

Business Intelligence Data-Driven Assistant (Bidda) for Msmes Using Setup Predictive Performance Model

**Russell N. Aquino¹, Arnel C. Fajardo², Betchie E. Aguinaldo³,
Rose Mary A. Velasco⁴**

^{1,2,3,4}College of Computing Studies, Information and Communication Technology, Isabela State
UniversityCauayan Campus, San Fermin, Cauayan City, 3305, Isabela, Philippines

Abstract:

The Department of Science and Technology (DOST) is offering soft loan services under the Small Enterprise Technology Upgrading Program (SETUP) to assist micro, small, and medium enterprises (MSME) in availing of useful technologies and machines in order to improve their operations. A low rate of repayment affects the agency's operations and the government. This paper aimed to create a predictive system analysis to foresee the success of loan repayment in the agency, particularly in the SETUP program. MSMEs may enroll in this program through a project proposal, indicating the marketing aspect, technological aspect, and financial aspect of the firm. The DOST evaluates the firm's positivity and its repayment capability through the abovementioned three aspects. BIDDa aims to determine the significant attributes in the development of data sets of SETUP adopter selection criteria in terms of: a. demographic profile; b. pre-performance business profile; and c. post- performance business profile after S&T intervention. There are also three foundations for the predictive computation of the success rate: the financial, which covers 50%; the sector, which covers 30%; and the location, which covers 20% of the total success rate. This also helps the MSMEs determine, not only in terms of the SETUP program success rate but also in terms of their business success rate. We used the Multi-Criteria Decision-Making (MCDM) machine learning model for the predictive analysis in the BIDDa application.

Keywords: Predictive System Analysis, BIDDa, Loan Repayment, MCDM

I. INTRODUCTION

One of the banner programs of the Department of Science and Technology (DOST) is the Small Enterprise Technology Upgrading Program (SETUP). The DOST implements SETUP as a primary means to reach out to Filipino entrepreneurs in the country, not only to support and sustain the growth of micro, small, and medium enterprises (MSMEs), but also to directly and immediately address the needs of local businesses to avail of appropriate technologies. The DOST offers equipment-based soft loans under the SETUP Program to improve the operations of MSMEs. The DOST conducts monitoring of all SETUP beneficiaries in terms of status, improvements, and repayments.

Loan default has been a problem in the past as well. Some SETUP beneficiaries can't completely return the monthly amortization because of financial difficulties in some instances, and that is something

that needs to be improved. The loan repayment rate plays a vital role in banking society and specifically in the DOST, as it reflects the progression of the community. Loan default problems also affect the agency’s operations, including its performance. An Auto- developed predictive system for determining success rate is needed to improve repayment status. Applicant or client screening was the conventional way to evaluate a borrower before. Due to large and broad data, it always requires a labor force that is quite troublesome and expensive in terms of time. Hence, it saves time and effort by using machine learning to predict the likelihood of loan default, which can significantly improve accuracy and efficacy [1].

Other researchers apply predictive systems that use different machine-learning algorithms for classification and regression tasks. There are predictive algorithms that exist in the ICT industry. According to [2], by adding a gradient boosting technique to the survival tree models, the researchers present a nonparametric ensemble tree model known as the gradient boosting survival tree (GBST). By additively minimizing the negative log-likelihood, the survival tree ensemble is learned. Also, by simultaneously optimizing the survival probability for every time period, the suggested model can greatly lower the total error. According to [3], using the Logit model, it is possible to construct a model that can assist in estimating the risk of a loan before making decisions, and by employing the Logit model for regression analysis on data from the LendingClub platform, the study identified the primary elements influencing default risks and produced a model that may be used to assess borrowers’ default chances ahead of time.

factors throughout the selection process. Numerous tools and techniques from MCDM may be used in a variety of sectors, including engineering, design, and finance. In this application, it will predict the success rate of the project under the SETUP program in terms of the repayment rate. It will automatically identify the MSME’s information in terms of: a. demographic profile; b. pre-performance business profile; and

c. post-performance business profile after S&T intervention. The app will be used by the DOST for its setup program.

II. PARADIGM OF THE STUDY

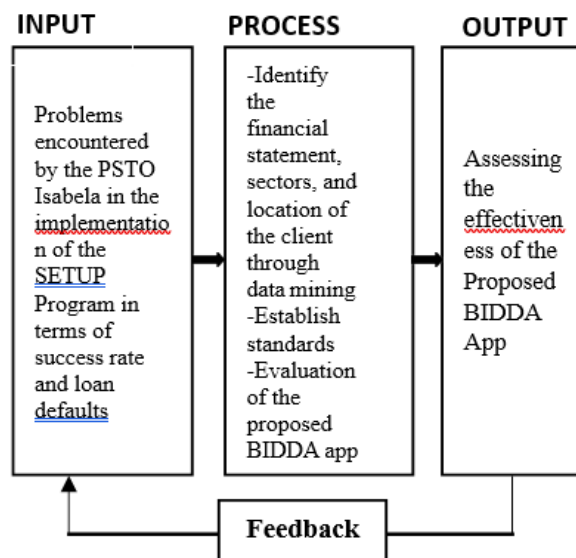


Fig 1. Conceptual framework for the development of Business Intelligence Data-Driven Assistant (BIDDA) app

In [4], the author discusses the mathematical representation of logistic regression. In order to realize the predictive and probabilistic methods for a particular problem of loan approval prediction, his study uses logistic regression as a machine learning tool. According to [4], in order to explain the outcome variable's dichotomous behavior, several models will be created in the future. Because of its versatility and clarity in mathematics, the logistics regression model was selected above the other models. It can include one or more predictors.

III. OBJECTIVES OF THE STUDY

This project aims to provide a Business Intelligence Data-Driven Assistant (BIDDA) app using the SETUP performance predictive model. The predictive analysis model has become more known in the present time. In this study, we developed a BIDDA application and applied predictive analysis using a Multi-Criteria Decision-Making (MCDM) machine-learning model. It is an area of research that focuses on decision-making when there are several factors or goals that must be considered. In MCDM, decision-makers assess potential courses of action by weighing a number of factors according to their relative relevance. It seeks to identify the optimal option by taking into account many to estimate the success rate of the MSMEs in terms of loan repayment that will be enrolled in the SETUP program. This will be used by the Provincial Science and Technology Office (PSTO) in Isabela. Specifically, this paper aims:

- To investigate the SETUP beneficiary's performance trend in Isabela
- To determine the significant attributes in the development of data sets of SETUP beneficiary selection criteria in terms of:
 1. demographic profile; b. pre-performance business profile; and c. post- performance business profile after S&T intervention
- To develop a SETUP business predictive model for determining the performance level of SETUP beneficiaries
- To develop the BIDDA app to determine the success rate and possible performance level of SETUP adopters
- To test the newly developed SETUP Adopter Predictive Performance Model using the BIDDA platform

IV. METHODOLOGY

This research uses both qualitative and quantitative data. The qualitative aspect deals with the description of the system called BIDDA and how it will be created to describe the steps and procedures to follow. Meanwhile, its quantitative aspect deals with the data to be gathered on the system's effectiveness, performance, and algorithm used for the predictive analysis system of the app. Also, we used the Multi-Criteria Decision-Making (MCDM) machine-learning model for the predictive analysis system to estimate the success rate of the SETUP adopter in terms of soft loan repayment. There are three (3) areas that served as the foundation of the prediction to calculate the success rate of the loan. The financial sector is 50% of the total success rate; the sector is 30% of the total success rate; and the location is 20% of the total success rate. These three areas are calculated at 100%. This research used data mining to support the computation through the SETUP predictive model.

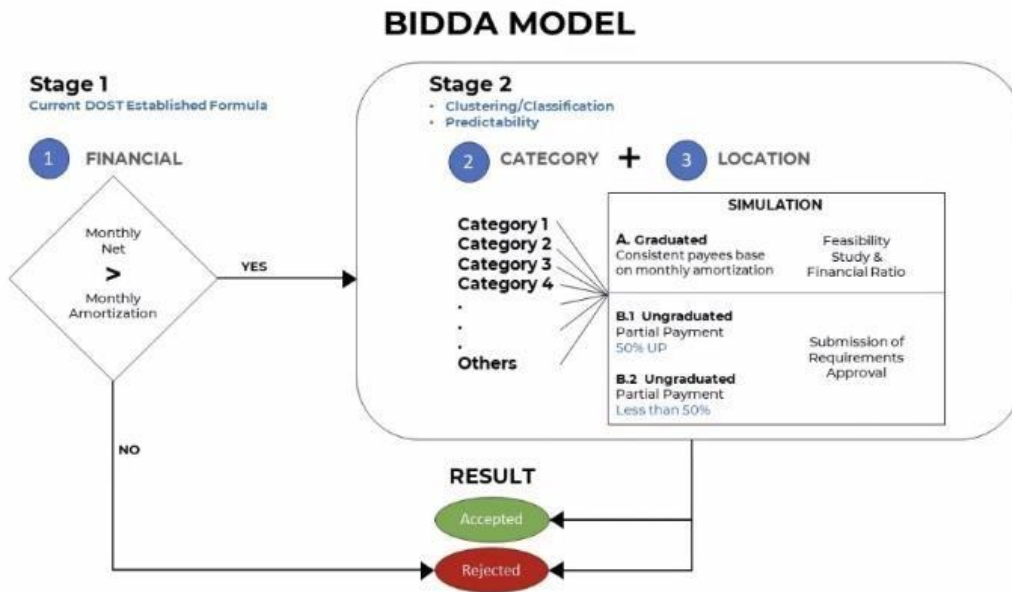


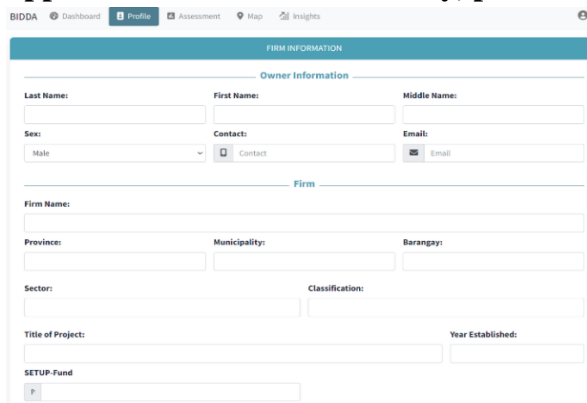
Fig 2. Data Flow Diagram of the proposed BIDDA app in PSTO Isabela

V. RESULTS AND DISCUSSION

I. Problems encountered by the PSTO Isabela interms of loan defaults in the SETUP Program:

- Increasing loan defaults under the SETUP Program.
- Difficulty in the identification of the repayment success of SETUP beneficiaries.
- Accuracy in the loan screening process.

II. Development of BIDDA application in terms of effectivity, performance, and algorithm.



BIDDA Dashboard Profile Assessment Map Insights

FIRM INFORMATION

Owner Information

Last Name: First Name: Middle Name:

Sex: Contact: Email:

Male Contact Email

Firm

Firm Name:

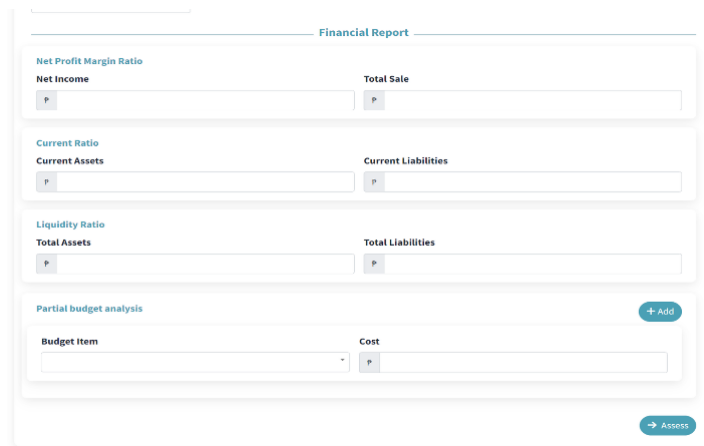
Province: Municipality: Barangay:

Sector: Classification:

Title of Project: Year Established:

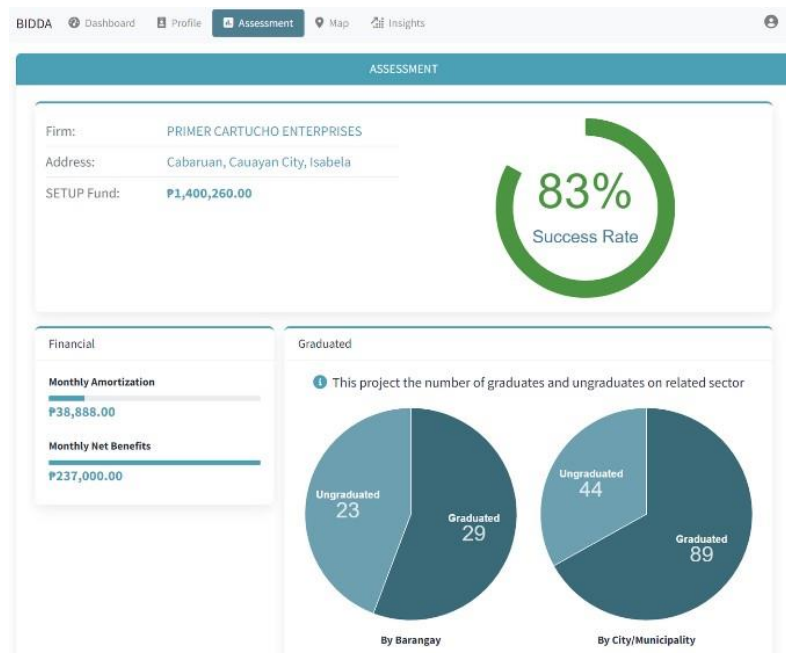
SETUP-Fund

This GUI form is for setup applicants. This is used to gather data from applicants based on their business classifications. This will get data on the location, year established of the business, the business sector, and the SETUP fund, which is the cost of the soft loan. This data will be used for the calculation of the success rate of the SETUP loan.



The image shows a 'Financial Report' form with several input fields for financial data. The fields are organized into sections: 'Net Profit Margin Ratio' with 'Net Income' and 'Total Sale' fields; 'Current Ratio' with 'Current Assets' and 'Current Liabilities' fields; 'Liquidity Ratio' with 'Total Assets' and 'Total Liabilities' fields; and 'Partial budget analysis' with a 'Budget Item' dropdown and a 'Cost' field. There are '+ Add' and 'Access' buttons at the bottom right.

This GUI form of the financial report will be used to determine the success rate on the financial aspect, which is 50%.



This is the assessment panel of the BIDDA app, which indicates the success rate of the SETUP applicant. It automatically shows the monthly amortization and the monthly net benefits of the applicant based on the gathered financial statement.



There is also a map indicating the demographic location of the applicant, including the related sectors in the barangay and city/municipality.

VI. CONCLUSIONS

The statistics collected provide compelling evidence that PSTO Isabela needs to improve and digitize its soft loan screening procedure using a Business Intelligence Data-Driven Assistant app. The results of the study's analysis of the issues in the corresponding reports clearly support the need for automation of the current process. The developed BIDDA app for PSTO Isabela is a valuable tool in predicting the result of the loan repayment, thus improving its accuracy in approval. It also enhances the current system in terms of security, efficiency, and effectiveness.

VII. RECOMMENDATIONS

Based on the conclusion drawn from the analysis, it is strongly recommended that PSTO Isabela prioritize the implementation of a Business Intelligence Data-Driven Assistant (BIDDA) app for improving and digitizing its soft loan screening procedure. This recommendation is supported by the compelling evidence gathered from the statistics collected, indicating the need for automation of the current process. By adopting the BIDDA app, PSTO Isabela can significantly enhance the accuracy of loan repayment predictions, thereby improving the overall approval process. Additionally, the app offers advantages in terms of security, efficiency, and effectiveness compared to the current manual system. Therefore, investing in the implementation of the BIDDA app is crucial for PSTO Isabela to streamline its operations and better serve its clients.

REFERENCES:

1. L. Lai (2020), "Loan Default Prediction with Machine Learning Techniques", *International Conference on Computer Communication and Network Security*, p. 5-9.
2. Bai M, Zheng Y, and Shen Y. (2019), "Gradient Boosting Survival Tree with Applications in Credit Scoring" *The Operational Research Society*, p. 39-55.
3. Tiannan Deng (2019), "Study of the prediction of micro-loan default based on Logit model", *International Conference on Economic Management and Mode Engineering (ICEMME)*, p. 260-264.
4. Ashlesha Vaidya (2017), "Predictive and Probabilistic Approach using Logistic Regression: Application to Prediction of Loan Approval