

EZ BUILD: A DIGITAL SOLUTION TO EFFECTIVE MATERIAL PROCUREMENT



FINAL YEAR PROJECT UG – 2019

By

Muhammad Ali Khan (G.L)	- 296956
Muhammad Bilal Dawood	- 287211
Zain ul Abideen	- 285201

(UG BECE 2019 NICE SCEE NUST)

Supervisor

Dr. Muhammad Usman Hassan

NUST Institute of Civil Engineering (NICE)
School of Civil and Environmental Engineering (SCEE)
National University of Sciences and Technology (NUST)
Islamabad, Pakistan
Year 2023

CERTIFICATION

This is to certify that the thesis entitled

EZ Build: A digital solution to effective material procurement

Submitted by

Muhammad Ali Khan (G.L)	296956
Muhammad Bilal Dawood	287211
Zain ul Abideen	285201

has been accepted towards the fulfillment of the requirements

for the award of an undergraduate degree

in

Bachelor of Engineering in Civil Engineering

Dr. Muhammad Usman Hassan

Assistant Professor

Construction Engineering and Management Department

NUST Institute of Civil Engineering (NICE)

School of Civil and Environmental Engineering (SCEE)

National University of Sciences and Technology, Islamabad, Pakistan

We hereby dedicate this project to our parents, teachers, our seniors, our juniors, and the unfound potential of the construction industry.

Acknowledgement

We are grateful to Almighty Allah for giving us the opportunity to complete this research document by granting us strength, courage, and perseverance. We additionally accept the open door to offer our thanks and regard to our parents and siblings, without whose supplications and wishes we could never have possessed the capacity to fulfill our objectives.

It is of most extreme important to recognize and thank our advisor and mentor Dr. Usman Hassan, for all his admirable direction, help and inspiration given all through degree of our project. It is with his support that we have been fruitful in accomplishing our goals.

Abstract

In the contemporary world, different sectors of the construction industry are shifting towards digitization to increase the yield of the construction industry. Therefore, we introduce EZ Build a digital solution to effective material procurement. The motive behind this platform is to streamline the material procurement process by providing vendors with a common platform and exploring new opportunities. Clients can contact vendors online and order the required material from the most suitable vendor. The website allows e-tendering for material procurement and has a responsive AI Chabot that answers your queries in the context of civil engineering terms.

The aim of the website is to reduce communication barriers and to smoothen the material procurement process through our simple UI design. The Chabot, daily price update and nearby vendors detecting system are also integrated into the website to remove any difficulty a client might have while ordering material online.

Declaration

It is hereby solemnly and sincerely declared that the work referred to in this thesis project has not been used by any other university or institute of learnings as part of another qualification or degree. The research carried out and the dissertation prepared was consistent with normal supervisory practice and all the external sources of information used have been acknowledged.

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Chapter 1: INTRODUCTION

1.1 Background

During the construction phase inappropriate supervision and management of construction materials at the site will directly affect the total cost, time, and the quality of the construction project (Kasim, Anumba 2005). In developing countries cost overruns in construction projects mostly occur due to delay within the delivery of materials and instruments management to construction sites (Manavazhi and Adhikari 2002). Arrange the buying and issuing of plans for delivering to different vendors and then following that up to manage properly till material delivery on time is the context of procurement (Payne, Chelsom et al. 1996). Our Motive behind creating a digital platform for material procurement was to streamline the process by smoothening the communication between the two stakeholders involved. And integrating a responsive chatbot to act as a consultant in case of any confusion while ordering.

1.2 Problem statement

Construction industry is one of the largest employments generating industries in the world. The construction, renovation, maintenance and demolition of buildings and civil engineering projects together accounted for over 273 million (part-time and full time) jobs worldwide in 2014, constituting an estimated 8.6% of the total global employment (Infrastructure and Cities for Economic Development (ICED), 2018)

Construction industry, being the driving force behind the world's economy, still lacks technological advancements as compared to other industries. Construction industry

has experienced a lack of efficiency improvement. It has only managed to reach approximately half of the efficiency improvements compared to other industries in the last 50 years (Kraatz, Hampson, & Sanchez et al. 2014).

So, looking into this industry, to get construction or renovation tasks done, it is important for you to select the most experienced and cost-effective construction procurement process for the completion of the project. The construction industry has a lot of untapped potentials and is not producing the yield it is capable of. This is due to the barriers to communication between the parties involved in a project. It is a lot of hassle for the client to find the appropriate vendor to supply material of the required quality. A lot of time and money is wasted in the search for the perfect vendor.

Delays in finding a suitable vendor and any issues in the supply of material can result in the delay of the project, costing heavy amounts and resources to the client.

Currently, there is no centralized platform for procuring material online with options for uploading tenders and the performance evaluation of the vendor to ensure their credibility.

Hence there is a sheer lack of a single centralized platform for effective construction material procurement, this loophole is the reason behind the creation of the E Proc system. It aims to address all these problems simultaneously while giving the client a complete sense of hold over the entire process with better and more frequent job opportunities for vendors.

1.3 Research objectives

The aim of this profound research was to see which sector of the construction industry could be improved and a transition of procurement from traditional and tedious ways

to digital online procurement of materials and to increase the efficiency of the construction industry and save time and costs.

1.4 Competition

One of the major reasons for the construction industry lagging other industries in efficiency is lack of digitalization and automation. This lack of automation and digitization puts hindrances in the workflows of construction processes. The sub-optimal working process is caused by fundamental problems with time overruns, quality problems, conflicts between stakeholders and a low level of knowledge transfer between actors (Kraatz, Hampson, & Sanchez et al. 2014).

There are certain platforms available which offer services such as buying construction materials. But what they all lack is innovation and to remain the neutral third party which just plays its part to connect vendors to buyers in effective ways portal, to post tenders for different vendors to bid on for competitive pricing, a proper review system of the vendors, and an AI chatbot for support and option to register either as a vendor or a client.

1.5 Methodology

The study will be carried on by extensive research, data collection, UI development, data acquisition in the database, an easier and more understandable project procurement acquisition process for the vendors and buyers, a fair rating criterion, and the digitization of information which will then serve as a means of contacting vendors and client for project information.

We aim to fill in this gap with our new and improved online platform with help of new features, an intuitive User Interface (UI) that aids the everyday client to find the best

selection for the project through our data archives and reducing the communication barriers. The whole purpose of proposing this idea is to improve client satisfaction, save them from the hassle and help bring clients and vendors on a single centralized system along with improving the basic process of material procurement.

1.6 Conclusion

Keeping in view the recent advancement and development of smart management systems worldwide for the online procurement portal, we aim to introduce a new readily available, usable and accessible smart application for the low income masses to aid them in their search for jobs, helping the clients find suitable vendors for the required procurement through a location based digital database and archives of registered vendors along with a simple bid posting, new project finding traits for our audience to find the best possible option for both the client and the vendors. Furthermore, for the assistance of both parties, the E-receipts portal and AI chatbot was added. This platform was made as a junction for the construction industry, to modernise the procurement sector and increase the overall yield of the industry.

Chapter 2: LITERATURE REVIEW

2.1 e-Procurement

2.1.1 What is e-procurement

The process of requisitioning, ordering, and acquiring products and services online is known as electronic procurement, sometimes known as e-procurement or supplier exchange. When properly implemented, e-procurement establishes a direct line of communication between a company and a supplier, allowing for interactions such as bids, purchase orders, and Emails (Isikdag, U. et al. 2019).

2.1.2 Comparison between e-procurement and traditional procurement

Traditional procurement entailed administering the function manually, with a strong reliance on paperwork, making phone calls to people for updates, and so on, whereas E-procurement makes use of a web interface or other networked system to connect suppliers and clients.

2.1.3 Advantages of e-procurement over traditional methods

Traditional procurement is the age-old, conservative method of procurement that relies on manual operations, heavy paperwork, phone calls, and other forms of communication, whereas E-procurement is a more strategic and digitalized approach. E-procurement not only replaces traditional procurement functions, but it also adds value, improves transparency, and speeds up corporate operations dramatically.

In traditional procurement, suppliers often as to be physically present in specific locations, and clients must visit suppliers and attend meetings whereas we can remotely access any retailer 24/7 which allows procurement activities anywhere with an internet connection. For improvement and optimization of their procurement strategies, it is difficult to track and observe behavior and patterns in the traditional procurement system, and companies couldn't realize significant value or savings to negotiate better contracts without a clear, streamlined view of operations and transactions, whereas in e-Procurement, all information is centralized and can be made available to management, stakeholders, shareholders, or the public, as appropriate, enhancing transparency (Hawking, P. and Stein, A. 2002). Companies can also watch their expenditure in real time, which helps them better manage and monitor their spending as well as track savings, resulting in a significant reduction in maverick spending. Companies can also optimize their workflow by having a streamlined process between different sections of organization which may require manual data entry and long process in traditional system.

It was difficult to manage connections with suppliers and track their performance when procurement was done manually. E-procurement software gives businesses a better understanding of their purchasing operations and a better handle on the life cycle of their supplier contracts.

2.1.4 Benefits of e-procurement

- It is cost-effective. Built-in monitoring tools assist with cost control and performance optimization while decreasing expense and paperwork. Fully automated solutions streamline procedures and potentially shorten the time it takes from order

creation to fulfilment. There is also the possibility of a wider range of products and services.

- E-procurement also improves visibility into enterprise procurement spending and provides better reporting of procurement trends and KPIs.
- There are shorter purchasing cycles.
- E-procurement aids in the automation of the purchasing process. Reduced delivery timelines and procurement cycles are aided by centralised transaction tracking, simpler reporting, and contract compliance.

2.1.5 Challenges faced by e procurement

Installing and integrating an e-procurement application with other corporate back-end systems are two of the most difficult aspects of the process. Another challenge is teaching staff how to utilise it. Companies must also collaborate with their suppliers to guarantee a smooth transition to the new online system. Seeing a complicated and unintuitive user interface that the user is unfamiliar with is an added challenge. Being subject to hacker attacks and the difficulty in getting the suppliers to cooperate electronically further the list (Isikdag, U. et al. 2019).

2.2 Analysis of other e-procurement platforms

2.2.1 Existing apps and opportunities in the market

There are some already existing apps and websites that tried to use an online platform-based procurement of different materials, to get an idea of their strategies, we analysed platforms using different ways to supply the material than each other.

Zarea is a service that small project contractors can use to get help with the procurement of general items. It also provides a delivery service for items that take a couple of days to complete various home improvement projects. The client can sign up to use Zarea platform and can buy different materials and explore different brands from the website. Zarea sells the product itself and involves no local vendors.

The UI of Zarea's application is simplistic and elegant with a nicely designed home page that allows users to search for service providers that are suited to their desired job.

Clicking or searching any category of the products which would take us to required product in few steps. This is because Zakea categorizes both contractors and users by their zip codes and links the pre-screened professionals with the help of it.

In Reccichem, it provides a variety of materials that are their plant processed so they provided multiple options where we can get extensive technical information in pdf about product and their uses. Any client will have technical knowledge of the product and it lowers the chance of wrong use of the product and the client will have trust in the product.

Just like Daraz, our platform would utilize keywords and location to link clients with vendors. The keywords would result in more accurate results in terms of provision of specific vendors than going through extensive series of categories, it would ultimately be more user friendly which is extremely detrimental to our project. You can get a custom quotation for your own specific job by giving specific keywords.

FoodPanda is Pakistan's largest online food delivery portal which emphasizes on placing and delivering orders in a time effective manner.

It boasts a unique, yet simple user interface used by millions of people all around the world. FoodPanda, just like our proposed platform provides services around a pre-determined radial area of the specific service provider (in the case of FoodPanda, restaurants are the material providers) which needs to undergo a certain screening procedure to be able to provide services on the platform.

Similar to our application, FoodPanda asks users to provide access to their location or enter their location manually via google maps.

Dsspak.pk is an online platform to help find and procure material. It does provide its services in product bundling which helps the client and boost revenue with lower costs. Similarly, Buildersmart is also an online platform that focuses on providing services for the whole project, and material is provided according to client requirements.

In all these platforms except Daraz, one common thing was that they were online warehouses instead of being the 3rd party that focuses on connecting material suppliers to potential clients. The platform can earn its cut through service charges once the order is completed and it also cuts the delivery charges plus increases the material accessibility and availability around the project.

2.2.2 Issues with material procurement in Pakistan

It is common practice in Pakistan to procure the material from the same few suppliers for every project because it is a big hustle to find specific suppliers according to our needs. Many suppliers miss on the opportunity despite being the better option and miss out on the opportunity of breaking through this system of material procurement which is a loss on both sides.

2.3 User Interface

2.3.1 Steps for user interface

The user interface determines the approach user have towards the website, UI is more than selecting the colour and placement of elements of website. It is devoted to selecting the appropriate visual tools for the assigned technical tasks.

The most effective user interfaces are essentially undetectable. They avoid unnecessary features and use straightforward language in conversations and on labels. To create uniformity, use standard UI components. If you use common elements in your UI, users will feel more comfortable and be able to finish jobs faster. It should be in line with the technical implementation of the product, deliver the intended message to the end user, and satisfy their wants and preferences.

A digital product can achieve higher user retention and engagement by having a solid understanding of its target audience. The main objective of every online or website is to reduce users' pain points, which is impossible to do without first comprehending how users interact with the app.

Major developments are not a surprise to users of leading digital solutions. To maintain a unified appearance and feel across all UI designs, they instead use brand manuals and company style guides.

The user interface should be developed in such a way that any flaws may be addressed promptly. Users will not become irritated with your website if they accidentally tap the wrong button this way.

A good user interface utilizes the following principles:

- well-defined target audience
- familiar with UI elements
- attractive visuals
- design is made for people.
- all features are easily accessible.
- a limited number of gestures
- intuitive user navigation
- consistency throughout a digital product
- feedback on user actions
- well-defined target audience

2.3.2 Common issues in UI

A challenge with some user interface designs is organization. Navigation and hierarchy are two examples of poor navigation in a user interface design.

Visitors may become perplexed if the page lacks organizational order. Additionally, it might give customers a negative opinion of the business.

2.3.3 Logical processes

The detailed needs of an application system are modeled using a logical-level process model. It describes how processes behave and how they interact. Different app and website models, such as Daraz, Amazon, Alibaba.pk, and Upwork, have influenced the logical process.

Chapter 3: METHODOLOGY

3.1 General background

We aim to introduce an online platform for material procurement in Pakistan. The online procuring services will be provided through e-Proc, an online procurement website that is user-friendly and simple to use and that covers the missing features of existing platforms. Clients will be able to post the construction projects/tenders that are required and material providers within their locality will be able to bid for the posted projects. A rating-based criterion will be in play where the material providers with the best reviews will be displayed on priority minimizing the hassle of performance evaluation of suppliers. To further identify consumer wants, Google forms and voting polls were posted. Our statistical analysis supports our UI design and additional features because the goal was to establish a platform that improves usability.

In Pakistan's construction industry, material procurement can be broadly categorized into two groups: suppliers who utilize advanced digital platforms and are adept at navigating online marketplaces, and those who depend on conventional procurement methods. To cater to both groups, our platform features an intuitive interface that streamlines the registration process, requiring only essential information from suppliers. This approach ensures that suppliers who have not yet embraced digital solutions are included in our database.

When a material request remains unfulfilled on the application for a specified duration, our system will proactively reach out to suppliers to facilitate the

procurement process. This innovative approach aims to expand material procurement opportunities in the construction market while minimizing unproductive time for both suppliers and contractors.

Our platform seeks to bridge the digital divide in Pakistan's construction industry by making online material procurement accessible to a wider range of suppliers. A primary objective of our business is to simplify the material selection and acquisition process, connecting suppliers and clients through a web-based application. This strategy fosters increased competition in the market, encouraging suppliers to offer the highest quality materials and services to meet client demands.

We want to keep the platform's understanding requirements to a minimum, and as word of mouth grows, more capabilities can be added to enhance both the authentication and delivery processes.

3.2 Our steps

Our material procurement project methodology is designed to ensure that we develop a platform that meets the unique needs of the construction industry in Pakistan. The methodology is divided into four major steps, each of which plays a critical role in the success of the project:

1. Extensive Research:
 - This phase involves conducting in-depth research on the construction industry in Pakistan, including the current state of material procurement, the challenges faced by suppliers and contractors, and the latest trends and technologies in the market.
 - Analyzing the procurement processes of leading companies in the industry to identify best practices and areas for improvement.

2. Comparative Analysis:

- In this phase, a comparative analysis of different material procurement platforms and marketplaces to identify their strengths and weaknesses will be conducted.

- The analysis will help us identify the features and functionalities that are most important to suppliers and contractors and inform the development of our own platform.

3. Data Collection:

- This phase involves collecting data on suppliers and contractors in the construction industry in Pakistan, including their contact information, material preferences, and procurement history.

- It also involve surveys to collect data of user preferences for the platform to be built to make it more user friendly and engaging for the users.

4. Website Development:

- The final phase of the methodology involves the development of our material procurement application, which will be designed to meet the specific needs of suppliers and contractors in the construction industry in Pakistan.

- All the necessary features and add ons will also be build in this step.

These four major categories have been further sub divided into various steps to ease the flow of project.

3.2.1 Extensive research

The initial phase of our methodology involved drawing conclusions from a thorough investigation conducted as part of the literature review. The primary objective of this research was to gain insights into the current state of the digital market in Pakistan. Identifying gaps within the industry and pinpointing specific areas where our material procurement platform, EZ Build, could make a difference was crucial. It became apparent that there is a significant digital divide in Pakistan, and the country lacks specialized platforms dedicated to providing high-quality online services, particularly within a single market. Due to the multidisciplinary nature of existing platforms in Pakistan, designers struggle to achieve simplicity in their designs. By targeting the material procurement market specifically, EZ Build addresses the unique requirements of this industry in Pakistan and caters to its needs effectively.

3.2.2 Comparative analysis

In order to come up with an optimized and comprehensive platform a comparative analysis of four companies operating in the construction e-commerce space: Zarya.pk, DSSPak.pk, BuildSmart, and Ressichem.com. The analysis will focus on their product offerings, user experience, pricing, and other relevant factors. Despite the good features of these platforms other essential feature are also inculcated in EZ Build.

Zarea:

It offers a wide range of construction materials, including cement, steel, bricks, and sand, as well as construction tools and equipment. It features a user-friendly interface with easy navigation, detailed product information, and a secure checkout process. Offers competitive pricing for a wide range of construction materials and tools, with

discounts for bulk orders. Also provides customer support through phone, email, and live chat, along with delivery and installation services for selected products. It does not provide daily prices, reviews, instant customer support.



Figure 1: Logo Zarea

Resschem:

It offers a wide range of construction materials, including cement, steel, bricks, and sand, as well as construction tools and equipment. It features a user-friendly interface with easy navigation, detailed product information, and a secure checkout process. Offers competitive pricing for a wide range of construction materials and tools, with discounts for bulk orders. Also provides customer support through phone, email, and live chat, along with delivery and installation services for selected products. It does not provide daily prices, reviews, instant customer support.



Figure 2: Logo Ressichem

Dsspak:

It provides a variety of construction materials, such as cement, steel, and bricks, along with construction chemicals and waterproofing solutions. Offers a clean and organized layout, with filters for different material categories and a responsive design for both desktop and mobile devices. It provides market-competitive prices for construction

materials and chemicals, with a focus on quality and reliability. Also offers customer support via phone and email, with a focus on timely delivery and customer satisfaction.



Figure 3: Logo Dsspak

Buildersmart:

Specializes in sustainable and eco-friendly construction materials, including green cement, recycled aggregates, and energy-efficient insulation. Provides a visually appealing and informative website, with a focus on sustainability and eco-friendly construction practices. Prices may be higher due to the focus on sustainable and eco-friendly materials, but the long-term benefits and cost savings can offset the initial investment. Features a dedicated customer support team, along with resources and guides on sustainable construction practices.



Figure 4: Logo Builder Smart

To summarize, it was identified that the introduced platform must have a simple UI that the already lacking construction material industry could find progressive way. Features such as quick delivery, locating nearby store, AI integration and Big digital database to the advance in use for procurement industry and hence, were incorporated in our application. On the other hand, features such as reviews, Ads, and AI integration can greatly benefit the client and were hence, incorporated by e-Procurement platform. The results can be encapsulated as below:

Table 1: Comparative analysis

Websites	Delivery time	Daily Prices	Reviews	Info of vendors	Rating System	Responsive chatbots
Zarea	2-3 days	Nil	Nil	Nil	Nil	Nil
Dsspak	-	Nil	Nil	Nil	Nil	Nil
Buildersmart	3-5 days	Nil	Nil	Nil	Nil	Nil
Ressichem	-	Nil	Y	Y	Nil	Nil

3.2.3 Data collection

The next step of our methodology was collecting data to understand the user requirements for the UI/UX. To begin with, first all the possible stakeholders are to be identified, and arranged in power interest matrix. Then to improve the user experience and to evaluate the suggested feature a Voting Poll and an in-depth UI/UX survey Google form are circulated.

3.2.3.1 Stakeholders' analysis

To start off, it was immensely important for us to identify all the important stakeholders of the platform that was being created. Upon identifying they were assessed on the basis of their power-interest matrix understanding the usage and

influence of every stakeholder on the platform. Some possible stakeholders for the construction e-commerce website project, along with their power index grid rankings:

Project Owners/Clients:

- Power: High
- Interest: High
- Project owners/clients are the primary stakeholders for the construction e-commerce website project, as they are the ones who will be using the platform to find contractors, suppliers, and materials for their construction projects. They have a high level of power and interest in the project, as their satisfaction and feedback will be critical to the success of the platform.

Contractors:

- Power: High
- Interest: High
- Contractors are another key stakeholder for the construction e-commerce website project, as they will be using the platform to find new projects and clients. They have a high level of power and interest in the project, as their participation and feedback will be critical to the success of the platform.

Suppliers:

- Power: High
- Interest: High
- Suppliers are also a key stakeholder for the construction e-commerce website project, as they will be using the platform to find new customers and expand their

business. They have a high level of power and interest in the project, as their participation and feedback will be critical to the success of the platform.

Web Developers:

- Power: Medium
- Interest: High
- Web developers are responsible for designing and developing the construction e-commerce website, and they have a medium level of power and high level of interest in the project. Their expertise and feedback will be critical to the success of the platform, but they may not have as much power as the primary stakeholders.

Investors:

- Power: Medium
- Interest: High
- Investors are another key stakeholder for the construction e-commerce website project, as they will be providing funding and resources for the platform. They have a medium level of power and high level of interest in the project, as their investment and feedback will be critical to the success of the platform.

Regulators:

- Power: Low
- Interest: Medium
- Regulators, such as government agencies and industry associations, may have some influence over the construction e-commerce website project, but they have a low level of power and medium level of interest. Their main concern may be ensuring that the platform complies with relevant regulations and standards.

Competitors:

- Power: Low

- Interest: Low

- Competitors may have some interest in the construction e-commerce website project, but they have a low level of power and interest. Their main concern may be monitoring the platform for potential threats or opportunities.

By conducting a stakeholder analysis and sorting stakeholders on the basis of their power and interest, you can identify key stakeholders and prioritize their needs and concerns.

Table 2: Stakeholder Analysis

Stakeholder Analysis		
Stakeholder	Interest	Power
Construction Company Owner	8	8
Material Supplier	8	8
Project managers	8	8
Website developers and IT support	8	8
Government regulator	8	8
Financial institutions (e.g. Banks)	4	8
Industry associates	4	8
Construction workers	4	8
Site supervisor	8	4
Architects and engineers	8	4
Clients	8	4
Logistics Provider	8	4
Local community members	8	4
Environmental organizations	4	4
Competing digital platforms	4	4

The stakeholder analysis identified several key stakeholders for the construction e-commerce website project, including project owners/clients, contractors, suppliers, web developers, investors, regulators, and competitors.

Based on their power and interest in the project, the stakeholders were sorted into a power index grid, with project owners/clients, contractors, and suppliers having the highest power and interest, followed by web developers and investors with medium power and high interest. Regulators and competitors had low power and interest in the project.

The stakeholder analysis helped identify the key stakeholders and prioritize their needs and concerns. This information can be used to develop a more effective project plan and communication strategy and ensure that the construction e-commerce website project meets the needs of all stakeholders.

3.2.3.2 UX/UI design requirements

When asked for key features that a UI must have, users went on to respond with answers such as “User-friendly”, “Simplicity”, and “Responsiveness”. Users were also questioned about their opinions on the current gaps in the UI/UX present in Pakistan. Respondents had answers such as “Information and guide”, “Minimalist design language”, “A basic theme of action”, and “User-friendliness”. The opinions were incorporated into our UI/UX in such a way as to simplify the use for any first-time user and create an intuitive platform that is easy to comprehend for every class.

3.2.4 Website development

This marks the final stage of our project expanding on the research and developing the researched UI/UX best fit to the population it aims to target, clients and vendors.

3.2.4.1 The UI/UX

After thorough market and UI research, a simplistic UI/UX was designed on Squarespace. The UI/UX design on Squarespace is focused on providing a user-friendly and visually appealing experience for users who want to create and manage their websites. Squarespace is known for its clean, modern, and professional templates that cater to a wide range of industries and purposes.

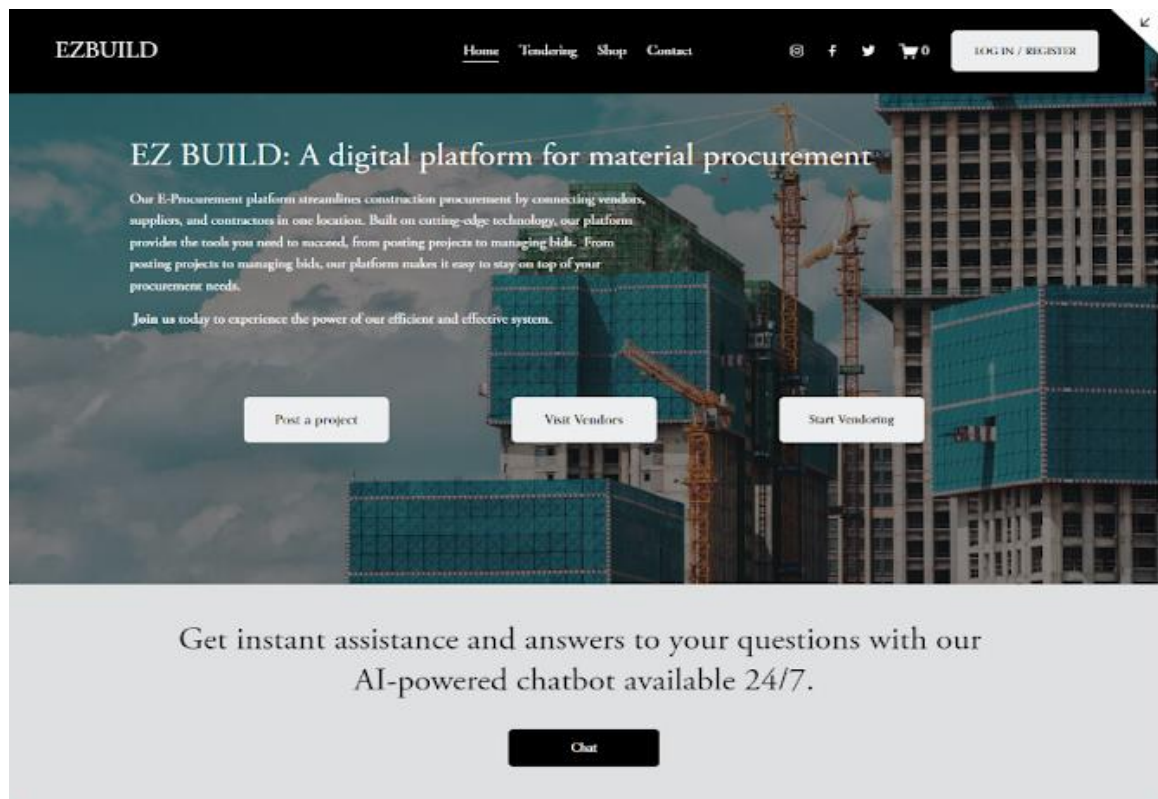


Figure 5: UI/UX design Screen

3.2.4.2 Our business model

Our business model focuses on streamlining the procurement process, simplifying project management, and fostering a transparent and efficient marketplace for all stakeholders involved in construction projects. To formulate the business model we went with lean canvas model. It has nine major components which are:

3.2.4.2.1 Problem

The construction industry faces several challenges, such as inefficient procurement processes, difficulty in finding reliable contractors and suppliers, and a lack of transparency in pricing and material quality. These issues can lead to delays, cost overruns, and subpar project outcomes.

3.2.4.2.2 Customer segments

The platform targets various customer segments, including project owners/clients who need construction services, contractors who provide these services, suppliers who offer construction materials, and investors who support the platform's growth and development.

3.2.4.2.3 Unique Value Proposition (UVP)

The platform aims to provide a streamlined procurement process through a user-friendly interface, creating a transparent marketplace for contractors, suppliers, and project owners. It also offers a comprehensive suite of tools for project management and material tracking, setting it apart from competitors.

3.2.4.2.4 Solution

The platform addresses the identified problems by offering an easy-to-use material procurement page with filters, comparison features, and detailed information. It also

includes contractor and supplier ratings and reviews to help users make informed decisions. Additionally, the platform provides project management tools, such as scheduling, budgeting, and progress monitoring, as well as material tracking and inventory management features.

3.2.4.2.5 Channels

The platform is accessible through desktop and mobile devices, making it convenient for users. It also employs social media marketing and advertising to reach its target audience. Furthermore, the platform engages with industry events and conferences and forms partnerships with industry associations and organizations to expand its reach and credibility.

3.2.4.2.6 Unfair advantage

The platform's unfair advantage lies in its user-friendly and comprehensive design tailored specifically for the construction industry. It also benefits from a strong network of reliable contractors and suppliers and continuously improves and adapts to industry trends and user feedback.

3.2.4.2.7 Key metrics

The platform's success is measured by the number of active users (project owners, contractors, and suppliers), transaction volume and value, user satisfaction and engagement rates, and conversion rates for premium subscriptions and advertising.

3.2.4.2.8 Cost structure

The platform incurs costs related to development and maintenance, marketing and advertising, customer support and training, and legal and regulatory compliance.

3.2.4.2.9 Revenue streams

The platform generates revenue through subscription fees for premium features and services, commission fees from transactions between contractors, suppliers, and project owners, and advertising fees from suppliers and other industry-related businesses.

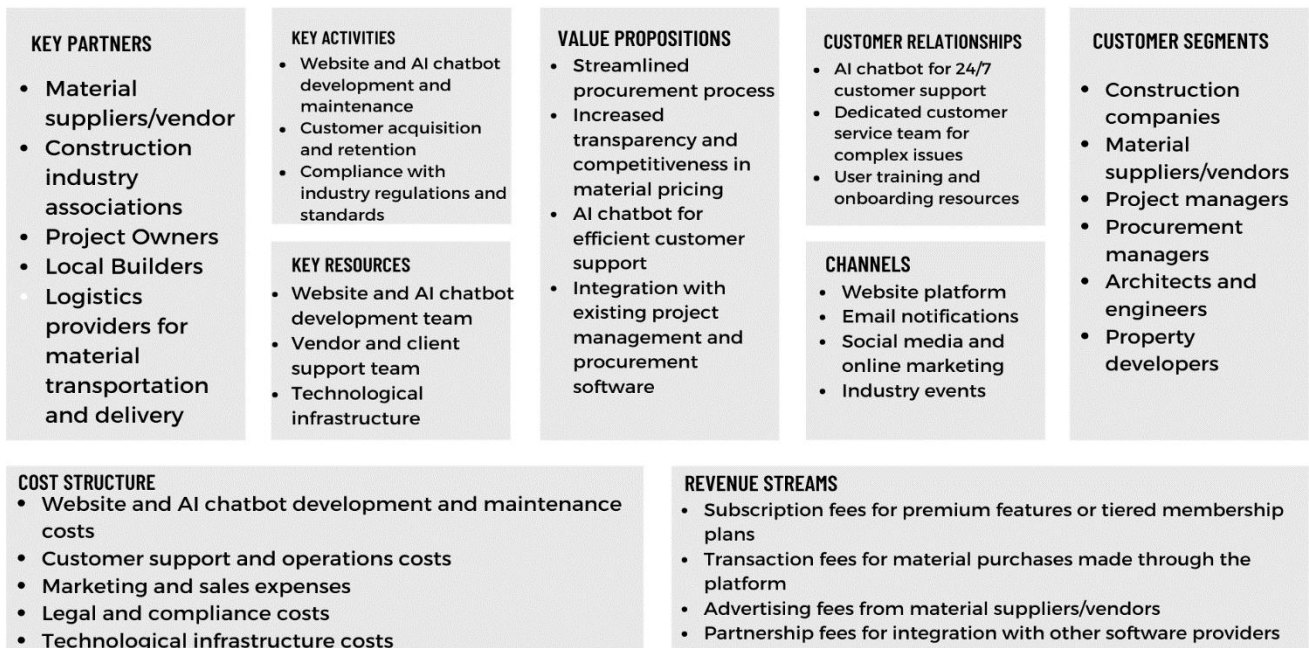


Figure 6: Business Model Canvas

3.2.4.3 Website usage

This area will take you into the application and breakdown the steps that each of the users will have to carry out in order to carry out the procurement or job seeking through the application.

The construction e-commerce website's website is designed to cater to the needs of both clients (project owners) and vendors (contractors and suppliers), providing a

seamless and efficient experience for all parties involved. The website usage for each group can be described as follows:

3.2.4.3.1 Client (Project Owner) Website Usage

Project Creation and Management: Clients can create new projects, inputting relevant details such as project type, location, budget, and timeline. They can also manage ongoing projects, tracking progress, and adjusting as needed.

- **Contractor and Supplier Search:** Clients can search for contractors and suppliers based on various criteria, such as location, expertise, and ratings. They can also view detailed profiles, including past projects, reviews, and certifications.
- **Request for Quotations (RFQs):** Clients can send RFQs to multiple contractors and suppliers, streamlining the bidding process and allowing them to compare prices, materials, and services.
- **Communication and Collaboration:** The website provides a platform for clients to communicate with contractors and suppliers, discussing project details, negotiating terms, and addressing any concerns.
- **Payment and Invoicing:** Clients can make secure payments through the website and receive invoices from contractors and suppliers, simplifying the financial aspect of the project.

3.2.4.3.2 Vendor (Contractor and Supplier) Website Usage

- **Profile Management:** Vendors can create and manage their profiles, showcasing their expertise, past projects, certifications, and reviews to attract potential clients.
- **Project Bidding:** Vendors can receive and respond to RFQs from clients, submitting their proposals, prices, and other relevant information.

- **Project Management:** Contractors can manage their ongoing projects, updating progress, and collaborating with clients and suppliers. Suppliers can track their inventory and manage orders from clients.
- **Communication and Collaboration:** Vendors can communicate with clients and other vendors through the website, discussing project details, negotiating terms, and addressing any concerns.
- **Payment and Invoicing:** Vendors can receive secure payments through the website and send invoices to clients, simplifying the financial aspect of the project.

3.2.4.4 SWOT Analysis

A SWOT analysis of the construction e-commerce website can help identify its strengths, weaknesses, opportunities, and threats, providing valuable insights for strategic planning and decision-making. Strengths and Weakness gives the analysis of internal influence an potential while Opportunities and Threats gives the analysis of external influence and challenges Here's an explanation of each aspect of the SWOT analysis:

SWOT ANALYSIS

STRENGTHS

- 1.Streamlined procurement process, reducing time and effort for clients and vendors
- 2.Increased transparency and competitiveness in material pricing
- 3.Enhanced communication and collaboration between stakeholders
- 4.AI chatbot providing quick and efficient customer support



WEAKNESSES

- 1.Potential resistance to adopting digital platforms by some stakeholders in the construction industry
- 2.Cybersecurity risks and data privacy concerns
- 3.Initial investment and ongoing maintenance costs for the platform
- 4.Ensuring the AI chatbot can effectively handle diverse user queries and language nuances

THREATS

- 1.Competition from existing digital platforms and traditional procurement methods
- 2.Changes in government regulations and policies affecting the construction industry or e-commerce
- 3.Economic downturns or instability impacting construction projects and investments
- 4.Technological advancements that could render the platform obsolete



OPPORTUNITIES

- 1.Growing demand for digital solutions in the construction industry
- 2.Expansion into new markets and regions
- 3.Collaboration with other construction industry software providers for seamless integration
- 4.Promoting sustainable and environmentally friendly procurement practices
- 5.Continuous improvement of the AI chatbot and platform features based on user feedback

Figure 7: SWOT analysis

3.2.4.4.1 Strengths

The construction e-commerce website has several strengths that set it apart from competitors. Its user-friendly interface and comprehensive suite of tools make it easy for clients, contractors, and suppliers to manage their projects and transactions. The platform's focus on transparency and efficiency helps streamline the procurement process and fosters trust among users. Additionally, the website's responsive design ensures a seamless experience across various devices, making it accessible and convenient for users on the go.

3.2.4.4.2 Weaknesses

Despite its strengths, the construction e-commerce website may face some weaknesses. As a new entrant in the market, it may initially struggle to establish a strong user base and network of reliable contractors and suppliers. The platform may also face challenges in differentiating itself from existing competitors and convincing users to switch from traditional procurement methods. Furthermore, the website may require significant resources for development, maintenance, and marketing, which could impact its profitability.

3.2.4.4.3 Opportunities

There are several opportunities for the construction e-commerce website to grow and expand its market share. As the construction industry continues to evolve, there is an increasing demand for digital solutions that streamline processes and improve efficiency. The platform can capitalize on this trend by continuously updating its features and functionalities to meet the changing needs of users. Additionally, the website can explore partnerships with industry associations, organizations, and influencers to increase its credibility and reach. Expanding into new markets and targeting niche segments within the construction industry can also provide growth opportunities.

3.2.4.4.4 Threats

The construction e-commerce website may face various threats that could impact its success. Competition from established players and new entrants in the market can pose a significant challenge, as they may offer similar services or adopt innovative strategies to attract users. Changes in regulations and industry standards may also

affect the platform's operations and require adjustments to its features and functionalities. Economic fluctuations and changes in the construction industry's growth can impact the demand for the platform's services. Finally, potential security breaches or data privacy concerns may harm the website's reputation and user trust.

Chapter 4: RESULTS

4.1 Result

According to our market research, which was conducted, the Pakistani construction industry is still dependent on old and outdated methods of procurement that most of the world has moved away from.

Contrary to other process sectors that have already shifted or are in the midst of doing so, it has been noted that the construction industry is in urgent need of a web-based platform for the convenience of accessing and obtaining construction material.

4.2 Platform working

When someone chooses to use our services, our platform will operate as described in the following steps. According to the user's designation, such as Client or vendor, we have categorised the user interface.

- Post A Project
 - Client signs up by entering their Name, Phone Number, CNIC, and their desired password with additional company information like company name, complete address, tax identification number, and company registration number.
 - They are then requested to enter the OTP received on their cell phone for verification purposes.
 - Now Client can log in via their CNIC and password.
 - Logging in lands the user on the home page where they can go to post the project.

- Then the user defines their project, estimated material by quantity survey and quality, or specifies the brand which they prefer for their project.
- They will be notified when a bid is filled for their project.
- Active Projects
 - User will first need to sign up by entering their Name, Phone Number, CNIC, and their desired password with additional company information like shop name, complete address, and tax identification number.
 - Logging in lands user to home page from where they can go to bid for a project.
 - They will find all the active projects that are posted and can click bid find the technical information of the project they will be interested in and post their bid following PPRA rules.
 - The material suppliers will be notified when client will accept the bid or ask to negotiated price.
 - Once the project will be completed, it will be added into My profile where it will be displayed will all previous projects done.
- Visit Vendors
 - Client will first need to sign up by entering their Name, Phone Number, CNIC, and their desired password with additional company information like shop name, complete address, company registration number, and tax identification number.
 - Logging in lands user to home page from where they can go to visit vendors.
 - They will find all the active Vendors that are available, and client can use filters or search descriptions to find the related items arranged according to radial distance from provided zip code.

- After finding the material for search or from going through specified catalogs client will review the contractor and technical specifications of the selected product to verify and then he can give a quotation for the product.
- Once the vendor finds the given quotation, both parties will agree to a deal and a successful deal will be added to both's profiles.
- After the deal, the client will give his reviews and share his experience with the vendor for other's help.

4.3 Digital platform development

Using the literature review on how important timely procurement is for a project and after noticing the market gap with respect to a lack of a dedicated digital construction platform, we determined it was feasible to develop a working prototype.

4.4 Unique value propositions

4.4.1 AI chatbot

AI is revolutionizing every industry and it is making a huge impact on every industry. The addition of this feature can provide quick and to-the-point responses to customer questions related to material pricing, availability, and delivery times. It can increase customer satisfaction by providing 24/7 service and reduce the workload of the team for customer support. It can also be used for finding rough Quantity surveys, Q/A about different construction materials and its properties of materials plus which admixtures or chemicals will be most suitable for the increase of efficiency in certain jobs.

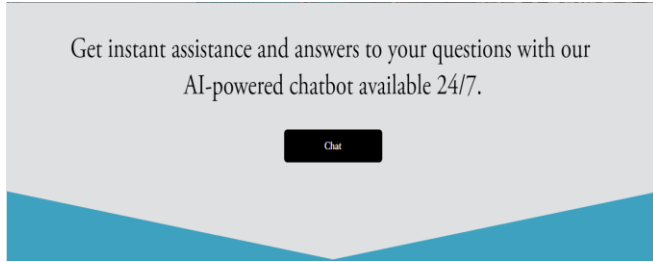


Figure 8: AI Chatbot working step 1

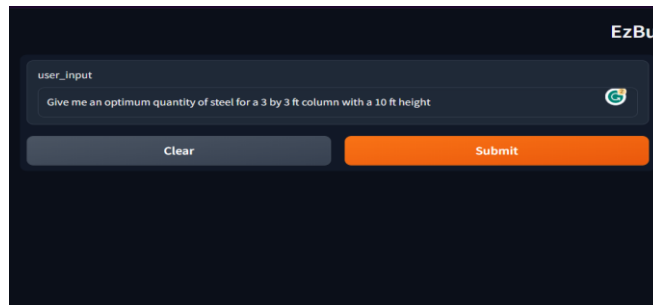


Figure 9: AI Chatbot working step 2

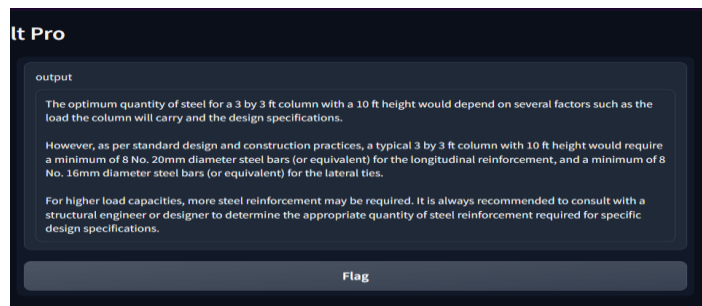


Figure 10: AI Chatbot working step 3

4.4.2 Daily price updates

Daily price updates keep users informed about the most up-to-date pricing for materials, which ultimately helps them in making an informed decision about the material they need to purchase, because of which customer loyalty and satisfaction may increase. It will also help the website by keeping it competitive in the market and it will help vendors on the website to keep updating their prices according to new prices given. It will also help the construction industry to optimize their procurement

strategy from observing the provided insights into pricing trends and patterns change according to market and it can help make better decisions regarding your inventory management and procurement procedures as a result can help your company save money in the long run. Users can compare prices across multiple suppliers to find the best deal, it saves users time and effort in researching material prices and promotes transparency and competitiveness in the material procurement process.

Sr. No	Name	Brand	Date	Weight	Price
1	Amreli 60-Grade Steel Bar	Amreli Steels	15-May-23	Per Kg	290-292
2	Kamran 60-Grade Steel Bar	Kamran Steel	15-May-23	Per Kg	286-288
3	FF 60-Grade Steel Bar	FF Steel	15-May-23	Per Kg	277-279
4	SJ 60- Grade Steel Bar	SJ Steel	15-May-23	Per Kg	Out of Stock
5	Mughal Supreme - Grade Steel Bar	Mughal Steel	15-May-23	Per Kg	284-286
6	Mughal Steel Bar	Mughal Steel	15-May-23	Per Kg	283-285
7	Moiz Steel 60-Grade Steel Bar	Moiz Steel	15-May-23	Per Kg	277-278
8	AF Steel 60-Grade Steel Bar	AF Steel	15-May-23	Per Kg	Out of Stock

Serial No	Brand	Date	Unit	Prices
1	Flying Cement	15-May-23	50kg Per Bag	1070
2	Bestway Cement	15-May-23	50kg Per Bag	1105
3	Bestway Xtreme Bond	15-May-23	20kg Per bag	680
4	Bestway SRC	15-May-23	50kg Per Bag	1200
5	Bestway Pakcem	15-May-23	50kg Per Bag	1110
6	Cherat Cement OPC	15-May-23	50kg Per Bag	1095
7	DG Cement OPC	15-May-23	50kg Per Bag	1105
8	Kohat Cement	15-May-23	50kg Per Bag	1095
9	Fauji Cement	15-May-23	50kg Per Bag	1100
10	Lucky Cement OPC	15-May-23	50kg Per Bag	1090

Figure 11: Daily Price Update

4.4.3 Nearby vendors

One exciting feature to consider for the online construction material procurement project in Pakistan is the ability for buyers to easily connect and communicate with nearby material suppliers. This feature offers a range of advantages that can greatly benefit buyers. It can save on transportation costs and significantly reduce delivery times, which is especially useful for urgent or time-sensitive projects where every moment counts.

Not only that, but by involving nearby suppliers, you can establish a more personal and direct relationship with them. This opens up better lines of communication, builds trust, and encourages collaboration.

What's great about this feature is that it also supports the local economy. By giving preference to nearby suppliers, you contribute to the growth of small and medium-sized enterprises (SMEs) operating in the construction material sector. It's all about making the process smoother, fostering stronger relationships, and boosting the local economy along the way. the routes.

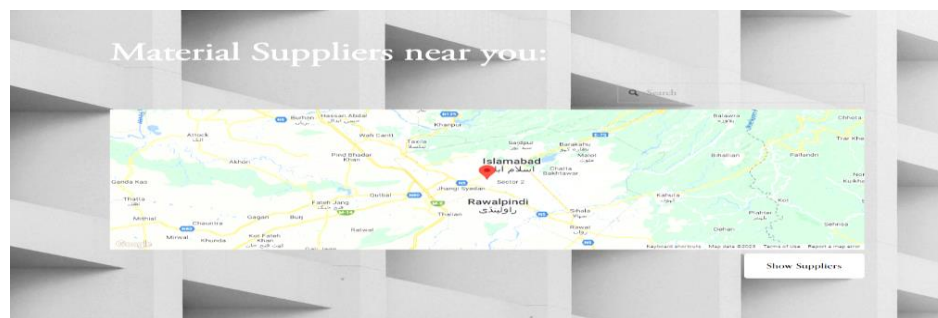


Figure 12: Nearby Vendors

4.4.4 Digital database

On initial login, Client and material suppliers both have to share their basic personal and company details which are instantly added to website's database as they register. The register Client and material suppliers both will have their data base and experience updated as they complete projects.

Sign up.

Name (required)
First Name Last Name

Email (required)

Password (required)

Phone

Company name

Address
Country

Address Line 1 (required)

Address Line 2

City (required) Postal Code

Tax identification number

Company registration number

Sign in.

Email (required)

Password (required)

Figure 13: Digital database

4.5 User interface walkthrough

The user interface is designed to be simple and easy to walk through, it is focused on three other major user interfaces other than the unique feature mentioned above.

4.5.1 Sign up

The signup page will continue us to direct for filling out the information about the client and vendor which will then lead us to have a huge database of information about vendors and client and their companies. This information will further help us to determine and evaluate the vendors for the client to have maximum information.

Main Page: This page will appear as you will start the platform and it will have the simple and recognisable design for new users to understand the platform and continue to the Signup form.

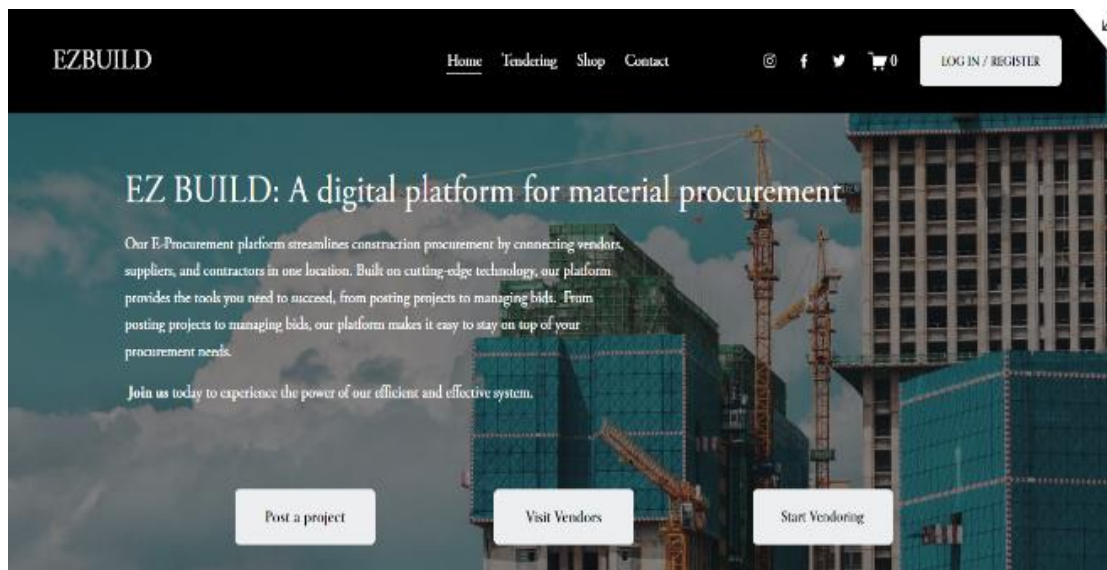


Figure 14: Landing Page of platform

Login Page: After finding the signup button top right, user need to give his personal information, his contact information, and his company information. This information is used to further qualification of vendor and client.

Sign up.

Name (required)
First Name Last Name

Email (required)

Password (required)

Phone

Company name

Address
Country
Pakistan

Address Line 1 (required)

Address Line 2

City (required) Postal Code

Tax identification number

Company registration number

Sign in.

Email (required)

Password (required)

Figure 15: Log in page of platform

After logging in, the information is verified by team for security reasons and to have community of people how actually are reliable and serious about bids they will made.

4.5.2 Post a project:

To post a project a project for bids will help client get maximum bids for the project and get competitive rates from a suitable vendor which is verified and he will have his information beforehand.

4.5.3 Active projects

This page will show all the listed active projects available where vendors can give their quotes, the client will select one of the vendors based on their history, warehouse location and his understanding.

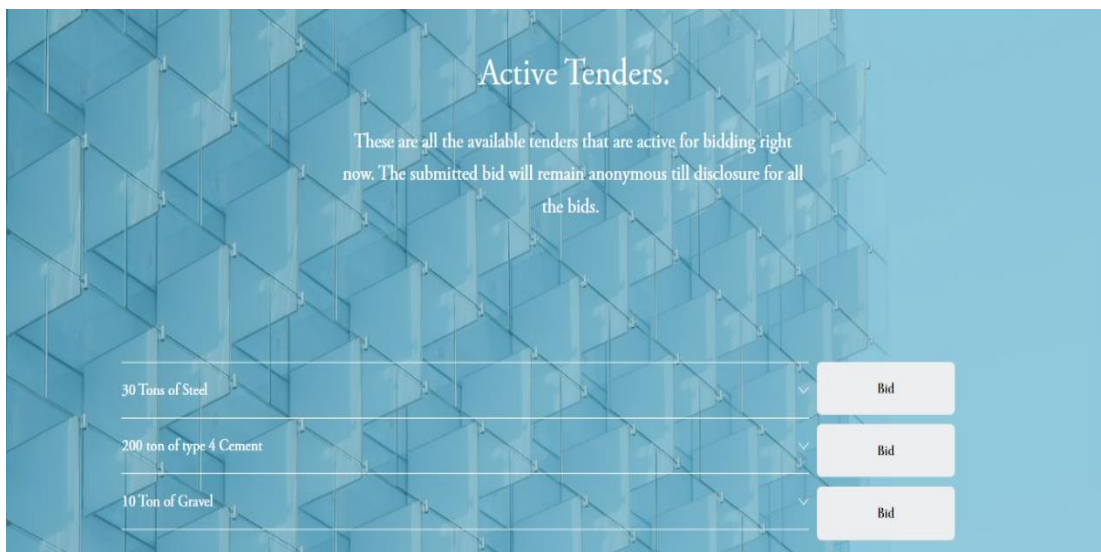


Figure 16: Active projects

Then the vendor will visit the notice page to have all the information about the project and can have his bid registered here. It will have basic project information, required documentation according to PPRA rules and items that will be required estimated by quantity surveyor with detailed information about items.

Tender Notice	
Tender Subject	10th Avenue Road Construction
Tender No.	BCB 15 04 2023 2035
Estimated Cost	Pkr. 85,00,000
Procuring Agency	CDA
Procuring Agency Details	(062) 4234567
Required Documents	
Technical Specification Document	
CNIC	
Bank Statement	
Active Tax Payer List	
Upload	
Scheduled Items	
30 ton Steel	
	W60 grade steel 10 in. dia

Figure 17: Active projects notice page

4.5.4 Visiting suppliers

User can visit one for four provided categories of vendors to get their quotes.



Figure 18: Page for visiting suppliers

If user visit one for four provided categories, he is then directed to page with available vendors and materials they are offering, and client can then contact the vendors by selecting their page.

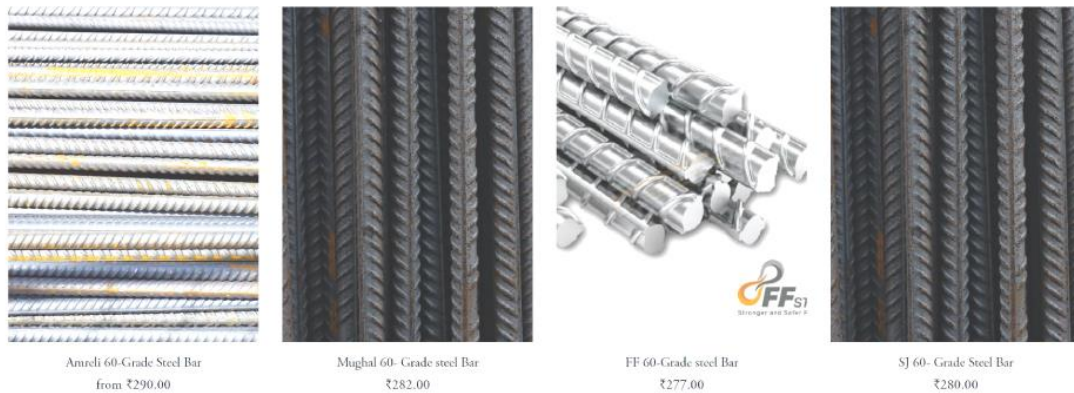



Figure 19: Available vendors page

Client can then review the vendor, read the previous remarks about the vendor, its information and history of project that vendor has done. He can make his decision based on given information and get a quote from vendor on his required material.



Amreli 60-Grade Steel Bar

₹290,000.00

Grade 60:

PRODUCT SPECIFICATIONS:

- Strength: 72,500 PSI
- Benefit: Up to 15% Consumption Saving as
- Compared to ASTM 615 Grade 60 Bars*
- Usage: Safely Weldable
- Benefit: Earthquake Resistant**
- Standard: Revised British Standard 2016
- Type of Steel: G500 = British Standard, W = Weldable

Grade:

60

Figure 20: Vendor detail page

4.6 Reviews

4.6.1 Reviews from professional

“Construction is one of the biggest industries in Pakistan but one that yet has a lot of room for innovation. I liked the idea of building a marketplace for finding the right people for material supply. Quality material at needed time is more important than anything else in the entire process and such an initiative has the potential to start addressing the problem. The current version of the website is good for starters as it starts from the basics of the solutions. Many features can be gradually added to make the recruitment process smoother and more effective.”

Omer Arshad, Procurement Engineer

One Eleven Group

“I really like the concept and idea. Its new and innovative. The website’s interface is easy to use and simple keeping in mind the target audience. Few features can be explored in future to increase target user’s engagement. The user flow is easy to understand and uses standard practices. Overall, a really good effort.”

Adil Oun, Senior Manager

High Commission of Canada in Pakistan

“It's a great initiative to digitize the otherwise lagging construction industry! The application is very simple to understand and use, especially from a construction procurement industry's perspective and makes the difficult process of material procurement very simple. Some features like AI chatbot and daily price update are very new and make the process even easier!”

Zain-ul-Islam, Assistant Director

SGEHA

Chapter 5: CONCLUSION

5.1 Research conclusions

The research conducted for the construction e-commerce website project has provided valuable insights into the needs and preferences of various stakeholders, including project owners, contractors, and suppliers. The findings indicate that there is a significant demand for a user-friendly platform that streamlines the tendering process, facilitates material procurement, and promotes sustainable construction practices.

The research also revealed that stakeholders value transparency, efficiency, and reliability in the construction industry. By incorporating features such as detailed user profiles, supplier ratings and reviews, and real-time updates on material availability and delivery status, the construction e-commerce website can address these needs and provide a valuable service to its users.

- E-proc will save precious time and resources by convenient procurement of material from site and at any time.
- It will also revolutionize our procurement approach since we have provided an easier alternative to procuring materials.
- The digital platform will provide freedom of choice to a client looking to procure material while also providing his user experience.
- Clients will no longer have to rely on word of mouth while procuring material for specific materials since the platform shows the past experience of every vendor
- Provides a detailed database of materials and vendors in your locality saving precious time of clients during the procurement process.

- From the problems identified as a part of our research studies, all the necessary features were incorporated to overcome them.
- Small vendors will find new opportunities to grow.
- Keeping in view the entrepreneurial aspect of the project, the web-based platform can be run as a start-up soon.
- A huge number of clients and suppliers are very supportive and encouraging of the innovation of such a platform in the industry.
- The low literacy rate of most suppliers and clients in Pakistan contributes to the reluctance of the industry to lean in the direction of online management.
- Launch of this platform will be a step forward for Pakistan in achieving UN's SDG number 1 No Poverty, SDG number 8 Decent Work and Economic Growth, SDG number 9 Industry Innovation and Infrastructure, and SDG number 11 Sustainable cities and Communities.

Pakistan's construction industry holds immense potential to challenge the world on an international scale and revamp with the pace of the progressing world. We have all the right tools and resources that will enable us to compete internationally, what we require is a more streamlined approach by adopting technology.

5.2 Recommendations

Keeping in view the above drawn conclusions, the following recommendations are made that can substantially improve the overall procurement practices in place in the industry.

- Develop a user-friendly interface: Ensure that the website has a clean, professional, and easy-to-navigate design that works well on both desktop and mobile devices. This will help users find the information and resources they need quickly and efficiently.
- Provide detailed user profiles: Collect relevant information during the sign-up process to create comprehensive user profiles for contractors and suppliers. This will facilitate the tendering process and help project owners evaluate potential partners based on their expertise, experience, and credibility.
- Implement a material procurement page: Create a comprehensive material procurement page that allows users to easily browse and compare materials based on their specifications, pricing, and other relevant factors. This will help users make informed decisions and optimize their material usage.
- Incorporate supplier ratings and reviews: Include a system for users to rate and review suppliers based on their experience. This will help ensure quality and reliability and assist other users in making informed decisions when selecting suppliers.
- Promote sustainable construction practices: Provide tools and resources for waste management, material optimization, and performance evaluation to encourage users to adopt sustainable construction practices and reduce waste.
- Ensure data security and privacy: Implement robust security measures to protect user data and ensure compliance with relevant data protection regulations.

- Continuously improve and update the platform: Regularly gather feedback from users and monitor industry trends to identify areas for improvement and implement new features and functionalities as needed.

As our industry is always progressively moving forward, we should also always be on the lookout for more key areas to research into and incorporate more and more features to assist the clients and the suppliers and the industry. The transition may be time consuming at first but once the transition is complete, the fruits of our hard work will be evident, and the industry will flourish in the years to come.

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