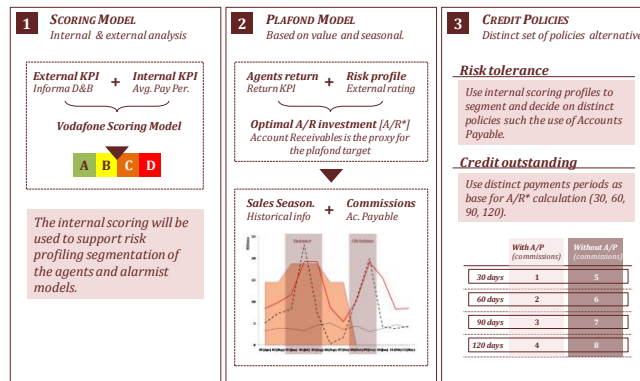


**TITLE: A NEW CREDIT MONITORING FRAMEWORK FOR AGENTS' NETWORKS**



**PURPOSE:** A LISBON MBA WORK PROJECT FOR OBTAINING MASTER OF SCIENCE IN BUSINESS ADMINISTRATION

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## **1. ABSTRACT & EXECUTIVE SUMMARY**

The purpose of this work is to develop a practicable approach for Telecom firms to manage the credit risk exposition to their commercial agents' network.

Particularly it will try to approach the problem of credit concession to clients' from a corporation perspective and explore the particular scenario of agents that are part of the commercial chain of the corporation and therefore are not end-users.

The agents' network that served as a model for the presented study is composed by companies that, at the same time, are both clients and suppliers of the Telecommunication Company. In that sense the credit exposition analysis must take into consideration all financial fluxes, both inbound and outbound.

The current strain on the Financial Sector in Portugal, and other peripheral European economies, combined with the high leverage situation of most companies, generates an environment prone to credit default risk. Due to these circumstances managing credit risk exposure is becoming increasingly a critical function for every company Financial Department.

The approach designed in the current study combined two traditional risk monitoring tools: credit risk scoring and credit limitation policies. The objective was to design a new credit monitoring framework that is more flexible, uses both external and internal relationship history to assess risk and takes into consideration commercial objectives inside the agents' network.

Although not explored at length, the blueprint of a Credit Governance model was created for implementing the new credit monitoring framework inside the telecom firm.

The Telecom Company that served as a model for the present work decided to implement the new Credit Monitoring framework after this was presented to its Executive Commission.

## 2. STATEMENT OF THE RESEARCH PROBLEM

The new credit monitoring framework was designed to answer the Telecom Companies question on the optimal amount of credit plafond they should grant to each company of its agent network.

The Telecom Company network that served as a model for this project is composed by over fifty individual companies that sell products, mostly mobile phones and price-plans of the Telecom Company, through agent branded stores (e.g. Phone House) or stores that use the own brand of the Telecom Company.

This channel has a major role in the consumption market (B2C), serving as a gateway to introduce new products. As so managing credit risk on the agents' network must take into consideration potential commercial impacts: reducing credit plafond to agents may impact directly the availability of inventory for sale in the stores network.

The companies that belong to the analyzed agents' network buy their inventory on credit directly from the Telecom Company. They earn their revenues from the product sales to final consumers and are also paid commission fees by the Telecom Company.

Both product sales and commissions fees have typical seasonal distributions and so credit limits policies must take this into consideration.

As agents' have a dual relationship with the Telecom Company, procuring its products (client) but also being paid commission fees (supplier), they have a direct impact in the Accounts Receivable and Accounts Payable of the Telecom Company. The analysis of the credit risk exposition analysis takes this factor into consideration.

Previously to the current project the plafond for credit limits in the Telecom Company did not discriminate credit distribution using as criteria the business effectiveness of the agents or their commercial objectives. The process included a risk analysis and a sales prediction based on past data. Process execution and revision analysis of the proposed plafonds were highly labor-intensive and time consuming.

The new credit monitoring framework should address the current pitfalls and provide a more robust solution in terms of easiness of response to modified agents' risk, address the credit seasonality needs and reward the agents' with higher value creation potential for the Telecom Company.

### **3. CREDIT MONITORING LITERATURE REVIEW AND DISCUSSION**

Current business conditions in Portugal have limited the availability of credit by the banking sector. As a result total loans amount to the non-financial sector companies have decreased every month since June 2011, on a year-on-year basis<sup>1</sup>.

Companies can reduce their finance needs for working capital by delaying payment to their suppliers. This is exactly other of the current problems affecting the Portuguese economical system. The combination of delayed of payments and a reduction in credit provided by banks is leading to a liquidity crisis that can cause credit default scenarios in many companies.

Telecom companies act as suppliers of credit to their agents, as they sell its products mostly as credit sales. So they typically end up financing the working capital needs of these agents. The decision to limit the amount of credit, or reduce credit availability by sales is then an operation that has much in common with commercial banking.

There are a limited number of studies that concentrate on corporate credit rather than banking credit. The 1987 article by Srinivasan and Kim tries precisely to approach the problem through the corporate rather than a banking perspective.

Credit granting theoretical prescriptions are summarized as follows (Srinivasan, V., Kim, Y. (1987) "Credit Granting: A Comparative Analysis of Classification Procedures", The Journal of Finance):

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<sup>1</sup> "Monthly Economic Indicators 12/2011", Banco de Portugal

- i. Credit granting is a multiperiod problem, implying that granting credit may not enable the firm current sale but also to sell in the future to the same customer;*
- ii. The extent of credit investigation must be determined by the tradeoff between the incremental costs of investigation and the amount of credit involved;*
- iii. Estimate the present value of benefits and losses from granting credit for all the periods in the planning horizon, given the customer's action in the immediately prior period;*
- iv. Integrate probabilities of collection and default with benefits and losses each period to compute the net present value from granting credit;*
- v. Grant credit, if computed present value is positive and reject full credit, otherwise.*

These prescriptions may in effect synthesize the credit granting dilemma, but in relation to the question in hand, relative to credit granting to agents/dealer network there are other points to be considered:

- i. Limiting credit to agents impact the availability of services to end-costumers, in this sense agents are not typical clients;*
- ii. The credit needs of agents are typically correlated with the commercial objectives of the Telecom Company, since they are part of the commercial channel to reach end-costumers, the true "clients" of Telco's.*

One of the main credit monitoring tools, used to limit costs of credit investigation, is credit scoring. Credit scoring can be defined as "method of evaluating credit risk of loan applications" (Mester, L (1997) "What's the Point of Credit Scoring?", Business Review - Federal Reserve Bank of Philadelphia). As a tool it was designed as a "formal statistical methods used for classifying applicants for credit into 'good' or 'bad' risk classes" (Hand, D., Henley, W. (1997) "Statistical Classification Methods in Consumer Credit Scoring: A Review", Journal of the Royal Statistical Society).

So credit scoring models are based on the interpretation functions of certain parameters to predict the behavior of loan applicants. Credit Scoring methods were first introduced in

the 1950's in commercial banking, precisely to reduce the costs of processing information of loan applicants. Since small businesses have typically a more complete relationship with banks the information costs for individual evaluation of loans were lower and so scoring models were initially not introduced for these customers.

Moreover, the introduction of credit scoring in small business loans applications is also not as direct as for consumer credit: typically the lender bank may choose to apply the scoring decision or simply use it as a supplement in the loan evaluation process (Frame, W., Srinivasan, A., Woosley, L. (2001) "The effect of credit scoring on Small-Business lending", Journal of Money, Credit, and Banking). According to Frame, Srinavasan and Woosley 2001 research, 74% of surveyed USD commercial banks used credit scoring for evaluating small business loans between \$250.000 to \$1.000.000 USD. Of those using scoring models only 41,9% automatically apply its decisions for small business loans decision.

Good scoring models need extensive data to be designed, according to Hand and Henley 1997, credit scoring databases often have over "100.000 applicants measured on more than 100 variables".

Limitations on size, characteristics and credit events in corporate credit granting to agents network hinders the development of specific credit scoring models for addressing the current research problem. However external credit auditing firms supply credit ratings for individual companies, with existent predictable default rates. The Telecom Company that served as a basis for the current study did have such an information provider.

#### 4. RESEARCH APPROACH

Considering then the corporate credit granting dilemma and the specific points to address the current business problem, we considered that the credit monitoring model should apply the following principles:

1. The new model should consider the information costs of analyzing data of existent agents, and so be statistically prepared to identify both credit rating and specific credit limits.
2. The model should have a multi-period approach, based on rolling forecasts that consider expected sales seasonality and so include a dynamic analysis of credit needs.
3. The benchmark basis to determine the amount of credit is 60 days of sales, since no changes would be made on payment policy of the company.
4. Use the existent commercial objectives or, if not possible, include the actual business performance of the distinct agents in the network as a factor for credit distribution among the agents' network.
5. Include, as a factor for credit distribution, the expected default rate of the agents.

For developing the new scoring model the following points should also be included:

1. The new scoring model will be based on existent external and internal information. The objective is for it to be more responsive to parameters that can be more easily observed by the credit granting Company rather than the external Credit Scoring analysis (for instance, average payment periods).
2. The new scoring model could not be used to accurately predict default rates due to lack of data. It should be for prompting alarms for credit risk potential and as a managerial information tool.
3. The model would be developed based on regression analysis. Regression analysis is one of the tools for developing scoring models (Kočenda, E., Vojtek, M. "Default Predictors and Credit Scoring Models for Retail Banking").

## 5. RESEARCH RESULTS

As discussed, the new credit monitoring tools should be developed to provide a pragmatic answer to risk management on the agent network. As so, for its implementation, four major contributes were developed:

- A. A Scoring model that addresses changes in perceived risk more directly than the already existent external scoring grades, and can be used to prompt alarms for credit risk changes;
- B. A framework for calculating credit limits that address risk management but also evaluate each agent rate of return as a trigger for credit disbursement;
- C. Credit policies that could serve as mechanisms for discretionary business decisions on credit limits setting inside the corporation;
- D. A governance model for managing credit policies inside the organization.

### A. SCORING MODEL

As discussed the use of credit scoring improves the perception of the credit risks that individual agents may have.

Telecom companies may use external scoring information from providers, such as Informa D&B, or develop internal processes to attribute credit scoring to its clients and partners.

The objective of the scoring model developed during the current project was to combine external scoring information and internal KPI data to create a more responsive scoring process.

To do so several KPI related to the agents companies financial status and their relationship with the telecom company was collected and consolidated in a database<sup>2</sup>. Of the over 60 agents of the network, 35 were selected as representatives based on information availability criterias.

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<sup>2</sup> See table 3 in Annex.

To develop the new Scoring model, the internal risk perception of each of the individual agent companies was calculated in a scale indicating higher risk potential by an internal telecom credit risk analyst.

The next step included, through a multi linear regression analysis, the identification of what KPI, internal or external, had statistical significance in explaining the internal risk perception of the credit risk analysis.

The new model, with the selected KPI variables that proved both statistical and business significant, was consolidated into a new “credit scoring” model that could be used to predict the credit risk score of each of the different agents.

The business interpretation of the new model is based on the fact that the risk that a firm represents is a function of its external risk scoring and financial health (for which we use external variables) and its relationship with the Vodafone, based on its payments profile (the average payment period).

The following figure represents the relational scheme of the new Scoring Model, that has four notations from A, low risk to D, highest risk.

The same figure also shares some of the results of the model, with a comparison between the external perception (external risk scoring), the internal perception (the dependent variable of the new model) and the actual results of the new scoring model. The statistical interpretation of of the regression analysis can be consulted in the annexes.

Internal Score		Significant?	Correlation	
<div style="display: flex; flex-direction: column; align-items: center; gap: 5px;"> <div style="background-color: red; color: white; padding: 2px 5px;">D</div> <div style="background-color: orange; color: white; padding: 2px 5px;">C</div> <div style="background-color: yellow; color: black; padding: 2px 5px;">B</div> <div style="background-color: green; color: black; padding: 2px 5px;">A</div> </div>	<i>Informa rating</i> (1-20) KPI1	▶ at 7%	+	<i>External KPI</i>
	<i>Debt/SE</i> KPI47 <i>ROA</i> KPI9	▶ at 15%	-	
	<i>Operational Margin</i> KPI47	▶ at 6%	+	
	<i>Average Payment Period</i> KPI24	▶ at 5%	-	<i>Internal KPI</i>
	<i>Risk Index (Informa)</i>	<i>Internal perception</i>	<i>Scoring model</i>	
<i>Average</i>	2,5	2,2	B	
<i>Company A</i>	1	1	B	
<i>Company B</i>	4	4	D	
<i>Company C</i>	1	4	D	

Table 1 - Business interpretation of the regression results

Since the results of the new scoring model are continuous and the client decision was to use discrete variables, a scoring notation of each individual firm four different intervals was constructed in accordance to two principles:

1. A case by case analysis of the results of the scoring model, setting the result interval in the closest to the maximum number of alignment to the internal perception.
2. Offset the bias to the mean that the typical linear regression have by reducing the central intervals.

SCORE	A	B	C	D
LEVEL	< 1,5	<2,25	<3	<=4

Table 1 - Grade interpretation in scoring model

### B. PLAFOND MANAGEMENT FRAMEWORK

The Plafond Management framework objective is to determine the amount of credit exposition to grant to each Telecom Company agent. This amount must be subjected to two restrictions, the limitation to credit risk exposition but, at the same time, it should not limit the capacity of the agents to support the Telecom Company business development needs.

The variable that most represents the average exposition to credit risk is the Account Receivables<sup>3</sup> amount. But since agents act also as suppliers of telecom companies, receiving commissions for existent sales and client retention, the deferred amount of these payments, the Accounts Payable<sup>4</sup>, must also be considered.

The current model uses the following base reasoning: *using as a baseline the current credit policy of 60 days of sales, the available credit that the Telecom Company grants (its Account Receivable) should be targeted to the most valuable and less risk pervasive agents.*

The following diagram and formulas explain this reasoning.

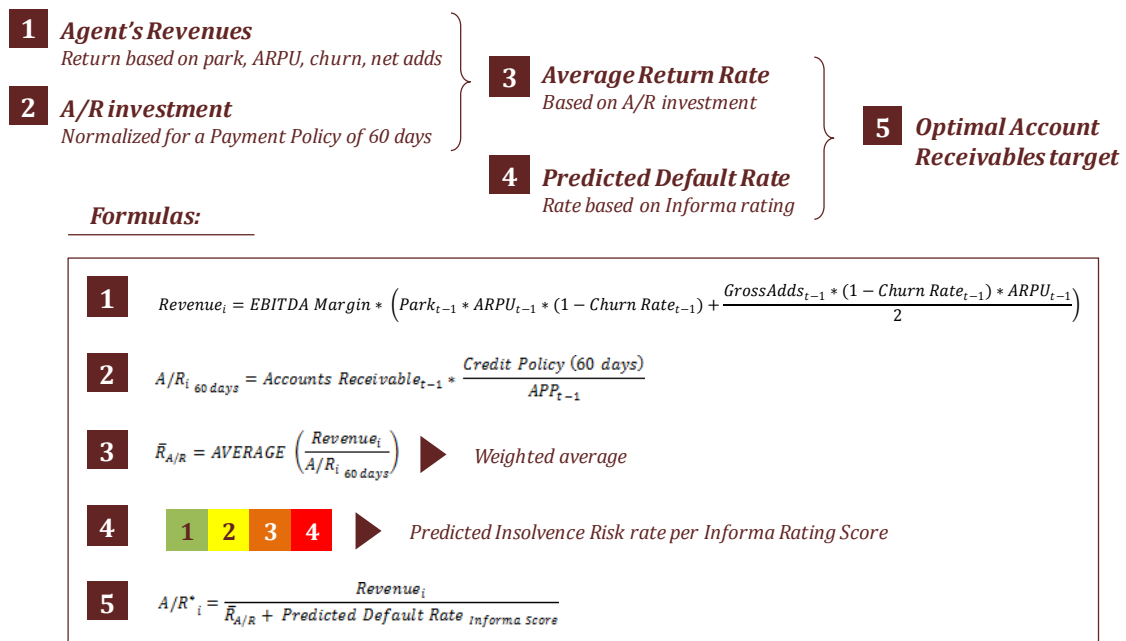


Figure 2- Process and formulas used to calculate the optimal Accounts Receivable to grant to each Vodafone Agent.

To achieve this goal the framework uses a process that starts by calculating the actual return that each agent brings to the Telecom Company. This is made through an analysis of the number of existent customers that subscribed the service through the agent, plus net-adds, considering the average ARPU that each subscriber has and the actual churn rate of the agent's subscribers (Formula 1 in the figure).

<sup>3</sup> Accounts Receivable (AR) - is money owed to a business by its clients (customers) and shown on its Balance Sheet as an asset

<sup>4</sup> Vodafone agents are not only clients but also suppliers (they receive commissions based on new or retained subscriptions).

The actual return is then calculated using the Account Receivable that each of the agents received during the last twelve months. This amount is calculated considering a base of 60 days payment base to correct the weight of distinct agents' policies in the actual return (Formula 2).

The average return of the Accounts Receivable (Formula 3) is used as a benchmark to align the redistribution of the Accounts Receivables investment (Formula 5). The credit default risk is also considered, using the External Scoring Provider predicted default rate as a factor in the calculation (Formula 4 and 5).

The result of the framework is a distribution of the credit available through the Accounts Receivable to each of the agents.

But two factors must also be considered for defining the Credit Limit policy:

1. The use of net exposition, this is to consider or not the existent Accounts Payable to the agent when deciding its credit limit;
2. The predictable seasonal necessities of credit, since sales are mostly concentrated in two periods – Christmas and summer.

To fine tune the amount of the credit plafond regarding net exposition, the model includes a decision variable to increase the total exposition to the agent by adding the amount of the Accounts Payable of the agent, estimated as an average month of Commissions<sup>5</sup>.

For including seasonality, the model uses a seasonal prevision of the Account Receivable needs, based on an aggregated analysis of previous years' total sales per month. To simulate the actual need for credit plafond the seasonal prevision of sales is calculated using a moving average analysis based two or three months<sup>6</sup> that simulates the average payment periods of each purchase of equipments by the agents to the Telecom Company.

The following figure is a practical example an analysis of the results of executing the model

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<sup>5</sup> Commissions are paid monthly, near the 20<sup>th</sup> day. Typically they are paid in reference to the previous month defined operational KPIs.

<sup>6</sup> The three months moving average has shown being more empirically aligned to the typical plafond expectations.

based on a seasonal prediction of sales and commissions value. The actual plafond target is a monthly moving average since that agents' sales are paid on multi-month period.

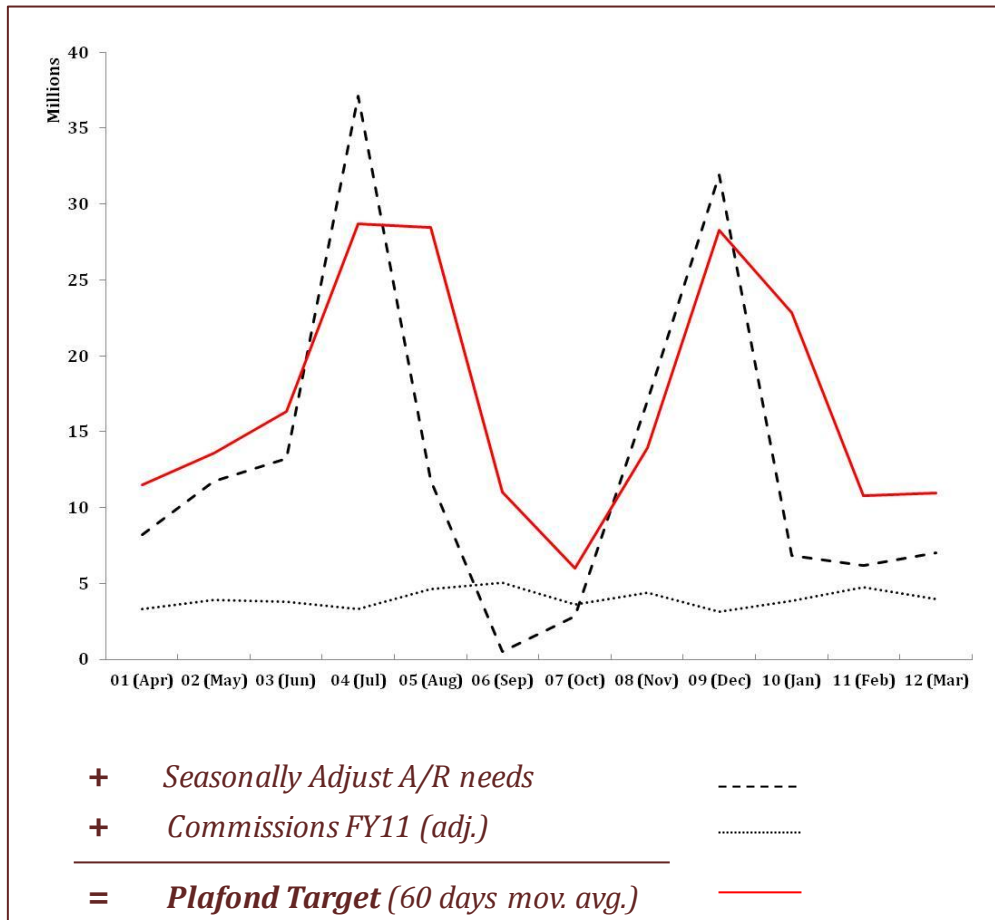


Figure 3- Seasonality analysis impacts the multi-period analysis of the credit necessities of the Agents' network.

### C. CREDIT POLICIES

The Plafond Management Framework sets a general model for credit distribution among the agents network. But management decisions on the amount of credit granted should also consider other potential discretionary distribution criteria.

Based on the plafond management framework a set of eight possible credit policies was designed to serve as the basis of business decisions on what credit plafond to apply for each agent. These eight policies are determined by two basic variables:

1. The number of days sales outstanding used when calculating the Accounts Receivable target in the Plafond Management framework<sup>7</sup>;
2. The expansion of the credit limit to agents by including in the credit limit the amount of unpaid commissions – the Accounts Payable.

	<i>With A/P (commissions)</i>	<i>Without A/P (commissions)</i>
<i>30 days</i>	1	5
<i>60 days</i>	2	6
<i>90 days</i>	3	7
<i>120 days</i>	4	8

Table 2 - Set of potential credit policies that can be applied to agents or agents segments.

The objective of the credit policies set is to support a more rational and less time-consuming process of discretionary business decisions.

The policies can be chosen depending on the relevance or commercial objectives that each agent has to the Telecom Company.

### **Credit Policies – An Example**

As an example of the use of the credit policy to support, we present a segmentation analysis based on two vectors: the internal risk scoring profile and an index of geographic relevance of each agent.

The index of geographic relevance was calculated on a district basis, using the Herfindahl Index to determine the districts with the highest concentration of market share per agent. Each agent quota on the highest concentration markets was then added and so the agents with most relevance in markets with high concentration were identified.

<sup>7</sup> The baseline model uses 60 days, aligned with the Telecom Company clients' credit policy.

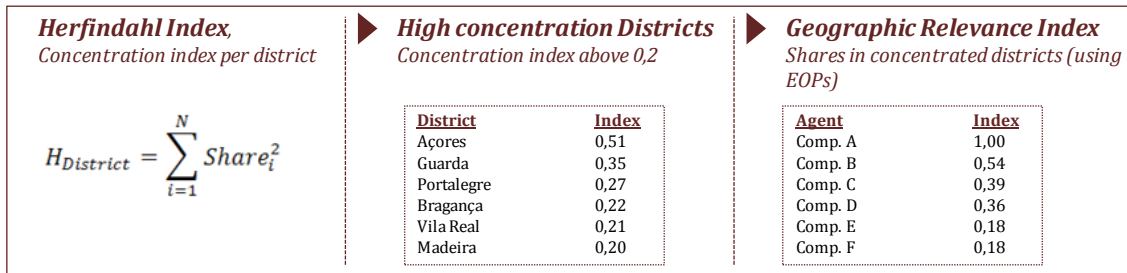


Figure 4 - Calculation of the geographic relevance Index

The index for concentration can then be combined with the risk scoring of the agents and four distinct segments are identified. These segments can serve as the basis for the attribution of specific credit policies.

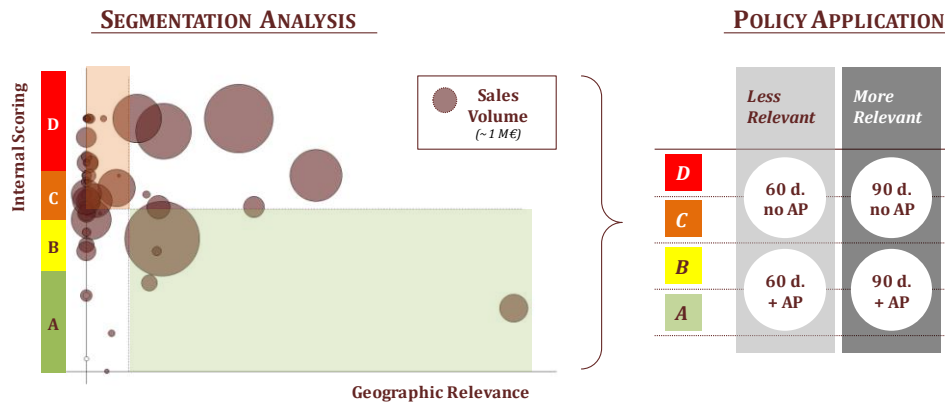


Figure 5 - The Credit Policies are applied to specific agents segments

The use of credit policies can then help management into fine tuning the credit limits policy aligned with its business interests.

#### D. GOVERNANCE MODEL

To apply the credit policy and to monitor all credit risk framework for agents, a governance model, with management backing, needs to be institutionalized.

The following makes a short presentation of the objectives of such governance model that will not be discussed in further detail on the current work project.

##### OBJECTIVES



The governance model has the objective to **regulate the targeting of the existent credit policies** to specific agents segments or agents, based on financial and commercial objectives.

The governance model will also **monitor sporadic credit events**, reviewing policies if necessary.

##### FREQUENCY



The reviewing process will take place **twice per year, before each major campaign**, and will set a credit plafond target for a **time horizon of six months**.

##### PROCESS

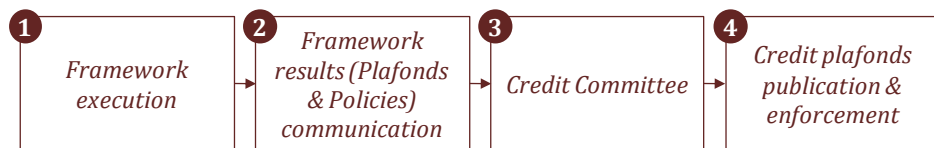


Figure 6 - The suggested model for the Governance Process

## 6. SUMMARY

The credit granting problem from the perspective of corporations has many similitudes with reduced maturity credit issued by commercial banks. But, when business relations are more complex, and in this particular case, where part of the company's commercial network is actual based on external companies (an Agents' Network) credit granting must address several concerns.

Approaching this question solely on a risk analysis perspective reduces the understanding of the distinct dimensions of the problem: when business partnerships are crucial for business development new factors must be taken into consideration in credit disbursement.

The presented framework, which is currently being implemented in a Portuguese telecom operator, tries to address these multiple issues of the credit granting decision:

1. A Credit Monitoring environment that has internal alarms and processes to address Credit issues;
2. Considering the risk of default scenarios by agents' in setting credit limits;
3. Inclusion of business performance as a crucial factor for credit distribution;
4. Developing a method for combining discretionary business decisions with model based results;
5. Addressing the problem in a multi-period perspective, including characteristics such as sales seasonality and rolling forecasts analysis.

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## 8. ANNEXES

### Scoring model results

#	KPI	Internal / External
KPI1	Rating from external provider	External
KPI2	Risk indicator from external provider	External
KPI3	Financial Capacity	External
KPI4	Credit Opinion	External
KPI5	Incidents	External
KPI6	Stock Rotation Index	External
KPI7	Average Payment Period	External
KPI8	Added Value per sale	External
KPI9	ROA (%)	External
KPI10	ROE (%)	External
KPI11	# of Available Financial Reports	External
KPI12	Total Assets	External
KPI13	Operational Results	External
KPI14	Net Profit	External
KPI15	Shareholder Equity	External
KPI16	Sales	External
KPI17	Working Capital funds	External
KPI18	SE / Liabilities (%)	External
KPI19	Solvability Ratio	External
KPI20	Total Sales (to agent)	Internal
KPI21	Total Non-credit sales (to agent)	Internal
KPI22	Total Credit Notes (to agent)	Internal
KPI23	Accounts Receivable (to agent)	Internal
KPI24	Average Payment Period (of agent)	Internal
KPI25	% Invoices paid after 60 days	Internal
KPI26	% Sales made in credit	Internal
KPI27	Average Total Open Amount after 60 days	Internal
KPI28	Total Exposition	Internal
KPI29	Average Invoice amount after 60 days	Internal
KPI30	Total Commissions Amount	Internal
KPI31	Values in transit (between Telco and Agent)	Internal
KPI32	Historical Credit Limit	Internal
KPI33	Current Credit Limit	Internal
KPI34	Existent Banking Warranties amount	Internal
KPI35	# Incidents/default on invoices payment	Internal
KPI36	# Incidents that ended in customer being blocked / refused sales	Internal
KPI37	Commercial Objectives	Internal
KPI40	Sales Department of Agent	Internal
KPI42	Churn on agents' park	Internal
KPI43	ARPU of agents' park	Internal
KPI44	% of customer' inside the park using direct banking debit as payment method	Internal
KPI46	Weight of commissions paid to agent relative to total sales to agent	Internal
KPI47	Operational Results over Merchandise Sales	External
KPI48	Herfindahl index per district and Agent's relevance	Internal
KPI49	Total Amount of non-sales credit granted to Agent	Internal

Table 3 – KPIs' considered for the model

**ANOVA<sup>b</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14,200	5	2,840	4,245	,005 <sup>a</sup>
	Residual	19,400	29	,669		
	Total	33,600	34			

a. Predictors: (Constant), KPI47, KPI1, KPI24\_2011, KPI18, KPI9

b. Dependent Variable: SCORE

Table 4 - ANOVA results of the regression analysis of the Scoring model

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2,431	,604		4,024	,000
	KPI1	-,068	,037	-,332	-1,865	,072
	KPI9	,056	,035	,417	1,581	,125
	KPI18	-,016	,010	-,343	-1,567	,128
	KPI24_2011	,012	,005	,376	2,392	,023
	KPI47	-,012	,006	-,345	-1,988	,056

a. Dependent Variable: SCORE

Table 5 - Coefficient matrix of the regression of the scoring model