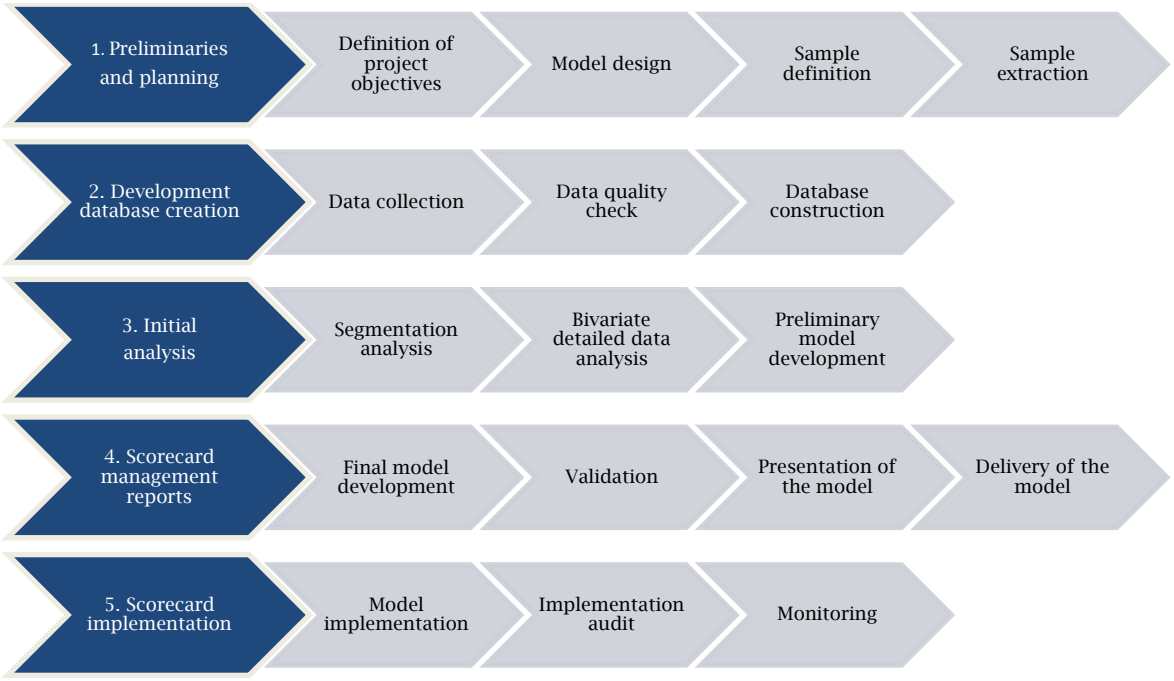
3. OVERVIEW OF CREDIT SCORING MODELS

The credit scoring models (e.g. application scoring, behavior scoring in retail business) refer to a techniques of risk evaluation associated with potential loan applicant. The best practice counterparty assessment for small businesses involves the combination of rigorous quantitative models and standardized qualitative rating tool. We give in this section an overview of the credit scoring approaches to assess the credit risk of SME.

3.1. Credit scoring approach

The credit scoring models [14] require a thorough development, richer and more creative data sets. Indeed, a rigorous process is required to drive the model to best practice levels. The following diagram summarizes the main steps of the scorecard development process.

Figure 2. Overall process for developing and implementing a quantitative credit scoring model



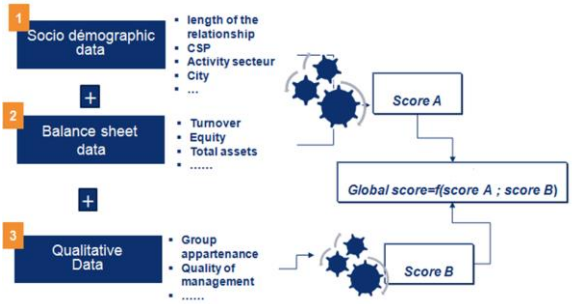
Preliminaries and planning: This is an important phase in which the project is defined, with a clear definition of the target to be reached, the theoretical model design, sample definition and finally sample extraction.

Development database creation: This phase concerns the important activity of data manipulation, that is, data collection, data aggregating, and database construction, with a sequence of joins between the datasets with elementary information included. Of equal important is the first data quality check that identifies the characteristics with no effectiveness in the analysis.

Initial analysis: The analyst begins by looking at the data in detail, studying the relationships between the potential predictive variables and the target, measure to be investigated. This phase is often called detailed data analysis, in so far as it asks the analyst to also explore the economic implications, and not only the methodological/ statistical interpretation. One of the outputs is also the preliminary model.

Scorecard management reports: After the preliminary version of the model, there is a phase of tuning which arrives at the final model, which needs to be robust easy to interpret and powerful. The final scorecards are produced by running the best predictive characteristic (Output from the initial analysis phase) and statistical algorithms (e.g., logistic regression) on the training dataset, to generate the final set of characteristics for the scorecard.

Figure 3. Input considerations for scoring models



This final model, on the basis of the test sample is then validated to demonstrate its stability.

The figure below gives the three kinds of data commonly used in the traditional scoring model.

However, in the context of smaller business, these data sources show some limitation. Indeed, for these profiles, the historical and projected income statements (revenue) and balance sheet are limited, are usually not consistent with varying quality and the potential for fraud is high. In addition, there are few (typically 4-6) qualitative factors based on relatively short and broad questions (e.g., "How would qualify the succession plan of the borrower?") with short and subjective answer options (e.g., "No successor, but this is not critical").

To remedy to these limitations and build scoring system which fit well for small businesses and portfolio with a poor data environment, users of the credit scoring models (banks or other company) can in addition to quantitative scoring model, incorporate a qualitative PD-rating model to improve rating performance.

In the following, we propose a decision aid approach leading to successful deployment of operational programs set up by the National Agency for the Promotion of SMEs (ANPME).

4. PRAGMATIC APPROACH TO SELECT THE BEST MICRO-ENTREPRENEUR PROJECTS

As mentioned above youth aged 15 to 20 include one third of the total Moroccan population and 44% of the working age population (those aged 15-64 years), this demographic situation brings both opportunities and challenges for government.

To accompany these youth people (Student, informal, unemployed, apprentices at a local craft workshop) the National Agency for the Promotion of SMEs has set up a support program for 100,000 auto entrepreneurs with a budget of 500 million MAD (i.e. 4 billion US).

In collaboration with experts of the agency, bank risk managers and academician specialist in entrepreneurship, we have established a qualitative PD-rating model to select the best micro-entrepreneur projects. This qualitative rating approach can be complementary to statistical scoring models or stand-alone if quantitative data is unreliable, unavailable, or insufficient.

4.1. Presentation of the approach

The qualitative rating approach is similar to the internal rating systems established by banks and required by Basel II [15]. It is based on a statistical regression model to test interactively whether qualitative indicators (questionnaire) used, improve the predictability of credit decisions.

Significant effort to develop question to assess the entrepreneur and his/her project is required. Indeed, we have invested multiple workshops and more than 100 hours of debate along several rigorous assessment frameworks to short-list questions from 100 to 200 candidates. In addition, the questions selected narrow down broad concepts (e.g., "shareholder structure") to real risk drivers and specific yet generally applicable treats (e.g., "Has Entrepreneur cash to support the business if needed?"). Also, each question's score follows a specific methodology based on its predictive power. The discriminative power can be assessed by regarding the risk distribution of the variable which is shown by the Weight of Evidence (WOE) [17]. The Weight of Evidence can be calculated from the column percentages with the following formula:

$$WoE = \ln\big(P(Entrepreneur|Good)\big) - \ln\big(P(Entrepreneur|Bad)\big) \quad (1)$$

The interpretation of WoE is straightforward: Increasing values of the Weight of Evidence indicate decreasing risk.

The rating includes both the promoter and the project. It allows assessing both the project entrepreneur quality and quality of the project itself. It is for this reason that various criteria are taken into account in the overall score as the training of young entrepreneur, his experience, his contribution in business and feasibility of the project.

To develop the scorecard we performed the logistic regression [16] not against the input (Option's answer), but rather against the weight of evidence of each option. The final scorecard is then produced in the system point format (table 2, 3) in order its ease of understanding by the decider (discrete numbers are easier to work with).

There are several scales in use in the industry. One of the widely used is "points to double the odds" (pdo) [18] in which the relationship between odds[3] and scores can be presented as a linear transformation:

$$Score = Offset + factor \ln(odds) \quad (2)$$

Since the scorecard in our proposed approach is being developed using the WOE as input, the preceding relationship can be modified as:

$$\begin{aligned} Score &= Offset + factor \ln(odds) = \\ &-\left(\sum_{j,i=1}^{k,n}(woe_j * \beta_i) + a\right) * factor + offset = \\ &-\left(\sum_{j,i=1}^{k,n}(woe_j * \beta_i + \frac{a}{n})\right) * factor + offset = \\ &\sum_{j,i=1}^{k,n}(-(woe_j * \beta_i + \frac{a}{n}) * factor + \frac{offset}{n}) \end{aligned} \quad (3)$$

Where *WOE* = weight of evidence for each grouped option; β = regression coefficient for each characteristic; a = intercept term from logistic regression; n = number of questions; k = number of options (of attributes) in each questions.

The formula would calculate the scores to be attributed to each option, for every question in the scorecard developed, and summing all the scores for each option would then provide the final score.

However, the model separates the «Entrepreneur» part to the «project» part. Therefore, each party is assigned a score involving an overall score of 100. The final score is estimated from the combination of the two scores estimated and presented in the tables 2 and 3, namely the

[3] If the probability of winning is 0.8, the odds are 0.8/0.2=4, because there are four times as many chances of winning as losing. If winning is certain, the odds are infinite.

entrepreneur and project score. The weightings of each of these notes in the model have been defined from a statistic approach. Indeed, the two scores are used as independent variables in the logistic regression and the weight of each score is calculated by the ratio (estimated value / error type) (figure 4).

Figure 4. Overall score estimation

Estimations par l'analyse du maximum de vraisemblance

Paramètre	DDL	Valeur estimée	Erreur type	Khi-2 de Wald	Pr > Khi-2
Intercept	1	-1.0958	0.0824	176.8879	<.0001
Score_Entrepreneur	1	0.8175	0.0258	1001.3119	<.0001
Score_Project	1	0.6019	0.0314	368.3406	<.0001

Contribution Marginal				
Score_Entrepreneur	0.8175	0.0258	31.68604651	0.62
Score_Project	0.6019	0.0314	19.16878981	0.38
			50.85483632	

Score_Entrepreneur	62%
Score_Project	38%

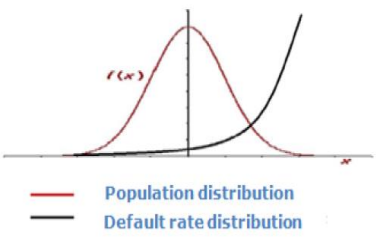
The result above shows that the entrepreneur's quality is a priority to the quality of the project. This can be explained by the fact that a good entrepreneur will make the most of an average project while a bad entrepreneur may fail on easy project. Finally, the overall score is calculated as following:

Entrepreneur score (62%) + Project score (38%) = Overall score (4)

The risk scale is from 0 to 100 points, with 100 being representative of the best couple (Entrepreneur, Project).

To subdivide the overall score in several rating classes similar to those produced in the context of Basel II, we adopted a mixed approach which started with an objective grouping of classes and it continues with more empirical approach. We used an algorithm to define the master scale by linking the probability of default of the entrepreneur to an exponential distribution with a frequency close to the normal distribution (figure 6). These classes have been modified after according to empirical criteria to identify the most satisfactory master scale. This technique is frequently used for corporate exposure [19] in accordance with rating scale build by the major rating agencies like Standard & Poors.

Figure 5. Master scale example



This overall score is consequently converted to notes between 0 and 9 (9 being the worst):

– An overall score between 0 and 10 corresponds to the grade 9.

– A global score between 10 and 30 is representative of a risk called "uncertain" (corresponding to 7 or 8 grade).

– When the overall score between 30 and 100, it is judged as acceptable or favorable (involving a lower or equal to 6 grade).

Figure 6. Number of good and bad distribution for overall score

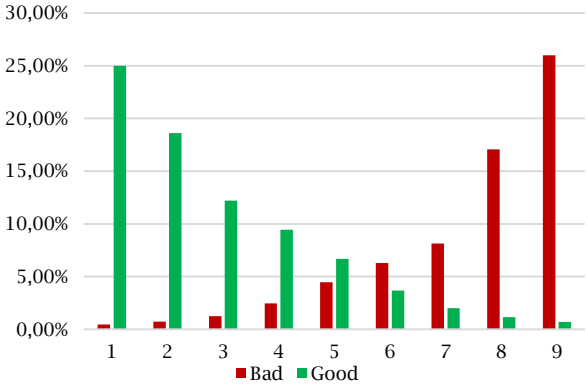
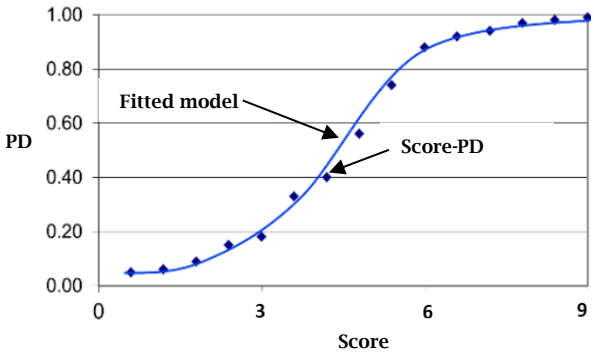


Figure 7. Probability of default as function of score



4.2. Entrepreneur/ project scorecards

In this section, we present the questions selected from 100 to 200 candidates and identified as most predictive.

4.2.1. Entrepreneur score

The rating of the entrepreneur, on 100 points, is determined based on eight indicators:

– *Entrepreneur training and education:* Indicate the ability of the entrepreneur to better manage its business.

– *Entrepreneur's financial skills:* Skills that the entrepreneur need to have in order to get ahead, like for example cash flow management and projection.

– *Entrepreneur's contribution:* Young entrepreneurs, who own a local or hold percentage of capital, are more likely to see their project succeed.

– *Entrepreneur's behavior:* The consultation of credit bureau agency (Experian was installed in Morocco in 2009) allows the checking of the Entrepreneur's borrowing history with any bank and his debt capacity.

Table 2. Entrepreneur scorecard

Indicators	*Score*	*Option*	*Option's score*
Entrepreneur's years of relevant and up-to-date experience in the industry	/20	More than 15 years	10
		10 to 15 years	14
		5 to 9 years	8
		1 to 4 years	4
		Less than 1 year	0
Qualification of the entrepreneur	/20	Has university/ college degree in respective fields and proven hands-on experience	20
		Has university/ college degree in respective fields but does not have actual hands-on experience	16
		Has formal training in respective fields; performed the job at managerial level	12
		Has formal training in respective fields, never performed the job at managerial level	6
		Does not have university/college degree or formal training in respective fields	0
Entrepreneur's Financial skill	/10	Has good financial skills as demonstrated by good cash flow projection/management	10
		Has above average financial management skills	6
		has some knowledge of financial management	2
		Has little knowledge of financial management	0
Whether the entrepreneur have the local to be used for the project	/10	Entrepreneur owns local	10
		Entrepreneur owns local but it should be renovated	6
		The client says not to own local	0
Support from the entrepreneur	/20	The entrepreneur hold more than 20% of the capital and he has proporty which can be used as guarantee for bank loan.	20
		The entrepreneur hold less than 20% of the capital but he didn't has proporty which can be used as guarantee for bank loan.	10
		The entrepreneur hold less than 20% of the capital but he has proporty which can be used as guarantee for bank loan.	6
		The entrepreneur hold less than 20% of the capital and he didn't has proporty which can be used as guarantee for bank loan.	0
Entrepreneur'borrowing history with any bank	/20	No unpaid and / or rejection of checks regularized in the month.	20
		Up to 2 unpaid and / or rejection check regularized in the month	10
		Between 3 and 4 unpaid and / or rejection check regularized in the month	4
		Unpaid and / or rejection of checks than one month	0
Total	/100		

4.2.2. Projet score

To estimate the project profitability, several elements are to assess and cross namely:

– *The sector of activity:* A prior knowledge of the project evaluators of the risky activities, high default rates in regions and areas most exposed to different climate risks allows to cross any information and to assess the profitability of the project and thus the solvency of Micro entrepreneur.

– *The legal status of the enterprise:* Through the knowledge of the legal status of the company, we can deduct the company's size and the impact that may incur microenterprise following an adverse change in national or international rules.

– *Age of the enterprise:* More an enterprise grows old and it is organized and formalized.

– *Size of the enterprise:* The empirical results showed that there is a link between the size of workforce in terms of the business and its structure.

– *Life cycle of the enterprise's products:* This allows to identify priorities for the strategy of products development and so the level of the turnover.

– *Provision of a bank account of the enterprise:* This indicator gives information about the degree of professionalism of the created enterprise.

Table 3. Project scorecard

Indicators	*Score*	*Option*	*Option's score*
Which is the default rate of the sector of activity compared with the average default rate in Morocco?	/10	Below the Avrage	10
		Equal to the average	4
		Above Average	0
Type of premises	/10	Permanent position	10
		Itinerant	0
Legal status of the enterprise	/10	Individual enterprise	0
		Society	6
		Association	10
Age of the enterprise	/20	>=60 Months	20
		[48 60Months[	18
		[36 48Months[	14
		[24 36Months[	12
		[12 24Months[	8
		[6 12Months[	4
		<6 Months	0
Size of the enterprise	/20	4 persons & more	20
		3 Persons	14
		2 Persons	10
		Self employement	4
Life cycle of the enterprise's products	/20	A launch phase	12
		A growth phase	14
		A phase of maturity	10
		A phase of decline	4
Provision of a bank account of the enterprise	/10	YES	10
		NO	0
Total	/100		

5. CONCLUSION

Prepared following the events of the Arab Spring, this article presented the programs and structural reforms implemented by the Kingdom of Morocco to promote entrepreneurship among young micro entrepreneurs.

For a successful deployment of these programs, we have established a credit scoring model strongly adapted to small business namely the lack of transparency and data reliability.

However, in the same logic, global entrepreneurship programs offering training and mentoring by experienced entrepreneurs are prerequisites for any successful employment program. Such interventions could target secondary school graduates and less educated disadvantaged young people who account for most of unemployed youth, completing the « Moukawalati » program for graduates of higher education.

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