

RESEARCH ARTICLE OPEN ACCESS

# WEB-CONCISE (WEBSITE for CONSTRUCTION COMPUTATION, the INVENTORY of SUPPLIERS, and ESTIMATION) for CONTRACTORS, CONSTRUCTION MATERIAL SUPPLIERS, and ESTIMATORS in PAMPANGA

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## Abstract:

Studies show that delays are common in construction project management, particularly in construction material procurement and estimation. Technology develops alternate solutions, such as web-based platforms and e-commerce, to address these issues. Quantity estimation of different building materials is done using technologies that are currently available. However, since it is crucial for contractors to find possible suppliers for the purchase of building materials, the researchers combine the concepts of quantity estimation using Max B. Fajardo, Jr.'s Simplified Construction Estimate, e-commerce material procurement, and supplier identification using PCAB categorization into one website. WEB-CONCISE is made by gathering the consent of thirty-six suppliers in Pampanga, including their construction material inventory and pricing, and by creating a database program for the digital computation of quantity estimates. A descriptive type of approach is carried out to gather the stakeholders' ratings on WEB-CONCISE based on material procurement, inventory of suppliers, and estimate calculator functions. The findings indicate that the respondents strongly agree that WEB-CONCISE functions well in terms of its three main components. Its effectiveness in minimizing delays is also supported by the respondents' verbal descriptions. Overall, WEB-CONCISE is a multifunctional procurement, inventory, and estimation website useful to small-scale civil engineering stakeholders.

**Keywords —Construction Project Management, Delays, E-commerce, Estimation, Inventory, Material Procurement, Website**

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## **I. INTRODUCTION**

Construction project management is a professional service that provides project owners with effective control over the project's budget, timeline, scope, quality, and function. It covers the plan, organization, coordination, and control of every aspect of a construction project. It is a responsibility that directly affects the successful accomplishment of any construction endeavor [1]. One important sub-process in construction project management is material procurement. Construction material procurement is the purchasing of materials as part of construction materials management, which refers to the systematic planning, organizing, and controlling of materials throughout the lifecycle of a construction project [2]. Construction estimation and bidding are also considered important in construction project management in order to project budget and resource allocation for the entirety of a project [3].

As part of the planning process in construction project management, completion before the intended date is a critical criterion in assessing a successful construction project. Two of the factors included in the sub-processes that can be indicators of project completion success are proper material procurement and construction estimation [3]. However, delay is a common situation and is extensive in various construction projects [4]. A survey conducted in 2016 by Assaf and Al-Hejji reveals that 70% of projects undergo delays, and an average of between 10% and 30% was determined based on the questionnaires [4]. Furthermore, in the same study, dissatisfaction arises among all parties involved when a construction project is delayed. Project managers and contractors' task is to ensure the project is done within the proposed timeframe [4].

The emerging use of technology is an aid to the problems experienced in construction delays, especially when it comes to procurement and estimation, because they can be done digitally instead of using traditional methods [5]. Even though using new technologies may involve a substantial initial investment, many of these technologies may result in long-term time and cost

savings while also expanding company potential. For the most significant assessment of the most advantageous and financially worthwhile technologies, construction experts must remain up-to-date with the most recent information [5]. Computerization is unmistakable proof of science and technology's growth, whose mission is to fulfill its purpose to the fullest. One of the best alternatives to manual tasks like calculations, record-keeping, and information retrieval is converting to an automated system [6]. Furthermore, a high degree of accuracy in quantity estimates and costs is crucial to avoid conflicts in the face of growing demands for constitution projects [7].

The succeeding parts of this paper are as follows: Section II discusses the background for the formation of the study. Section III presents the related literature and studies with reference to the conduct of this paper. Section IV indicates the methods and procedures carried out for the data gathering and creation of the website. Section V indicates the final output of the study, the results from the assessment, and the interpretation of the data. Section VI contains the summary, conclusions, and recommendations for future researchers.

## **II. BACKGROUND OF THE STUDY**

This section indicates the reasons behind the conduct of the study.

### ***A. Construction Project Delays in the Philippines***

In the Philippine context, when it comes to construction projects, construction companies pay between 15 and 35 percent of each project's budget to cover expenses associated with delays [8]. An article by Desiderio states that Ronilo Balbieran, vice president for operations at REID Foundation, states that information gathered from interviews with industry players showed construction companies spend up to 35 percent for operating costs or those incurred from project delays [8].

### ***B. Pre-existing Technologies for Quantity and Cost Estimation***

Considering that various factors cause inexcusable delays in the Philippines, technology is being utilized in order to cope with these situations. However, the pre-existing technologies for quantity and cost estimation like PlanSwift, Clear Estimate, ConWize, and Builxact, which are discussed further in the literature review, exist only in Western and European countries. Building standards in these locations are different, which makes it hard to apply in the Philippine construction context. Furthermore, the stated estimating software only provides the quantity and does not directly involve the construction materials of suppliers in the conduct of material procurement. This is why construction material procurement is for consideration, along with estimation, in creating assistance for stakeholders.

#### **C. Traditional Construction Material Procurement**

Construction material procurement is essential to construction completion; however, acquiring materials is a paper-based procedure under the traditional contractual status quo [9]. With this tactic, potential suppliers are contacted through phone and fax while looking for supplies and suppliers in paper-based paperwork. The typical method of acquiring supplies for building projects involves a methodical, specialized procurement procedure that is primarily paper-based. The procurement process is part of the creation, duplication, and transfer of several contract paper documents, including materials requisition papers, quotes, purchase orders, etc. Traditional material procurement's limitations include geographical limitations, stipulated business hours, limited supplier and product information, and the use of catalogs only [9]. Construction businesses have suffered several setbacks due to the inefficient purchasing practices of the paper-based procurement approach, including loss of profit owing to time, labor consumption, loss of material knowledge, and high levels of process uncertainty [9]. This results from using out-of-date supplier information from catalogs, production time requirements, etc. [9].

#### **D. Development of WEB-CONCISE**

Utilizing technology as an assistance to individuals involved in construction, WEB-

CONCISE (WEBSITE for CONstruction Computation, the Inventory of Suppliers, and Estimation) is a platform where suppliers can offer construction materials for procurement, and a digital catalog is included for an easier material search experience. At the same time, the estimation feature supports the accuracy of identifying total quantity and cost in the Philippine construction context.

### **III. LITERATURE REVIEW**

This portion presents the previous literatures formed and studies conducted in relation to the formation of the synthesis and objectives of the study.

#### **A. Causes of Construction Delays**

Ansari et al. conducted research in 2019 that revealed the causes of construction project delays through survey questionnaires. Among the 50 questionnaires distributed by the researchers, 45 were returned, of which 18 (36%) were responded to by clients, 14 (28%) were answered by consultants, and 13 (26%) were filled out by contractors. The mean of each factor's distribution was computed using SPSS to evaluate the outcomes of the components that contributed to the delay. The respondent's frequency of response was the basis for sorting the criteria. The top variables that delay building development are those that have the highest mean scores [10].

The researchers address the issues aligned with construction project management revealed from the study of Ansari et al., focusing on traditional acquisition of construction materials, old technology, and delays caused by contractors due to estimation delays, where the features of the website will be part of making the job a lot easier.

#### **B. Key Aspects in Construction Material Procurement**

The study by Buzzetto et al. examines the essential elements of procurement in project management, investigating the impact of selection criteria, supplier integration, and acquisition dynamics. Companies are working even harder to improve supply chain collaboration in uncertain and complex environments. Partnerships between

suppliers and buyers that are well managed can help improve procurement effectiveness and collaboration fluency. Companies are essential to the success of a project as a whole. A project's success depends on choosing the best supplier and assessing the pertinent procurement procedures, both of which support efficient supply chain management [11].

Furthermore, research by Araújo et al. indicates that supplier performance ought to be routinely tracked and managed in order to detect and address any shortcomings. To guarantee the project's success, the supplier's performance must be assessed during project implementation. Choosing a supplier is one of the procurement department's primary tasks. The effectiveness of the project as a whole may suffer in the absence of a sufficient and accurate procedure for choosing the best supplier [12].

### *C. PCAB Categorization for Construction Suppliers*

The main focus of the study—providing a platform for suppliers to list down their products—will require parameters in choosing them. In order to identify the potential suppliers who will register on the website, it is crucial to list down the classification of contractors that the potential suppliers have already handled; that will be a parameter in selection. Illustrated in the table by the Construction Industry Authority of the Philippines, the classifications of construction contractors in the Philippines are General Engineering, General Building, Specialty, and SP-Trade, which are divided into four categories: AAAA, AAA, AA, A, B, and C. License categories are divided into six classifications based on their size range. Under Large B are AAAA and AAA, which include above 225 million pesos for the single largest project and have allowable ranges of contract costs of less than or above 450 million pesos. Large A is in the AA category, which includes more than 150 million up to 225 million pesos of a single largest project and has up to 450 million pesos of allowable ranges of contract costs. Medium B is under license category A, which includes more than 75 million up to 150 million pesos of a single largest project and has up to 300 million pesos of allowable ranges of contract costs. Medium A under the license category B

includes above 15 million up to 75 million pesos of the single largest project and has up to 150 million of allowable ranges of contract costs. Small B under the license category of C & D includes less than 15 million pesos of a single largest project and has up to 30 million allowable ranges of contract costs. Lastly, Small A, under the category of Trade/E, includes up to 1 million pesos of the single largest project and allowable ranges of contract costs [13].

Furthermore, research by Araújo et al. indicates that supplier performance ought to be routinely tracked and managed in order to detect and address any shortcomings. To guarantee the project's success, the supplier's performance must be assessed during project implementation. Choosing a supplier is one of the procurement department's primary tasks. The effectiveness of the project as a whole may suffer in the absence of a sufficient and accurate procedure for choosing the best supplier [12].

### *D. Website for Material Procurement*

Kong et al. reveal in their study that several e-commerce platforms for the purchase of building materials have appeared in the past few years. Manufacturers, suppliers, agents, and buyers use these platforms as online marketplaces to acquire and sell building supplies. Forty to forty-five percent of the overall cost of all construction projects is generally made up of construction materials. Problems in existing e-commerce systems for construction material procurement are also identified in their study. Information on building supplies and transaction facilitation are the two main tasks an e-commerce system performs for trading construction goods. Depending on how the system is designed, producers, suppliers, or agents of materials may supply information on construction materials. Some e-commerce platforms are owned and run by a manufacturer or a supplier. Therefore, the amount of material information available to customers could be more constrained [14].

Stewart observed that e-commerce is now widely used, and innovations in this field have already been undertaken by a variety of stakeholders in the construction sector. Because of the global increase in internet and e-commerce



usage, the building sector will become a consumer of these innovations, which will have a significant impact on how development occurs [15].

#### ***E. Impact of E-commerce on Construction Material Procurement for Sustainable Construction***

In the study of Fapohunda et al., e-commerce will be considered an alternative to traditional material procurement. E-commerce means processing, transmitting, storing, and displaying information between various parties via electronic technology and software applications. As a result, e-commerce offers a virtual setting (e-marketplace) that enables the sharing of data (specifications and price) on large quantities of materials by procurement players via an "inter-organizational" internet-based information system [9]. The same study claims that implementing e-commerce strategies when carrying out construction material procurement activities enhances the communication system and encourages the accurate, efficient, and prompt exchange of material information among the various procurement participants. The electronic commerce system's ability to better manage material information over time is a crucial feature and benefit. The arrangement benefits both clients and suppliers [9].

It has been identified by Stewart that e-commerce is now becoming more widely used, and a number of stakeholders in the construction industry have begun developments in this area. The increased use of the Internet and e-commerce in Australia suggests that the construction industry will adopt these technologies, which will have a significant impact on how production is carried out [15].

#### ***F. Pre-Existing Estimation Technologies***

Ellis states that it is essential to ensure that the quantity estimates and costs have high accuracy to prevent conflict amid rising constitutional project demands. In the study, it is essential to utilize construction estimation software to speed up the process, minimize stress, and produce more accurate bids. In this study, the researchers will go through finding existing estimation software [7].

The first software that is reviewed is PlanSwift. It is an estimating software considered a

construction takeoff. Tech Unlimited, Inc., based in South Jordan, Utah, USA, is the one behind the idea of this software. Construction professionals may quickly measure quantities from digital designs and provide precise project cost estimates thanks to PlanSwift's digital takeoff features [16]. The advantages of PlanSwift include digital takeoff, ease of use, integration, customization, accuracy, and collaboration. Its disadvantages include cost, learning curve, and dependency on digital blueprints.

The second piece of software researched is ConWize. This privately held business, founded in Europe, made its public launch in early 2020. It is a cutting-edge cloud-based cost estimation tool with a variety of capabilities. Advanced cost estimation, price analytics, cost and profit management tools, thorough KPI analysis, powerful risk management skills, and predictive analytics based on historical data are a few of these. ConWize also makes transparent bid-filing possible. ConWize addresses one of most businesses' most prevalent problems: a smooth transition from the project's bidding phase to its execution phase [17]. The advantages of ConWize include a pre-contract management module, a visual and intuitive module, onboarding, integration, and live support. Its disadvantage is the cost of the subscription.

The third software checked is Clear Estimates Software by Nolan Orfield. Since its creation over 14 years ago, Clear Estimates has simplified the estimation process for thousands of contractors and remodelers. It was created by remodelers, for remodelers. They designed Clear Estimates to be simple since a project manager might want to be in the field rather than at a keyboard. With user-friendly software that keeps remodelers in mind, Clear Estimates is still at the forefront of the business more than ten years after it entered it [18]. The advantages of Clear Estimates include ease of use, easy management, and live support. Its disadvantages include an incorrect labor code and inconsistencies in estimates.

The fourth system identified is Buildxact. This is an Australian-based corporation with domestic product headquarters in Austin, Texas. The company was established in 2011. It is a cloud-based solution for builders and contractors.

Buildxact claims that it helps to raise home building industry experts since builders can be more honest about pricing. John Allison, Chairman, is a co-founder of Buildxact and LogicalTech and has a 30-year track record of developing successful technology firms [19]. The advantages of Buildxact include ease of use, speed, and digital takeoff. Its disadvantages include the inability to use functions, lock templates, and the subscription cost.

#### **G. Simplified Construction Estimates**

The definition of an estimate has historically been viewed as a value based on opinion or approximately derived from incomplete or defective data; a computation that is not purportedly accurate; an appraisal; as well as a declaration, such as one made by a constructor, regarding the cost of certain work [20].

Author Max B. Fajardo, Jr. published a book entitled *Simplified Construction Estimate*, which is in line with his desire to provide help for individuals, especially beginners, who want to facilitate the study of estimation. The design of his book is a guideline outline for people concerned with work in estimating. To easily formulate solutions and their costs, sample problems are also provided in the text. Tabular data on multipliers and formulas have been provided in the written work to provide an easy computation of quantity estimates [21].

#### **H. Synthesis**

Since the previous studies reveal that in construction management, delays are prevailing and are caused by various factors, particularly when it comes to materials procurement and estimation, technology is utilized in order to create alternative solutions that include e-commerce and software. Existing estimating technologies are already available to provide individuals with access to quantity identification for various construction materials. However, since it is important for contractors to identify potential suppliers for construction materials procurement, the researchers merge the ideas of identification of suppliers who handled various contractors using PCAB categorization, e-commerce material procurement through utilization of technology, and quantity

estimation using *Simplified Construction Estimate* by Max B. Fajardo, Jr. The process of procurement focuses on the buyer-supplier relationship while protecting both parties in performing each function. This website is an assistance to industry through innovation to provide a technological advancement with the means of a procurement, inventory, and estimation website.

#### **I. Objectives of the Study**

The objectives are to identify construction materials for material procurement from selected construction material suppliers around Pampanga in terms of location, material category, and pricing through a website; to include available construction materials from construction material suppliers in Pampanga in a website dashboard that can be updated from time to time as prices may increase or decrease; and to estimate quantity and total cost in terms of concrete, masonry, metal reinforcement, wood and lumber, forms and scaffoldings, roofing materials, tilework, painting, and hardware through a construction cost estimator on a website.

Upon the conduct of the study, the researchers seek to answer the questions, including 'How can construction materials for material procurement be identified through a website, considering user location, material category, specific material listing, and pricing?' 'How can available construction materials be offered for material procurement through a website in terms of listing construction materials, updating product details, and updating product pricing?' 'How can quantity estimation of construction materials be done through a website in terms of computing the quantity needed, computing the total cost needed, and summarizing construction materials with quantity and cost in a list?'

### **IV. METHODOLOGY**

This section indicates the procedures done upon the creation of WEB-CONCISE and the research method implemented for the website simulation and assessment.

**A. Methodological Framework**

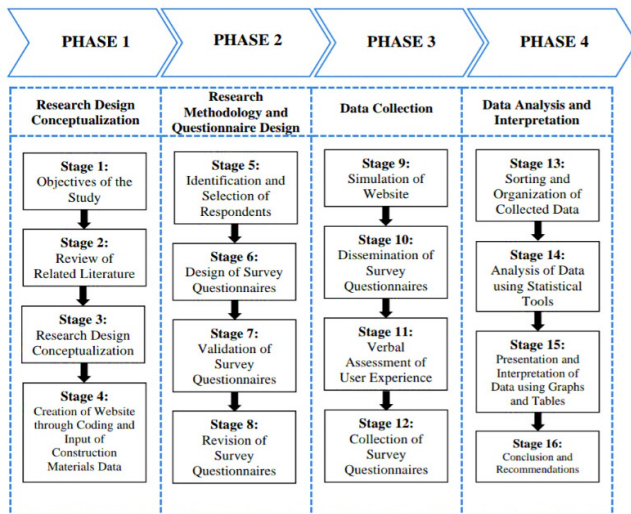


Fig. 1. Methodological Framework

The methodological framework of the study is shown in Figure 1. It is divided into four phases: Phase 1 is Conceptualization of the Research Design; Phase 2 is Research Methodology and Questionnaire Design; Phase 3 is Data Collection; and Phase 4 is Data Analysis and Interpretation. Individual stages make up respective phases, and these are covered in more detail in the subsequent sections of this chapter.

**B. Website Algorithm**

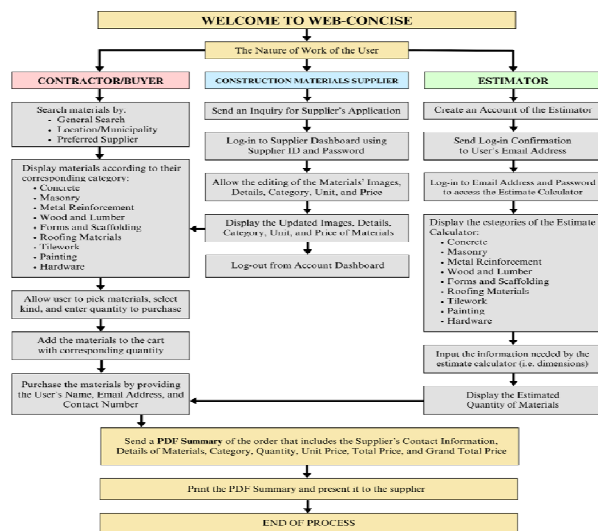


Fig. 2. Website Algorithm

Figure 2 describes the design of the website algorithm, including conditions that guide the flow. There are three parent modules, namely, the Module for Contractors, the Module for Suppliers, and the Module for Estimators.

**C. Programming, Database, Dashboard, and Registration**

The research utilizes the following programming languages: JavaScript (including React JS, Next JS, and Typescript).

JavaScript is the programming language that allows for a dynamic web site that actively communicates with users. JavaScript is a client scripting language that is also used on the server side in today's web applications. It provides client-side and server-side coding that is important for the website. It allows a web design that can be created with a single code base and still look good on laptops and mobile devices. It also allows the development of a dynamic website that does not only display static information but also has interactive functionalities. It is supported by all major browsers, such as Chrome, Firefox, and Microsoft Edge [22].

ReactJS, the fact that Facebook, a business with the means and dedication to support and develop this technology, raises the bar for its long-term sustainability. It offers constant support from a significant player, which frequently translates into regular upgrades and enhancements and a dedication to the technology's durability. It's more user-friendly for people without a lot of technical experience because it has a sizable and vibrant community with lots of resources, tutorials, and support. ReactJS is a JavaScript library that allows you to build reusable user interface (UI) components [23]. Furthermore, ReactJS is a library for creating modular user interfaces, according to the official React documentation. React allows for the development of large and complex web-based applications that can change their data without requiring page refreshes [24].

Next JS is a strong framework that boosts website performance. It is the best framework for React JS, which is supported and developed by Vercel. It is used by popular and successful companies, and it offers server-side rendering (SSR), which is a feature that enhances web application performance by rendering pages on the server rather than in the browser [25].

PostgreSQL is an efficient database since it has an open-source license and its source code is freely available. The authors prove that it is reliable in keeping a user's data safe and sound. It works well with different data types as it can handle various types of data, including modern ones like JSON. It is useful for different things, as it can be used for businesses, maps, storing lots of information, and even connecting devices together [26].

The civil engineering profession is crucial because professionals in the field must follow crucial procedures in order to learn the processes and standards. In order to protect the safety of the groups who will take part in the website, the researchers provide a dashboard. This functions as the overall monitoring of information that includes their materials, stocks, and prices. Each supplier's dashboard is exclusively accessed in line with their corresponding user ID and password. Furthermore, to prevent the alteration of quantity estimation, the website has a pre-registration form where every response is to be verified by the Super Admin. With these actions, the civil engineering profession is safeguarded, and the standard of material procurement and estimation will not be altered.

#### ***D. Research Design***

The researchers utilize a descriptive type of research. Descriptive research seeks to describe and explain events, objects, resources, institutions, groups, and fields. This allows us to better understand them, categorize them, and establish relationships. The descriptive research model attempts to describe scientific features such as observation, recording, determining relationships between events, and making generalizations through controlled, unchangeable principles. This research will be carried out using observational approaches. Therefore, the researchers have no

control over the characteristics of the variables or how they behave. In this study, a cross-sectional study is carried out in which various segments of the same group are examined.

This research is conducted using the observational method, under descriptive research, where researchers employ both quantitative and qualitative observations, as stated in the study of Dudovskiy. The author clearly defines that in quantitative observation, an objective data collection with a primary focus on numbers and values is focused. Statistical and numerical analysis techniques are used to derive the results of quantitative observation. On the other hand, qualitative observation simply includes observing characteristics without the use of measurements or numbers. In this instance, the investigators list down the experiences of the respondents with using the website.

#### ***E. Data Analysis***

The gathered information is filtered in a Microsoft Excel spreadsheet using categorical variables and frequency analysis to determine the highest and lowest values and to make sure there are no instances of duplicate or missing data. The following statistical methods are deployed.

Descriptive statistics include percentages, frequency distribution, mean, median, mode, and standard deviation. Percentages display the proportions after the assessment of contractors, suppliers, and estimators. The mean measures the central tendency used to summarize a set of values and will be the basis for assessing the parameters in the Likert Range Interval. Median helps in determining the middle value that will separate higher and lower values. Mode helps identify the values that occur most frequently in the dataset. Standard deviation yields a numerical representation of the dispersion or spread of values within the dataset. Indicating that the data points are densely packed around the mean is a lower standard deviation.

A Likert scale with a 5-point parameter is used to measure the agreement of the respondents regarding the various identifiers stated above. The parameters include "strongly agree," "agree," "neither agree nor disagree," "disagree," and



“strongly disagree.” Likert scales are excellent for going deeply into a particular subject to learn more about what people think about it. Thus, whenever it is needed to learn more about a particular topic, such as how people are responding to an innovation, consider using Likert survey questions [27]. The range and verbal interpretation that correspond to the mean score are shown in Table I.

TABLE I.  
LIKERT DESCRIPTION RATING

Rating	Descriptive Rating	Range Interval
5	Strongly agree	4.21 – 5.00
4	Agree	3.41 – 4.20
3	Neither agree nor disagree	2.61 – 3.40
2	Disagree	1.81 – 2.60
1	Strongly disagree	1.00 – 1.80

## V. RESULTS AND DISCUSSIONS

This portion indicates results of the study. The first ten sub-headings focus mainly on the final output of WEB-CONCISE. The other parts comprise the analysis and interpretation of the numerical and verbal data gathered through the assessment of three main groups of respondents, namely contractors and project managers, construction material suppliers, and estimators, after the simulation of WEB-CONCISE.

### A. Construction Materials from Suppliers in Pampanga

The proponents of WEB-CONCISE conducted an initial survey to gather information from various municipalities in Pampanga. In a span of three months, the proponents gathered information from five municipalities or cities, namely Guagua, the City of San Fernando, Bacolor, Mexico, and Lubao.

The initial analysis survey questionnaires reveal the scope of construction materials each supplier offers to their clients. The suppliers gave their consent to processing the data and prices they included in the price list forms. These data are arranged and sorted in order to include them in the material procurement of WEB-CONCISE.

Presented below are the suppliers who consented to including their materials, prices, and

information on the supplier inventory for material procurement.

1. Cove Concrete Products and General Merchandise
2. Horsewin 289 General Merchandise
3. LDL Corporation
4. JSD Concrete Products and Construction Materials
5. Bituin Merchandising
6. M.D. Fernando and Sons Lumber and General Merchandise
7. Tansung Construction Supply
8. Almo Hardware
9. Ron Riley Steel Supply and General Merchandise
10. Rich Rock Trading
11. Anros Builder Center
12. Reyser Hardware
13. Welber Trading & Construction Supply
14. Joluz Hardware
15. Genesis Construction Supply Co.
16. Wellcome Construction Supply
17. Royal Gold Steel OPC
18. Junsol Construction Supply
19. Landmark Lumber Trading and Hardware
20. Metrokey Steel
21. Golden MLLT
22. JC Hardware
23. Gladd Steel Trading
24. Starblocks Hardware
25. Metrobest Steel Trading
26. Northern Ceramica’s Tile Center
27. Intercon Construction Supplies Trading
28. 8848 Hardware
29. Primaltech Tools and Hardware
30. Uni-Way Construction Supply
31. Mega Lion Enterprises
32. T&L Trading and Construction
33. LTK Hardware
34. Crystal Queen’s Hardware & Construction Supply
35. Channel Construction Supply

36. LDL Corporation

**B. Official Logo of WEB-CONCISE**



Fig. 3. Official Logo of WEB-CONCISE

Figure 3 displays the official logo that shall function as the identity of the website, separating it from others.

**C. WEB-CONCISE Homepage**

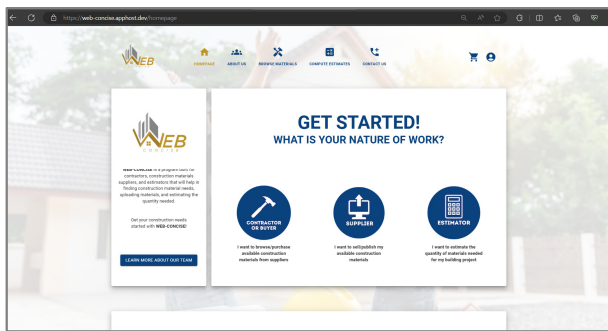


Fig. 4. WEB-CONCISE Homepage

Figure 4 illustrates the Homepage section which displays the three main purpose of the website – procurement, inventory, and estimation.

**D. WEB-CONCISE About Us Page**

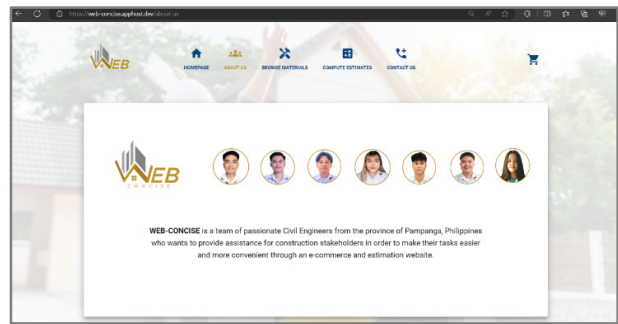


Fig. 5. WEB-CONCISE About Us Page

Figure 5 indicates the information about the proponents of WEB-CONCISE.

**E. WEB-CONCISE Construction Material Procurement Page**

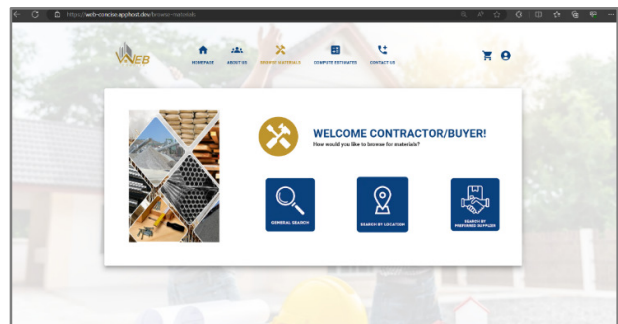


Fig. 6. WEB-CONCISE Construction Material Procurement Page

Figure 6 depicts the construction material procurement page of the website. The website will allow the user to search products in general.

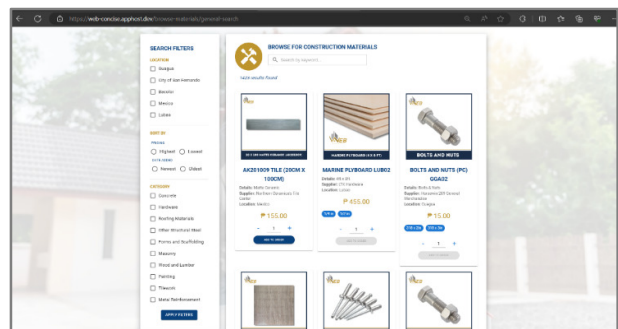


Fig. 7. WEB-CONCISE Procurement – General Search Page

Figure 7 illustrates the procurement window for the general search that includes a search bar and filters (i.e. location, sort by newest or oldest date added, sort by highest or lowest price, and category) that makes browsing for construction materials easier.

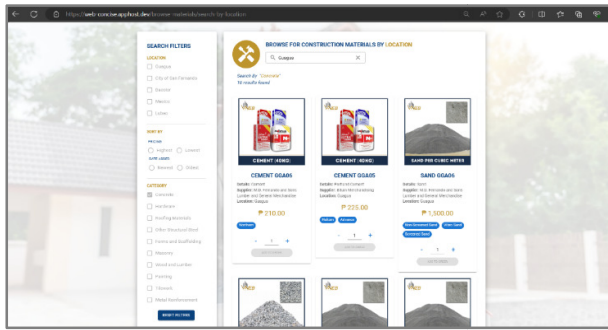


Fig. 8. WEB-CONCISE Procurement – Search by Location

Figure 8 depicts the procurement window for searching by location that includes a search bar and filters that makes browsing for construction materials easier when looking for a close supplier based on user location. The municipalities including Guagua, Mexico, Lubao, Bacolor, and the City of San Fernando are included as the initial locations for material search.

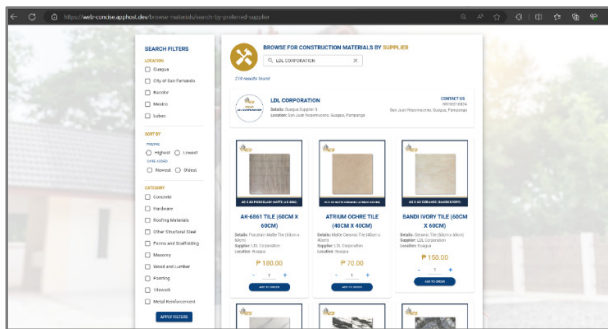


Fig. 9. WEB-CONCISE Procurement – Search by Preferred Supplier Page

Figure 9 shows the main procurement window for searching by preferred supplier that includes a search bar and filters that makes browsing for construction materials based on a particular supplier.

**F. WEB-CONCISE Supplier Registration Inquiry**

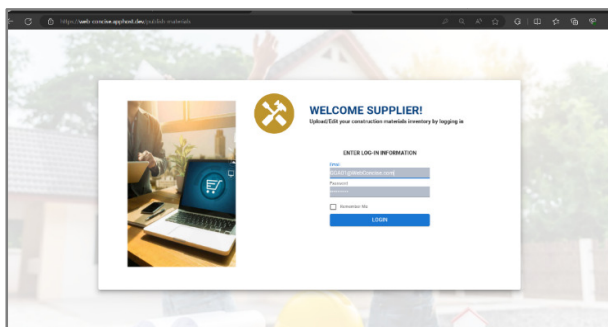


Fig.10. WEB-CONCISE Supplier Registration Inquiry

Figure 10 shows the function of the website that allows construction material suppliers to inquire and register their business. The inquiry will be then sent to the admin. They will carefully assess the information provided by the suppliers. The admin will provide the supplier ID and password that the suppliers can use to access the dashboard.

**G. WEB-CONCISE Supplier Dashboard**

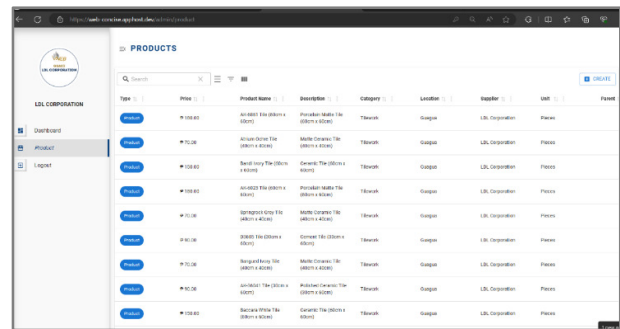


Fig. 11. WEB-CONCISE’s Supplier Dashboard

Figure 11 indicates the dashboard provided to the supplier once application is approved. In this portion, a particular supplier can add and publish their available constructions materials.

**H. WEB-CONCISE Quantity Estimator Registration**

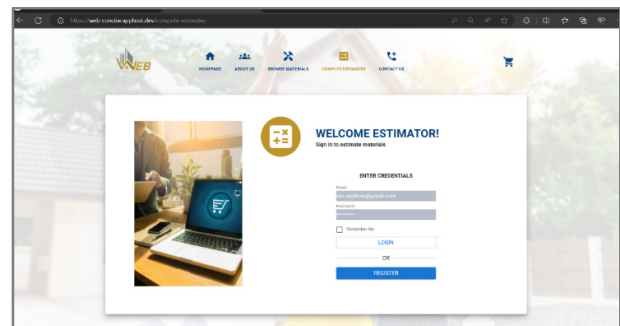


Fig. 12. WEB-CONCISE’s Quantity Estimator Registration

Figure 12 shows the initial step before quantity estimation is done in order to safeguard the profession. Once a user registers, a confirmation e-mail is sent for the verification process.

**I. WEB-CONCISE Estimate Calculator**

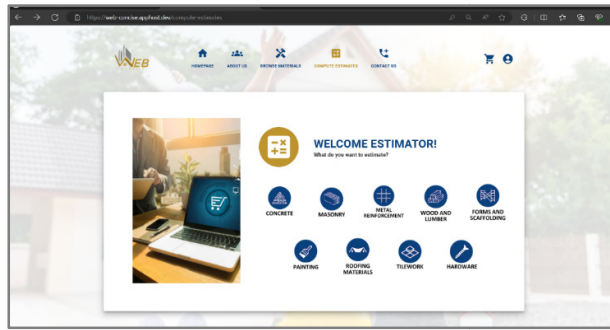


Fig. 13. WEB-CONCISE Estimate Calculator Main Page

Figure 13 illustrates the window where quantity estimation takes place. The window includes different civil works.

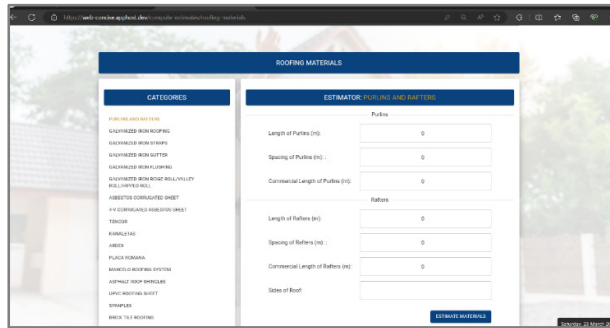


Fig. 14. WEB-CONCISE Estimate Computation

Figure 14 shows the window where details are inserted to produce quantity estimates. Each category has corresponding scopes of work.

**J. WEB-CONCISE Materials Checkout and E-mail Summary of Construction Materials**

Cove Concrete Products and General Merchandise						
San Matias, Guagua, Pampanga						
09198183715						
April 7, 2024						
No.	Materials	Category	Quantity	Unit	Price	Total
1.	Phenolic GGA01 - 1/2 in	Wood and Lumber	4	pcs	P645.00	P2,580.00
2.	Concrete Nails GGA01 - 180	Hardware	4	kg	P110.00	P440.00
3.	Concrete Nails GGA01 - 1-3/4in	Hardware	6	kg	P110.00	P660.00
4.	Ultra Corrugated Roof (0.4mm) GGA01 - 10R	Roofing Materials	1	pcs	P900.00	P900.00
5.	B.I. Tubular (1.5mm) GGA01 - 25mm x 25mm (Lix x Lin)	Roofing Materials	1	pcs	P265.00	P265.00
6.	Ordinary Plyboard GGA01 - 1/2 in	Wood and Lumber	3	pcs	P860.00	P2,580.00
7.	Age Corrugated Roof (0.4mm) GGA01 - 12R	Roofing Materials	3	pcs	P780.00	P2,340.00
8.	C-Channel Bar (6mm) GGA01 - 50mm x 50mm (Lix x Lin)	Other Structural Steel	1	pcs	P125.00	P125.00
9.	Marine Plyboard GGA01 - 1/2 in	Wood and Lumber	4	pcs	P1,550.00	P6,200.00
10.	Acrylic Clear Glass Emulsion Paint (1 Gal) GGA01	Painting	4	Gal	P595.00	P2,380.00
11.	Latic Paint Thinner (1 Gal) GGA01	Painting	3	Gal	P435.00	P1,305.00
12.	Automotive Lacquer (1 Gal) GGA01	Painting	3	Gal	P1,135.00	P3,405.00
13.	Plastering B-7760 (1 Gal) GGA01	Painting	3	Gal	P760.00	P2,280.00
			<b>Total QTY</b>	<b>40</b>	<b>Total Cost</b>	<b>P25,460.00</b>

Fig. 15. WEB-CONCISE PDF Summary

Figure 15 indicates a sample of the Portable Display File (PDF) to be sent to the user’s e-mail which contains the summary of construction materials being purchased. The summaries are sorted based on the supplier of each material.

**K. Respondents’ Assessment on How can Construction Materials for Material Procurement be identified through a Website considering User Location**

Table II indicates the respondents’ assessment of the function of WEB-CONCISE in terms of material procurement, considering user location. With the data presented, the respondents strongly agree with the indicators because of the acquired grand mean of 4.72, which falls within the 4.21–5.00 range based on the Likert scale.

TABLE II. Respondents’ Assessment on How can Construction Materials for Material Procurement be identified through a Website considering User Location

Indicators	Weighted Mean	Descriptive Rating
1. Suppliers are categorized based on their location on the website.	4.76	Strongly agree
2. Construction material procurement based on user location is made possible through the website.	4.67	Strongly agree
<b>Grand Mean</b>	<b>4.72</b>	<b>Strongly agree</b>

**L. Respondents’ Assessment on How can Construction Materials for Material Procurement be identified**



*through a Website considering Material Category and Specific Material Listing*

Table III shows the respondents' evaluation of WEB-CONCISE's material procurement function, considering material categories and specific material listings. According to the data, the respondents strongly agree with the indicators. This is because of the accumulated grand mean of 4.75, which falls between the 4.21–5.00 range on the Likert scale.

TABLE III. Respondents' Assessment on How can Construction Materials for Material Procurement be identified through a Website considering Material Category and Specific Material Listing

Indicators	Weighted Mean	Descriptive Rating
1. Category, details, specifications, variations, and images of construction materials for user reference are provided on the website.	4.79	Strongly agree
2. Construction material procurement based on a specific material is made possible through the website.	4.71	Strongly agree
<b>Grand Mean</b>	<b>4.75</b>	<b>Strongly agree</b>

*M. Respondents' Assessment on How can Construction Materials for Material Procurement be identified through a Website considering Pricing*

Table IV shows how respondents rated the material procurement function of WEB-CONCISE, considering pricing. Based on the data, respondents strongly agree with the indicators. This is due to the acquired grand mean of 4.91, which falls between the 4.21–5.00 range on the Likert scale.

TABLE IV. Respondents' Assessment on How can Construction Materials for Material Procurement be identified through a Website considering Pricing

Indicators	Weighted Mean	Descriptive Rating
1. The prices of the main products and sub-products are indicated on the website.	4.88	Strongly agree
2. Construction material procurement based on the highest and lowest prices are made possible through the website.	4.93	Strongly agree
<b>Grand Mean</b>	<b>4.91</b>	<b>Strongly agree</b>

*N. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Listing Construction Materials*

Table V shows the respondents' assessment of the function of WEB-CONCISE in terms of the

inventory of construction material suppliers by listing construction materials. With the data obtained, the respondents strongly agree with the indicators due to the acquired grand mean of 4.75, which falls within the 4.21–5.00 range based on the Likert scale.

TABLE V. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Listing Construction Materials

Indicators	Weighted Mean	Descriptive Rating
1. A supplier can register and login to the user dashboard for listing construction materials after sending an inquiry.	4.74	Strongly agree
2. Details, specifications, variations, and images of construction materials for user reference can be uploaded in the website.	4.76	Strongly agree
<b>Grand Mean</b>	<b>4.75</b>	<b>Strongly agree</b>

*O. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Updating Product Details*

Table VI shows the respondents' evaluation of the function of WEB-CONCISE on the inventory of construction material suppliers by updating product details. According to the data presented, the respondents strongly agree with the indicators. This is because of the accumulated grand mean of 4.73, which falls between the 4.21 – 5.00 range on the Likert scale.

TABLE VI. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Updating Product Details

Indicators	Weighted Mean	Descriptive Rating
1. Details, specifications, variations, and images of construction materials for user reference can be updated on the website.	4.71	Strongly agree
2. The updated details, specifications, variations, and images of construction materials are reflected on the website after editing.	4.74	Strongly agree
<b>Grand Mean</b>	<b>4.73</b>	<b>Strongly agree</b>

*P. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Updating Product Pricing*

Table VII shows how respondents rated the inventory of construction material suppliers function of WEB-CONCISE by updating product pricing. Based on the data provided, respondents strongly agree with the indicators. This is due to the acquired grand mean of 4.75, which falls between the 4.21 – 5.00 range on the Likert scale.

TABLE VII. Respondents' Assessment on How can Available Construction Materials be offered for Material Procurement through a Website in terms of Updating Product Pricing

Indicators	Weighted Mean	Descriptive Rating
1. Prices of construction materials for user reference can be updated on the website.	4.71	Strongly agree
2. The updated prices of construction materials are reflected on the website after editing.	4.79	Strongly agree
<b>Grand Mean</b>	<b>4.75</b>	<b>Strongly agree</b>

**Q. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Computing the Quantity Needed**

Table VIII shows the respondents' evaluation of WEB-CONCISE's quantity estimation function by computing the quantity needed. According to the data provided, the respondents strongly agree with the indicators. This is because of the accumulated grand mean of 4.80, which is included between the 4.21 – 5.00 range on the Likert scale.

TABLE VIII. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Computing the Quantity Needed

Indicators	Weighted Mean	Descriptive Rating
1. The input of required data for the quantity estimation (i.e. measurements, material type, and size of material) is included on the website.	4.81	Strongly agree
2. The quantity estimator reliably solves and displays the required material quantity.	4.79	Strongly agree
<b>Grand Mean</b>	<b>4.80</b>	<b>Strongly agree</b>

**R. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Computing the Total Cost Needed**

Table IX shows the respondents' evaluation of the function of WEB-CONCISE on quantity

estimation by computing the total cost needed. According to the data presented, the respondents strongly agree with the indicators because of the accumulated grand mean of 4.77, which satisfies the 4.21 – 5.00 range on the Likert scale.

TABLE IX. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Computing the Total Cost Needed

Indicators	Weighted Mean	Descriptive Rating
1. The total cost of materials is provided after choosing the quantity and materials to purchase.	4.79	Strongly agree
2. The quantity multiplied by the pricing is computed precisely in the website.	4.74	Strongly agree
<b>Grand Mean</b>	<b>4.77</b>	<b>Strongly agree</b>

**S. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Summarizing Construction Materials with Quantity and Cost in a List**

Table X shows how respondents rated quantity estimation function of WEB-CONCISE by summarizing construction materials with quantity and cost in a list. Based on the data provided, respondents strongly agree with the indicators. This is due to the acquired grand mean of 4.78, which falls between the 4.21 – 5.00 range on the Likert scale.

TABLE X. Respondents' Assessment on How can Quantity Estimation of Construction Materials be done through a Website in terms of Summarizing Construction Materials with Quantity and Cost in a List

Indicators	Weighted Mean	Descriptive Rating
1. The details of the supplier and chosen construction materials are reflected in the purchase summary sent via email.	4.81	Strongly agree
2. The quantity and total cost of chosen construction materials are reflected in the purchase summary sent via email.	4.74	Strongly agree
<b>Grand Mean</b>	<b>4.78</b>	<b>Strongly agree</b>

**T. Interpretation of Qualitative Data from Survey Questionnaires for the Website Assessment using Verbal Descriptions**

After the respondents simulated the website, they provided comments and suggestions based on

their experiences, which serve as the verbal data of the study. Below are the comments and suggestions of the respondents:

1. Respondent 1: “The website provides an easy summary of the functions of contractors, suppliers, and estimators where they can do the work instantly, which saves effort.”
2. Respondent 2: “The items are easily found when I searched for a specific material upon looking based on material, location, and supplier and everything is summarized that makes the work a lot faster.”
3. Respondent 3: “The filters really helped me in looking for materials which makes the work lot faster.”
4. Respondent 4: “The website gives a PDF to my email after purchasing the materials that is helpful to save time when summarizing the materials I want to purchase.”
5. Respondent 5: “It helps to do fast transactions to the suppliers when I am planning to purchase since the materials, details, and prices are already summarized.”
6. Respondent 6: “Our business can be easily registered where our materials can be also included and the log-in function can be accessed easily.”
7. Respondent 7: “The website functions like an online brochure for our materials which helps buyers to browse for possible materials quickly because each item has prices, details, and images.”
8. Respondent 8: “We can use this website so that our clients will take a short time in asking for the specifications of the materials and quantity since details are already posted and it has an estimate calculator that can save plenty of time.”
9. Respondent 9: “It loads the materials fast and after editing the details on the dashboard, they are reflected instantly.”
10. Respondent 10: “It is helpful because it makes the purchase a lot faster if our buyers already have a summary of what they are planning to purchase. It saves time instead of asking the materials physically.”
11. Respondent 11: “It is secured because it has a registration for estimators.”
12. Respondent 12: “The website produces instant estimates in just a matter of seconds after I entered the dimensions and information needed.”
13. Respondent 13: “Even though we already have our own estimation software, the website is useful for instant results if you want to compute quantity on the spot.”

The verbal data provided by the respondents is thematically analyzed in order to determine the reoccurring ideas based on the website simulation. The common ideas that appeared in the comments and suggestions include saving time, informing buyers with details for faster transactions, providing a summary, doing the work instantly, showing instant results, and taking a short time. Through the repetition of these principles after the website assessment, WEB-CONCISE saves time, provides the details of the materials, does the summary of wanted purchases, and it shows instant results that can minimize delays.

## VI. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

### A. Summary of the Findings

1. The finalization of WEB-CONCISE includes the consent approval of thirty-six suppliers in Pampanga.
2. The finalization also reveals that during December, January, and March, prices of construction materials most likely rise, while during rainy seasons in June and July, prices most probably drop.
3. The final output of WEB-CONCISE is composed mainly of the Homepage, About Us Page, Construction Material Procurement Page, Procurement-General Search Page, Procurement-Search by Location Page, Procurement-Search by Preferred Supplier Page, Supplier Registration Inquiry, Supplier Dashboard for Publishing Materials, Quantity Estimator Registration, Quantity Estimator

Registration Approval, Estimate Calculator Main Page, Estimate Computation, and PDF Summary.

4. The results based on the respondents' assessment of how construction materials for material procurement can be identified through a website considering user location, material category, specific material listing, and pricing reveal that they strongly agree that WEB-CONCISE functions well in terms of construction material procurement.
5. The results, considering the respondents' assessment of how construction materials can be offered for material procurement through a website in terms of listing construction materials, updating product details, and updating product pricing, show that they strongly agree that WEB-CONCISE functions great in terms of the inventory of construction material suppliers.
6. The results, considering the respondents' assessment of how quantity estimation of construction materials can be done through a website in terms of computing the quantity needed, computing the total cost needed, and summarizing construction materials with quantity and cost in a list, reveal that they strongly agree that WEB-CONCISE functions great in terms of quantity estimation.
7. From the descriptive rating of strongly agree and verbal interpretation considering material procurement, WEB-CONCISE is considered functional in being an e-commerce platform—an alternative to traditional procurement—through the utilization of technology in order to cope with construction delays because materials are easily determined based on the filters and the materials are sorted and summarized in a list that serves as the buyer reference for the purchase, which makes the work a lot faster.
8. From the descriptive rating of strongly agree and verbal interpretation considering the inventory of construction material suppliers, WEB-CONCISE is considered functional in

providing a platform for suppliers to utilize e-commerce as part of being an aid to delays because the suppliers can add, edit, and upload their materials easily, and the website gives brochure-type displays for the supplier's potential buyers, which saves time and effort when acquiring details and prices.

9. From the descriptive rating of strongly agree and verbal interpretation considering the estimate calculator, WEB-CONCISE is considered functional in producing instant quantity estimates because the website instantly reflects the results in seconds, which saves time and effort rather than doing manual estimates.
10. WEB-CONCISE aligns with SGD Number 9: Industry, Innovation, and Infrastructure, developed to improve the technological capabilities of the construction industry to lessen construction setbacks.

#### **B. Conclusions**

Upon considering the turn-over of the initial analysis questionnaires, a conclusion is to be drawn that WEB-CONCISE has 36 initial participants for making construction material procurement in Pampanga possible through a website. The efficiency of the construction material procurement function of WEB-CONCISE makes it easier to find available construction materials considering user location, material category, specific material listing, and pricing. The functionality of WEB-CONCISE when it comes to the inventory of construction material suppliers makes it possible to offer available construction materials for material procurement through a website in terms of listing construction materials, updating product details, and updating product pricing. Lastly, the estimate calculator of WEB-CONCISE provides a platform for quantity estimation of construction materials by computing the quantity needed, computing the total cost needed, and summarizing construction materials with quantity and cost in a list. Overall, WEB-CONCISE is a multifunctional procurement, inventory, and estimation website that is helpful to different stakeholders in the engineering profession in limiting construction delays because it is an



alternative to traditional procurement, inventory, and estimation, based on the respondents descriptive rating and verbal interpretation.

### C. Recommendations

1. Analyze using ANOVA the price trend analysis, market analysis, risk assessment, and sustainability metrics.
2. Include the evaluation using ISO 25010, or the quality model for ICT and software products.
3. Conduct a time simulation for the respondents to assess whether the website provides faster work compared to doing manual tasks in order to quantify the effectiveness of the website in terms of minimizing construction delays.
4. Acquire the assessment of an information technology professional to assess the technical side of WEB-CONCISE because the proponents are mainly focused on the engineering part.
5. Since the study is intended for small-scale projects, conduct data gathering from local government units in Pampanga in order to determine the scope of small-scale projects and further support the study's relevance to the engineering field.
6. Include an option for suppliers to indicate if they have a Philippine Government Electronic Procurement System (PhilGEPS) registration in order to have an additional filter that will inform a user in case a purchase is about to be made under government agencies for construction material procurement.
7. Provide an actual input of the available quantity of the stocks of construction materials for the supplier's inventory
8. Develop the integration of the admin-supplier relationship in order to encourage the suppliers to continuously upload their materials and use the website practically.
9. Increase the database server capacity for further addition of users, materials, and data integration.

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