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SPECIAL NEEDS ASSESSMENT SYSTEM FOR PERSONS WITH DISABILITIES FOR THE CITY OF LEGAZPI, ALBAY USING DECISION TREE ALGORITHM

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ABSTRACT

The formation of a specialized agency to aid individuals with disabilities (PWDs) in their rehabilitation, self-development, self-reliance, and integration into society is mandated by the Philippine Constitution of 1987. Due to the overall lack of disability statistics, government organizations are unable to assess the level of inclusion of individuals with disabilities in other mainstream social services. By automating the profiling and assessment process, this study intended to develop a Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay. Identification of information needs for system development, use of decision tree methods for the Decision Support System, and evaluation of system acceptability based on the ISO/IEC 25010 Software Product Quality Model are the topics covered by this research. The results show that determining the specific requirements of PWDs may be designed and developed with sufficient support from the data and practices already in place in Legazpi City. The decision tree method provides useful assistance in classifying the many types, levels, and particular demands of disabilities. The features such as data visualization and evaluation capabilities, effectively identify the needs of people with disabilities while expediting the tracking and reporting procedure for government agencies engaged in PWD inclusion programs. The recommendations include implementing a training program to familiarize authorities with the system's components, improving the system's communication features to provide status notifications, and expanding the system to include needs distribution management and monitoring. In conclusion, the Special Needs Assessment System for Persons with Disabilities provides a practical means of assessing, organizing, and forecasting the distribution of resources for PWDs in Legazpi City, Albay.

Keywords: *persons with disabilities, PWDs profiling, special needs assessment, decision tree algorithm, decision support system, needs assessment system*

Introduction

The 1987 Philippine Constitution acknowledges the necessity of assisting society's most vulnerable groups, including persons with disabilities (PWDs). Article XIII, Section 13 provides that "the State shall establish a special agency for disabled persons for their rehabilitation, self-development, self-reliance and their integration into the mainstream of society." The Philippines ratified the United Nations Convention on the Rights of Persons with Disabilities, which states that "the State shall establish a special agency for disabled persons for their rehabilitation, self-development, self-reliance and their integration into the mainstream of society." The Philippines is required by these laws to respect the rights of people with disabilities (Ernie Cecilia, 2021).

Persons with disabilities are defined as those "who have long-term physical, mental, intellectual or sensory impairments which, in interaction with various barriers, may hinder their full and effective participation in society on an equal basis with others. People with "disabling diseases resulting in the person's limitations to do day-to-day activities as normally as possible, such as but not limited to those

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undergoing dialysis, heart disorders, severe cancer cases, and such other similar cases resulting in temporary or permanent disability" are included in these categories (Disability and Human Rights, 2014).

Approximately 500 kilometers south of Manila is the province of Albay located in the Bicol Region in South-Eastern Luzon Island in the Philippines. Based on Legazpi City, Albay Profile – the political and economic hub of the Bicol area is Legazpi, which also serves as the capital of the Albay province. The 2020 Census found 209,533 people living there. Legazpi has 70 barangays (PSA, 2021). According to Abion (2022), there is an estimated 4,349 registered persons with disability in Legazpi City from the master list recorded in Persons with Disability Affairs Office (PDAO) in the province of Albay. With a total of 2,038 counts, people with physical disabilities make up the majority, whereas those with intellectual disabilities have the fewest numbers at just 71. According to the following statistics: Visual has 401, Psychosocial has 287, Deaf/Hearing has 269, Mental has 253, Speech/Language has 244, Learning has 242, and Senior Citizen has 544.

As per Abion (2022), for those with disabilities in the Province of Albay in which Legazpi City is included, access to education, health care, career opportunities, and transportation are all seriously limited. The department and other government agencies are unable to determine the degree of inclusion of people with disabilities in other mainstream social services due to the general absence of statistics on disability. This includes compiling accurate statistics on the prevalence of disability and information on community involvement by individuals with impairments.

People with disabilities shared the same fundamental rights, needs, and difficulties as everyone else. They do, however, encountered various extra obstacles. They are particularly vulnerable to hazards to their safety, including an increased risk of assault, exploitation, and abuse, as well as significant discrimination. They encountered obstacles when trying to access services including healthcare, education, livelihoods, and humanitarian aid. Disability disaggregated data are increasingly needed to better understand the prevalence of disabilities and, more importantly from the perspective of development programming, to support the creation, implementation, and evaluation of successful, inclusive development programs. (Disability and Human Rights, 2014).

The Special Needs Assessment of Persons with Disabilities is a crucial process that aimed to evaluate and identify the unique needs and requirements of individuals with disabilities. This assessment played a vital role in determining the appropriate support, services, and accommodations that should be provided to enhance the quality of life and promote inclusivity for people with disabilities. The Special Needs Assessment procedure has typically been a tedious and manual process that frequently relies on paper-based forms and substantial manual data entry. However, many organizations and institutions have started employing automated technologies to streamline the evaluation process in response to technological improvements and the rising demand for efficiency and accuracy.

The study titled Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay Using Decision Tree Algorithm established automation of consolidated PWDs profiling, disability categorization, and special needs analysis that will aid the government sector with inclusion program, and ensured accurate reports for evaluation, monitoring, and basis for resource allocation. The study's main goal was to come up with a plan and develop a Special Needs Assessment System for Persons with Disabilities that will assist the city in evaluating, planning, and predicting the special needs resource allocation. A consolidated system of Profiling of Persons with Disabilities (PWD) in the city of Legazpi was included for easy access and

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processing of information. It involved assessing the capabilities, determining options for assistance, and then putting in place a plan based on the objectives and alternatives. In order to better understand how stakeholders viewed the automation system for Special Needs Assessment of Persons with Disabilities, this study looked into their perceptions. By learning more about their viewpoints, the study aimed to offer insightful comments and suggestions to improve the efficacy and acceptance of the automation system, ultimately advancing inclusive practices and enhancing support services for people with disabilities.

This study attempted to provide an assessment of how the City of Legazpi administered the resource allocation for disabled persons, from planning to implementation. The following issues were covered:

1. What are the information requirements needed in order to design and develop the Special Needs Assessment System for Persons With Disabilities for the City of Legazpi, Albay?
2. How to utilize decision tree algorithm for the proposed Decision Support System for the Needs Assessment for Persons with Disabilities?
3. What are the features of the proposed Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay Using Decision Tree Algorithm?
4. How is the acceptability level of the system using the ISO/IEC 25010 or the Software Product Quality Model tested in terms of:
    a. Usability
    b. Functional Suitability
    c. Performance Efficiency
    d. Reliability
5. What is the perception of various users regarding the automation system used for the Special Needs Assessment of Persons with Disabilities, and how does this perception vary across different user groups?

The outcome of this project will benefit various stakeholders involved in disability support services. It will assist policymakers, healthcare professionals, and support organizations in allocating appropriate resources and interventions to different disability categories. Furthermore, it can aid in the development of targeted programs and initiatives that address the unique needs of PWDs, promoting inclusivity and improving the quality of life for individuals with disabilities.

The system utilized the decision tree algorithm as a machine learning technique to analyze and classify the needs of PWDs based on a set of input criteria. It created a tree-like model of decisions and outcomes, enabling effective decision making for the allocation of resources and support. Also, it provided an evaluation of the special needs and requirements of PWDs to support them in accessing appropriate services and resources. However, the distribution process of resources was not included in the system. Since the system is designed for the City of Legazpi, Albay, it would not address the specific needs or variations in other regions or cities. The system's effectiveness may be limited when applied outside its intended scope without appropriate customization and consideration of local requirements.

Disability is tied to many facets of life and involves interactions between the individual and his or her environment, making it challenging to define and quantify. In order to create the International Classification of Functioning, Disability, and Health (ICF) as a consensus framework, the World Health Organization (WHO) Project on Assessment and Classification of Human Functioning, Disability, and Health. WHO developed the WHO Disability Assessment Schedule (WHODAS 2.0) to address this need, and provide a standardized way to measure

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health and disability across cultures. WHODAS 2.0 offers a standard metric for measuring how any health condition affects functioning. The tool has been shown to be helpful for determining the degrees of health and impairment in both the general population and particular groups (such as individuals with a variety of various mental and physical illnesses). Additionally, WHODAS 2.0 makes it simpler to plan health-related initiatives and evaluate their results. WHODAS 2.0 includes six domains namely cognition, mobility, self-care, getting along, life activities, and participation. It includes actions like standing, moving around the house, leaving the house, and walking a considerable distance, as well as hygiene, dressing, eating, and being alone. Furthermore, it also encompasses communication and thinking activities and measures the level of difficulty with daily tasks and social aspects. Finally, it evaluates interactions with others and potential challenges confronted with this life sphere as a result of a medical issue (Federici S;Meloni F;Mancini A;Lauriola M;Olivetti Belardinelli M., 2016).

In April 2016, a cluster randomized cross-sectional survey was carried out in Albay Province, the Philippines, to evaluate the prevalence of disability and accessibility to support services. The United Nations Statistical Commission and UNICEF's Washington Group population-based survey methodology were used. With probability proportional to size, a sample of 70 barangays—the third level of administrative division in the Philippines—was chosen as clusters, and 30 homes were randomly chosen in each barangay to be surveyed. In comparison to urban areas, rural areas have a greater estimated prevalence of disability. The effectiveness of the currently offered programs was found to have deficiencies, and access by children with disabilities to support services was lowest in rural barangays in the highlands and plains of the countryside. In Albay Province, particularly in the remote highlands, there was a sizable unmet demand for support services addressing the needs of people with disabilities. People with disabilities had less access to school and work opportunities, and many were not aware of their basic rights. Community-based rehabilitation (CBR), health, and other rehabilitation services must effectively communicate with one another, map and analyze their current work, identify their comparative strengths, and coordinate their future work in order to properly identify, educate, and support people with disabilities. The evidence basis for enhancing the quality and scope of services for persons with disabilities would be strengthened by prevalence surveys that place a larger emphasis on the characteristics and effectiveness of CBR and related programs (Hodge, Bolinas, Jaucian, Boneo, Schapira, & Villanueva, 2017).

In the study of Monreal and Palaoag (2021), they discussed that both organized and unstructured data can be classified. Data is categorized using the process of classification into a predetermined number of classes. Finding the category or class that fresh data will fall within is the basic objective of a classification challenge. A classification model seeks to infer some conclusion from the input values given for training. For the new data, it will forecast the class labels and categories. The researchers included the types of Classification Algorithms such as Naïve Bayes, Stochastic Gradient Descent, K-Nearest Neighbours, Decision Tree, and Support Vector Machine. (True Positive + True Negative) / Total Population is the formula for calculating an algorithm's accuracy. The ratio of accurately anticipated observations to all observations is called accuracy. The most logical performance metric is accuracy. True Positive: The proportion of correctly foreseen positive outcomes. True Negative: The proportion of correctly predicted negative events. Meanwhile, the harmonic mean of recall and precision is the F1 score. It is a statistical metric used to evaluate performance. In other words, an F1-score is

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a mean of a person's performance based on two elements, namely precision and recall (from 0 to 9, with 0 being the lowest and 9 the most). Using the formula (2 x Precision x Recall) / (Precision + Recall), the F1-Score is calculated. The weighted average of Precision and Recall utilized in all different kinds of classification algorithms is called the F1-Score. Therefore, both false positives and false negatives are considered while calculating this score. In most cases, F1-Score is more helpful than accuracy, especially if your class is distributed unevenly. The comparison matrix for the algorithms is displayed in Table 1. Thus, the decision tree method outperformed the other algorithms in terms of accuracy and F1-score.

Table 1. Comparison Matrix of the Algorithms

Classification Algorithms	Accuracy	F1-Score
Decision Tree	84.23%	0.6308
Support Vector Machine	84.09%	0.6145
K-Nearest Neighbours	83.56%	0.5924
Stochastic Gradient	82.20%	0.5780
Naives Bayes	80.11%	0.6005

In today's data-driven corporate environment, where decision-making is heavily influenced by factors such as big revenues for many industrial organizations, data visualization is essential. However, there is a growing need for database experts to assist with efficient and effective data visualization due to the increased demand for data processing with respect to the volume, velocity, and validity of data. (1) Visualization specifications lay down the process by which users can outline the specifications for producing visuals. (2) Effective methods for data visualization process the data and a specified visualization specification to create graphics with the main goal of being effective and scalable at an interactive pace. (3) The recommendation for data visualization is to auto-complete a specification that isn't full or to find more intriguing renderings based on a reference visualization (Qin, Luo, Tang, & Li, 2019).

The product quality model as defined in ISO/IEC 25010 which comprises eight characteristics that make up the product quality model's classification of product quality properties (functional suitability, reliability, performance efficiency, usability, security, compatibility, maintainability, and portability). Based on ISO/IEC 25010 (2019), when employed under specific circumstances, a product or system's functional appropriateness characteristic measures how well it fulfils both explicit and implicit demands. The degree to which a product or system can be used by specific users to accomplish specific goals with effectiveness, efficiency, and satisfaction in a specific context of use is known as usability. Then the degree to which a system, product, or component carries out specific functions under specific circumstances for a specific amount of time is known as its reliability. Finally, the effectiveness and efficiency with which a system, product, or component can be moved from one operational or consumption environment to another depend on the hardware, software, and other factors that affect portability.

The researcher identified gaps in the lack of a standardized profiling system that captured essential information about PWDs consistently and uniformly. This led to challenges in monitoring and evaluating the effectiveness of interventions, planning inclusive policies, and facilitating collaboration among various stakeholders.

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By bridging this gap through the development of a standardized profiling system that captured relevant information, and ensuring consistency and compatibility across different agencies and organizations working with PWDs, significant progress was made. Additionally, the absence of a comprehensive assessment system that accurately evaluated the needs and capabilities of PWDs in Legazpi City was identified as another significant gap. There may be a lack of standardized tools, protocols, and trained personnel to conduct thorough assessments. Bridging this gap involves developing an inclusive and reliable assessment framework that considers various disabilities, their unique challenges, and individual strengths. Another crucial gap is the limited collection and analysis of data related to PWDs in Legazpi City. Bridging this gap requires implementing a robust data collection system that includes demographic information, disability types, functional capabilities, educational background, and employment status of PWDs. This data can then be analyzed to generate insights for resource allocation and policy planning.

Conceptual/Theoretical Framework

Figure 1 shows the proposed Special Needs Assessment System for Persons with Disabilities (PWDs) in the City of Legazpi, Albay utilizing a Decision Tree Algorithm as its conceptual framework.

Figure 1. Conceptual Framework

Community-Based Rehabilitation (CBR) played a crucial role in adding or updating the demographic information of PWDs as well as their domain ratings. The CBR was also responsible for collecting relevant data and inputting it into the system. This information helped in understanding the specific needs and requirements of PWDs in the community. Meanwhile, the City Social Welfare and Development Office (CSWDO) is responsible for updating the details of each barangay, including the chairperson's information and user access. They have the authority to add or modify these details within the system. Additionally, the CSWDO verifies the PWD applications and disability statuses, and assigns them to appropriate categories. The system automatically generates a categorized list of PWDs, a statistical report, and a validated needs assessment status for each barangay. These reports can be viewed by the Persons with Disability Affairs Office (PDAO). The PDAO acts as a central authority to oversee the needs assessment process and ensure that the PWDs' requirements are adequately addressed. Authorized agencies involved in disability-related programs can view the overall assessment report generated by the system. If needed, they can request a detailed assessment report from the CSWDO, which aligns with the scope of their respective programs. This facilitates

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effective coordination and collaboration between different agencies to ensure comprehensive support for PWDs. Finally, the Decision Tree Algorithm was used for the classification and analysis of data collected through the system. It helped draw conclusions and insights regarding the evaluation of PWDs' special needs. These conclusions can be endorsed to different agencies for consideration in government program planning and implementation.

Materials and Methods

This study employed a research design that incorporated quantitative, descriptive, and developmental research designs. The quantitative research design focused on the collection and analysis of numerical data to test hypotheses, identify patterns, and establish statistical relationships. In the context of this study, the researcher used quantitative methods to assess and evaluate the effectiveness of the special needs assessment system for PWDs in the City of Legazpi.

According to Gillaco (2014), the descriptive approach looks for the actual facts in regard to a certain circumstance. Additionally, this approach focuses primarily on the description, contrast, analysis, and interpretation of existing data. It is used to outline a population's characteristics and gather information to respond to a variety of what, when, and how inquiries regarding a certain population or group.

On the other hand, developmental research is the scientific study of creating, developing, and assessing educational processes, products, and programs that must conform to internal consistency and effectiveness standards. In other words, the descriptive developmental technique is a systematic research that involves carefully planning, creating, and assessing educational processes, products, and programs that must adhere to certain standards or requirements. Thus, developmental research focused on understanding and enhancing existing practices or systems. Overall, the combination of quantitative, descriptive, and developmental research methodologies allowed the researcher to collect and analyze data, describe the existing special needs assessment system, and propose improvements.

The researcher included the group of respondents to evaluate the system. A total of 20 respondents assessed the acceptability level of the Special Needs Assessment System for PWDs in Legazpi City Using Decision Tree Algorithm. The first group was composed of five barangay focal persons for Community-based Rehabilitation (CBR) who were the front liner for the PWDs. The next group was composed of five representatives from the City Social Welfare and Development Office (CSWDO) who were in charge of the management of PWDs' social services concerns. There were also five respondents from the People with Disabilities Affairs Office (PDAO) which monitors the PWDs. And lastly, five section/office heads from the government sector with inclusion programs such as City Engineering Office, DILG, TESDA, DTI, and City Health Office.

By employing purposive sampling, the researcher ensured that the selected participants represent a range of perspectives and viewpoints that are relevant to the research questions. The primary source of data used by the researcher was an interview with the Disability Affairs Officer of the Persons with Disabilities Affairs Office (PDAO). The collected data gave the researcher enough details on how the suggested system may be developed, including certain requirements and potential agencies that can benefit from it.

In the proposed Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay Using Decision Tree Algorithm, the researcher defined the roles and responsibilities of government sectors by using document analysis. In order to understand the duties of each sector in relation to resource allocation for the PWDs

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and their significance to society, public government files were also examined.

After the data has been processed using statistical software applications, the researcher interpreted and synthesized the study's findings. The researcher gathered and analyzed data in order to identify critical variables in terms of system evaluation and feedback. The researcher determined the rate of the proposed system's Usability, Functional Suitability, Performance Efficiency, and Reliability using the ISO/IEC 25010 Product Quality Model.

The proposed Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay Using Decision Tree Algorithm was designed and developed with the use of the Rational Unified Process (RUP) Methodology. RUP is an agile technique that the researcher selected because it promotes close communication between developers and customers, allowing for quick and concise increments or phases, and minimizing costs. Agile software development involves a cultural change in many businesses since it emphasizes the clean delivery of specific software components rather than the full solution. The Agile cycle makes it simple to make adjustments, enabling the team to adjust the procedure to best meet their goals (Brush & Silverthorne, 2022).

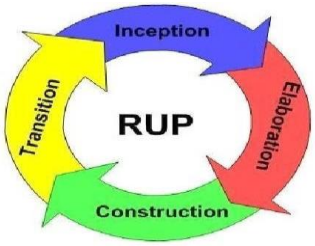

Figure 2. RUP Methodology Phases

RUP is composed of the following phases as shown in Figure 2: Inception, Elaboration, Construction, and Transition (RUP Methodology Complete Guide on RUP Methodology, 2021)

The project was proposed during the inception stage. By identifying the issue, the system's scope, launching the project, etc., this phase sought to develop a business model. The researcher gathered information in this phase regarding the PWDs' special needs management procedures that are required for the design and development of PWDs profiles, categorizing disabilities, and special needs assessments carried out in the City of Legazpi. Additionally, the researcher identified and analyzed methodological approaches for retooling the current procedure, including the capacity to create a brand-new system. In the Elaboration stage tried to conduct a thorough examination of the situation. The researcher gathered the necessary documents, such as reports and forms, developed the system's scope, and outlined the requirements of the stakeholders in terms of PWDs profiling, and needs assessment during this step. These criteria were investigated, reviewed the study's contents, and created the software development strategy, which included establishing a stable software architecture and designing the database, components, programs, and system modules. The production method was constructed during this construction phase where the researcher examined the system's requirements and develops a solution while taking into account the requirements, limitations, and all relevant standards and rules. To make sure that the system operated in accordance with the system's design and satisfied all requirements laid out in the specification documents, the program source codes were developed and test the unit. Documentation including user manuals, test sets, test findings, training programs, and marketing

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materials were examples of product deliverables for this phase. The product was distributed to end users in the transition phase. Delivery of the system to the user community counts as development. It also includes with installation, user communities, packaging, marketing, etc. It conducts beta testing to see whether the new system satisfies the needs of the user or not.

Statistical Treatment of Data

The gathered data were then collated, tabulated, employed with the proper statistical tools presented and analyzed. The statistical tool used were Weighted Mean and Analysis of Variance (ANOVA). The evaluation of the Special Needs Assessment System for Persons with Disabilities for the City of Legazpi, Albay involved collecting perceptions from a group of respondents. These statistical techniques provided a strong framework for comparing the perceptions of different groups and identifying potential areas for improvement in the system. The most significant variables in the data, such as the methods now in use, the issues that have been encountered, and potential solutions, were identified using weighted mean.

Table 2 shows the scaling system. It is an interval using a scale to show the description and interpretation of the average response in the system in terms of ISO ISO/IEC 25010. The researcher employed a 5-Point Likert Scale to gauge the acceptability of the evaluation results among the respondents. By using a structured scale, the researcher aimed to obtain measurable data on the respondents' perceptions. The Likert Scale consisted of five points, ranging from 1.0 to 5.00, each associated with a specific verbal interpretation and description. These points provided a clear framework for the respondents to express their level of acceptability towards the evaluation results. By utilizing this 5-Point Likert Scale, the researcher aimed to gather quantitative data on the respondents' perception of the evaluation results' acceptability. This approach facilitated a systematic analysis and interpretation of the respondents' viewpoints, enabling the researcher to gain insights into the level of acceptability from the collected data.

Table 2. The Scaling System

Interval Scale	Verbal Interpretation	Description
4.20 – 5.00	Highly Acceptable	System is excellent. It meets requirements far beyond what is expected.
3.40 – 4.19	Moderately Acceptable	System is very satisfactorily developed. It adequately meets the requirements.
2.60 – 3.39	Acceptable	System addresses the minimum functionalities required.
1.80 – 2.59	Fairly Acceptable	System is fair but needs significant improvement.
1.0 or 1.79	Poorly Acceptable	System is poorly developed and unacceptable.

Results and Discussion

Existing process and information requirements of special needs assessment system

The Community-Based Rehabilitation (CBR) is led by the barangay focal person in reporting residents with disabilities, while the Persons with Disability Affairs Office (PDAO) in the

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province of Albay is led by the Disability Affairs Officer in drafting the report for the inclusion plan of PWDs programs report. The City Social Welfare Department (CSWDO) verifies and approves applications for PWD identification, implements needs allocation, and distributes commodities and requirements. The focal person of the CBR collects demographics of people with disabilities such as name, purok, age, gender, educational background, employment status (if applicable), and type of impairment. To ascertain the overall number of PWDs, the focal person provides actual data from the PWDs. In order to prepare for the needs assessment and for planning purposes, the classification of disability is also necessary in order to determine the category of disability.

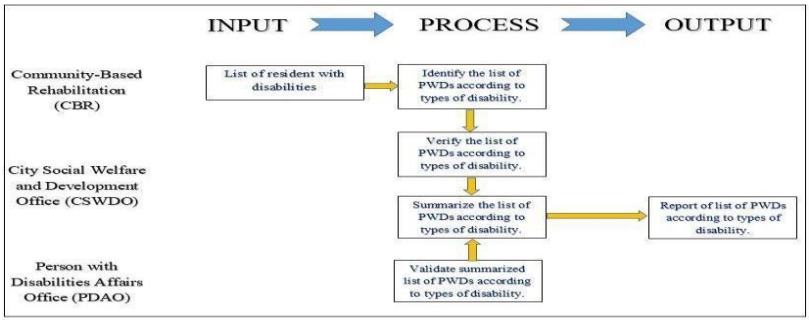

Figure 4. Existing Process of Listing PWDs per Barangay

Figure 4 illustrated the process of actions involved in identifying PWDs in a barangay. The summarized list of PWDs according to disability type was provided by the focal person of CBR. Based on the submitted list from the barangay, CSWDO verifies and summarizes the list. Validation on the type of disability is requested from the PDAO office. With this process, report on the list of PWDs in each barangay is generated. The provision of resources for Persons with Disabilities (PWDs) is an essential aspect of ensuring inclusivity and equal opportunities within a community. Barangays, as the smallest administrative units in the Philippines, play a crucial role in identifying and addressing the needs of their constituents including PWDs.

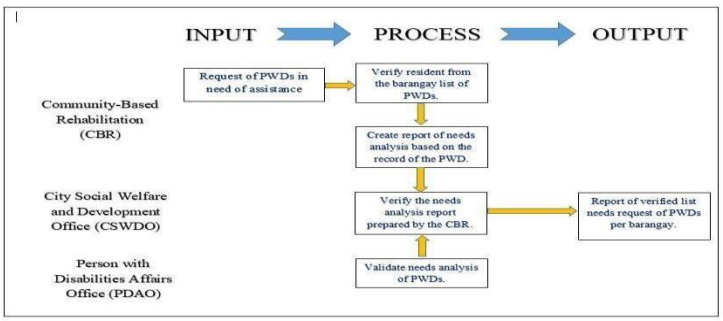

Figure 5. Existing Process in Reporting PWDs in Need of Assistance

Figure 5 illustrated the process of reporting PWDs in need of assistance in a barangay. The CBR accepts requests for assistance from the PWDs. The focal person of the CBR first verifies the existence of PWD from the verified record. Then CBR prepares the needs analysis and submits it to CSWDO. The CSWDO then verifies the needs based on the analysis report of the barangay. Validation from the PDAO in terms of analysis of the needs of PWDs is requested. The CBR prepares the report of

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the list of PWDs in need per barangay. The summary report is necessary as a prerequisite for allocating PWDs' needs. One of the essential components of CBR is the evaluation of the needs of PWDs. This evaluation is conducted to understand the specific challenges and requirements of individuals with disabilities within a particular community.

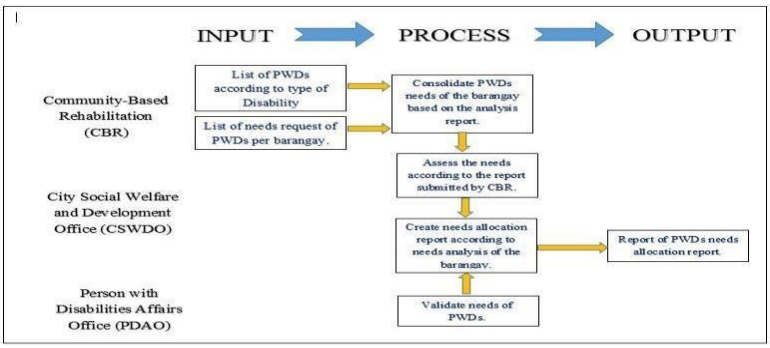

Figure 6. Existing Process in Conducting PWDs Needs Assessment

As shown in Figure 6, the CBR based on the list of PWDs in the barangay and the needs request generates a consolidated report of needs to the CSWDO based on the resident needs analysis report. The CSWDO evaluates the needs according to the analysis endorsed by the focal person of the barangay. From the evaluation, a consolidated needs evaluation report is generated. Validating needs according to disabilities is requested by PDAO to ensure appropriate needs provision for PWDs.

Algorithm used in the development of decision support system for the needs assessment of persons with disabilities

The program utilizes a dataset containing information about PWDs and their respective disability categories. The dataset includes attributes such as deaf, intellectual disability, learning disability, mental disability, physical disability, psychosocial disability, speech disability, and visual disability. By leveraging this data, the program will learn to classify PWDs based on their characteristics and provide valuable insights into their specific needs.

The approach involves data preparation which loaded the dataset, containing information about PWDs and their disability categories, then pre-process the data, including label encoding of categorical variables. The next process is the Train-Test Split, which split the dataset into training and validation sets to evaluate the program's performance. Then the Decision Tree Classification utilized the decision tree classifier from the scikit-learn library to build a model based on the training data. This process includes the setting of the criterion as entropy and determining the minimum number of samples required to split a node. To present the generated algorithm, visualization is the next step wherein it plotted the decision tree provides a visual representation of the classification process. The matplotlib library was used to create a tree plot that illustrates the decision-making process. Next is the evaluation which evaluated the performance of the program by predicting the disability needs of PWDs in the validation set. It computed the confusion matrix to assess the accuracy of the classification.

The decision tree classification algorithm was implemented to classify the disability needs of persons with disabilities (PWDs) based on the level of the category domain. The dataset used for this project contains information about PWDs, including their disability category levels

.

```
# Initialize and train the decision tree classifier with entropy
as the criterion
clf = DecisionTreeClassifier(criterion='entropy')
clf.fit(X, y)
```


Figure 7. Decision Tree Classifier

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Then initialized the DecisionTreeClassifier with entropy as the criterion as shown in Figure 7. The entropy criterion measured the impurity of the classification and aids in determining the most informative features for the classification task. The classifier is then trained using the feature matrix x and target variable y, enabling it to learn patterns and make accurate predictions.

```
# Generate the graphviz representation of the decision tree with
domain (impurity)
dot_data = tree.export_graphviz(clf, out_file=None,
feature_names=features, class_names=clf.classes_, filled=True,
impurity=True)
graph = graphviz.Source(dot_data)

# Save the decision tree visualization to a file
graph.format = 'png'
graph.render('decision_tree')

# Display the decision tree
graph
```

Figure 8 . Decision Tree Representation

In order to gain insights into the decision-making process of the classifier, visualization of the decision tree was generated as shown in Figure 8. First, use the tree. export_graphviz() function from the sklearn. tree module to generate a graphviz representation of the decision tree. This function takes various parameters, including the trained classifier (clf), the output file (out_file = None), the feature names (feature_names = features), the class names (class_names = clf. classes_), and other options like filling the nodes with colors based on impurity (filled = True). The resulting graphviz representation is stored in the dot_data variable. Once the graphviz representation is generated, save the decision tree visualization to a file. In this implementation, set the output format to PNG (graph. format = 'png') and save the visualization as a file named "decision_tree. png". Finally, it display the decision tree visualization using the graphviz. Source function, passing the dot_data variable as the input. This displays the decision tree directly in the output, allowing to visually analyze the tree's structure, nodes, and decision paths.

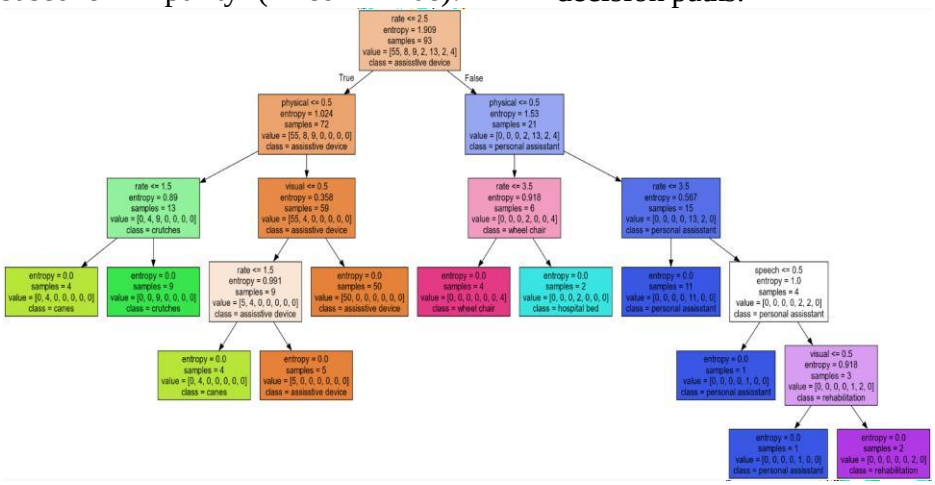

Figure 9. Decision Tree Algorithm Model

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Shown in Figure 9, the decision tree is plotted using the plot tree function from the sklearn.tree module. The plot visualized the decision-making process of the tree, showing the conditions at each node and the resulting classes Another decision tree classifier was built using the entire dataset, but with a different minimum number of samples to split an internal node (50 in this case). This decision tree is used to generate a text representation of the tree using the export_text function. The text representation provided a detailed view of the decision tree structure.

The program then proceeds to predict the disability needs of PWDs in the validation set using the second decision tree classifier. The predictions are compared to the actual labels, and a confusion matrix is generated using the confusion_matrix function. The confusion matrix shows the number of true positive, true negative, false positive, and false negative predictions.
Finally, the accuracy score is calculated by summing the diagonal elements of the confusion matrix and dividing it by the total number of samples. The accuracy score provides an evaluation of the performance of the decision tree classifier in classifying the disability needs of PWDs.

The algorithm determined the special needs that matched the capability evaluation of the PWDs after categorizing the data and obtaining the actual count and percentage. Following the algorithm's integration, the system produced reports on the overall number of PWDs in each barangay, the special needs identified during the assessment, and the percentage of PWDs by age and gender in each barangay. The algorithm's decision relied on the procedure of using the formula and calculating the PWDs' requirements assessment.

The algorithm checked if the resident was a PWD and then, the type and level. After classifying the data and getting the actual count and percentage, the algorithm decided the special needs applicable to the categorized capability of the PWD. After the integration of the algorithm, the system generated an output of the total resident disability report, special needs assessment per disability report, percentage of PWD per age, gender report, and even the percentage of PWD per employment and educational status. The Decision in the algorithm works on the process of implementing the formula and determining the needs applicable to the level of disability of the resident.

Features of the data visualization on the Special Needs Assessment System for Persons With Disabilities for the City of Legazpi, Albay Using Decision Tree Algorithm Manage User Access.

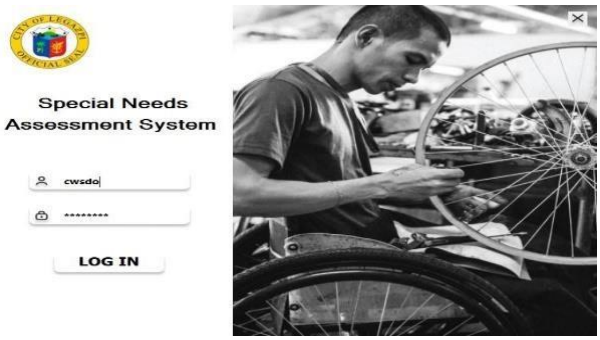

Figure 10. User Login

The User login is the authentication mechanism used to verify the identity of users before granting them access to a system. User access management is indeed crucial for ensuring the security and integrity of a system. Figure 10 shows the system user log in. The system defined different user roles based on their responsibilities and access needs. It assigned appropriate privileges to each role, granting access only to the functionalities and data necessary for their job. It utilized

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access control lists to define what resources each user or role can access and the level of access (read, write, delete, etc.) they have.

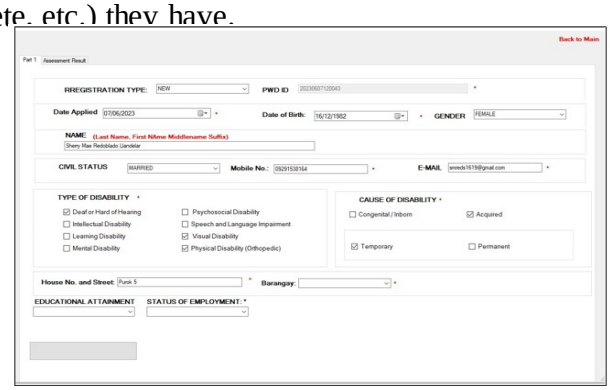

Figure 11. Add PWD Info

The developed system included the managing of the information of the PWDs. The Barangay Rehabilitation Committee Focal Person has access to add and update the PWDs' information. This can be particularly useful for various purposes, such as tracking the number of PWDs in the barangay, identifying their specific needs, and providing appropriate support and services. Having a centralized system for managing PWDs' information also allows for better coordination and collaboration among different stakeholders involved in supporting PWDs. Figure 11 illustrates the form used for adding new Persons with Disabilities (PWD) information to the system. This information is then used for reporting disability and needs to the Barangay Rehabilitation Committee, assisting in the formulation of appropriate programs and support for PWDs in the community.

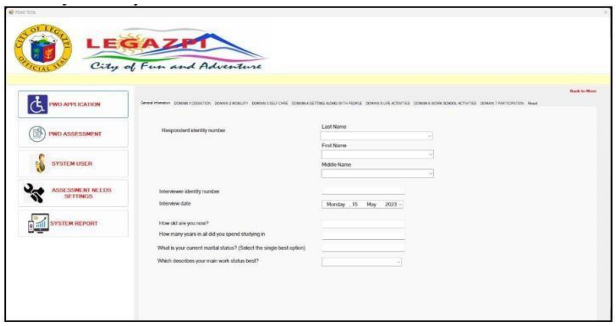

Figure 12. PWDs for Assessment

Figure 12 represents the retrieval of PWD information for assessment, suggesting that the system allowed for accessing the necessary data to conduct the categorization process accurately. The system mentioned can automatically classify the degree of capacity and categorize them according to their specific disability types of PWDs. The Barangay Rehabilitation Committee utilizes the capability assessment feature provided by the system. This auto-generated function enables the committee to generate capability assessment reports that categorize PWDs based on their level of disabilities per domain.

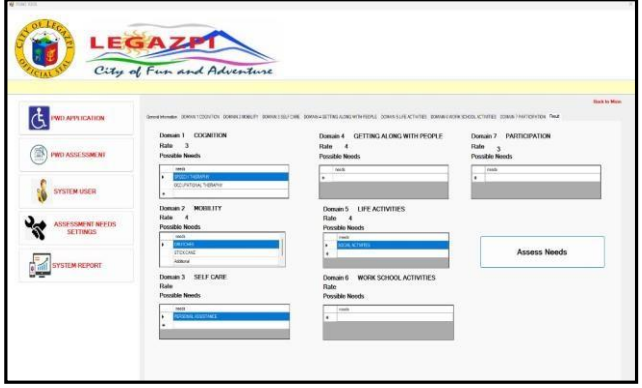

Figure 13. Needs Assessment Result

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The special needs assessment feature will be an auto-generated function of the system. As shown in Figure 13, based on the answer provided in each domain, the system will generate an assessment of the needs of the PWDs. It will display the needs applicable to the assessed category and level of disability of the PWD. Each domain level has a corresponding special need that would help the resident to be productive despite the impairment. The responsibility for generating the assessment report lies with the City Social Welfare and Development Office (CSWDO). To generate the report, the CSWDO needs to ensure that all reporting details and reports submitted by the Barangay Rehabilitation Committee Focal Person are in compliance. The assessment report serves as a reference for the Provincial Disability Affairs Office (PDAO) and the government sector in inclusive program planning and implementation.

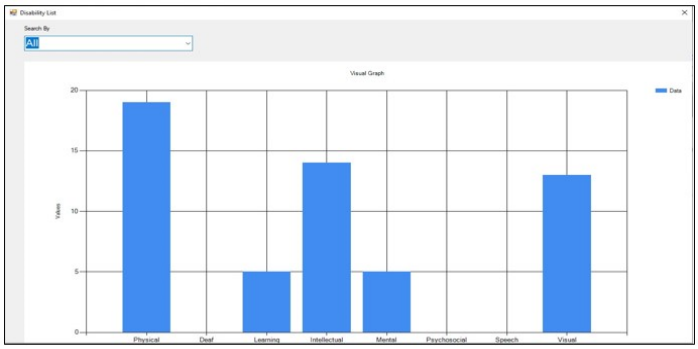

Figure 14. Report on Over-All PWD Statistics

Figure 14 represents the report that provides a graphical representation of statistics related to Persons with Disabilities (PWDs). The report presented the total number of PWDs within a specific area or jurisdiction. The visualization graphs allow the specific agency to determine the needs that can be allocated in preparation for planning purposes. The visualization graph displays a summary of the PWDs' needs in each barangay.

The Level of Acceptability and Comparison of Perception of the Developed System

ISO/IEC 25010 or the Software Product Quality Model was the tool used to test the acceptability level of the developed system in terms of usability, functional suitability, performance efficiency and reliability as perceived by the respondents such as the focal persons of the Barangay Rehabilitation Committee, Disability Affairs Officer of PDAO and representatives from some government agency with inclusion program for the PWDs.

Evaluations were done during the testing of the system. The collected information was then combined, tabulated using the appropriate statistical techniques, and examined. The statistical methodology employed was Weighted Mean to identify the prominent variables in the data, such as the present methods employed, issues encountered, and possible solutions. To ensure the effectiveness of the assessment system, it was crucial to assess and compare

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the evaluation ratings across different disability groups. This is where the ANOVA (Analysis of Variance) came into play.

Functionality. Based on the functional suitability evaluation of Key Area 1-3, the system has received an average weighted mean within the range of moderately acceptable, this meant that the system adequately covered all the specified tasks and user objectives, but there might be some areas for improvement or additional features that could enhance its functionality further. This indicated that the system generally provided correct results with the required degree of precision. It also suggested that the system adequately facilitated the accomplishment of specified tasks and objectives. While it met the basic requirements and supported users in achieving their goals, there might be some areas where the system could be improved to enhance the overall user experience and efficiency. In summary, based on the rating, the developed system addressed the minimum functionalities required.

Table 3. Summary of Functional Suitability Rates of the Developed System

Functional Suitability		
Key Areas	AWM	Verbal Interpretation
1	3.8	Moderately Acceptable
2	4.1	Moderately Acceptable
3	3.7	Moderately Acceptable
Overall Mean	3.9	Moderately Acceptable

Based on the provided information in Table 7, an analysis of variance (ANOVA) for functional suitability evaluation, and the results indicate that the F-ratio value is 0.21271, and the associated p-value is 0.887037. The result was not considered significant at the conventional significance level of $p < 0.05$. Interpreting these results, it means that there is no significant evidence to suggest that there are differences in functional suitability among the groups or conditions being compared. Therefore, based on the ANOVA analysis, the perception of the functional suitability of the developed system was similar across all the groups of respondents.

Table 4. ANOVA Result for Functional Suitability

	Result Details			
Title	No. of Respondents	Mean	Standard Deviation	F-Test
Functional Suitability	60	3.85	0.515	0.21271

Reliability. Based on the reliability evaluation of Key Area 1-4, the system has received an average weighted mean within the range of moderately acceptable. This indicated that the system meets the required level of reliability under normal operation. However, it was worth noting that there may still be potential areas for improvement in terms of reliability, such as handling exceptional situations or rare error cases. It implied that the system was generally operational and accessible when required for use but there might be occasional instances where the system experiences downtime or accessibility issues, which could be improved upon for a higher level of reliability. This implied that there might still be potential areas for improvement to further enhance the system's fault tolerance and ensure even greater reliability. The system demonstrated a level of resilience and provided mechanisms for data recovery and system restoration. However, there may be

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areas where the system's recovery processes or mechanisms could be further improved to ensure more efficient and seamless restoration. In summary, based on the rating, the developed system addressed the minimum functionalities required

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Table 5. Summary of Reliability Rates of the Developed System

Reliability		
Key Areas	AWM	Verbal Interpretation
1	4.0	Moderately Acceptable
2	3.9	Moderately Acceptable
3	3.9	Moderately Acceptable
4	3.8	Moderately Acceptable
Overall Mean	3.9	Moderately Acceptable

Based on the provided information in Table 6, an analysis of variance (ANOVA) for Reliability Evaluation in this case, since the p-value (0.731013) is greater than the conventional significance level of 0.05 ($p < 0.05$), we fail to reject the null hypothesis. The null hypothesis in ANOVA typically assumes that there are no significant differences between the groups. Therefore, the result suggested that there was no significant difference in system reliability among the evaluated conditions or groups.

Table 6. ANOVA Result for Reliability

	Result Details			
Title	No. of Respondents	Mean	Standard Deviation	F-Test
Reliability	80	3.9	0.3765	0.43182

Usability. Based on the usability evaluation of Key Area 1 to 6 except 2 and 5, the system has received an average weighted mean within the range of moderately acceptable. This indicated that the system users could generally recognize whether the system was appropriate for their needs. However, there might be areas where the system's communication or presentation could be further improved to enhance users' understanding of its appropriateness for their needs. It suggested that the system could be effectively used by specified users to achieve specified goals of learning to use the product or system. However, there might still be potential areas for improvement to further enhance the system's effectiveness, efficiency, freedom from risk, and user satisfaction in the specified context of use. This indicated that the system had attributes that made it relatively easy to operate or control. However, there might still be some areas where the system's operability or control could be further improved to enhance user convenience and minimize any potential difficulties. It included features, safeguards, or design elements that helped prevent or mitigate user errors. However, there might still be room for improvement in terms of error prevention mechanisms or error recovery strategies to enhance user protection further. The system provided an interface that was visually appealing, intuitive, and enjoyable to use, which contributed to a positive user experience. However, there may still be potential areas for improvement to further enhance the system's interface and interaction design, ensuring a more satisfying and delightful user experience. The system demonstrated inclusivity by accommodating users with different abilities, preferences, and needs.

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However, there might still be areas where the system's accessibility or adaptability could be further improved to ensure a more seamless and effective user experience for a diverse user base. Overall, the respondents rated the usability was very satisfactorily developed and it adequately met the requirements.

Table 7. Summary of Usability Rates of the Developed System

Usability		
Key Areas	AWM	Verbal Interpretation
1	4.0	Moderately Acceptable
2	4.0	Moderately Acceptable
3	4.2	Highly Acceptable
4	3.9	Moderately Acceptable
5	4.3	Highly Acceptable
6	3.9	Moderately Acceptable
Overall Mean	4.1	Moderately Acceptable

As shown in Table 8, the F-ratio, measuring the variance between groups relative to within groups, was relatively low at 0.49153. This indicated that the variability between the groups was relatively small compared to the variability within each group. The accompanying p-value of 0.689079 represented the likelihood of observing the obtained data or more extreme outcomes if the null hypothesis, suggesting no differences between groups, was true. With the p-value exceeding the significance level of 0.05, which is commonly used for establishing statistical significance, there was a 68.91% chance of obtaining the observed results or more extreme results under the assumption of no true differences between the groups. In summary, the ANOVA results indicated that the usability evaluation did not find a statistically significant difference among the groups.

Table 8. ANOVA Result for Usability

	Result Details			
Title	No. of Respondents	Mean	Standard Deviation	F-Test
Usability	120	4.05	0.5161	0.49153

Performance Efficiency. Based on the performance efficiency evaluation of Key Area 1-3, the system has received an average weighted mean within the range of moderately acceptable. This indicates that the system was generally responsive and processed data within a reasonable amount of time when performing its functions. However, there may still be potential areas for improvement to further optimize the system's performance and reduce any delays in data processing. It suggested that the system utilized very minimal amounts and types of resources when performing its functions. However, there might still be potential areas for improvement to further optimize resource utilization and minimize any unnecessary resource usage. It implied that the system's maximum limits of product or system parameters generally met the requirements. However, there may still be areas where the system's maximum limits could be further improved to better align with the requirements or accommodate potential scalability needs. Based on the rating, the developed system addressed the minimum functionalities required.

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Table 9. Summary of Performance Efficiency Rates of the Developed System

Performance Efficiency		
Key Areas	AWM	Verbal Interpretation
1	4.0	Moderately Acceptable
2	4.0	Moderately Acceptable
3	3.9	Moderately Acceptable
Overall Mean	4.0	Moderately Acceptable

Interpreting these results shown in Table 10 suggests that there was no strong evidence to reject the null hypothesis. In the context of Performance Efficiency Evaluation, it means that there was no significant difference among the groups or conditions being compared. The observed variation could be due to random chance rather than a genuine effect. There might still be some differences among the groups, but the sample data was not large enough to detect them with sufficient statistical power. In summary, based on the given ANOVA results, the Performance Efficiency Evaluation did not yield a statistically significant difference among the groups or conditions being compared, as indicated by the non-significant p-value of .201822

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Table 10. ANOVA Result for Performance Efficiency

	Result Details			
Title	No. of Respondents	Mean	Standard Deviation	F-Test
Performance Efficiency	60	3.967	0.5513	1.60811

Table 11 shows the Overall Evaluation Rating of the developed system based on different quality characteristics. The quality characteristics are functional suitability, reliability, usability, and performance efficiency. The table shows the mean rating for each section and the average weighted mean for all sections. The system had an average weighted mean of 3.975 with the interpretation as moderately acceptable

.

Table 11. Overall Evaluation Rating of the Developed System

Quality Characteristics	Section Mean
Functional Suitability	3.9
Reliability	3.9
Usability	4.1
Performance Efficiency	4.0
Average Weighted Mean	3.975

Conclusion

Several significant results have been made following a thorough investigation into the planning and creation of a system to evaluate the unique requirements of people with disabilities (PWDs) in the City of Legazpi These results demonstrate the efficacy and efficiency of the suggested strategy and illustrate the favorable effects

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it can have on numerous government agencies and PWD inclusion programs.

1. First, the study verified that, as key informant respondents shared, the data and processes used for the system's design and development were carried out correctly. For the Barangay Rehabilitation Committee, CSWDO, PDAO, and other pertinent government entities, this simplified the process of compiling reports and needs evaluations. The suggested method makes it possible to help PWDs in the city more effectively by increasing the efficiency of this process.
2. The decision-making process of the system was greatly aided by the Decision Tree approach used in the study. It was applied in analyzing the type and severity of PWDs' disabilities as well as their unique requirements. This useful tool offers insightful data that can be used to direct the distribution of resources and support services, ensuring that PWDs get the help they need.
3. The study also emphasized the usefulness and effectiveness of the PWD Special Needs Assessment Data Visualization elements. These new features considerably decreased the reliance on manual processes that the CSWDO and PDAO had previously used to track PWDs and produce reports on persons with impairments. This innovation makes it possible to identify PWDs' requirements more precisely, which eventually results in better service delivery.
4. The researcher used ISO/IEC 25010, also known as the Software Product Quality Model, to assess the produced system's acceptance level. The three crucial components of this paradigm are functional appropriateness, reliability, and usability. While dependability evaluates the system's performance over time, functional appropriateness evaluates the system's capacity to satisfy specific needs. The system's effectiveness, efficiency, and simplicity for intended users are measured by its usability.
5. The study's analysis, which employed the ANOVA approach, showed that there were no appreciable differences among the various respondents' assessments of functional appropriateness, reliability, and usability. This means that different stakeholders consistently viewed the produced system as appropriate, dependable, and user-friendly. This result shows that the system's quality satisfied stakeholder expectations, ensuring its efficacy and wide adoption.

The study's findings highlight the effectiveness of the suggested system for determining the unique needs of PWDs in the city of Legazpi. The Decision Tree approach and Data Visualization elements have greatly increased the efficiency and accuracy of recognizing and addressing PWDs' requirements thanks to the streamlined processes. Its effectiveness, dependability, and user-friendliness are further supported by the system's high quality, as determined by the ISO/IEC 25010 model. These results pave the path for the system's application throughout pertinent government programs and offices, ultimately boosting Legazpi City's general support and inclusiveness for people with disabilities.

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