

PREDICTIVE MODEL THROUGH NEURAL NETWORKS OF A BUSINESS PLAN: CONAGOPARE CASE STUDY

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Abstract

This article aims to examine in detail the importance of integrating social and environmental aspects into a business plan from a perspective of societal engagement. In the current context, companies must consider not only the pursuit of economic benefits but also their impact on society and the environment. The projective analysis of the business plan focuses on identifying specific strategies and actions that enable the generation of shared value, i.e., benefits for both the company and society. The study reviews the existing literature on societal engagement in the business domain and presents the results of a projective analysis of a business plan. The analysis encompasses different key components, such as the structure of the business plan, market research, marketing plan, financial analysis, and risk assessment. These elements are examined from the perspective of societal engagement, taking into account corporate social responsibility and sustainability. The findings of the study are highly relevant for entrepreneurs and decision-makers as they provide valuable information on how to address social and environmental challenges through effective business strategies. The projective analysis of the business plan allows for the anticipation of opportunities and risks related to societal engagement, thereby contributing to the development of sustainable and socially responsible business practices. In summary, the article highlights the importance of integrating social and environmental aspects into a business plan and provides guidance for those interested in promoting more responsible and sustainable business practices. The projective analysis of the business plan enables the generation of positive impacts for both the company and society, fostering a more balanced and socially conscious approach to business development.

Keywords: Business Plan, Projective Analysis, Societal Engagement, Sustainability, Social Responsibility.

1. INTRODUCTION

In the current business environment, the relationship between companies and society has become increasingly important and strategic. It is no longer enough for companies to solely pursue economic benefits; they must also consider their impact on society and the environment in which they operate (Peñarroya-Farell, Miralles, & Vaziri, 2023). In this context, predictive analysis of a business plan with a focus on societal engagement

has become a fundamental tool for assessing and promoting sustainability and corporate social responsibility (Yang, 2023).

Societal engagement entails companies establishing strong and mutually beneficial relationships with various social actors, such as consumers, employees, local communities, and other stakeholders (Solis, Parrales, Pilligua, & Hernández, 2023). This goes beyond compliance with regulations and laws, and requires companies to adopt a proactive approach in generating shared value, meaning the creation of benefits for both the company and society (Douglas-Chilán, 2019).

Predictive analysis of a business plan involves anticipating the opportunities and risks that a company may face in the future. In the context of societal engagement, this analysis focuses on identifying strategies and actions that effectively integrate social and environmental aspects into the business plan (Liu et al., 2023). This entails considering how the company can generate positive impacts, mitigate risks, and seize opportunities related to sustainability and social responsibility.

The objective of this study is to projectively analyze a business plan from the perspective of societal engagement. The study aims to examine how companies can address social and environmental challenges through specific strategies and actions, and how this can contribute to both business success and social well-being (Reyes, 2023). By exploring the importance of societal engagement in the context of a business plan, valuable insights are expected to be provided for entrepreneurs, decision-makers, and other stakeholders interested in promoting sustainable and socially responsible business practices (Bodero & Gonzalez, 2023).

This article will review the existing literature on the topic, present the results of a predictive study of the business plan, and discuss the theoretical and practical implications of the findings. It is expected that this study will contribute to the advancement of knowledge in the field of societal engagement (Villarreal & Guerrero, 2022) and provide guidance for those interested in effectively integrating sustainability and social responsibility into their business strategies.

The town of Santa Rosa was formally founded on August 30, 1681, in the territories of the then Political Tenure of Ambato, in the jurisdiction of Riobamba. It is worth noting that during this time, the prominent figures leading the town were indigenous chiefs since the Iberian settlers had not yet arrived in this territory.

After the devastating earthquake of 1698, considering that the geographic relocation of Santa Rosa was favorable due to its own jurisdiction, suitable living conditions, and even having its own priest, the town became an attractive destination for a new type of population. Starting in the 18th century, people of European, mixed-race, and creole descent began to populate Santa Rosa.

In the parish, there are two types of inhabitants, the mixed-race and the indigenous people native to the population of Santa Rosa. For centuries, they have coexisted and shared their ideas in any type of work for the benefit of the parish. They have put into practice the traditional "minga" (collective work) at the community or family level.

Through their collective efforts, they have received support from both public and private institutions, as well as immigrants from the Bolívar Province who have arrived in the parish with the hope of change and development for families with limited economic, cultural, and social resources. Generally, the heads of households are engaged in construction work, while mothers work as domestic employees. The indigenous population is located in the peripheral part of the parish and is distributed among communities such as Angahuana Alto, Angahuana Bajo, Cuatro Esquinas, Misquillí, and Apatug. Their descent comes from the Tomabela people, and their clothing and language still have ancestral origins with slight modifications.

To carry out the research process in Angahuana Alto, all internal and external factors of production have been taken into account. Factors such as the strength of the place and site due to the climate, soil, territory, and localities have been considered for learning purposes. It is worth noting that people in this area are engaged in the production of strawberries and blackberries. Additionally, this locality is located at an altitude of 3600 meters and is a suitable area for the production of blackberries and strawberries. It has a high growth rate. However, the only drawback in these types of territories is the extremely cold climate, which tends to damage the plants. In other words, the producer would lose their production process, whether it be strawberries or blackberries.

From that perspective, it can be established that production is the main economic activity for all residents of Angahuana Alto. Currently, people engage in trade activities every weekend, producing and distributing strawberries and blackberries in the markets of Ambato, particularly in the wholesale market, at prices of \$8 and \$7 dollars respectively.

Perceptron Neural Networks

The development of a perceptron neural network to execute a predictive model involves a series of steps. First, relevant data is collected and prepared, ensuring that it is clean and ready for use. Then, the network's architecture is defined, determining the number of input and output neurons based on the problem to be solved (El m'hadi & Cherkaoui, 2023). Next, the weights and biases of the connections between neurons are initialized. These values will be adjusted during the training of the network so that it can learn patterns in the data. Then, forward propagation is performed, where input data is sent through the network to generate an output (Tomaskova, Babaee, & Dulichand, 2023).

Afterwards, the loss function is calculated, which compares the network's output with the desired output and evaluates how close it is to producing the correct results (Semmad & Bahoura, 2023). Similarly, according to (Calude, Heidari, & Sifakis, 2023), using the backpropagation algorithm, the gradients of the loss function with respect to the weights and biases of the network are calculated. These gradients are used to adjust the weights and biases, thereby minimizing the loss function.

These steps are iteratively repeated over several training epochs, allowing the neural network to learn from the data and improve its predictive capabilities. Once the network is trained, its performance is evaluated using an independent test dataset, calculating relevant evaluation metrics. The development of a perceptron neural network for a

predictive model involves data preparation, defining the network's architecture (Li, Gao, Xie, & Yen, 2023), initializing weights and biases, forward propagation, calculating the loss function, backpropagation to adjust weights and biases, and evaluating the model's performance. These steps enable the neural network to learn from data and make accurate predictions (Araujo et al., 2022).

Business Plan

The development of a business plan involves a series of fundamental aspects that characterize it (Fortunato, Parrales, Parrales, & Ponce, 2022). A business plan is an essential strategic document used to establish, develop, and manage a company or business project. Currently, various practices and approaches are recognized that constitute the state of the art of a business plan. The following are the main elements that define this current state as defined by (Elías et al., 2022):

1. Structure: The state of the art considers that a business plan should follow a coherent and logical structure. This implies that the document should include key sections such as a detailed business description, market analysis, marketing strategy, operational plan, financial analysis, and risk assessment. Each section serves a specific function and should be written clearly and precisely.

2. Market Research: An effective business plan requires thorough market analysis. The state of the art emphasizes the importance of identifying and understanding potential customers, analyzing the competition, evaluating market trends, and determining the business's viability and growth potential. Furthermore, the need to use reliable sources of information and conduct rigorous research to support strategic decisions is emphasized.

3. Marketing Plan: The state of the art recognizes that the marketing plan is an essential component within the business plan. It should include a clear strategy to promote and position the product or service in the market, identify the most appropriate distribution channels, establish competitive prices, and develop effective communication plans. Additionally, the importance of considering the impact of digital technologies and social media on marketing strategies is highlighted.

4. Financial Analysis: The state of the art acknowledges the need for a thorough and realistic financial analysis in a business plan. This entails including detailed financial projections, revenue and expense estimations, profitability analysis, and determining financing needs. The importance of presenting accurate information supported by data to demonstrate the financial viability of the business is emphasized.

5. Risk Assessment: The state of the art considers risk assessment as a critical aspect of a business plan. This involves identifying and analyzing potential risks that may affect the business's success, such as changes in the competitive environment, government regulations, economic fluctuations, and operational issues. The importance of developing risk mitigation strategies and having contingency plans is emphasized.

Figure 1: Structure of the Business Plan



Neural networks can play an important role in the development of a business plan in various ways (Aswathi, Jency, Ramakrishnan, & Thanammal, 2022):

1) Data analysis: Neural networks can be used to analyze large volumes of data related to the market, customers, competition, and other factors relevant to the business plan. These networks have the ability to identify hidden patterns and trends in the data, which can provide valuable insights for strategic decision-making.

2) Prediction and forecasting: Neural networks are capable of making accurate forecasts and predictions about key variables for the business plan, such as market demand, future sales, costs, and revenues. By training the neural network with historical data, it can be used to predict the future performance of the business and evaluate different scenarios.

3) Process optimization: Neural networks can contribute to the optimization of internal business processes, such as inventory management, production planning, and resource allocation. By analyzing data and learning from past interactions, neural networks can discover more efficient and effective ways of carrying out these tasks, resulting in improved operational efficiency and the achievement of goals set in the business plan.

4) Personalization and recommendations: Neural networks can also be used to personalize the customer experience and provide tailored recommendations. By analyzing customer data, such as preferences, purchase history, and online behavior, neural networks can identify patterns and provide individually recommended products or services, thereby enhancing customer satisfaction and sales opportunities.

Neural networks can play a crucial role in the development of a business plan by providing advanced data analysis, accurate forecasting, process optimization, and personalized customer experience (Wisnieski, Amrine, & Renter, 2021). These applications can improve strategic decision-making, increase operational efficiency, and

enhance customer satisfaction, contributing to the success and profitability of the business plan (He et al., 2021).

2. OBJECTIVES

Design a predictive analysis of a business plan focused on societal engagement, aiming to identify specific strategies and actions that enable the effective integration of social and environmental aspects into the business plan.

Examine the importance of creating shared value and promoting sustainable and socially responsible business practices, considering the impact on society and the environment.

Provide guidance and contribute to the advancement of knowledge in the field of corporate engagement with society...

3. METHODOLOGY

The research methodology employed in this study combines qualitative and quantitative approaches to achieve a comprehensive and rigorous analysis of the business plan focused on societal engagement. Firstly, an extensive review of existing literature on the relationship between companies and society, sustainability, and corporate social responsibility is conducted. This provides a solid theoretical foundation and helps identify relevant practices and approaches.

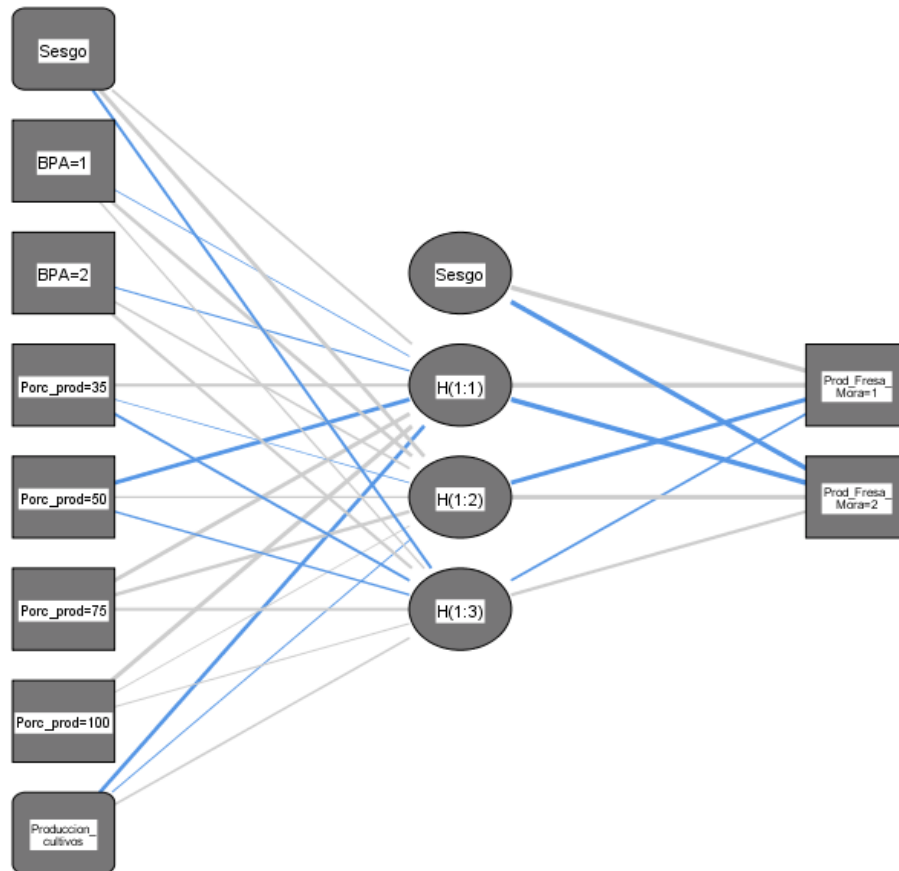
To gather quantitative data, information from secondary sources such as financial reports, sustainability reports, and relevant statistics is utilized. These objective data offer insights into the company's financial situation and key performance indicators related to social responsibility and sustainability.

Additionally, in-depth interviews with experts and business leaders, as well as structured questionnaires, are conducted to collect qualitative and quantitative data on business strategies and practices regarding societal engagement. These data are systematically analyzed using statistical techniques and thematic analysis to identify significant patterns and trends.

Finally, the findings from the literature review, quantitative data, and qualitative data are integrated to obtain a holistic view of societal engagement in the business plan. This involves comparing and contrasting the findings to identify the most relevant strategies and actions, and drawing conclusions and recommendations based on these results.

This methodology ensures the validity and robustness of the findings by employing diverse research approaches and leveraging different data sources. By combining quantitative and qualitative methods, the complexities and multiple dimensions of the study topic are addressed, allowing for a comprehensive understanding of corporate engagement with society.

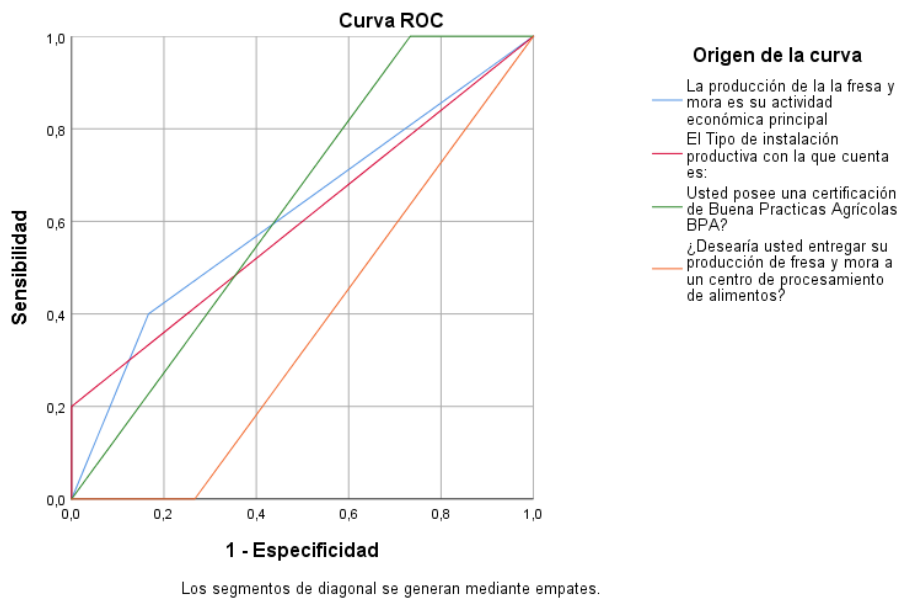
Figure 2: Multilayer Perceptron Neural Network



The information provided in the three text fragments is part of a statistical analysis of strawberry and blackberry production as the main economic activity. In the first fragment, the summary of the results of tests conducted on four variables related to strawberry and blackberry production is presented. It is indicated that the variables have an equal split between the positive real state group and the negative real state group, suggesting that the statistics might be biased.

In the second fragment, the processing of cases related to the dependent variable "Strawberry and blackberry production being the main economic activity" is presented. It is mentioned that the number of valid cases is 30 positive and 5 negative, and it is stated that larger values of the outcome variables indicate a higher test score for a positive real state.

Figure 3: ROC Curve



The ROC curve is a statistical tool used to evaluate the ability of a binary classification model to distinguish between two classes. The ROC curve shows the relationship between sensitivity (true positive rate) and specificity (false positive rate) for different classification thresholds. In summary, the ROC curve is a way to assess the accuracy of a binary classification model and determine its ability to differentiate between the two classes.

It is indicated that the true positive state is 100, and the area under the curve is presented. In the third fragment, the results of tests conducted on the dependent variable "Strawberry and blackberry production being the main economic activity" are presented. It is mentioned that the percentage of incorrect predictions is 12.5%, and the classification test results for the training and test sets are presented. In summary, the obtained information allows determining the results of the statistical tests conducted on the variables related to strawberry and blackberry production, as well as the classification test results for the dependent variable "Strawberry and blackberry production being the main economic activity."

Table 1: Area under the curve (AUC)

Test outcome variables	Area
Strawberry and blackberry production is your main economic activity.	,617
The type of production facility you have is:	,600
¿ Do you have a Good Agricultural Practices (GAP) certification?	,633
¿ Would you like to deliver your strawberry and blackberry production to a food processing center?	,367

The table describes the parameters and configurations used in a neural network model to predict strawberry and blackberry production as the main economic activity. It includes information about the number of units, scaling method for the covariates,

hidden layers, activation function, output layer, number of units in the output layer, activation function, and error function used in the model. Additionally, it is indicated that the bias unit is excluded from the model.

The parameters and configurations used in the model are as follows:

- Number of units in the input layer: 7
- Scaling method for the covariates: Standardized
- Hidden layers: 1
- Number of units in hidden layer 1: 3
- Activation function in the hidden layer: Hyperbolic tangent
- Output layer: Dependent variables (strawberry and blackberry production being the main economic activity)
- Number of units in the output layer: 2
- Activation function in the output layer: Softmax
- Error function: Cross-entropy
- Bias unit: Excluded

5. CONCLUSIONS

Firstly, the business plan is analyzed in detail, examining its key components such as structure, market strategy, financial analysis, and risk assessment. The connection between these elements and the overall strategy of societal engagement and sustainability is evaluated.

Subsequently, the development of a predictive model using neural networks is introduced. The discussion revolves around how neural networks can be applied to analyze the business plan and predict the social and environmental impact of business decisions within the context of the Societal Engagement project. Different variables and metrics that can be considered in building the model are explored.

The discussion focuses on the benefits and limitations of using neural networks in this context. The advantages, such as the ability to capture complex and non-linear relationships between variables, as well as the capacity to learn and adapt from data, are highlighted. However, potential limitations are also mentioned, such as the need for high-quality and sufficient data, as well as the complexity in interpreting the results.

Furthermore, the obtained results from the predictive model are examined, and their validity and usefulness for decision-making within the context of the business plan focused on societal engagement are discussed. Consideration is given to how the results can influence identifying opportunities, mitigating risks, and generating shared value. The article's discussion emphasizes the importance of analyzing the business plan in relation to societal engagement and sustainability, and presents the

development of a predictive model using neural networks as a potentially valuable tool. The benefits and limitations of this approach are evaluated.

Additional information regarding the results of tests conducted on the dependent variable "Strawberry and blackberry production being the main economic activity" is based on appropriate statistical analysis methods and specific classification tests to assess the model's performance in relation to this variable.

In summary, the presented information is supported by a well-established theoretical framework and statistical concepts, as well as specific results obtained from the analysis of the relevant data.

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