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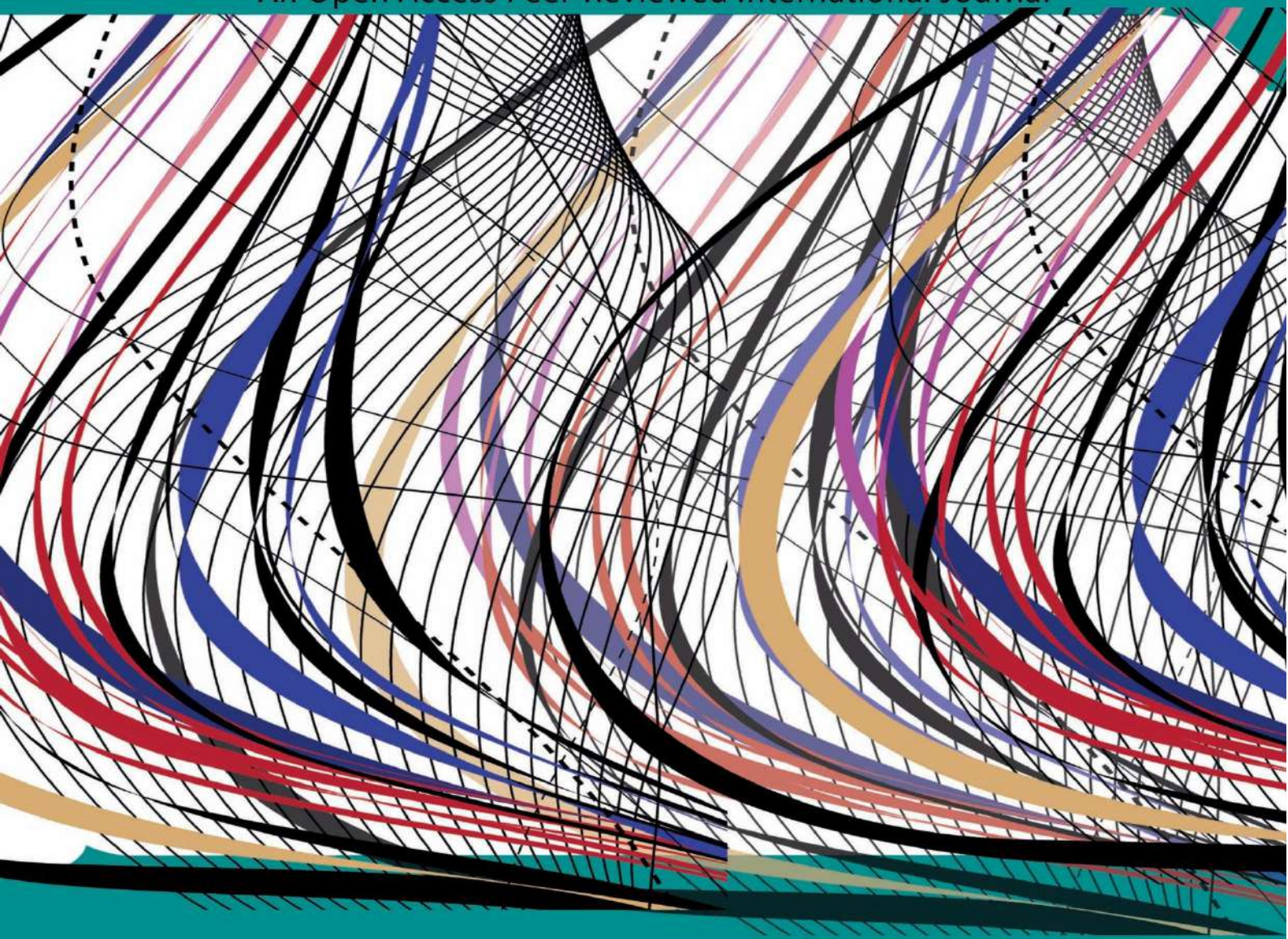

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FOREWORD

I am pleased to put into the hands of readers Volume-7; Issue-8: August 2021 of "**International Journal of Advanced Engineering, Management and Science (IJAEMS) (ISSN: 2454-1311)",** an international journal which publishes peer reviewed quality research papers on a wide variety of topics related to Science, Technology, Management and Humanities. Looking to the keen interest shown by the authors and readers, the editorial board has decided to release print issue also, but this decision the journal issue will be available in various library also in print and online version. This will motivate authors for quick publication of their research papers. Even with these changes our objective remains the same, that is, to encourage young researchers and academicians to think innovatively and share their research findings with others for the betterment of mankind. This journal has DOI (Digital Object Identifier) also, this will improve citation of research papers.

I thank all the authors of the research papers for contributing their scholarly articles. Despite many challenges, the entire editorial board has worked tirelessly and helped me to bring out this issue of the journal well in time. They all deserve my heartfelt thanks.

Finally, I hope the readers will make good use of this valuable research material and continue to contribute their research finding for publication in this journal. Constructive comments and suggestions from our readers are welcome for further improvement of the quality and usefulness of the journal.

With warm regards.

Dr. Dinh Tran Ngoc Huy
Editor-in-Chief
September, 2021

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Comparative Study on Graph-based Information Retrieval: the Case of XML Document

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Abstract— *The processing of massive amounts of data has become indispensable especially with the potential proliferation of big data. The volume of information available nowadays makes it difficult for the user to find relevant information in a vast collection of documents. As a result, the exploitation of vast document collections necessitates the implementation of automated technologies that enable appropriate and effective retrieval.*

In this paper, we will examine the state of the art of IR in XML documents. We will also discuss some works that have used graphs to represent documents in the context of IR. In the same vein, the relationships between the components of a graph are the center of our attention.

Keywords— ***Information Retrieval, graph relations, graph-based approach, XML document, XML document retrieval.***

I. INTRODUCTION

In the context of BigData, The continual spread of digital multimedia documents necessitates the updating of the many existing technologies used to exploit the available digital mass. Consequently, locating information is a process of matching the query expressing the user's need with the documents in the documentary database.

In a digital world, where the number of documents grows exponentially, studies have shown that more than 80% of the organizations and businesses' data is in the form of documents, compared to less than 20% in traditional databases. Our research operates within the framework of the Information Retrieval (IR) in semi-structured documents (SSD). Indeed, the SSD has organizational properties that facilitate their analysis.

In the literature, the XML document (eXtensible Markup Language) is a documentary standard, which is generally qualified as a semi-structured document. Indeed, the XML document is quickly becoming the ultimate format for exchanging documents - and, more typically, information. It is currently utilized by ERP providers, middleware editors, database providers, and in e-commerce and libraries. To retrieve information from a document corpus, a representation model that is appropriate for the type of document is required. The more sophisticated the modeling of the documents will be, the more relevant but difficult the comparison of the documents will be[1] . The standard structuring languages such as XML and their derivatives allow serializing a tree structure of a document in the same file. As a result, the DSS must be represented by a graph that measures the many relationships between the components of the XML document and prioritizes the semantic and contextual information conveyed.

The rest of the paper is organized as follows: In section 2, we will describe the principle of Document Information Retrieval, by establishing a state of art on the works that addressed the issue of Information Retrieval in XML documents. In section 3, we will highlight the types of relationships that exist between the components of the graph. In section 4, we will analyze the relevance of the structural aspect, specifically the relations of a graph, as well as the advantages and limitations of the many types of relations that exist between the components of the graph, to determine which would best serve our context.

II. INFORMATION RETRIEVAL IN XML DOCUMENTS

2.1 Introduction

Information Retrieval is a field of computer science that deals with the acquisition, organization, storage, search and selection of information [2], That system can locate precisely documents related to a query expressing a user's need.

Globally, the classic steps of an IRS are the indexing phase, the representation phase, and the comparison phase. During the indexing phase, the system unifies the coding of the documents in the document collection and organizes the collection. At the level of the document representation phase, documents are represented by a model that synthesizes them as much as possible. In the comparison phase, the system compares the query to all of the documents in the collection. It does so by providing a matching mechanism between the user query and the documents, or more particularly between the query representative and the document representatives, the system compares the query to all of the documents in the collection.

IR is a promising field that has been growing steadily since the 1990s. Since then, new approaches have been created, particularly in terms of the information available on the web. These SRIs are normally based on textual or multimedia content or the use of external resources (semantics). They allow the query to be matched to documents without taking the structural aspect into account. This, of course, excludes the option of including the relationships between the entities in a document. The structural aspect is primarily based on a tree-like document representation. It allows the documents to be structured in such a way so that the various relations of a document representation are highlighted.

In the following subsection, we survey a literature review about different publications, which address IR in XML documents.

2.2 Information Retrieval in XML documents

The goal of an IRS is no longer to deliver an exact response to the user's request, but rather to provide the user with a set of results arranged by relevance. Querying a collection of XML documents means comparing the query with all the XML documents in the document database. Indeed, the XML document is a semi-structured document by essence. Therefore, one of the major problems of IR is to be able to compare two documents by taking into account the content, the structure, and the semantic aspect. In our previous paper, we discussed two categories of document representation: dependent and data-independent structures.

In what follows, we present the body of work that has addressed the problem of IR in XML documents. The work [3] provides an information retrieval paradigm based on a similarity metric to rigorously compare XML documents. It sets a comparison framework of XML document structure based on the commonality of subtrees and the semantics of labels. [4] Performs IR in XML documents using the notion of tree tuples to semantically identify consistent substructures. The work [5] addresses the IR problem at the structural level by path matching between the XML document and the query representing the user need. In terms of content similarity, a matrix is generated utilizing artificial language processing techniques to compute the similarity between the keywords. For the calculation of semantic similarity, the approach relies on fuzzy matching.

In [6], the proposed approach is based on edit distance, which takes into account the content's structural and textual similarities. The suggested structural similarity algorithm merges the set of DTDs (Document Type Definition). This latter comprises the document collection into an undirected graph by employing the edit distance method and the shortest path method [7]. The structural similarity is computed preterially between the subtree of relevant nodes S and the query tree. The extraction of the S subtree starts with a selection phase of the relevant leaves. Paths are extracted based on the existing nodes in the query, from the root to the leaf. These relevant node paths are merged into a subtree. These steps reduce the size of the subtrees and increase the efficiency of the proposed model because the time of the edit distance path strongly depends on the cardinality of the input trees. In [8], the approach used for IR is based on two scores. The first one (content score) is propagated at the tree level in order to obtain the sub-trees containing the relevant leaves; the score is computed by a weighting algorithm of the form tf-idf. The second (structure score) computes the score of the subtrees previously extracted by the tree editing distance algorithm.

In the next part, we offer a state-of-the-art review of publications that have employed graphs for IR objectives.

III. GRAPH-BASED INFORMATION RETRIEVAL

3.1 Preamble

The classical graph theory problem can be described as follows: Given a graph database $D = \{G_1, \ldots, G_n\}$ and a graph representing the query q . Finding all the graphs in

which q is a subgraph, is equivalent to finding the suitable match between the query q and the D [1].

Graphs have been widely instrumental in the case of complex document representation and used in a variety of fields owing to the graph's vital function in increasing the meaning of the document represented.

Our previous research [9] has concentrated on aspects that contribute semantics to graph-based IR methods in the context of images.

Using graph theory to solve IR issues entails taking structural, contextual, and semantic factors into consideration. The combination of these aspects increases the accuracy and best meets the need described in the query. Furthermore, the graph's flexibility allows for the modeling of multiple relationships between the same nodes.

The study [10] presents a method applied at the indexing phase, in order to extract sub-graphs for IR purposes. The adapted approach consists of matching the size of the query to the size of the sub-graphs utilized to create the index. [11] uses a graph-based approach for enhanced bibliographic retrieval to a co-citation network incorporating citation context information; the method is based on a graph similarity calculation algorithm and the Random Walk with Restart (RWR) algorithm. The authors of [12] describe and structure the events of a document in order to build the text summary. The method consists in building the event graph by combining machine learning and rule-based methods. This extractive multi-document summarization approach chooses sentences based on the significance and temporal structure of events.

Graphs are made up of vertices and edges. Edges are responsible for combining and linking the vertices. The relations in the graph express the relation of membership or typing [1]. In [13], the proposed model is based on the graph which is an algebraic model closely related to the vector space model. Each vector coordinate is a value that expresses the significance of the term in the document or query. A bipartite graph is used in [14] to represent the documents with the indexed terms in the document collection. The link reflects the relationship between the document and its own indexed terms. Work [15] proposes a technique for bibliographic retrieval by an interface of interrogation for documentary bases by natural language, the structuring of the request and the documents is based on graphs.

[15] Presents a technique for bibliographic retrieval which uses an interface of interrogation for documentary bases and relies on natural language. On that regard, the structuring of the request and the documents is based on graphs.

In the next section, we discuss within the context of IR the relationships between the components of a graph.

3.2 Relationships between the components of the graph

A graph G is a set of nodes connected by links called edges. Indeed, an edge can carry information about the direction of navigation from one node to another, typing information or a content serving the user need. Moreover, the information carried by the link differs according to the context and the objective of the study. In the context of social networks, edges can express connections, friendship links between individuals. Edges on the Internet might indicate wire or wireless connections between computers or routers. As for the web, edges can reflect the hyperlinks between web pages. In rail networks, edges can be used to express connections between stations. As for road networks, edges can represent the road segments between its intersections. At documents, edges convey the relationship between the document and its own indexed terms or sometimes they express the link between nodes that correspond to the distance between documents, etc.

Following that, we divide a graph's relations into three categories: grammatical relations, string relations, and numerical relations.

- Grammatical relations

The vertices of a graph representing a document depend on the words or morphemes of a text. Syntactic functions produced by a dependent grammar are often used to designate such edges. In the literature, grammatical relations are used to structure a textual document in order to build a hierarchical structure that can be browsed and analyzed. In [16], the text is structured using a dependency parsing process. Grammatical relations, according to the same paper, are intended for sentence identification and syntactic structure creation. They play an essential role in the semantic analysis phase [17]. Independent grammar is a process that determines the type of dependent relationship that exists between the terms in the document. The work [15] proposes a method of bibliographic retrieval which uses a query interface for documentary databases and relies on natural language. In the same vein, a parser is used to structure the query and the documents, allowing it to display the many grammatical relations that link the text fragments. It is worth mentioning that this type of relationship can only be applied to IR in the text.

- String relations

The String relations include typing or membership information and describes the link's characteristics.

Moreover, this type of relation enriches the semantics of the document. Because of its great expressiveness, this type of relationship is often utilized in image and video IR. In the same context, this type of connection can express spatial and temporal relations. Allen relations [18] allow to structure the content of audiovisual sequences according to temporal information. Indeed, [18] identifies a complete set of temporal relations which can exist between two intervals. In [12], document is represented as an event graph where a graph representation involves not only the recording of events, but also the representation of temporal connections.

The work [19] illustrates the spatial interactions that govern the relationships between the image's parts. The scenes are represented by relational graphs that include information on area types and spatial layouts. The study [1] focuses on a case-based reasoning application in the field of CAD (Computer Aided Design), where cases are design items represented by directed label graphs. The work [20], [21] and [22] use spatial and temporal relations in the field of image IR.

- Numerical relations

Numerical relations are used in all fields of IR. Their basic idea is to provide a numerical value to each edge in the graph, called edge weight. The weight of an edge is computed either by a weighting function, or fixed according to the needs of the approach. The weighting function is a mathematical expression that is used to calculate sums, integrals, or averages in which certain components are more important or influential on the same set than others. In [23], the weighting function is used in the context of multi-structured documents for document classification purposes. The proposed weighting function expresses the constraints related to hierarchical or contextual. In other words, it expresses the distribution of these components in the graph and the nature of the relations between these components. In [8], the weight of an edge, abbreviated as structure score, is obtained by combining all the scores of the editing distance of the subtrees. In [5], the weight of an edge positioning in a *i* hierarchy is defined as $\frac{1}{2^i}$. This work is applied to an XML document hierarchy modeling for IR purposes. In [24], the nodes of the tree correspond to the XML documents and the relationship between the nodes correspond to the distance between the documents. Therefore, the relationship between the nodes of the structure ensures the preservation of the order. In the same regard, the tf-idf paradigm is also used to weight the relationships of the graph.

The method followed in [25] is based on a summary of the tree, in which a collection of vectors is retrieved by sequentially reducing the structure and aggregating the leaves containing the text. The weighting function is used in the same way as tf-idf-edf [26] to assign a weight to each node and edge that reflects its relevance in the collection to which it belongs. [10] presents a model for presenting terms as nodes and the number of occurrences of terms as the relationship between nodes.

IV. DISCUSSION

In this paper, we have reviewed some work that have engaged with IR in XML documents. We also discussed several studies in which graphs have been utilized to represent texts in the setting of IR. As we proceeded, we conducted research on the many sorts of connections that occur between entities. Indeed, the graph is made up of nodes and the connections between them. The relations constitute the backbone of the graph since they make explicit the nature of the link and add contextual, structural and semantic information.

Table 1 summarizes the advantages and limitations of each type of relationship.

Table 1: Advantages and limitations of each type of relationship

RELATIONS TYPE	ADVANTAGES	LIMITS
String Relations	• Well expression of characteristics • Expression of temporal and spatial relations • Expression of semantic relations • Applicable in all areas of IR	• Order not taken into account • High complexity
Grammatical relationships	• The parser is well defined • Appropriate complexity • Multiple link types generation • Semantic expression support	• Order not taken into account • Poor information is carried by the relationship • Not applicable in image and video

		retrieval
Numeric relationships	• Numeric relationships • Appropriate complexity • Applicable in all areas of information retrieval	• A weighting function must be established • Necessary interpretation of results

There are three types of graph relations: string relations, grammatical relations, and numerical relations. String relations allow users to describe the properties of the connection to express a type or membership link, as well as depict the temporal and geographical relationships between graph nodes. In contrast to grammatical relations, which are exclusively used in textual corpus to approve the nature of the grammatical relationship between the words of a textual document, they are relevant in all IR settings. Grammatical and String relations do not convey the order of the nodes in the document structure, but numerical relations do. The connection weight can represent the degree of distribution of the graph's components or the significance of a node in respect to a node in the query. In all IR situations, the weighting function may be utilized to add contextualized information and quantify the information supplied by the connection.

Finally, each type of relation has its specificity, depending on the objective and the context of where it is applied.

V. CONCLUSION

This study is a continuation of our previous work on information retrieval in semi-structured documents. We referred to a number of studies that employed graphs to represent documents in the context of XML information retrieval. In this context, we have concentrated on the relationships between graph components. Indeed, in the field of graph comparison, and notably in document IR, these connections transmit a substantial amount of information.

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Strategies of Local Government Units (LGUs) to improve Business Tax Collections during the Covid-19 Pandemic

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Abstract**—** *This study gave details on the strategies used by Local Government Units (LGUs) to boost business tax collection during the COVID-19 pandemic. The study's findings also revealed the impact of the Pandemic on tax collection. The survey questionnaire was employed to gather data, and the descriptive method of study was applied. During the data collection period, the respondents were limited to the available personnel of the Cabanatuan City Treasurer's Office. The key statistical techniques employed in evaluating and interpreting the research data were descriptive statistics such as weighted mean and percentages. The results demonstrated that during the pandemic, tax collection was hampered by temporary or permanent business closures, and curtailed operations resulted in lower revenue for enterprises. The LGUs can deploy a digital facility for business tax assessment and payment, which promotes taxpayer compliance and aids the government in meeting its target collections during the pandemic while following minimal health protocols. Furthermore, retaining all essential information on taxpayers,using digital platforms, assists the LGUs in disseminating information about tax dues and extensions of payment deadlines.*

Keywords**— Business Tax, Collections, Digital Facility, Local Government Units,Tax Revenue.**

I. INTRODUCTION

In some ways, raising tax income is the government's most important function. Fundamentally, tax money is what allows the state to exist, paying everything from social programs to infrastructure investment [1]. As a result, revenue should be able to provide essential services such as security, education, and health care, as well as allow the government to participate in the financing of public investments. The government cannot support itself and the requirements of the public without tax money. As a result, it is frequently stated that taxes are the government's lifeblood. “This is true not only for the national government but also for the smallest government unit” (Dawilan, 2020) [2]. In line with the core concept of local autonomy, Section 129 of Republic Act 7160, also known as the "Local Government Code of 1991,“gives each Local Government Unit (LGU) the right to generate its own sources of revenue and collect taxes, fees, and charges according to the rules therein. The Local Government Code (LGC) lists the sources of revenue, and one of the local sources imposed by municipalities and cities is company tax. The LGC also specifies various tax rates and schedules that will be applied to each business based on its characteristics”.

In LGUs, business taxes are the most important source of local revenue. Business taxes are often based on a company's total sales or receipts for the previous year. These taxes, as well as other fees and levies, begin to

accrue on January 1st of each year and must normally be paid before the business license is given (Dawilan,2020). “According to the Bureau of Local Government Finance's (BLGF) Statement of Receipts and Expenditures (SRE) reports, the business tax has contributed the most to local revenues from 2009 to the third quarter of 2020” [4]. However, the revenue collected locally is insufficient to cover the local government's expenses. According to a 2016 analysis of LGU financial performance, LGUs are still 67 percent reliant on Internal Revenue Allotment (IRA), with local collection accounting for only 29 percent of total regular income (BLGF) [5]. The continued increase in local tax collection, on the other hand, demonstrates the success of local governments in collecting local revenues. The collection of company taxes has become an immense issue for each LGU as a result of the COVID-19 pandemic. In March 2020, the entire Luzon was placed under enhanced community quarantine to avert a rapid increase in COVID-19 cases. Only private businesses that provided basic requirements were permitted to operate. Executive Secretary's Memorandum, 2020). This leads to the temporary closure of many businesses, resulting in significant losses for business owners [6].Many firms survived the quarantine period by innovating and refining marketing techniques, but some were forced to close permanently due to health concerns and quarantine regulations. This season, on the other hand, represents an opportunity for online business. “The epidemic has hastened the transition to a more digital society and spurred changes in online shopping habits that are likely to have long-term consequences (UN Conference on Trade and Development, 2020)” [7]. In the fiscal year 2020, the BLGF takes into account the effects of a pandemic and authorizes LGUs to reduce the business tax collection target from Php126.19 billion to Php88.42 billion. LGUs exceeded their target in the third quarter of 2020, achieving a collection efficiency of 123 percent, or Php108.37 billion [8].

This was due to a variety of factors, including the relaxation of community quarantine restrictions, the restart of company activities, the extending of payment deadlines, and the introduction of online and alternative payment methods (BLGF). The outcomes of business establishment operations in 2020 will be used to assess business tax in 2021. Because of the pandemic and the slowdown in business activities in 2020, the BLGF has set the initial revenue target for business taxes for FY 2021 at Php97.75 billion. “The local government is expected to take the appropriate steps not just to help its citizens and business owners, but also to lessen the impact of the epidemic on local tax collection” [9]. “Determine the impact of COVID-19 on LGU Tax Collections, Assess the tax collection strategies implemented by LGUs during COVID-19 in terms of extensions of deadlines for payment of business tax, adoption of a digital facility for assessment and payment of business tax, and dissemination of information related to tax dues and extensions of deadlines and pro-rata payments” [9].

II. METHODOLOGY

The descriptive research design was utilized in this research. According to Calderon (2012), "descriptive method involves the outline, recording, analysis, and interpretation of the current nature, composition, or processes of phenomena that focuses on current conditions, or how an individual, group, or thing behaves or functions in the present." Relevant reports were obtained from the LGU's records or the BLGF's official website. The respondents were 25 employees of the Cabanatuan City Treasurer's Office who were purposefully chosen to perform direct and valid research ([10] as quoted by [11]). The instrument that was used to gather data was a questionnaire. The respondents were asked about the state of their business operations prior to the March 17, 2020, enhanced community quarantine in the first phase of the survey. The second section looked at the overall impact of the COVID-19 pandemic, including factors like company operations, financial flow, and raw material and workforce requirements. The impact of the COVID-19 pandemic on company operations was assessed using a Likert scale with responses ranging from (a) not affected, (b) slightly affected, (c) moderately affected, and (d) strongly affected. The survey and data collecting took place from June 7 to June 14, 2021. To summarize, characterize, and analyze the data acquired, descriptive statistical tools such as percentage and frequency distribution, tables, and graphs using Google Forms and Microsoft Excel were employed.

III. RESULTS AND DISCUSSION

Table 1 shows that all respondents believed that LGU's business tax collections were affected by the COVID-19 pandemic.

Table 1. Reasons why business tax collection was affected by the COVID-19 pandemic

	No. of Respondents	% of respondents
(a) temporary or permanent closure of businesses	20	100%
(b) the limited operation resulted to lower-income of businesses	15	80%
(c) noncompliance of businesses due to COVID-19 health protocol	5	20%
(d) lack of information about tax policies of businesses	0	0%
(e) limited operation of local government units	9	40%
(f) health consideration for taxpayers	15	80%
(g) others	0	0%

Table 1 shows that LGUs business tax collections were affected by temporary or permanent closure businesses. 80% of the respondents also indicated that it was affected by limited operations of businesses and the health considerations of taxpayers. Moreover, 40% of the respondents stated that it was affected by limited operations of LGUs while 20% believed that it was because of noncompliance to health protocol.

Table 2. Extension of Deadlines for Payment

Statement	Weighted Mean	Verbal Interpretation
The extension of deadlines for payment…		
1. helps the local government to achieve its collection target for the previous year.	3.8	Strongly Agree
2. gives the taxpayers a reasonable time to renew their business permits and pay the corresponding tax dues.	4	Strongly Agree
3. helps the local government in the proper implementation of minimum health protocols during a pandemic.	3.4	Strongly Agree
4. did not hinder the local government to achieve its target collections for business tax resulted from waiver of interest, surcharge, and penalties.	3.6	Strongly Agree
5. applies to all taxpayers, regardless of the amount.	3.6	Strongly Agree
General Weighted Mean	**3.68**	**Strongly Agree**

Table 2 shows that the majority of the respondents strongly agreed that the extension of deadlines for payment of business tax helps the LGUs to achieve their collection target for the previous year and properly implement minimum health protocols during a pandemic. Findings show that all respondents, with the highest weighted mean of 4.0, strongly agreed that it gives taxpayers a reasonable time to renew their business permits and pay the corresponding tax dues. Moreover, the majority of the respondents strongly agreed that it applies to all taxpayers regardless of the amount, and the waiver of interest, surcharges, and penalties did not hinder the LGUs to achieve their collection target. This means that the extension of deadlines for payment of business tax is an effective strategy to improve tax collections during the pandemic.

Table 3. Adoption of Digital Facility for Assessment and Payment of Business Tax

Statement	Weighted Mean	Verbal Interpretation
The local government…		
1. has the capacity to implement online transactions for assessment and	3.8	Strongly Agree

payment of business tax.		
2. adopted digital facility for business tax assessment and electronic payment (e-payment).	3.6	Strongly Agree
The adoption of online assessment and payment for business tax…		
3. increase taxpayers' compliance relevant to pay taxes.	3.8	Strongly Agree
4. helps the local government to achieve target collections during pandemic while properly implementing minimum health protocols.	3.6	Strongly Agree
5. provides fast and accurate information, reduces the processing time, and improves the collection period.	3.4	Strongly Agree
General Weighted Mean	**3.64**	**Strongly Agree**

Table 3 reveals that the majority of the respondents strongly agreed that LGU has the capacity to implement a digital facility for the assessment and payment of business tax. The study shows that the implementation increases taxpayers' compliance to pay taxes and helps the government to achieve target collections during pandemic while properly implementing minimum health protocols. The lowest weighted mean of 3.4 verbally interpreted as "strongly agree" is still an indication that the majority of the respondents strongly agreed that the adoption of the digital facility is an effective strategy in improving tax collections during a pandemic.

Table 4. Dissemination of Information Related to Tax Dues and Extensions of Deadlines

Statement	Weighted Mean	Verbal Interpretation
The local government…		
1. maintains all the relevant information of the taxpayers.	3.6	Strongly Agree
2. uses digital platforms to inform the taxpayers of their business tax dues, an extension of deadlines of payments, and other policies.	3.2	Agree
3. Actively reminding the taxpayers of their current tax dues and deadlines of payment help the local government to achieve its target collections.	3.4	Strongly Agree
4. Maintaining relevant information of taxpayers helps the local government to disseminate information about tax dues and extension of deadlines for payment during a pandemic.	3.6	Strongly Agree
5. The use of digital platforms helps the local government to comply with the minimum health protocols.	3.6	Strongly Agree
General Weighted Mean	**3.48**	**Strongly Agree**

Table 4 shows that the majority of the respondents strongly agreed that maintaining all relevant information of taxpayers helps the LGU to disseminate information about tax dues and extension of deadlines for payment while the use of digital flatforms helps them to comply with the minimum health protocols during a pandemic. In addition, the survey shows that actively reminding the taxpayers of their current tax dues and deadlines of payment helps the LGU to achieve its target collections. However, it "uses digital platforms to inform the taxpayers of their business tax dues, an extension of deadlines of payments and other policies", with the lowest weighted mean of 3.2 verbally interpreted as "agree", which means that LGU is still using face to face delivery of information.

IV. CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study, the researchers arrived at the following conclusions:

(a). The majority of the respondents believed that LGU's business tax collections were affected by the COVID-19 pandemic. (b). The LGUs business tax collections were greatly affected by temporary or permanent closure businesses. (c). The majority of the respondents strongly agreed that the extension of deadlines for payment of business tax helps the LGUs to achieve their collection target for the previous year and properly implement minimum health protocols during a pandemic.(d). The

majority of the respondents strongly agreed that LGU has the capacity to implement digital facilities for assessment and payment of business tax and also the implementation increases taxpayers' compliance to pay taxes and helps the government to achieve target collections during pandemic while properly implementing minimum health protocols.(e). The majority of the respondents strongly agreed that maintaining all relevant information of taxpayers helps the LGU to disseminate information about tax dues and extension of deadlines for payment while the use of digital platforms helps them to comply with the minimum health protocols during a pandemic. In line with the findings and conclusions, the following was recommended: LGUs should accelerate the shift of face-to-face to online transactions [12]. Provide a platform that taxpayers can see their profile, how much they should pay, deadline of payment, announcements and etc. This can help tax collection carry on amidst this crisis. Also, this also helps to ensure the safety of both taxpayers and collectors.

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Effects of Farm Mechanization on the Lives of Rice Farm Workers of Cabanatuan City, Nueva Ecija

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Abstract**—** *The effects of farm mechanization on the lives of rice farm laborers in Cabanatuan City, Nueva Ecija, were investigated in this descriptive study. Snowball sampling and a survey questionnaire with a consent form were used to collect data. Frequency count, percentages, and weighted mean were utilized to treat and analyze the data. The study's findings found that farm mechanization benefited farmer machine operators in earning more money through faster operations and that they are still regularly employed to work during cropping seasons. Despite this, the respondents see a considerable decrease in the number of rice field laborers.*

Keywords**— Agriculture, farm mechanization, income, labor productivity, rice farmworkers.**

I. INTRODUCTION

Agriculture has been one of the greatest discoveries that helped shape human civilization and survived up to this date. According to Llorente et al. (2018), agriculture has been performed by humans for approximately 10,000 years, and practices have been altered according to human needs and preferences. All goods for consumption are products or by-products of agriculture. It helps to sustain an economy through the provision of commodities, income sources, and trading. The agricultural industry is a major industry that drives an economy, especially those countries closely tied with agricultural activities. As reported by the Philippine Statistics Authority (2020), although the Agriculture, Forestry and Fishing sector was the lowest contributor among three major sectors of the economy, it recorded a share of 9.2 percent in the Gross Domestic Product (GDP) in 2019, an important indicator of the economic performance of a country. The Philippines is endowed with natural resources such as arable land and channels of rivers suitable for agricultural farming. Palay, being the major crop in the country, has the largest area harvested with 4.65 million hectares in 2019. Nueva Ecija topped ranked with 336 thousand hectares of rice area harvested. Farming is still widely practiced in the province, being the top producer of palay in 2019. Although industrialization has significantly diminished farm areas, remaining rice farmlands are thriving to support rice consumption of the country. There is now an increasing awareness among Filipino farmers with regards to the advantages of utilizing mechanization technologies in the agricultural production system. According to Bautista et al. (2017), Philippine farmers seem to recognize the many advantages of using farm machines over manual, even if these are expensive and will certainly displace laborers. Moreover, government policies on agriculture are now gearing towards food self-sufficiency and security through the adoption and utilization of technologies to improve crop and labor productivity. Amongo and Larona (2015) stated that the invention of machinery on rice farming, greatly aided the quality of production; from the use of carabao then to tractors,

manual planting to the use of mechanical rice transplanters, and manual harvesting transitioning to mechanical rice reapers and harvesters. Mechanized farming also reduced the cost of palay production, as a huge chunk of the cost came from the manual labor of farmworkers. The goal of mechanization is to reduce labor on rice farming. According to the Philippine Center for Postharvest Development and Mechanization (2019), the projected benefit of using farm machinery is reducing the production cost of palay by Php2.00 to Php3.00 per kilogram by using an accurate, effective, and complete set of machinery. The government is promoting the use of machinery in farming to help improve the quality and reduce the cost of production of palay. Republic Act 10601 also known as the Agricultural and Fisheries Mechanization Law of 2013 (AFMech Law) has strengthened the commitment of the government to boost the adoption and utilization of agricultural mechanization technologies to modernize the agricultural sector and to be at par with the ASEAN neighbors. It is hoped that the AFMech Law will aggressively push the implementation of sustainable agricultural mechanization to increase agricultural production to ensure food security, safety, and sufficiency. Other mechanization programs implemented by the Department of Agriculture, along with private enterprises venturing into service rental of machinery gave the boost on the promotion of the use of farm machinery. These vastly change the landscape of farming, from traditional to modern. Farm owners benefit from mechanized farming as it improves the efficiency of rice farming and helps to lower the production cost. However, there will be some sectors that will fall behind due to the adoption of mechanization. Schmitz and Moss (2015) stated that the introduction of new technologies results in losers and gainers. Rice farmworkers, those not owning farmland and providing hired labor, are also affected by these changes. New technologies will continue the trend toward displacing or replacing farm labor. Schulte and Howard (2019) further stated that technology will bring less work, make workers redundant, or end work by replacing workers. It is widely stated that manual workers are the most harmed by technological developments. The researchers aim to study the effects induced by mechanized farming on rice farmworkers. The degree of effect and how farmworkers act to mitigate these are of great value that some concerned institutions should look upon and consider. This study integrates on the other side of the development and deals with the losers from technological change.

II. METHODOLOGY

The study is Descriptive in nature which focuses on determining the effects of farm mechanization on rice farmworkers of Cabanatuan City, Nueva Ecija. The instruments utilized were survey questionnaires with a consent form and snowball sampling wherein the method is purely based on referrals and extensively used when a population is unknown. The Registry System for Basic Sectors in Agriculture (RSBSA) was established to collect information for farmers, farmworkers, and fisherfolk. On the evaluation of Reyes and Gloria (2017), the Registry is useful, but the general concerns are: it seems that the RSBSA failed to cover all farmers, farmworkers, and fisherfolk; the registry lacks technical specifications; and that some information on hectarage and another status might be inaccurate. Nevertheless, the researchers conducted the study with at least 10 rice farm workers per barangay namely, Brgy. Lagare, Brgy. Bangad, Brgy. Bakod Bayan, and Brgy, Kalikid Norte in Cabanatuan City, Nueva Ecija. These are among the barangays with the highest number of rice farm machinery recorded at Cabanatuan City Agriculture Office. A total of 50 respondents were gathered with data. Basic descriptive statistics such as frequency count, percentages, and weighted mean were used.

III. RESULTS AND DISCUSSION

1. Effects of Farm Mechanization on Rice Farm Workers of Cabanatuan City, Nueva Ecija

1.1 Labor Productivity of the Respondents

Table 1. As to Labor Productivity of the Respondents

	Statement	WM	VI
1.	I am frequently hired to work on rice farms	2.80	Agree
2.	I learned to operate rice farm machinery	2.64	Agree
3.	My knowledge of rice farming increased because of the adoption of rice farm machinery.	2.58	Agree
4.	There is an increasing number of rice farm workers due to modern farm	2.30	Disagree

	Statement	WM	VI
	machinery.		
5.	It is easy to find farm owners who will hire my farm service.	2.62	Agree
6.	I allot a long period of time on the farm working per day.	2.76	Agree
7.	I can finish working on a wide area of rice farms a day.	2.56	Agree
8.	My farm work gets easier and faster because of modern rice farm machinery.	2.76	Agree
9.	I have plenty of time that I can dedicate to another type of work.	2.38	Disagree
10.	I am regularly hired to work on rice farms during the cropping season.	3.02	Agree
General Weighted Mean		**2.64**	**Agree**

Table 1 shows the responses of the respondents regarding the effects of farm mechanization on their labor productivity, "I am regularly hired to work on rice farms during cropping season" got the highest weighted mean of 3.02 with a verbal interpretation of "agree", and "there is an increasing number of farmworkers due to modern rice farm machinery" got the lowest weighted mean of 2.3 with a verbal interpretation of "disagree". The findings show that respondents are still working regularly at rice farms every cropping season during this period of implementation and adoption of mechanization and modern technologies on rice farming. But respondents see a notable decrease in numbers of farmworkers due to farm mechanization, those displaced workers are already excluded in this informal work sector. Basic data from Decent Work Statistics-Philippine (DeWS-Philippines,2018) shows that the employment share of agriculture has been steadily falling, the decrease in agriculture's employment share has recently accelerated. Cited as the framework of this study: the "Dual Sector Model of Economic Development" points out that human labor normally shifts from agriculture into a modern industry. The existing labor surplus in the agricultural sector due to the huge population further expands in connection with the adoption of modern farm machinery in exchange for manual labor. The model assumed that few workers leaving the agricultural sector would have virtually no impact on the production output due to low labor productivity, attaining the balance on productivity between the modern industrial sector and traditional agricultural sector.

1.2 Income of the Respondents

Table 2. As to Income of the Respondents

	Statement	WM	VI
1.	I am earning enough as a rice farm worker.	2.04	Disagree
2.	I am receiving fair compensation based on the difficulty of my work on rice farms.	2.56	Agree
3.	Rice farm machinery aided in increasing the earnings I could receive by working on farms.	2.60	Agree
4.	It is quick to earnmoney on the farm working due to the use of modern farm machinery	2.78	Agree
5.	It is easy to save money by working on rice farms.	2.16	Disagree
6.	I seldom borrow money.	2.14	Disagree
7.	I can afford to buy my basic needs.	2.46	Disagree
8.	My family and I eat adequately every day.	2.62	Agree
9.	I do not need to look for another source of income	2.02	Disagree
10.	I can save money every cropping season.	2.32	Disagree
General Weighted Mean		**2.37**	**Disagree**

In relation to the income of the respondents as rice farmworkers, "It is quick to earn money on the farm working due to the use of modern farm machinery" got the highest weighted mean of 2.78 with a verbal interpretation of "agree", and "I do not need to look for another source of income" got the lowest weighted mean of 2.02 verbally interpreted as "disagree". This means that the respondents, composed of 56 percent who tried to operate machines during their farm work, suggest that it is easier and quicker to gain income with the use of machinery than manual labor alone. As stated by Srisompun et al. (2019), aside from the reduction of labor cost, the aid of rice farm machinery made farming faster and enables the cultivation of the larger area. Faster and efficient farming leads to a quick gain of income to a worker operating a farm machine. The respondents imply that, although it is quick to gain income with the help of farm machines, they still needed to look for another source of income. Aside from being seasonal work, poverty has always been tied up to the agricultural sector in the Philippines. A poverty study by Reyes et al. (2012) estimated that the incidence of poverty among agricultural households (57%) is thrice than that of the non-agricultural households (17%).Making agricultural households strive and dedicate more effort to earn for living.

2. Rice Farm Workers' Ways to Deal with the Effects of Farm Mechanization.

Table 3. As to Ways on Dealing amidst Farm Mechanization

Statement	*f*	Percentage
1. Operate rice farm machinery.	28	56 %
2. Look for rice farm work in other places.	30	60 %
3. Work on other high-value crop farms.	33	66 %
4. Borrow capital to start farming own rice crop and other high-value crops.	22	44 %
5. Rent an agricultural land to start farming own rice crop and other high-value crops.	6	12 %
6. Buy agricultural land.	5	10 %
7. Raise livestock.	36	72 %
8. Be a rice trader.	5	10 %
9. Officially stop on rice farm working.	8	16 %
10. Find an alternative source of income aside from working on rice farms.	41	82 %

Table 3 shows the responses regarding the ways of dealing with the effects of farm mechanization, "Find an alternative source of income aside from working on rice farms" which got the highest number of responses with 41 responses equivalent to 82% of the respondents. Although workers are regularly hired to work on the farm during the cropping period and those who operate the machine easily gain income with the help of farm machinery. They still needed to find an alternative source of income due to the seasonal and informal setting of the work they do. There is also a continuous decline in the number of farmworkers in general, hence the need to find an alternative job outside the agricultural sector. A combined 24% of the respondents listed "construction worker" and "tricycle driver" as the most frequent alternative jobs outside the sector of agriculture. According to Charlton and Taylor (2016), it is a worldwide trend that as countries' per capita incomes increase, their workforces shift from agriculture to non-agricultural industries. Industrial growth is expected to continue to uptrend the demand for non-farmworkers, leading to higher non-farm wages.

3. Proposed Programs that will address the Effects of Farm Mechanization on Rice Farm Workers

1. The Local Government Unit should have an exclusive registry system for agricultural farm workers in Nueva Ecija that could help on extending immediate support to the workers and for better program targeting.
2. The implementing agencies and units should establish a stronger information dissemination system to ensure that the existing programs will be effectively implemented and be delivered accordingly to the rightful beneficiaries.
3. Other concerned public and private institutions to create other livelihood and skills training, and more job opportunities to those farmworkers not qualified as beneficiaries on the existing government programs in Nueva Ecija.

IV. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions were drawn from the above-mentioned results of the study:

1. Respondents denote that they are still regularly hired to work on rice farms every cropping season amidst the adoption of farm mechanization. But respondents also see a significant decline in numbers of rice farm workers, those who are categorized as labor surplus in the agricultural sector are no longer working on farms.
2. Rice farmworkers earn quicker due to faster operations with the use of farm machinery. Though most of them still needed to find other sources of income.

Based on the findings and conclusions, the following were suggested:

1. Rice farmworkers could improve their knowledge and skills on operating farm machinery, through participation in workshops and training (Mina, Subia & Ermita, 2020) conducted by the government and through experience gained from other farm machine operators, to further increase their farm productivity.
2. Rice farm workers may also diversify their skills aside from farming, through skills training provided by the government and gained experiences, to have more job opportunities and source of income.
3. Future researchers could explore the study on a larger scopeor focus particularly on the agricultural farm workers (Subia, et al, 2019).

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Condition of the Negosyo Serbisyosa Barangay (NSB) Program of the Department of Trade and Industry (DTI) in Talugtug, Nueva Ecija during the Pandemic

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Abstract**—** *The goal of this study is to describe the state of business in Talugtug, Nueva Ecija, as well as the demographic profile of DTI program recipients. "NEGOSYO SERBISYO SA BARANGAY" is the name of their program. It also seeks to identify the challenges that beneficiaries face, as well as viable remedies or alternatives to those problems. Finally, the most critical goal is to determine the effectiveness of the DTI's specified program. In this research article, the descriptive approach was applied. Because of the importance of following safety protocols during a pandemic, the survey was performed online. According to the statistics acquired, the DTI's NSB program considerably aids MSMEs in Talugtug, Nueva Ecija in terms of sustainability and income generation. The DTI's efforts in providing services have been successful. Despite some predictions of closure, the beneficiaries manage to keep their jobs and their businesses going till the time of this study. Also, the DTI's Negosyo Serbisyosa Barangay Program is an excellent instrument for ensuring the long-term viability of its recipients' businesses. As a result, its efficacy must be maintained and enhanced. Lastly, the program enhances the long-term viability of MSMEs through business continuity training, increased productivity, and government subsidies [1].*

Keywords**— *COVID-19 pandemic, Department of Trade and Industry (DTI), Negosyo Serbisyosa Barangay (NSB), Productivity, Viability.***

I. INTRODUCTION

Economic development must be sustained in order to fully realize the long-term vision of the Filipino people entrenched under the AmBisyonNatin 2040 to have "Matatag, Maginhawa, at Panatagna Buhay". For the past years, economic growth has reached 6.5% and a vibrant MSME sector accounting for 99.5% of businesses in the country plays a key role in achieving such momentum.While the impact has yet to be assessed, the government's efforts on MSME development gained significant milestones with almost 300,000 MSMEs assisted for 2018. Backed Republic Act No. 10644 or Go Negosyo Act, DTI established more than 1000 NC's (Negosyo Centers), delivering services to potential and existing entrepreneurs. Despite these numbers, many entrepreneurs have not received nor heard of government programs, especially in less developed areas. This, therefore, presents a major concern, especially as Filipino for stronger value chain linkages of their industries and promote countryside development. In pursuing the directive of President Duterte to help the country's base of the pyramid, the DTI developed the Negosyo Serbisyosa Barangay (NSB). Republic Act 7160 also known as the Local Government Code of 1991 provides for the role of

barangays in attaining national development through serving as the primary planning and implementing unit of policies, plans, programs, projects, and activities in the community [2].

The Negosyo Serbisyosa Barangay (NSB) is one of the programs launched by the DTI to reach out to the underserved communities and bring business development where they are most needed. The NSB program extends the ease of doing business to barangays within the 4th, 5th, and 6th income classification municipalities in the country. It is aimed at promoting a more inclusive MSME development that will ensure stronger value chain linkages of our industries, encourage dynamic entrepreneurial activities at the barangay level, and capacitate more entrepreneurs to scale up their operations. It supports the whole of government approach wherein public agencies related to supporting inclusive business ecosystem work across portfolio boundaries and mandate to encourage entrepreneurial activities and integrated government assistance [3].However, the coronavirus disease 2019 (COVID-19) outbreak has a large impact on micro, small, and medium enterprises (MSMEs). COVID-19 is an infectious disease-causing global health crisis and economic downturn [4]. In the presence of the "new normal," the DTI is assisting MSMEs in adapting to new business principles and concepts. This study will contribute to the development of DTI's interventions and future plans for implementing its programs and services. Therefore, it is crucial to provide them with the appropriate interventions in mitigating the pandemic's impact on MSMEs and improve business resiliency to easily adapt to the disruptions caused by COVID-19 by providing business development support, capacity building, access to finance and market, and promoting a sustainable value chain [5].In 2019, The DTI has successfully launched the program in Talugtug, Nueva Ecija which included beneficiaries from the selected 4th to 6th class municipalities and has completed five (5) NegosyoSerbisyosa Barangay (Barangay Baybayabas, Cabiangan, Saverona, Quezon and Patola). As of December 2019, a total of 25 beneficiaries were given business starter kits. The program provides comprehensive trainings and seminars designed to prepare MSEs for their integration into the value chains of medium and large enterprises. The conduct of evaluation and assessment after all NSB beneficiaries run will provide information on how the program is contributing results to meet the objectives of the program deliverables.

II. METHODOLOGY

The descriptive research method was used in this study. The “descriptive research approach entails characterizing a population, scenario, or condition,” according to Balaria (2018) [6]. This is to figure out what steps need to be taken to improve the NSB program's implementation and aid NSB beneficiaries. The 25 NSB recipients were asked to participate in the study by filling out a simple online survey on Google forms. The survey was done by providing an online survey link to NSB recipients via group chat messenger, as directed by the Executive Committee of the Department of Trade and Industry, Nueva Ecija Provincial Office, and in accordance with established community quarantine and health regulations. The poll was entirely self-administered. The survey questions were designed as simple as possible to be answered using the following structure: the first section of the survey asked about the respondents' demographic data and profiles, including their age, business address, year of establishment, and type of business. The second section focused on the issues that NSB beneficiaries faced as a result of the COVID-19 epidemic, as well as the evaluation of the NSB program's effectiveness. The survey and data gathering took place during the Modified General Community Quarantine in April 2021. Descriptive statistical methods such as percentage and frequency distribution, as well as tables on Google Forms and Microsoft Excel, were utilized to summarize, characterize, and evaluate the data acquired.

III. RESULTS AND DISCUSSION

Table 1. Demographic Profile of the NSB beneficiaries

Category	Measure	Scores
Age	Mean	39.5
	Range	27 to 52
Gender	Female	19.00 (76%)
	Male	6.00 (24%)
NSB beneficiaries in Barangay	Baybayabas – 5 persons	25.00 (100%)

	Cabiangan – 5 persons	
	Quezon – 5 persons	
	Saverona – 5 persons	
	Patola – 5 persons	
Year the Business Started	2017	12.00 (48%)
	2018	7.00 (28%)
	2019	6.00 (24%)
Industry	Food (Banana, Camote and Taro chips)	5 (20%)
	Manufacturing (Mushroom Production)	20 (80%)

As presented in the table above, the age of the respondents ranges from 27 to 52 years old and the age mean is 39.5. Approximately, 76% of the respondents were female and the remaining 24% belongs to male respondents. The respondents were from different NSB Barangay with 5 beneficiaries in each barangay in Talugtug, Nueva Ecija. The year business started was 48% in 2017, 28% in 2018, and 24% in 2019. Likewise, 20% of the respondents are engaged in the food industry while 80% of them belong to the manufacturing industry.

Table 2. Risk Assessment of Business Continuity amidst to Crisis

Frequency (**f**)	Percentage (**%**)	Verbal Description
11	44.00%	close within a month or less
5	20.00%	-close within 3 months
9	36.00%	-close within 6 months
0	0.00%	-Not envision of business closure or shutdown

The illustration above shows the risk assessment of business continuity amidst crisis. The majority of the respondents predicted to close within a month or less with 44%, while 20% of them predicted that their business will close within a month to three months, 36% forecasted that their business will only last in less than six months and 0% don't envision of business closure or shutdown.

Table 3. Problems Encountered by the Businesses During the Pandemic

	No. of Respondents	**% of Respondents**
A. Decrease in number of orders	14	26.42%
B. Difficulty in delivering clients orders	10	18.87%
C. Financing Problems	8	15.09%
D. Loan obligations	7	13.21%
E. Logistics Problem	6	11.32%
F. Lack of personal protective equipment (e.g., masks)	5	9.43%

As shown in the illustration, the above are the problems encountered by the businesses. To be specific, 26.42% of the respondents experienced a decrease in the number of orders while 18.87% had difficulties in delivering the client's orders. In addition, 15.09% of the respondents experienced financing problems while 13.21% of them had loan obligations. Moreover, 11.32% had logistics problems. Lastly, 9.43% of them lack personal protective equipment like masks, face shields, etc.

Table 4. Potential Solutions to the Financial Problems

	No. of Respondents	% of Respondents	Rank
A. Bank Loans	5	16.67%	3
B. Government-assisted Loans	14	46.67%	1
C. Cost Reduction	7	23.33%	2
D. Negotiating with Lenders	4	13.33%	4

As reflected in Table 4, the majority, or 46.67**%** of the respondents said that they will ask for loans under the Government-assisted loans and 16.67% under bank loans. Doing so will aid the working capital. While 23.33% of the respondents said that they will do cost reduction and 13.33% will negotiate with their lenders.

Table 5. Alternative Solutions to Increase Sales

	No. of Respondents	% of Respondents	Rank
A. Sales promotion	7	10.61%	4
B. Negotiate for reseller/retailer	12	18.18%	3
C. Online selling	20	30.30%	2
D. Rolling of products to the community, payable for the agreed date	2	3.03%	5
E. Conventional selling (In house selling)	25	37.88%	1

The illustration above shows the alternative solutions on how to increase sales during the pandemic. 37.88% of the respondents said that they prefer to sell their products through conventional or in-house selling. Some 30.30% will do online selling while 18.18% will do the retailing of their products through retailers. 10.61% of the respondents will do sales promotion and the remaining 3.03% will roll their products to the community.

Table 6. Comparison of Financial Performance of the Business for the year 2020 and 2021

	April – June 2020		January – March 2021	
	No. of Respondents	% of Respondents	No. of Respondents	% of Respondents
Income	10	40%	23	92%
Loss	2	8%	0	0%
Breakeven	13	52%	2	8%

The table above shows the comparison of the financial performance of the NSB beneficiaries' businesses for the years 2020 and 2021. On April-June 2020, the majority, or 52% of the respondent's businesses had a break-even result. 40% of them have successfully gained profits and unfortunately, there is 8% who failed or experienced losses.

Table 7. Status of Business during the Conduct of this Research

Status of Business	Percentage (%)
Operational	25 (100%)
Non-Operational	0 (0%)

The illustration above has shown the status of the NSB beneficiaries' businesses during the conduct of this research paper. Despite uncertainties, 100% of the beneficiaries managed to sustain the operation of their businesses as of the time this research is conducted.

IV. CONCLUSIONS AND RECOMMENDATIONS

According to the findings, the twenty-five NSB recipients came from five barangays in Talugtug, Nueva Ecija. They work in the food industry, primarily in the preparation of chips (banana, camote, and taro chips) and mushroom production. The researchers discussed the various obstacles that businesses faced during the pandemic, including a decline in the number of orders, trouble with deliveries, financial issues, logistics issues, and, most importantly, the pandemic problem of a shortage of personal protective equipment. Despite the pandemic that began in the Philippines in 2020, the Department of Trade and Industry (DTI) and NSB recipients are working together to provide potential answers to the challenges that businesses in Talugtug, Nueva Ecija are facing. The researchers also discussed the state of firms and a comparison of business income from the previous year to this year. The researchers conclude that the DTI's NSB program considerably aids MSMEs in Talugtug, Nueva Ecija in terms of sustainability and income generation, based on the findings. The DTI's efforts in providing services have been successful. Despite some predictions of closure, the beneficiaries manage to keep their jobs and their businesses going till the time of this study. According to the findings, the DTI's Negosyo Serbisyosa Barangay Program is an excellent instrument for ensuring the long-term viability of its recipients' businesses. As a result, its efficacy must be maintained and enhanced. The researchers suggest that the DTI build a business development continuity strategy [7] to maintain the long-term viability of business operations and to accept more small enterprises in order to improve the NSB Program. Furthermore, the researchers urge that actual training activity dealing with financial management implications [8] and marketing strategies be conducted in order to provide NSB Programs participants with the necessary information and abilities. They will have more opportunities to grow and expand their firms as a result of these. In times of crisis, program execution should be more straightforward if direct subsidies to private entrepreneurs are to be provided [9]to address the needs of the recipients [10].

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