

Model of Assessment for DOST-SETUP Applicants Business Performance Using Rule-based Approach

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Abstract

The assessment model is vital in giving an efficient basis for something being evaluated, notably in the loan business with exceptional offers of zero interest rates. Automated assessment systems could be quite beneficial to an administrator in terms of making operations more convenient and efficient. Currently, DOST Isabela - Region II is assisting MSMEs with their business growth. However, not all of their clients are able to pay their amortization because of factors such as their financial situation, competition, demographic issues, and the nature of their business. The office is now conducting a manual procedure of examining applicants' papers to see whether they are eligible to pay. This paper introduces an assessment methodology for evaluating DOST-SETUP applicants' business performance level and success rate, which includes points that might help the office decide whether or not to pursue the clients' requests. The framework was meant to include forms where administrators could enter vital information for the pointing system.

Keywords: Assessment Model, Rule-based Pointing System

Introduction

Small business growth and development are greatly supported by the availability of equipment and financial support. Chen, X., et al. (2000) state that having financial institutions that can meet small businesses' needs is a significant ease for supporting small enterprises. As long as applicants are eligible and able to pay back the support, the Department of Science and Technology (DOST) in Isabela - Region II will accommodate their requests. But determining whether company owners qualify for this kind of support is frequently a laborious and subjective process, which could result in inaccurate and inefficient decisions being made. Müller, D., et al. (2017) emphasized how important it is to comprehend the elements that contribute to a business's success or failure because these elements will be crucial in determining if the company is eligible for equipment or financial support. The researchers have created a rule-based assessment model specifically for this study, which may be used to rate DOST-SETUP applicant success rate and performance level. As demonstrated by Hoard, B. et al. (2015) in their study,

using a rule-based model is an excellent way to track performances using training data that might provide scores as a reliable variable for determining whether a client is appropriate for assistance.

Research Design and Methods

Conceptual Framework of the System

Figure 1: Technical Framework of Model of Assessment for DOST-SETUP Applicants' Business Performance using Rule-based Approach

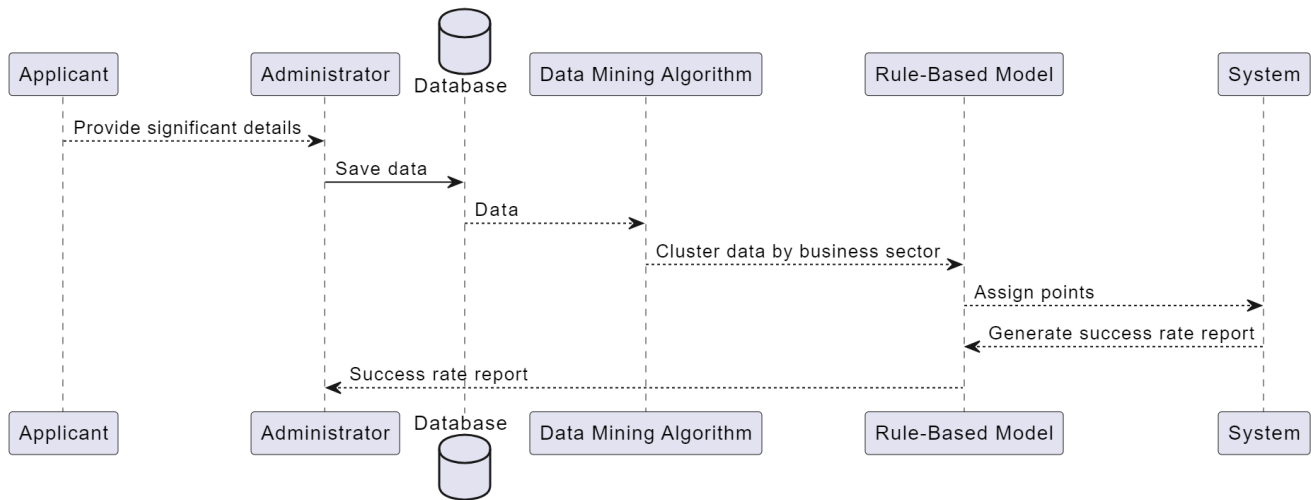


Figure 1 illustrates the conceptual structure of the current study, in which applicants submit relevant business papers to be evaluated by the office administrative officer using the assessment model. The administrator will enter the required information, which will be stored in the system database. The program will calculate the proportion of graduates in the same sector based on previous data. This percentage will be assigned corresponding points (sector criteria) based on the rule-based model, along with the applicant's computed income (financial statement criteria) and the number of consumers (business recipient criteria). The system will then provide a report on the applicant's success rate in points, as well as the relevant computations for the basis. These points will assist the assessor in deciding on whether to approve or reject the application.

Figure 2: System Flowchart of Model of Assessment for DOST-SETUP Applicants' Business Performance using Rule-based Approach

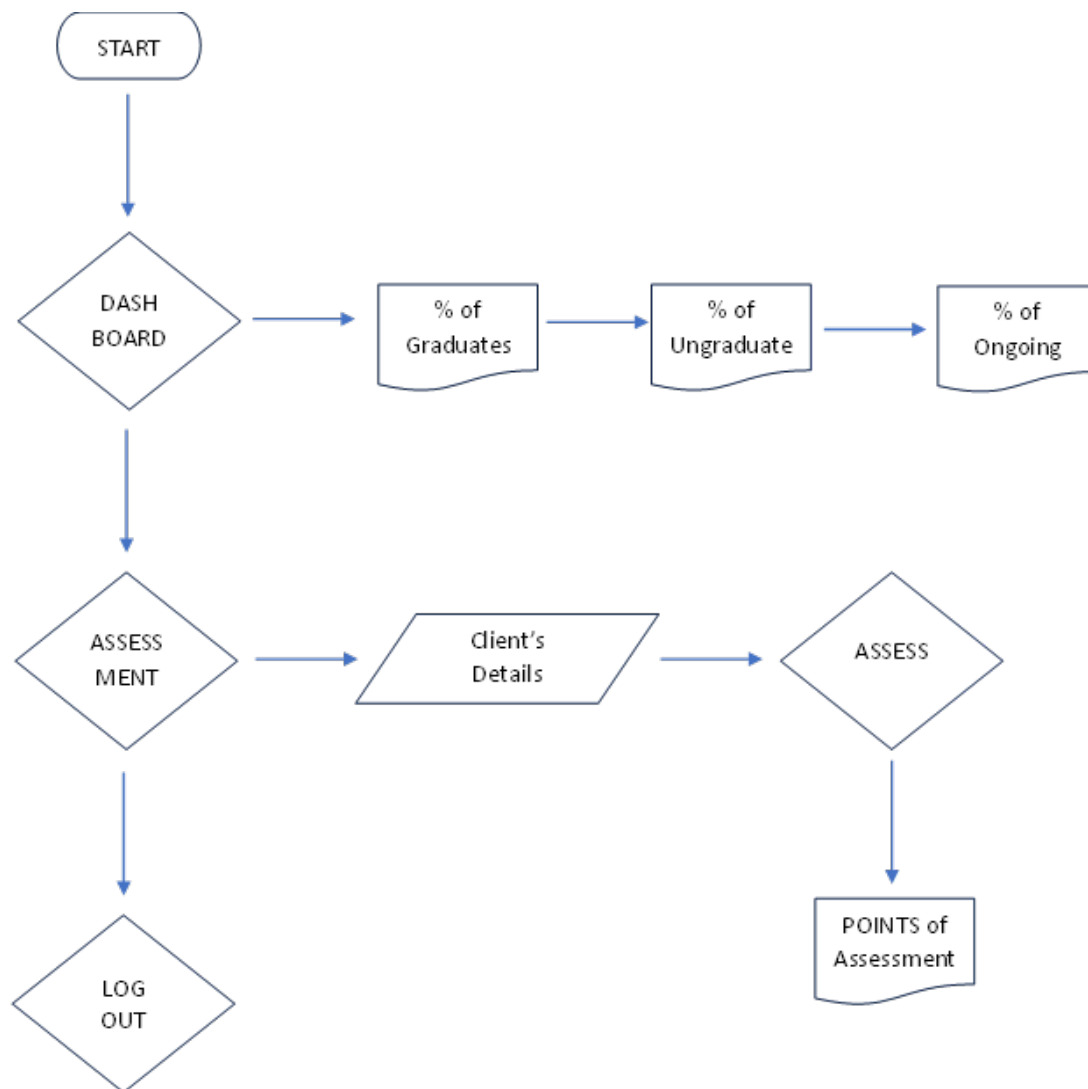


Figure 2 shows the system flowchart, where the administrator will be led to the dashboard once logged in. The administrator will be able to check out the percentage rate of graduates, ungraduated clients, and ongoing clients, on the dashboard. When the administrator has to assess a new client, he just clicks the evaluation menu in the system and is taken to a page where he can enter all of the necessary data for the evaluation. After the procedure, the system will automatically reflect points for the applicant's business performance, which will be used to help the assessor on deciding whether the client's application is accepted or not.

Proposed Criterion

Table 1: Assessment Criteria with Corresponding Weights

| Criteria | Weights |
|---------------------|-------------|
| Financial Statement | 70% |
| Business Recipients | 20% |
| Business Sector | 10% |
| Total | 100% |

Table 1 shows the suggested assessment criteria, together with the weights that would be used to determine the possibility of the applicants paying the requested assistance. **Financial Statement** was assigned the highest percentage break of 70%, in which the assessor calculates the applicant's monthly income based on their financial statements for the previous three years and projected financial statements for the future five years. Olayinka, A.A. (2022) studied that understanding a debtor's financial statements, including balance sheets. Income statements, and cash flow statements, can reveal their present financial condition, profitability, liquidity, and solvency. These statements help assess the debtor's ability to satisfy its financial obligations, provide evidence of past performance, and predict probable future financial health. **Business Recipients** whose scores are based on how many barangays in a town/city, or how many towns/cities in a province do they supply. Waterson, M. (2003) studied how consumers play roles in business competition, which has a significant impact on how business owners are able to make great income in order to pay their debts favorably. If the applicant supplies a big number of municipalities/towns in a province or barangays within a municipality/town, they gain a high concentration of business operations, which can give information about the debtor's revenue sources, client base, and relationships with important stakeholders. Assessing the creditworthiness of the debtors' customers and clients can provide insight into the consistency of their cash flows and the potential impact on the debtor's capacity to repay loans. **Business Sector** acquired 10%, with points given based on whether they operate in a sector with a high percentage of graduates and non-graduates based on DOST SETUP adopters. Different business sectors have varying levels of risk and volatility, which can affect a debtor's capacity to produce revenue and satisfy its financial obligations. Gajdosikova, D., et.al., (2024) have studied and analyzed that, understanding the larger economic and industry-specific issues affecting the debtor's sector can help evaluate the debtor's company stability and development potential.

Methods in Formulating the Proposed Criterion

The following techniques are used in the proposed criterion based on research conducted by Ezell, B., et al. (2021), who investigated numerous weighting techniques that are effective in allocating weights. This approach was utilized to assist the assessor in determining which factors are more significant and which are less relevant while assessing applications.

1. Simple Pairwise Comparison

The criterion: Financial Statement, Business Recipients, and Business Sectors were paired and compared to determine which is more important, using a points distribution.

- Financial Statement vs. Business Recipients: Financial Statement wins.
- Financial Statement vs. Business Sector: Financial Statement wins.
- Business Recipients vs. Business Sector: Business Statement wins.

Table 2: Total Points for Decision Criteria and Weight Calculation using Simple Pair-wise Comparison Technique

| Criteria | Points | Points (2/10 offset) | Weight |
|---------------------|--------|----------------------|-----------|
| Financial Statement | 2 | 4/12 | 0.44/0.36 |
| Business Recipients | 1 | 3/11 | 0.33/0.33 |
| Business Sector | 0 | 2/10 | 0.22/0.30 |
| Sum | | 9/33 | 1.00/1.00 |

Table 2 shows the accumulated points for each criteria and the calculated weight based on Simple Pairwise Comparison Technique. According to the comparisons, Financial Statement Criteria is the most important, followed by Business Recipient and the least important is Business Sector. According to Ezell, B., et al. (2021), 0 could be a null weight, hence the points were adjusted to 2/10 to provide proper weights.

2. Simple Multi Rating Technique (SMART)

Table 3: Total Points for Decision Criteria and Weight Calculation using Simple Multi Rating Technique (SMART)

| Criteria | Least Preferred | Preferred | Most Preferred | Score | Formula | Weight |
|---------------------|---|--|--|-------|---------|--------|
| Financial Statement | Amortization > Income | Amortization = Income | Amortization < Income | 70 | 70/100 | 0.7 |
| Business Recipients | > 50% of the total municipalities/ barangay | =50% of the total municipalities/ barangay | < 50% of the total municipalities/ barangay | 20 | 20/100 | 0.2 |
| Business Sector | Total graduates is less than 75% of the total | Total graduates is 75% of the total | Total graduates is greater than 75% of the total | 10 | 10/100 | 0.1 |
| Sum | | | | 100 | | 1.00 |

Table 2 shows the accumulated points for each criteria and the calculated weight based on Simple Multi Attribute Rating Technique. It also displays the preferences per criteria as support for decision making. The researchers of the current study recommended ranking the criteria as follows: first, financial statement, second, business recipients, and third, business sector. The Financial Statement was deemed the most crucial since it displays the income value for the ability to pay the amortization; therefore, as discovered, if an applicant reflects the ability to pay through his income, he is already eligible for assistance as the basis for success rate. Business Recipients is the second indicator of the company's performance as a supplier. The business sector is the last for determining if an application belongs to SETUP adoptors who are similar to the sector with a big number of graduates.

Proposed Pointing System

Ono, A. (2006) studied the importance of credit scoring in assessing loan applications, and his findings indicate that credit scoring should be considered to reflect applicants' ability to minimize financial risks. The current study offered a pointing system to aid the assessor in a more precise criterion and preferences for decision making.

The proposed pointing and rule system for each criteria was formulated based on the technique demonstrated by Ezell, B., et al. (2021) specifically the SMART.

Table 4: Pointing System under Financial Statement Criteria

| Preferences | Points | Formula | Weight |
|------------------------------|-----------|---------|--------|
| Amortization < Income | 70 | 70/140 | 0.5 |
| Amortization = Income | 40 | 40/140 | 0.29 |

| Preferences | Points | Formula | Weight |
|-----------------------|--------|---------|--------|
| Amortization > Income | 30 | 30/140 | 0.21 |
| Sum | 140 | | 1.00 |

Table 4 shows the proposed pointing system under Financial Statement Criteria, in which the preferences that reflect the comparison of the computed income and amortization of the application are assigned specific points that can help in analyzing the applicant's success rate.

Table 5: Pointing System under Business Recipients Criteria

| Preferences | Points | Formula | Weight |
|---|-----------|---------|--------|
| > 50% of the total municipalities/barangay | 20 | 20/35 | 0.57 |
| 50% of the total municipalities/barangay | 10 | 10/35 | 0.29 |
| > 50% of the total municipalities/ barangay | 5 | 5/35 | 0.14 |
| Sum | 35 | | 1.00 |

Table 5 shows the proposed pointing system under Business Recipients Criteria, in which preferences indicating the percentage of total barangays in a municipality/municipalities in a province are assigned specific points to assist in analyzing the applicant's performance level as suppliers.

Table 6: Pointing System under Business Sector Criteria

| Preferences | Points | Formula | Weight |
|--|----------|---------|--------|
| Total graduates is greater than 75% of the total | 10 | 10/23 | 0.43 |
| Total graduates is 75% of the total | 8 | 8/23 | 0.35 |
| Total graduates is less than 75% of the total | 5 | 5/23 | 0.22 |
| Sum | 23 | | 1.00 |

Table 6 shows the proposed pointing system under Business Sector Criteria, in which preferences indicating the percentage of total graduates in a sector are assigned specific points to assist in estimating the likelihood of graduating while paying the necessary support.

Proposed Success Rate and Performance Level Passing Rate and Conditions

Genovesi S., et al. (2023) emphasized the need of fairness in assessing loan applicants by including standards into decision making to eliminate bias and ensure the fairness of decision support. The current study provided standards for establishing the passing rate based on applicant success rate and performance level, as well as conditions for non-biased assessment.

The bold preferences and points in tables 4, 5, and 6 represent the good points and preferred preferences for each criterion, reflected below:

- The preference "Amortization < Income" (40 points) indicates that the applicant has the precise money to pay the amortization, making it a passing point for the Financial Statement Criteria.

- The preference "50% of the total municipalities/barangay" (10 points) indicates that the application provides an adequate number of recipients who can enhance their revenue and help pay the amortization, making it a passing point for the Business Recipients Criteria.
- The preference "Total graduates is 75% of the total" (8 points) indicates that the applicant is from a sector where half of the SETUP adopters graduated or successfully paid and completed their monthly dues, giving it a passing point for the Business Sector Criteria.
- The passing rate for the proposed assessment is equivalent to 58 points.

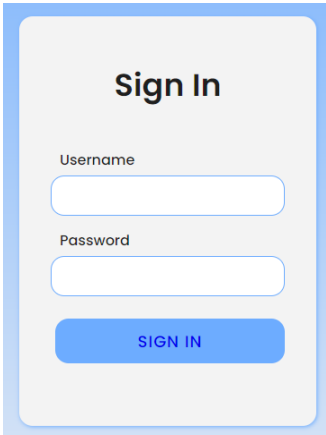
The least preferred preferences reflect the applicant's assessment failure; since the passing rate is 58 points, if the applicant obtained a score of 30 points in the Financial Statement, a perfect score (20 points) in the Business Recipients criteria, and a perfect score (10 points) in the business sector criteria, the total would be 60 points, which is more than the passing rate. However, as the Financial Statement requirement is the primary basis used by the DOST to determine whether an applicant is eligible or not, it should at the very least meet the preferred option. The following conditions are proposed:

- If the assessment rate is equal to or more than 58%, and the applicant obtained a passing score (40 points) in the Financial Statement Criteria, the evaluation is good.
- If the assessment rate is equal to or more than 58% and the applicant has a failing score (30 points) in Financial Statement Criteria, it is considered a negative evaluation.

Designed Assessment Model Technology

Houshmand, M. and Kakhki, M.D. (2007) stated that the multiple consequences of the manual evaluation process, which creates delays in transactions and occasionally disinformation, could have a negative impact on decision making, and that a systematized platform would be extremely beneficial. With this, the current study's researchers created a digitized platform to assist assessors in analyzing the applicants more easily and fast. The figures below are portions of a digital form used to enter information for the rule-based technique of assessment.

Figure 3: Admin Login Portal



The image shows a digital login form titled "Sign In". It features two input fields: "Username" and "Password". Below the password field is a blue button labeled "SIGN IN". The form is enclosed in a light blue border.

Figure 3 shows the admin login portal where the system administrator has to login their credentials to be able to proceed with the digitized assessment method.

Figure 4: System Dashboard

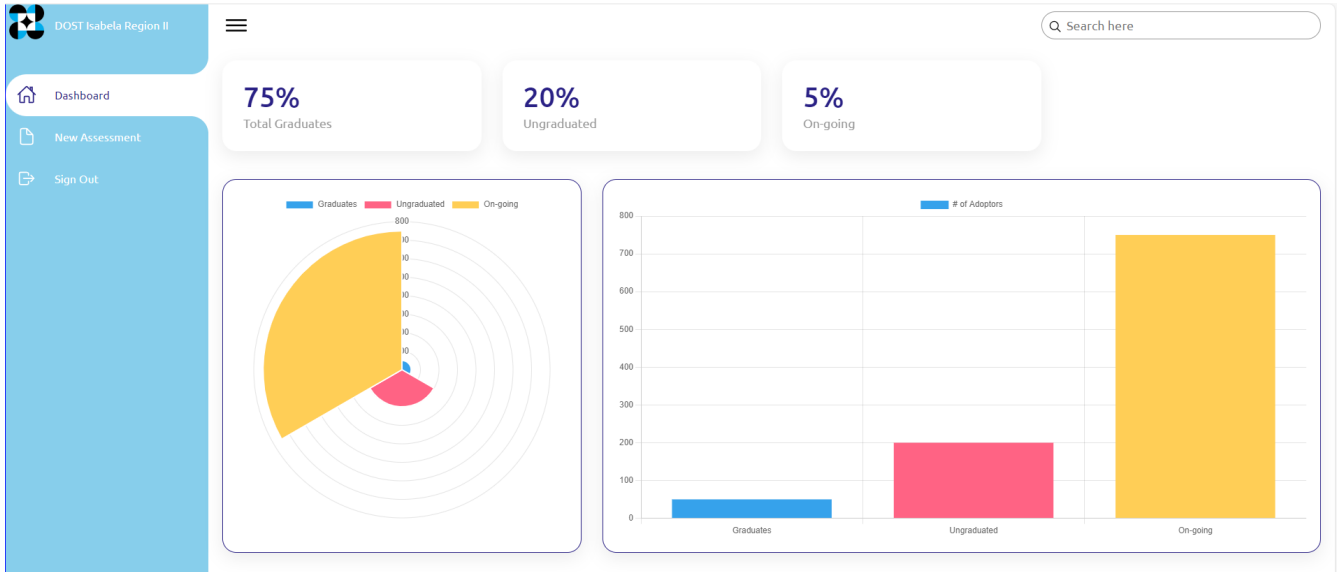


Figure 4 shows the system dashboard, which allows the administrator to see the percentages of graduates, ungraduated, and ongoing SETUP adopters.

Figure 5: Client Profile Section: 1st Part of the Assessment Form

The form is titled "New Assessment" and includes the following sections:

- Client Profile:** (Step 1)
 - Business Profile:
 - Firm Name:
 - Sector:
 - Product:
- Business Address:** (Step 2)
 - Province:
 - City/Municipality:
 - Barangay:
 - Street Name:
- Business Owner:** (Step 3)
 - Name:
 - Gender:
 - Email:
 - Contact#:
 - Buttons: NEXT, CANCEL

Figure 5 represents the first portion of the digital assessment form, the Client Profile Section, in which the administrator enters crucial applicant profile information. This section contains information for the Business Sector Criteria, which allow the model to estimate applicants' likelihood to pay based on their sector.

Figure 6: Financial Information Section: 2nd Part of the Assessment Form

Figure 6 shows the second part of the digitized assessment form, in which the administrator enters important financial information about the applicant, and the variables for the Financial Statement criteria are reflected to be used in computing the applicant's monthly income. This section contains information that will allow the model to determine whether the applicant is able to pay the monthly amortization of the requested assistance.

Figure 7: Assistance Information Section: 3rd Part of the Assessment Form

Figure 7 shows the third portion of the digital assessment form, where the administrator inputs information concerning the applicant's applied assistance. This part offers information that will enable the model to compare the amount of computed monthly amortization to computed monthly income, which is significant in Financial Statement Criteria.

Figure 8: Admin Login: Security Part of the Assessment Form

The screenshot displays a form titled "New Assessment". At the top, there is a progress indicator with three steps: "Client Profile" (1), "Financial Info" (2), and "Assistance Info" (3). Each step has a checkmark below it. Below the progress indicator, the text reads "Login to Generate Report :". There are two input fields: "Username" and "Password". At the bottom, there are three buttons: "PREVIOUS", "SUBMIT", and "CANCEL".

Figure 8 shows the final section of the digital assessment form, which serves as the form's security layer for secure report generation.

Results and Discussions

Figure 9: Printable Report

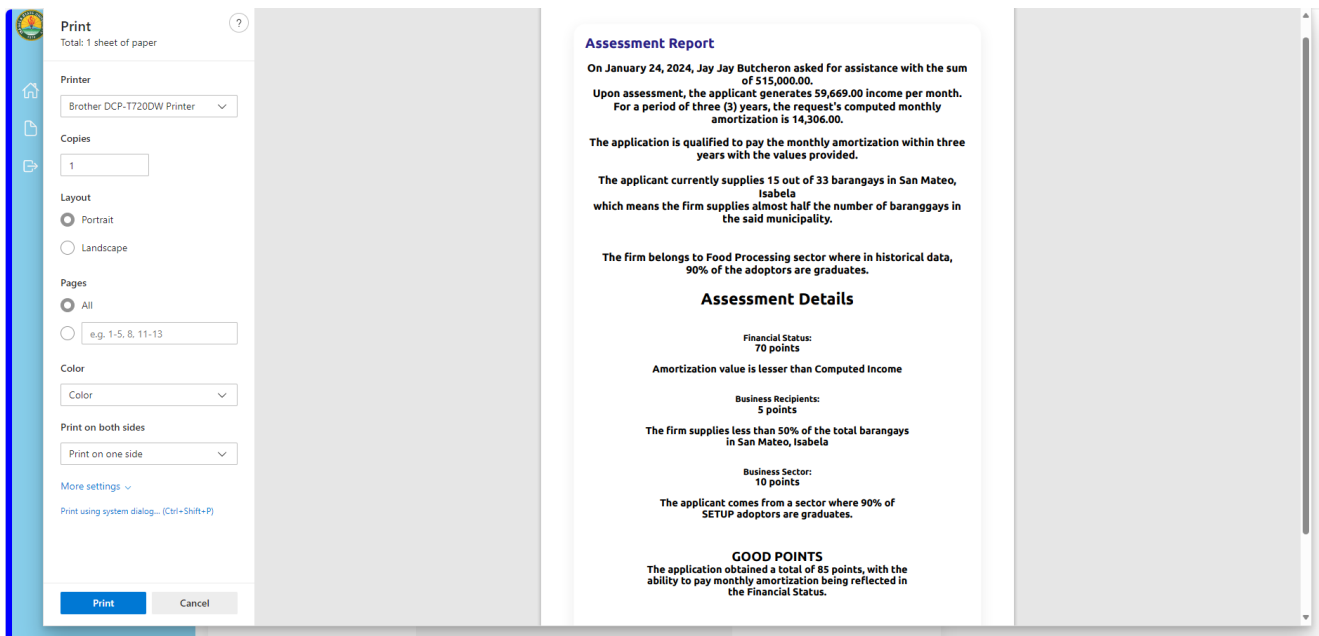


Figure 9 shows the printable report generated by the assessment model. This report helps the assessor determine whether the applicant is able to pay for the assistance or not by providing information on the applicant's success rate and performance level. It also represents the points that the applicant has accrued based on the guidelines in the assessment model.

Kaur, S. (2022) investigated how credit assessors perform in assessing applicants and how important their contributions are in deciding whether to accept or reject lending applications. Assessor qualities can influence personal decisions in a variety of ways. The proposed assessment model reduces the assessor's stress and confusion in decision making while also reflecting fair outcomes for the applicants, as it includes rules with fair preferences, passing rates, and conditions for non-biased results. The deployment of the assessment model gave key insights into how the rule-based model is used to assess DOST-SETUP applicants, which serve as a decision support system for assessing the applicants.

Conclusion

As studied by Ritonga, H.M., et al. (2017), assessment methods have proven to be a highly effective decision-making method particularly in assessing debtors. In this study, the researchers determined that using a rule-based automated evaluation model aided in giving points to applicants' performance and success rate, which may then be utilized to support the decision on whether or not to accept their application for assistance. As a result, a rule-based approach model offers a feasible option to speedier and more dependable evaluation procedures.

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