

2017 Dupont Award – Special mention

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Business Intelligence – The strategic solution for surety bonds

Introduction

Which is the impact of disruptive technologies on the surety market? No surety activity can avoid the digital era evolution and innovation; then: How will the technological change affect our market?

Insurers admit that innovation has the potential to create or transform a market, an agile and prompt response is the key to capturing the client and that the only way of taking advantage of the opportunities offered by this scenario is to create value. But in practice, the surveys conducted among Latin American operators show that the budgets deal with operating rather than strategic improvements. Eight out of ten executives acknowledge that success will be directly linked to the capacity to innovate more quickly than their competitors.

If we analyze the projected investments in research and development in the three main areas of the sector for the coming years, 60% will invest in improving the operating processes; 52%, in improving digital technology; 44%, in strengthening client loyalty and 26%, in reducing costs. Combined with the growth strategy for the same period, 31% will improve the existing products, 26% will develop new products associated with the current demand and only 19% will expand product offering to new segments, which indirectly involves the extension of the current business model.

Innovation will be required by the clients to all who wish to be their suppliers of goods and services; therefore, the companies cannot “do more of the same” and expect to grow as the financial instruments really do.

Technology, to which all operators have access, is characterized by changing preferences and eliminating competitive advantages. In the past, there was a captive market with mandatory guarantees that covered the needs in a static legal framework. Today, we have to design a cover that takes into account the spirit of the regulation and its possible evolution and application. It is in this process where our know-how marks the difference. However, to create solution alternatives, we first have to identify the problem. The traditional strategy, which is based on the decision-maker’s intuition, does not find an answer because it lacks a tool to simplify, isolate and understand the environment.

Disruption increases competition in the surety sector due to the entry of entities, technologies and business models that are imported from the financial market. Some operators, mainly the specialists, have felt this impact. The problem is to think that only surety bonds may meet a need, that this need will remain unchanged and that we are the only ones who may innovate, but when we decide to do it.

The purpose of this paper is to conceptualize the problem, define the relevant variables and outline a path towards strategic innovation. This involves benefiting from the experience of specialists, reinsurers and new players to draw up proposals intended to satisfy a dynamic and complex market, but with higher potential.

The impact of innovation on surety bonds

In the new financial market, technology is the key to success. Based on the continuous and constant introduction of innovations, the market uses the information as a strategic variable for the decision-making model.

The first step will be an analysis of the signs of change perceived in the market, which will allow describing the threats to be faced by the operators; it will identify the characteristics, perils and possibilities to transform this apparently negative reality. The purpose is not survival but a repositioning of the offering through the use of information, designing covers to meet the overall modern obligations generated by the change and providing the company with agility to adapt to the environment.

This paper focuses on the analysis of the catalyst for change, technology, and the determination of its impact on an intangible product, the surety bond, which covers obligations to do in compliance with regulatory requirements.

The signs of change are: (a) the speed and frequency of the changes in the legal framework, which requires ongoing control so that the covers do not have legal gaps; (b) higher claims frequency, which gives the client an opportunity to test the process speed and the effectiveness of the cover design; (c) the obligations arising from modern contracts are not considered by the traditional products; (d) the new instruments from the financial sector are preferred by the clients due to their flexibility, simplicity and effectiveness at contracting; and (e) capital return both for stockholders and reinsurers is lower due to the combination of multiple factors.

This transformation is seen in all markets. If surety bonds are not capable of adapting to it they will lose competitiveness and will be pushed into the background, greatly jeopardizing their permanence in the market. Reality showed that no organization, regardless of its size or position in the market, may remain immune to this process of change. A proof of this is Netflix for Blockbuster, Apple for Kodak, Uber for taxis and Spotify for record companies.

The success of their expansion and the perception within the same business model strengthen the idea that services do not require much innovation, which only pertains to the industrial sector. The purpose of this paper is to avoid the absurd situation of introducing an improvement only and continue doing the same, but more quickly. The threat is summarized by Tom Peters: "When capital and technology are accessible to everyone equally, what marks the difference is the quality of human capital."

In short, the market is evolving and the signs show the need for a strategic rather than an operating solution. The challenge for surety bonds is to change from an offering to a demand approach, where the axis is the client instead of the company, using information and experience to create value through decisions.

New scenario

The first step is to acknowledge the problem: changes in the environment, technological advances, loss of market, changes in the clients' behavior, i.e., everything that causes a change in the status quo is, in short, a threat or an opportunity. The German physicist Heisenberg remarked: "...and asking the right question is frequently more than halfway towards the solution of the problem." Then, I will make a brief historical review of the evolution of surety bonds and the bank aval from the technology perspective throughout the time.

Let us imagine what the purchase of a surety bond was like before the Internet era. As it is an accessory contract, it came up as a requirement of the contracting party. The companies established terms and conditions to control underwriting and, therefore, the business standards. Risk aggregation, as a consequence of the demand, made back-office operations a key process. New operators, attracted by excellent results, increased competitiveness and achieved differentiation through price and improvements in risk management. However, the critical process continued to depend on the underwriter's subjectivity. Conversely, the bank aval, which had more rigid processes, could not comply with the terms, flexibility and standards established by a more flexible product as the surety bond was.

The Internet and its globalization changed everything. The buyer-seller relationship has reversed. Today, the information the companies need for decision-making is only one click away. The financial sector repositioned itself using technology to narrow that gap through models that integrated information from different internal and external sources. It achieved self-sufficiency by creating its own system and developing an advantage. The insurance sector depends on the financial market; therefore its process is partial, incomplete and deferred in time, which results in the loss of efficiency in decision-making. Technology allowed for the creation of an advantage in the critical process, as it simplified underwriting and made surety bonds grow, expand and achieve leading positions in project execution.

Regulations such as Basel I, II and III, imposed by the environment to protect the sector and users, boosted the creation of models for risk measurement that were used as management tools. The models, created for a different function, became the main source of information for strategic decisions and improved marketing efficiency, the offering of benefits and the understanding of the client's needs.

The successful cases base their strategy on three innovation focuses: development of new business channels, like La Caixa (interface in-out); implementation of new models of artificial intelligence which improve the relationship with the client, like Santander (customer journey), and finally the efficient use of technology and data to create value, like BBVA (risk decision and profitability). Surety operators need to innovate and reposition themselves in the financial market through a strategy which creates value for this new client, or other people will do it instead.

CRISP-DM Method

After defining the problem, identifying the gap between what is desired and what is ideal, and evaluating the threat of ignoring technological changes, I selected the Cross-Industry Standard Process for Data Mining (CRISP-DM) method to structure my analysis. This is not a laboratory-developed method, but derives from real experiences and may be applied to any sector. It has the advantage of extracting useful, understandable and hidden knowledge from big data volumes, and its main purpose is to generate information impossible to obtain through traditional statistical methods, or intuitively.

Its objective is to generate timely, relevant and comprehensive information starting from a data mining model that provides knowledge for decision-making. The process has a four-phase cycle, which will be developed in depth in the Annexes section through a case applied to surety bonds. There follows a brief description which will enable the reader to understand this paper scheme:

1. **Business Understanding:** It places the potential and current client at the center of the strategy, which is the differential advantage of this method. In a changing environment, detecting the needs and defining the profile will allow the alignment of all the resources. Once the objectives are fixed, the survey helps define the data mining problem and implement a preliminary plan.
2. **Data Understanding:** data analysis and understanding starts with the identification of the internal and external variables directly affecting the sector. In the Annexes section, four variables may be recognized and their interaction enables a synthesis of the surety business critical flows: (a) behavior; (b) environment; (c) segmentation, and (d) rating. The first two are external, they cannot be controlled by the company; the other two are internal. In addition to the descriptive power required from the variables, they should come from reliable and feasible sources to contribute to the model predictive function.
3. **Data Preparation:** starting from the initial raw data, scenarios are built through relations and correlations among the variables; these scenarios generate multiple alternatives by assigning a probability of occurrence. The Bayes method allows incorporating additional experimental information to the initially available one to create tables and link the variables, their results and probabilities.
4. **Modeling:** once the data are refined and the probabilities distributed, a set of scenarios is adopted and simulations are used to identify patterns. Logical rules are created to describe the business behavior considering the relations between variables. They use real information, which will feed different sectors: (a) Technical, (b) Marketing and (c) Management. Due to its importance, they will be developed in the following items.

Like information, in the innovation era the CRISP-DM method is a key resource for service companies. The strategic decisions made from it will build a competitive advantage only when the potential and current clients perceive their actions as benefits. In the case of surety bonds, the result of this method will allow the design of an action plan from a model that summarizes the core business aspects such as a scorecard which integrates the company and its environment starting from the analysis of three key areas.

I. Technical: the “level premium” problem

The success of surety bonds, which are of legal and contractual nature, is due to the adaptation of the underwriting processes, which understood the clients’ needs reflecting them in covers issued by new operators: the insurance companies. However, the management model did not introduce suitable tools to understand the context, reduce the uncertainty of increasingly complex markets and adjust the technical standards to the regulatory requirements. Surety bonds currently lack an information system to reduce the gap between the current and future market and, therefore, catch up with their competitors.

Though all processes can be improved, from the technical standpoint surety bonds currently lack a pricing model that: (a) complies with the capital requirements and, simultaneously, (b) calculates the price according to the use of capacity and the cost structure of the company. In order to understand the importance of technology for surety bonds, I will do a comparative analysis of the current model, the one applied by the automobile line and the model developed in this paper, in order to overcome the current limitations and restrictions.

Since their inception, surety bonds use the “level premium” method, made up of a “risk premium” to meet the current expenses of the year and another one called “saving premium,” made up of amounts advanced by the insureds to cover the future contingencies. The cost is established by comparison between companies dealing with similar activities. Management accounting is used to rate the policyholder, obligations are analyzed and the rate is fixed according to the project global risk. There is no statistical and actuarial basis. Technical and management strategic decisions are limited because they have to wait for the disclosure of the accounting figures to correct deviations and technical results adjusting the financial statements items.

Conversely, the automobile line is in full transition from an average cost model to a pricing model focused on the client behavior and supported by data mining to generate information which enables: (a) the definition of a more accurate risk profile; (b) the transformation of a cover perceived as a commodity into a differentiated one, and (c) the adjustment of the price according to the exposure variation. Technology made it possible to understand the client and, with this information, generate a benefit for both the user and the company by selecting the most profitable clients and discarding others.

Data mining overcomes the limitation of actuarial mathematics and creates a model combining different techniques and disciplines which weigh the impact of the context on the company’s processes. According to this model, the underwriting process becomes a source of information which, in addition to others, contributes to the creation of probabilistic scenarios where the price is the correlation of multiple variables and standards. Though it is not exclusively a pricing system, when considering the whole value chain, it has the advantage of obtaining the optimum capital cost according to the restrictions and targets fixed for each variable. It has been proved that, due to their limitations, the risk compensation methods, like the level premium, are not adequate for surety bonds in dynamic contexts.

II. Marketing: customer journey

Now, I will show how the use of information systems and the right tool selection may be an instrument to widen the offering, which is the main concern of operators due to the low underwriting activity the industry has had in the last three years. Though the sector invested in technology, those investments were exclusively focused on improving the data input platform.

However, the brokers did not perceive this improvement as a benefit, but as a burden imposed by the companies, which shifted operating tasks and were the sole beneficiaries of automation. In some markets it was vertically integrated on both sides of the productive chain, from the policyholder to the beneficiary as in Brazil, which operates with electronic policy and digital signature, or partially as in Argentina, limited to customs bonds only.

But these developments waste the opportunity of meeting the clients to enrich the relationship and generate information in order to build more accurate profiles of the diverse users. The limitation is based on business perception and relies on intuition to define the targets for this type of project. Immersed in this management model, we abandon the possibility of capturing potential clients by widening the offering.

Today, when a company sets up a project, it looks online for suppliers and solutions, and assesses and compares them to decide a purchase. However, there are potential buyers who are not yet aware of the benefits and advantages of surety bonds. They still do not need them, though embarking on a project is a real risk. Then, it is necessary to create insurance awareness and lead the purchase behavior.

The sales force, the main commercial alternative and budget item of the companies, leads promotion in the surety market, and the companies rely on it for their product penetration strategy. However, in a heterogeneous and highly dispersed market, it has a limited cover. Service quality depends on the surety, is reactive and its scope is not enough to meet the expenses.

Data mining is based on strategic marketing principles. It places the user at the center of the strategy. In the modern management paradigm there is a first goal: to know the client to select and segment the demand and then position the product in the right niches to develop competitive advantages. The model scenarios, like the decision tree, identify patterns, segments and monitor the environment detecting opportunities which are then capitalized by tools such as: (a) data-driven: direct campaigns are designed for a specific segment; (b) inbound: the relationship with clients is improved through contents according to their profile.

All in all, it is about transforming data into knowledge, and knowledge into profitability. The paper shows how to align resources and identify clients' preferences and opportunities to widen the potential offering.

III. Management: data mining

The surety market challenge is to shift from an offering to a demand focus, like the industrial sector, where the power shifted from the company to the consumer. Henry Ford's phrase: "Any customer can have a car painted any color that he wants so long as it is black," today may be considered obsolete, but in a certain way, we go on using it. Redefining the business also involves restructuring the mental models on which our decisions are based and generated.

In this section, as well as throughout the paper, I analyze the role of information in the strategic decision-making process, such as the decisions that would compromise the company's mid- and long-term positioning. The client places surety bonds in the middle of a life cycle between maturity and decline. It needs innovation, a change in the management model, and so it has to develop tools that may understand the changes in the environment.

In the last years the situation has worsened: (a) written premiums slowed down in a three-year period; (b) the net and gross loss ratios doubled, which affects both domestic stockholders and reinsurers; ratios above 80% show that the "level premium" criterion is not effective in highly volatile contexts like the Latin American markets; (c) the regional technical results are at their

historical minimum proving that decisions on systems which use a posteriori information lose effectiveness as management models; (d) in Latin America, the combined ratio increased by 43.85% since 2011 and peaked at 82%; two important marketplaces, Brazil and Colombia, show ratios higher than 100%, which increase the risk in the region; and (e) the combination of drop in income and rise in expenses encouraged acquisitions and mergers because the operating margins did not allow for significant deviations.

The CRISP-DM method, used for building the decision tree, enables the design of a tailor-made information system by incorporating all the internal and external variables which directly affect our sector, with a focus on strategic decisions, such as: (a) problem solving; (b) a better use of opportunities, and (c) risk prevention. All in all, uncertainty is reduced if the information infrastructure is effective.

It is necessary to understand the causes of these deviations and how the environment is affecting our business. For the top management these models are beneficial when applied not only as a control tool but also for business purposes, as they allow moving forward and identifying purchase patterns, sectors with latent needs and new niches.

This paper showed that it is necessary to redefine our value chain. Besides technology, there are other factors that are changing the market. It is essential that the companies have an integrated management system to give an effective answer to the different environment changes, one of which is the constant evolution of the legal framework.

Conclusions

The transformation of the global financial market affects each one of its players differently in terms of intensity and speed. Surety bonds will also be impacted and will have to adapt to a new scenario where technology will create not only opportunities by broadening the offering but also threats for those who fail to adapt to new standards and preferences, as well as to the new profile of the client requiring this type of cover.

- Technology has stressed the dichotomy between two models: (a) *offering*: where the traditional operators maintain their competitive advantage with manual underwriting, cover design and commercial processes; reinsurers, as capital suppliers, demand higher returns and stable results; and (b) *demand*: where clients with greater alternatives, unsatisfied cover needs and preferences in the form of new contracts require instruments to continue enjoying the benefits of surety bonds but with a different service and cover.
- The gap is the problem and the focus of this paper. The key is using the information as strategic target to create value, making decisions to allow innovations in an intangible service like bonding and the adaptation to a dynamic environment.
- The value chain analysis revealed symptoms that require a comprehensive solution. The CRISP-DM method provides an approach to designing a predictive model that includes all the critical processes of surety bonds as well as the variables that directly affect them. The end product is a balanced scorecard built from probabilistic scenarios to conduct the business where our know-how is the differential advantage.

Annexes

Excess liquidity and the need for higher returns on equity increase competitiveness in the global financial market, which fosters the development of new instruments. Technology creates new rules and standards that change the industry and affect us directly. Based on the traditional sales force scheme, the cost of turning a potential client into a real one is between five and fifteen times the cost of doing it employing new technologies.

In this scenario, where the surety market tends to reach its potential, the product life cycle is transitioning from maturity to decline: (1) lower premiums due to new entrants; (2) increased loss ratio; (3) lower return on equity with greater portfolio exposure, and (4) loss of attractiveness due to the volatility of results which are close to the breakeven point. This summarizes the state of operators in Latin America. Moreover, the transfer of power from the offering to the demand calls for innovation and placing the focus on technological tools to adapt to the context faster and develop competitive advantages.

To describe the problem posed by the gap between the current and the future market, I will use data mining, which will enable taking advantage of the accumulated experience and knowledge. This tool is mainly useful for obtaining advance information about behavior patterns for decision-making.

As a starting point, four key variables were identified and classified. They will be used to develop predictive scenarios in the sector and apply them to any operators' structure.

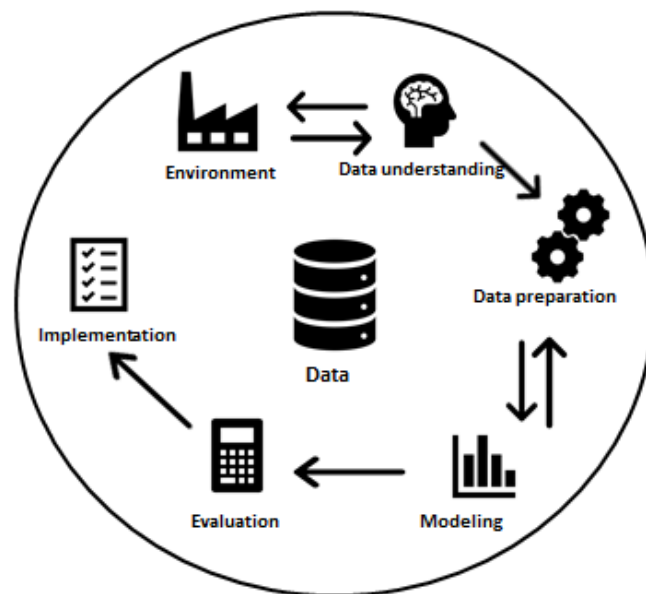
- *Behavior*: exogenous factors which are outside the company's control. They have a direct relationship with the level of demand and allow for market size prediction, e.g., level of investment, public spending and balance of trade.
- *Environment*: set of forces that operate beyond each company's boundaries and affect them directly. In continuous change, its state generates opportunities and threats, such as exchange rate, inflation rate.
- *Segmentation*: internal and descriptive; it divides the portfolio into homogeneous groups to do an in-depth analysis and adopt a different strategy for each of them. According to the basic surety bond classification, it will be split into: customs, public and private works.
- *Rating*: based on an ordinal scale, it describes the risk and potential profitability of a company by weighting the competitive environment (industry risk) according to underwriting parameters set by the insurer.

General objective

To develop a predictive model using data mining techniques to improve the value chain of insurers that underwrite surety bonds by turning the internal and external information into a strategic resource and a source of competitive advantage.

Methodology

The *CRISP-DM* method was selected because it includes a business understanding phase that is essential for creating a frame of reference specific to surety bonds and because of its flexibility to work with any data exploration tool. With this method projects can be developed according to a standardized process that ensures rationality, with a high impact on the business. This figure graphically shows the project stages to be developed below.



I. Business understanding

This is the strategic phase because it defines the objectives and requirements from the operators' perspective. Their experience, know-how and market vision help define the problem and implement a preliminary plan which is described below, based on LatinoInsurance report at 30 June 2017:

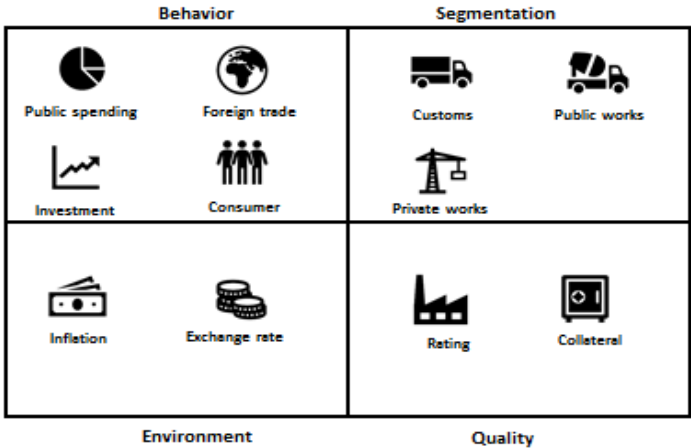
- Written premiums have declined in the last three years without recovering 2012-2013 values (maximum). In US dollars, the standard currency used by reinsurers and investors, they recovered slightly after working with negative ratios for three years.
- The gross loss ratio doubled from 2008 to 2017 and peaked at 30%; this implies lower technical results and greater distortion in the risk-profitability ratio. The gross and net combined ratios, close to 100%, affect both the domestic and international (reinsurance) markets.
- Ceded premium levels remain at 50%. Combined with the increase in loss ratios, premium cession widens the rate-of-return gap required by reinsurers to immobilize capital. The cost of minimum capital requirements increases and poses greater risk.
- The exposure, capital cost and pricing models used by the operators are based on historical figures, risk compensation principles and level premium, where deviations from the budget items can be identified but not individually corrected because they cannot be segmented to partially adjust some of them.

Surety bonds are operating in a mature market with slowdown signs and experience as the method to adapt to market changes. The defense strategy continues to be competing for the

price and offering a differentiated service. This excludes the potential market from the analysis, which is changing at a rapid pace and skips the operators' radar due to the lack of a system to break down the causes and act accordingly.

II. Data understanding

Once the project objective has been defined, the set of variables or attributes describing the business must be selected. Thereafter, as is shown in the scorecard below, the relations that will serve as data sources for building the model are established. In order to simplify the analysis, the number of variables was reduced.



The variables for the surety market can be grouped as follows:

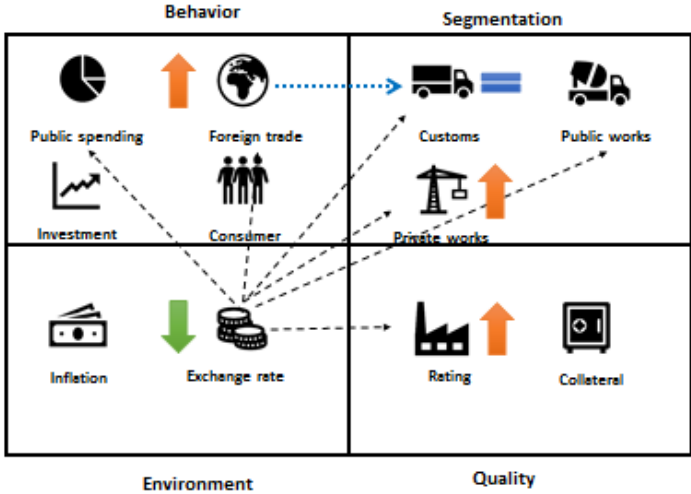
- a. External (behavior + environment): they describe the players' preferences that directly affect the demand. The Marketing area is responsible for interpreting the signs to identify trends and translate them into channel and design strategies for the technical area. There are also uncontrollable variables like revenues that influence the state of internal variables. For example, exchange rate variations condition the demand for customs bonds and simultaneously affect the company risk depending on their significance for the product cost and the sector where the activity is conducted.
- b. Internal (segmentation + quality): these variables are controllable by the operators; however, their state, which depends on management decisions and the relationship with the environment, has to be followed up to adjust deviations and control their compliance with corporate and regulatory standards. Currently, regulatory changes arising from the financial market crisis impose requirements on the insurance sector, condition the management model and reinforce the need for predictive rather than reactive tools.

After selecting the key variables that best describe the business behavior, the source to obtain this information must be identified and compliance with the use of information be analyzed.

III. Data preparation

This phase covers all the activities prior to creating scenario tables, which will be used in the following stage to demonstrate the model prediction effectiveness. It involves the selection of tables, records and attributes, as well as data transformation and cleaning with modeling and simulation tools that tune the parameters at optimum values. Dependence, independence and correlation relations are created, and conditional probabilities are assigned according to the state a variable can take with respect to the others.

The program iterates the simulation by analyzing the behavior of one variable with respect to the others. Thus, multiple studies can be performed for all the possible scenarios by assigning a probability of occurrence according to the iteration of the same result, which is the prediction algorithm for a company.



Due to space constraints, I will use one variable from the environment to show the importance of analyzing the impact of the environment on the sector and the operators. The process involves iterating the simulation and examining the results of all the states this variable may take and its effect on the rest of the variables. For example, what the scenario for a company would be if the exchange rate dropped by 20%.

- a. *Portfolio*: the segmentation will allow an in-depth study per category of cover. While for public works it will have no effect, private works will benefit by a reduction in the construction cost per square meter, which will foster their demand. Depending on the industry, a low exchange rate will increase the import of inputs, whereas exports will lose competitiveness.
- b. *Capital and minimum capital requirements*: the method analyzes the effect of an external variable on the capital by calculating the portfolio risk in two ways: (a) by aggregate guarantee exposure, and (b) relating that level of exposure to the risk and regulatory minimum capital requirements.
- c. *Technical*: the identification of sectors with more volatile contexts and higher risk covers will allow implementing policies to limit loss occurrence through active risk management. This involves doing a project follow-up, requesting additional guarantees, adjusting the price according to the exposure and the risk.

- d. *Marketing*: once favorable contexts and low-risk sectors have been detected, a specific segment can be targeted through a campaign in which the communication, content and channel are adjusted to the profile of that type of company. Moreover, discounts and special terms may be granted, just as the banks do when they offer loans to clients with good purchase behavior.

IV. Modeling

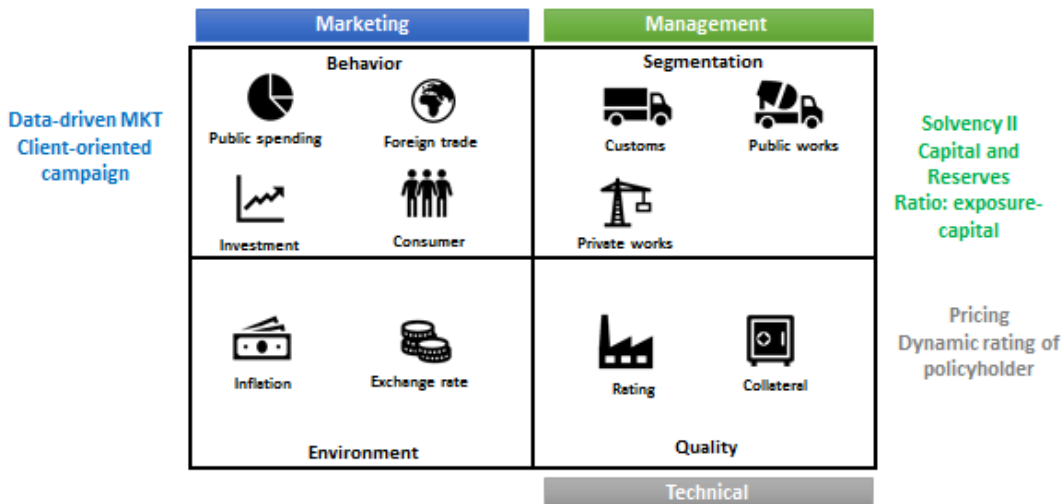
The relative significance of this phase is the criticism of the current management model that was the starting point of this paper. The special concern is the lack of schemes to adjust risk estimates. In dynamic and changing contexts, the strategic decision process is the source of value creation and competitive advantage. Predictive models generate a set of action alternatives so that the company has the possibility of repositioning itself. A static model, like the current one which considers historical information, does not include methods for adjusting to the context or plans to use them, which ends up conditioning and restricting decisions about:

- a) *marketing*: as the environment and client preferences are not on its radar;
- b) *management*: due to the lack of a comprehensive system to understand the situation-problem, its causes and effects, and also contextualize the signs to develop an action plan;
- c) technical (underwriting): as it lacks a pricing method to determine the cost for the use of the policyholders' capital according to the context, aggregation and solvency.

This paper focuses mainly on “emergency domain” decisions that give a critical value to information and hence, to the model that generates it. Decisions are characterized as being a process that requires planning.

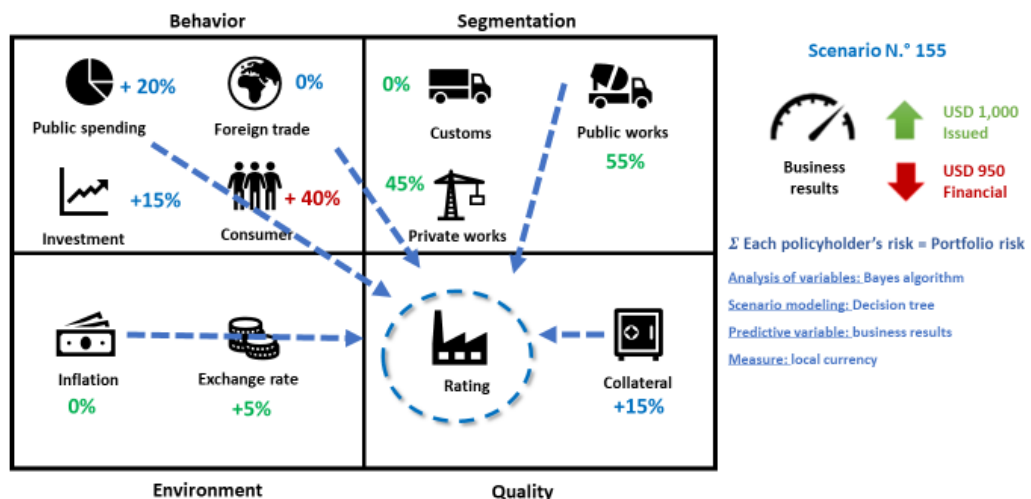
In this phase, various modeling techniques are employed and the parameters are tuned. Microsoft SQL Server 2005 was used; it provides an integrated environment for creating and working with models. This model was built using tables for data input. Its core is the algorithm based on Bayes probability criterion.

In dynamic contexts, the key to surviving is innovation, interpreting change and doing it faster than the competitors. The scorecard below explains how the modeling process includes the correlation of variables, the creation of scenarios with the different combinations of states and decision opportunities per company area.



Selection of the technical method: based on the classification of variables made in the first part I was able to study the behavior and the degree of influence on the predictive (critical) variable, which will summarize and consolidate the scenario results. Thus, a comparative analysis of the ranges that maximize the business results will be done. As we are working with scenarios made up of a combination of states, the Bayesian algorithm was selected because it calculates the conditional probability of multiple variables.

Analysis of influential variables: besides calculating the state each variable can take, the Bayesian algorithm does a hierarchical segmentation according to the degree of correlation with the critical variable, which will be used to build the decision tree. The scorecard below explains how scenarios are created from the states each one of the variables can take.



For example, if our objective is to evaluate the portfolio risk, we will simplify the analysis assuming there is only one policyholder (constructor); then, for this demonstration, the portfolio will be composed of a single company's aggregation.

Let us analyze Scenario No. 155 (see scorecard). Behavior variables: (a) foreign trade (0%), which does not have a direct impact and has a neutral effect on the risk; (b) public spending (+20%), proportional relation, which will boost the demand for these covers and the company's sales; (c) investment (+15%), direct relation, but with a lower effect on sales and covers.

Environment variables: (a) inflation (0%), neutral effect that decreases the insolvency risk as it limits the problem of price variations in public and private works contracts; (b) exchange rate (+5%) according to the activity, construction; no significant impact on contracts in US dollars and those companies using imported inputs.

The rating variable is the critical variable in this scenario because it summarizes the combined effect of all the others. Scenario No. 155 implies an improvement of the insolvency risk because all the variables have a positive effect on revenues and reduce the risk to the cost structure: imported goods and stability of local goods prices. There are no significant variations that may affect project profitability in a context with increased public spending and private investment.

The portfolio, composed of a single company's aggregation, is in a context of economic expansion, stable exchange rate and expanded demand. The company value will be greater than at the beginning of the accounting period; the risk-exposure ratio will be favorable and should translate into an improved client's rating.

Usefulness of information: if we analyze the model from the user's perspective, it becomes a management tool as it identifies the areas where the focus must be placed:

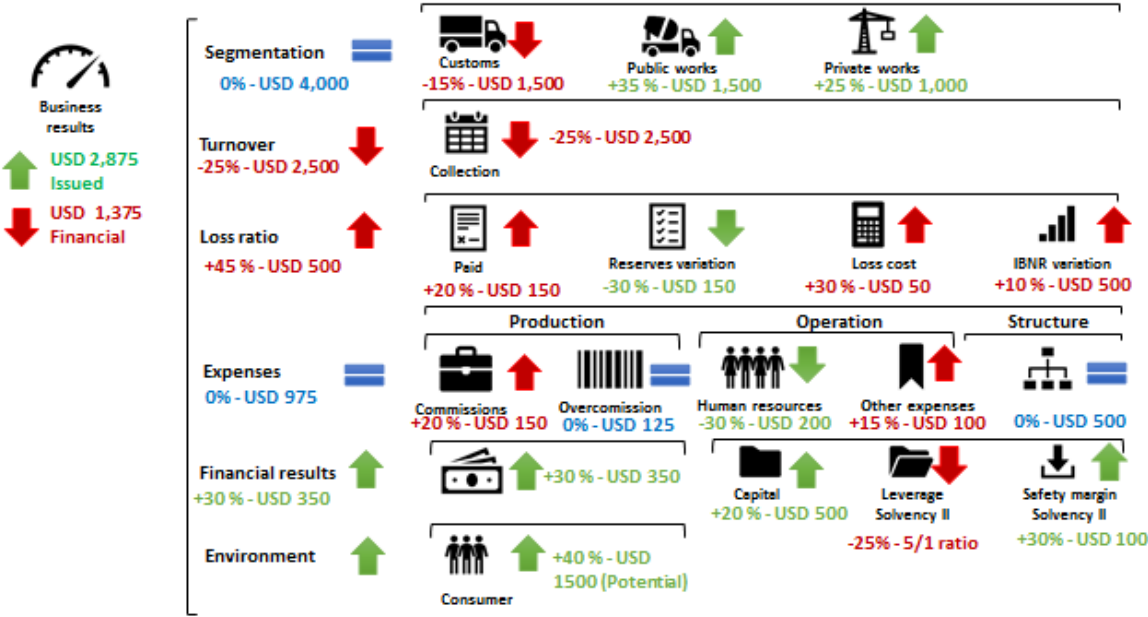
- *Technical (Pricing):* the individual and global risk of a segment can be measured; it provides the opportunity of implementing a score-based pricing policy that takes account of: (a) context; (b) credit rating, and (c) exposure level.
- *Management:* risk estimates allow the companies to calculate capital and reserves requirements. Solvency II criteria, as well as local regulations, set efficiency standards that penalize technical deviations with capital contributions or contingency plans that require the divestment of high-exposure assets. Integrated management systems, which obtain information from internal and external sources, determine the current and projected exposure as the environment changes. Information plays a key role because it provides an understanding of the situation from multiple internal and external perspectives to take actions when the deviation exceeds a certain level.
- *Marketing:* the identification of trends allows for planning strategies about how to reach the potential demand effectively. The inbound or data-driven tools require a system that detects variations to design campaigns based on the clients' profile to generate customized contents. Technologies and platforms are used to: (a) maximize the return on investments; (b) obtain greater visibility and presence in the potential market of interest (targeted marketing), and (c) redirect the sales force.

After selecting the variables, defining the correlations and doing multiple probabilistic simulations for the creation of scenarios, the information was structured using the decision tree algorithm; variables were arranged in a hierarchical order according to the weighting and

probability of occurrence, which translates into a scheme of nodes, the homogeneous variables being grouped according to the attributes.

For the model exposure, we followed the guidelines of the “Statement of Income” scorecard, which summarizes de critical business circuits, it can be uniformly applied in Latin America and is supported on accepted exposure principles. The decision tree constitutes a control panel composed of probabilistic scenarios according to the state each variable takes in correlation with the others. Both the internal and external information increases its usefulness as predictive model because: (a) it analyzes the impact and intensity of the environment factors on the market; (b) it determines the current positioning and its behavior over time; (c) it values the capital according to projected scenarios and controls compliance with regulatory parameters, and (d) it calculates global exposure per cover and policyholder.

The final phase of the CRISP-DM method consists of building a structured information system like a decision tree that summarizes the central circuits of the surety business: product mix (portfolio segmentation), turnover (collection), loss ratio, expenses, capital, financial results and environment. It offers a global vision of the company’s situation by gathering ongoing information from different perspectives and gives a clear picture of the situation and its evolution to detect deviations that require a strategy review.



Conclusions

In the present work, a surety market tool was proposed based on the use of information as a strategic recourse and competitive advantage.

- In a financial market with a new regulatory framework and changes in the client's preferences, technologies are changing our business and thus, the management model we have used so far. Dynamic environments and available tools are changing by the use of technological innovations, standards and preferences.
- Surety bonds require predictive models that reduce uncertainty and understand more complex environments. The management paradigms, tools and processes that have been effective for more static environments should be updated to understand scenarios that are continuously and constantly changing at a rapid pace. Information has become a strategic resource and can create competitive advantages when it is used as driver for innovation.
- Using CRISP-DM methodology, an information system that interprets the context-company relation and is specific to surety bonds was designed. The process identified critical variables and their relations, and estimated the degree of correlation; a model specifically designed for our sector was built. The model, which follows the decision tree structure, detects the areas where actions must be taken to take advantage of opportunities, such as: (a) conducting direct marketing campaigns to target potential niches; (b) offering benefits to policyholders with a good score and also considering threats like exposure levels in certain covers with risk aggravating circumstances in the context; (c) deviation in the exposure-capital ratio according to Solvency II standards, and (d) making corrections to the risk rate for policyholders in sectors with bad projections, deterioration in their rating or aggregation terms that exceed the established ones.