Project

SOFTWARE REENGINEERING

SE-4001

Course Instructor:

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Due Date:

Jan 10, 2023

Software Re-Engineering Project

Commercial Project Over-view:

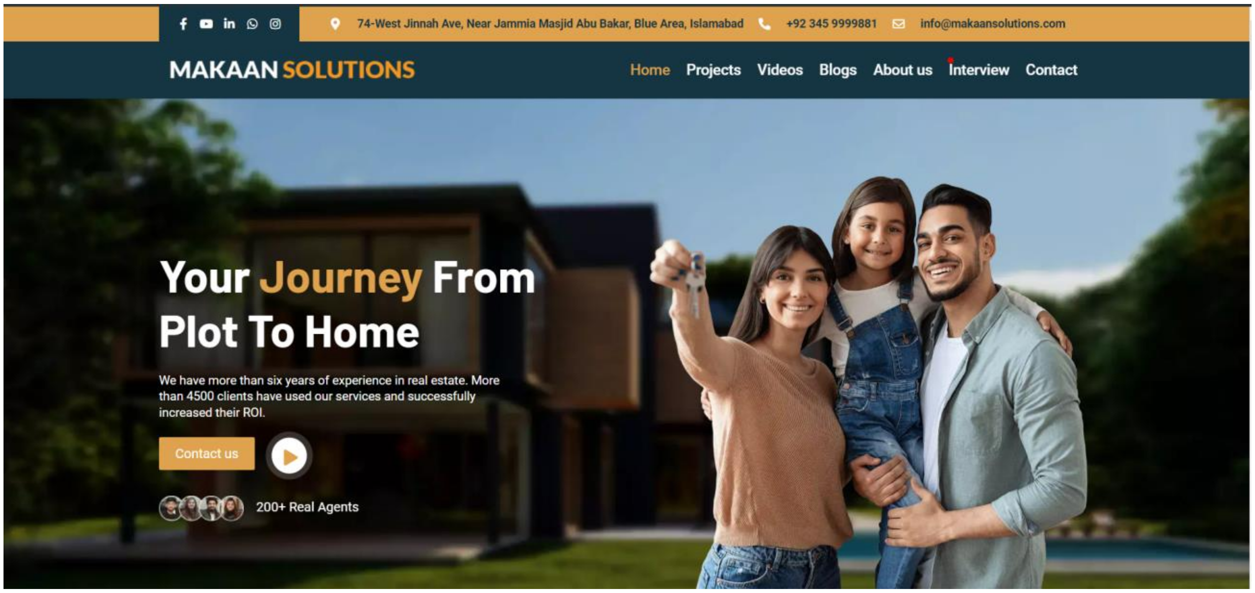
We have approved the Project Makaan Solutions, an open-source initiative designed for the employees of our organization. Makaan Solutions, a valued client of our organization, sought to enhance their online presence in this digital era. Makaan Solutions is a real estate and marketing firm based in Pakistan. It was founded in 2016 by Rizwan Cheema, who is the chairman and CEO of the company. It provides services such as investment consultancy, property analysis, sales and marketing for various housing societies in Islamabad and Lahore. Makaan Solutions helps its clients with property analysis by providing them with the best advice and recommendations to purchase or develop property in Islamabad and Lahore.

Our assignment involves rebuilding their existing website, focusing on improved search optimization, enhanced visual appeal, and presenting information in a well-organized manner. We aim to prioritize their valuable clients, ensuring that their needs are met through a sophisticated search engine for a seamless customer experience.

The project will be implemented in WordPress, utilizing low-code technology, and incorporating Elementor and Wooden-Berg Framework widgets. During the refactoring and restructuring of the website layouts, we will carefully consider the new requirements that need to be implemented.

As we don't have access to the login credentials for the existing website, we are required to build the website from scratch. This entails creating a project interface using wireframes.

To facilitate this process, we will propose a re-engineered report for the project, focusing on enhancing the user interface and incorporating new features.



74-West Jinnah Ave, Near Jammia Masjid Abu Bakar, Blue Area, Islamabad +92 345 9999881 info@makaansolutions.com

Your Journey From Plot To Home

We have more than six years of experience in real estate. More than 4500 clients have used our services and successfully increased their ROI.

Project Pages:

❖ About-us
❖ Blogs
❖ Client Portal
❖ Coming Soon
❖ Contact
❖ Home
❖ Interview
❖ Projects
❖ Videos
❖ Testimonials

New Requirements:

❖ Search Bar
❖ Interactive UI
❖ Client's Project Prioritization

Techniques to Analyze Legacy Systems:

1- Stakeholder Interviews:

❖ Conduct interviews with users who have interacted with the system, including administrators and customers.

❖ Gather feedback on their experiences and pain points. Identify any specific issues they have encountered, such as usability concerns or missing features.

e.g: Users are not able to view the projects of housing scheme, No search bar.

2- Business Impact Analysis:

❖ Assess how the legacy system contributes to the organization's daily operations, including displaying plot details offer.

❖ Identify potential risks associated with system disruptions, such as data loss or appointment scheduling failures.

e.g: They are not able to launch any market campaign, any new arrival or discount offer.

3- User Experience (UX) Assessment:

❖ Evaluate the user interface (UI) of the legacy system and Identify usability issues, such as outdated design elements or non-responsive layouts.

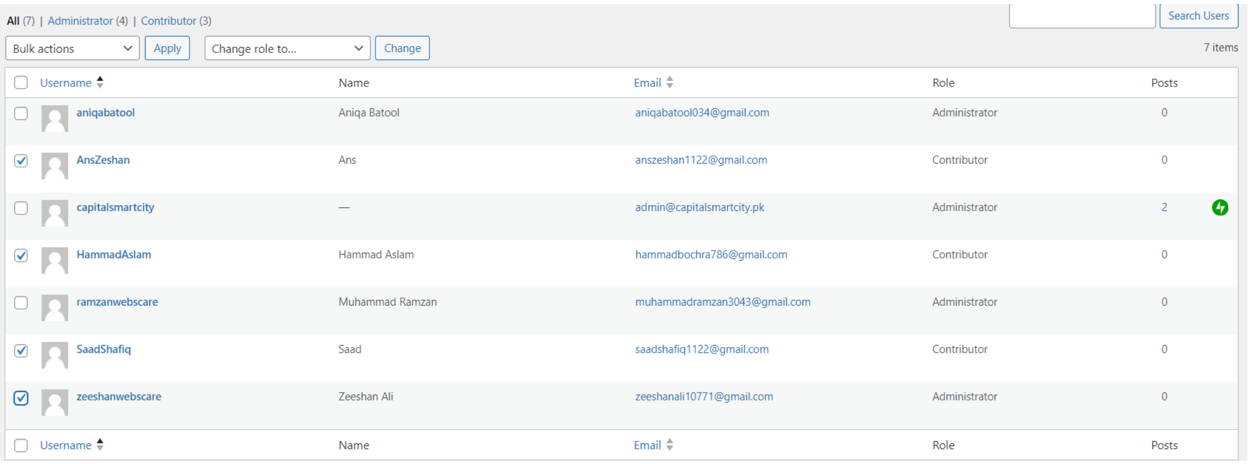
4- Legacy Data Assessment:

❖ Determine the quality of the data and identify any data that is no longer relevant.

By Reviewing the project Interface, we identified the project Improvements areas and Strengths & Weaknesses, so where we must focus more or not.

The abstract syntax tree would not be created because of low-code technology and mental model would be generated on basis of the functionality flow, so from statically website, no model would be mapped on which we study in the course.

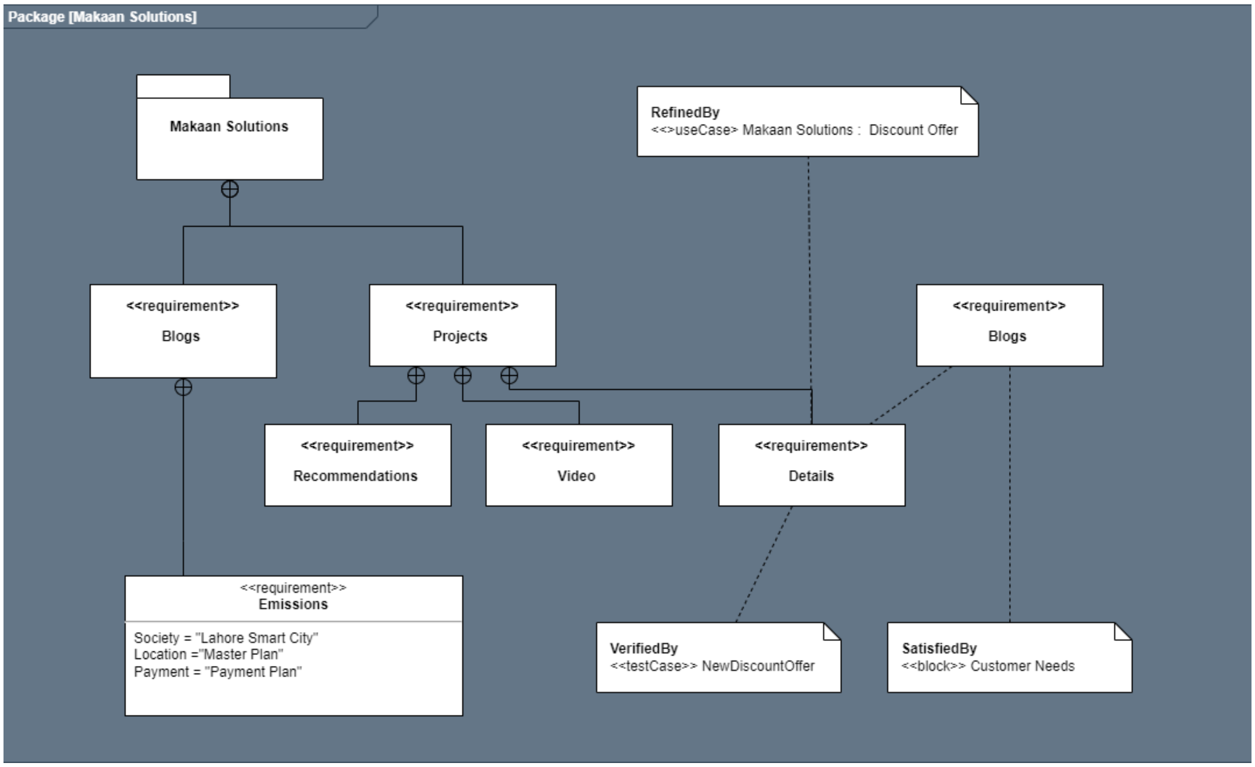
WordPress is a new technology that we learn first and then start working on it. So, the selected checkboxes are the user's role that we have in the project which shows the contribution in project.



☐	Username	Name	Email	Role	Posts
☐	aniqabatool	Aniqa Batool	aniqabatool034@gmail.com	Administrator	0
☑	AnsZeshan	Ans	anszeshan1122@gmail.com	Contributor	0
☐	capitalsmartcity	—	admin@capitalsmartcity.pk	Administrator	2
☑	HammadAslam	Hammad Aslam	hammadbochra786@gmail.com	Contributor	0
☐	ramzanwebscare	Muhammad Ramzan	muhammadramzan3043@gmail.com	Administrator	0
☑	SaadShafiq	Saad	saadshafiq1122@gmail.com	Contributor	0
☑	zeeshanwebscare	Zeeshan Ali	zeeshanali10771@gmail.com	Administrator	0
☐	Username	Name	Email	Role	Posts

Code/Website Visualization:

We have made a component diagram that depicts the hierarchy of the static website.



Re-engineering Strategies and Approaches:

We mainly focused on the User Experience Enhancement by following.

- **Approach:** By correcting the styling components of the Interface, to meet the standards that the system gives a feel for the real-time usage.
- **Rationale:** Improving the user interface enhances user engagement and satisfaction, making it more accessible and user-friendly.
- **Risks:**

    Development Complexity

    Compatibility Issues

    User Adaptation

Reverse Engineering:

As far in the reverse engineering part, we can visualize the CFG, CDG, PDG, DDG so we have made the component diagram to visualize the project architecture.

Architecture Recovery and Extract Design Information:

We have an interface wireframe, from this domain (makaansolutions.com) which gives layout flow and redirect pages information. Which is like the component diagram.

Software Quality Assessment (Complexity Metrics):

Qualitative Code Quality Metrics:

As for coding style, our code is well structed according to the module wise, are also written in the simplest way to extract information. Our code demonstrates.

- Readability and Code Formatting
- Clear
- Efficiency

Our System is not basically an OOP Oriented Project, so there will be no such operations that are applicable in classes such as inheritance etc.

For Complexity, we can’t apply FPA, LOC for complexity due to low code architecture.

Maintainability Metrics:

Maintainability metrics are used to assess the ease with which a software system can be maintained and evolved over time.

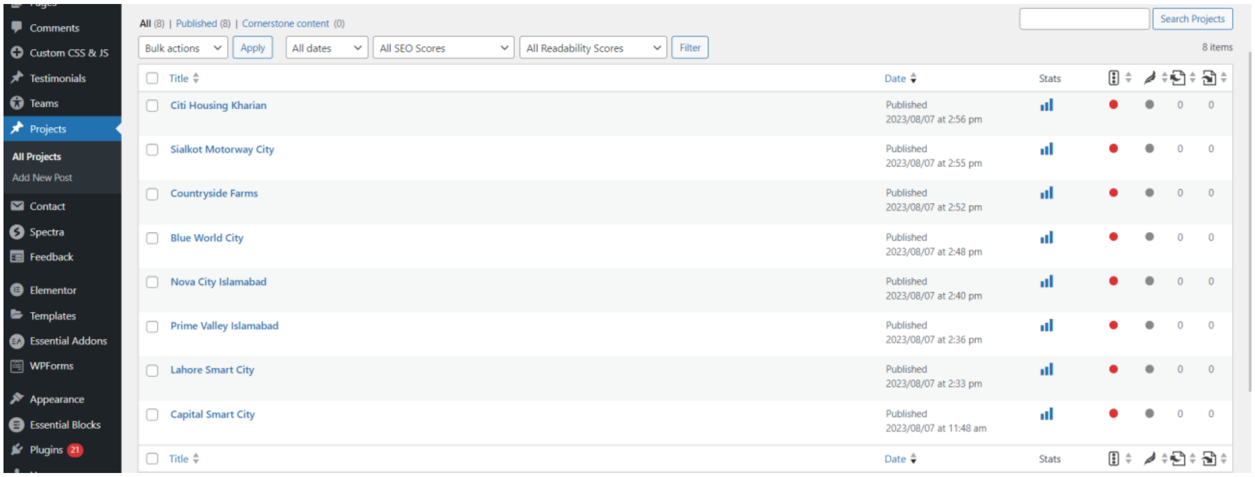
- **Code Duplication**: Code Duplication measures the extent to which identical or similar code segments appear in different parts of a software system. High code duplication can lead to maintenance challenges, as changes may need to be replicated in multiple locations.
- **Coupling and Cohesion Metrics:** Coupling measures the degree of interdependence between software modules, with low coupling indicating better separation of concerns. Cohesion measures how closely the elements within a module are related. High cohesion and low coupling are generally desired for maintainable and modular code.
- **Fan-in and Fan-out:** Fan-in is the count of functions or modules that call a particular function or module. Fan-out is the count of functions or modules that a particular function or module calls. Understanding fan-in and fan-out helps assess the complexity and dependencies within a software system.
- **Unit Testing:** Unit Testing is the practice of testing individual units or components of a software application in isolation. It ensures that each unit functions as intended. Effective unit testing is crucial for identifying and fixing bugs early in the development process, contributing to overall software reliability and maintainability.

Code Smells:

- **Duplicate Code:** There are repeated sections of code, especially within the Projects table rows and testimonials. You might want to create functions or loops to handle these repetitive tasks or make it dynamic to reducing code duplication.
- **Hardcoded Values:** There are hardcoded values scattered throughout the code. This can be problematic for maintenance. Using constants or configuration files for such values can make the code more flexible and easier to update.
- **Inline Styles:** There are several inline styles in HTML. Moving these to a separate CSS file can improve the readability of your HTML and makes it easier to manage styles globally.
- **Hardcoded Redirection Paths:** The redirection paths are hardcoded. Using a configuration file or constants for these URLs would make the code more flexible. Paths like 'location' are hardcoded, which could be problematic if the directory structure changes.

Refactoring Techniques:

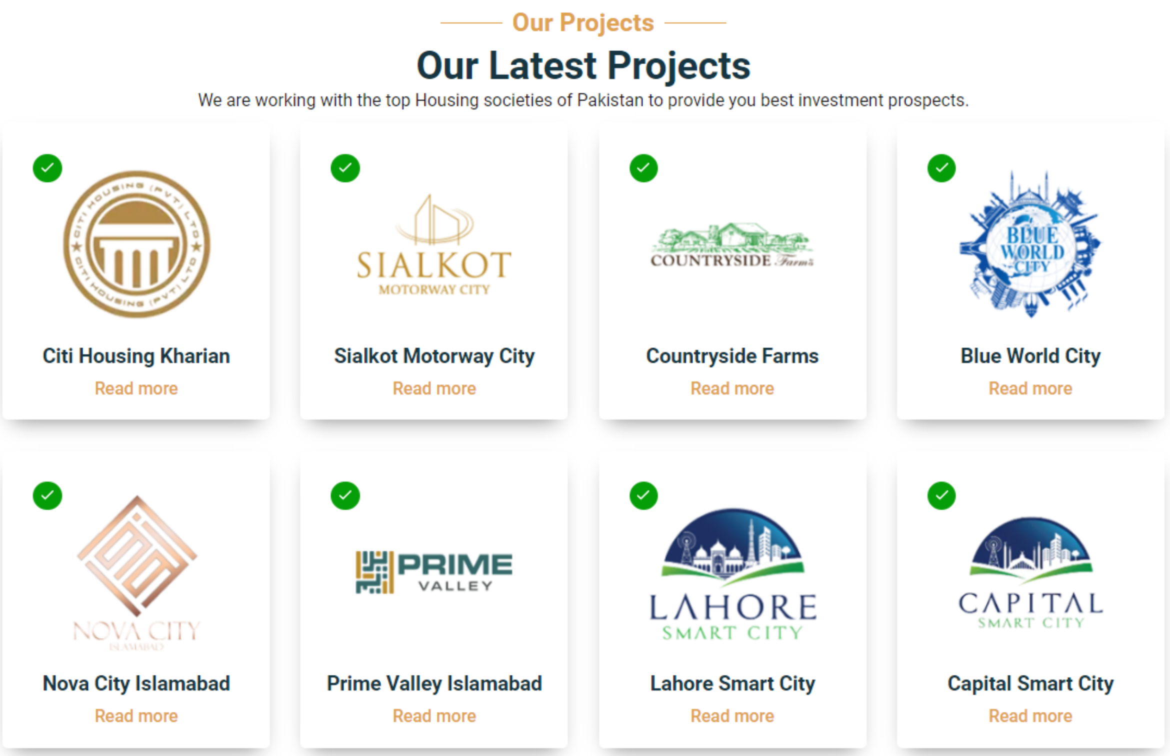
1- Create Dynamic Tables to add data with the same schema.



All (8) | Published (8) | Cornerstone content (0)

8 items

□	Title	Date	Stats				
□	Citi Housing Kharian	Published 2023/08/07 at 2:56 pm		●	●	0	0
□	Sialkot Motorway City	Published 2023/08/07 at 2:55 pm		●	●	0	0
□	Countryside Farms	Published 2023/08/07 at 2:52 pm		●	●	0	0
□	Blue World City	Published 2023/08/07 at 2:48 pm		●	●	0	0
□	Nova City Islamabad	Published 2023/08/07 at 2:40 pm		●	●	0	0
□	Prime Valley Islamabad	Published 2023/08/07 at 2:36 pm		●	●	0	0
□	Lahore Smart City	Published 2023/08/07 at 2:33 pm		●	●	0	0
□	Capital Smart City	Published 2023/08/07 at 11:48 am		●	●	0	0
□	Title	Date	Stats				



Our Projects

Our Latest Projects

We are working with the top Housing societies of Pakistan to provide you best investment prospects.

Citi Housing Kharian

Read more

Sialkot Motorway City

Read more

Countryside Farms

Read more

Blue World City

Read more

Nova City Islamabad

Read more

Prime Valley Islamabad

Read more

Lahore Smart City

Read more

Capital Smart City

Read more

Our Blogs

Latest Blogs And Articles

You can get the most recent news, updates, and more details related to Real estate investment , consultancy and solutions.

Developer of Tab City Rawalpindi

The developers of TAB City Rawalpindi are building an amazing and exciting residential project that has become highly successful because of

admin | July 21, 2023

Possessionable Plots Construction Procedure In Capital Smart City

The possessionable plots construction procedure in Capital Smart City is crucial for customers who are purchasing ready-made plots in society. Society has introduced possessionable plots

admin | July 31, 2023

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admin | July 21, 2023

Testimonials

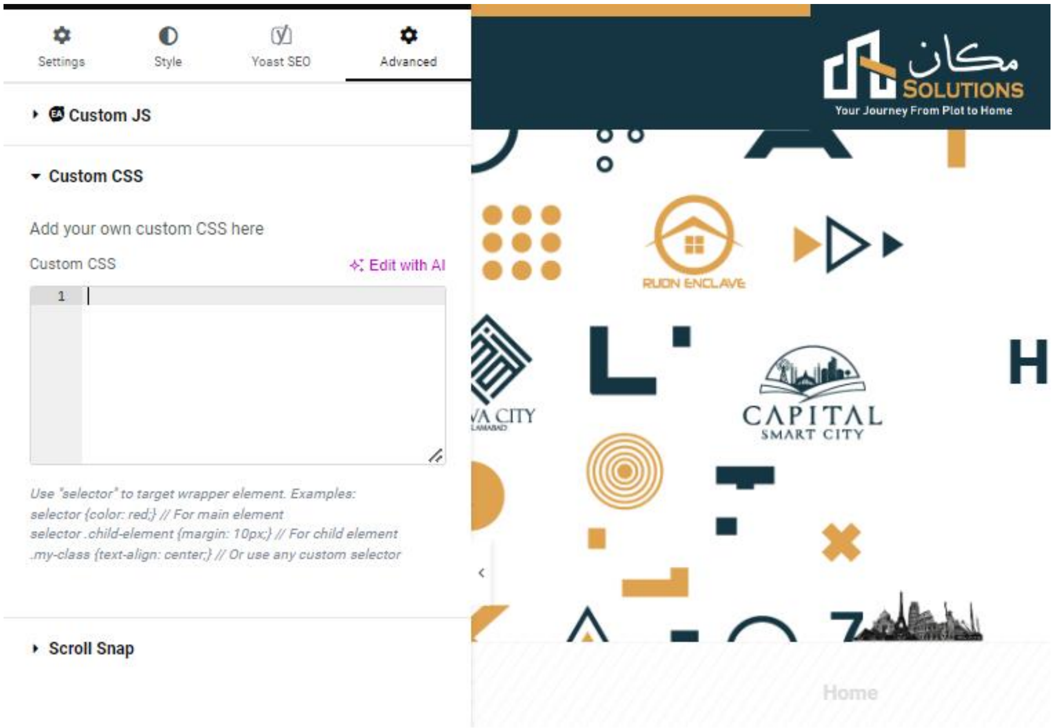
What Our Clients says

One of the best services I have adhered to. Bought a Plot from them in Capital Smart City. Their agent was so polite and humble and he has an amazing knowledge of the entire Society. Everything was explained in great detail and have loved the experience. I am so happy and proud to be associated with this consultancy.

Usman Khan

July 31, 2023

2- Externalize CSS Styles to add additional CSS to that page.



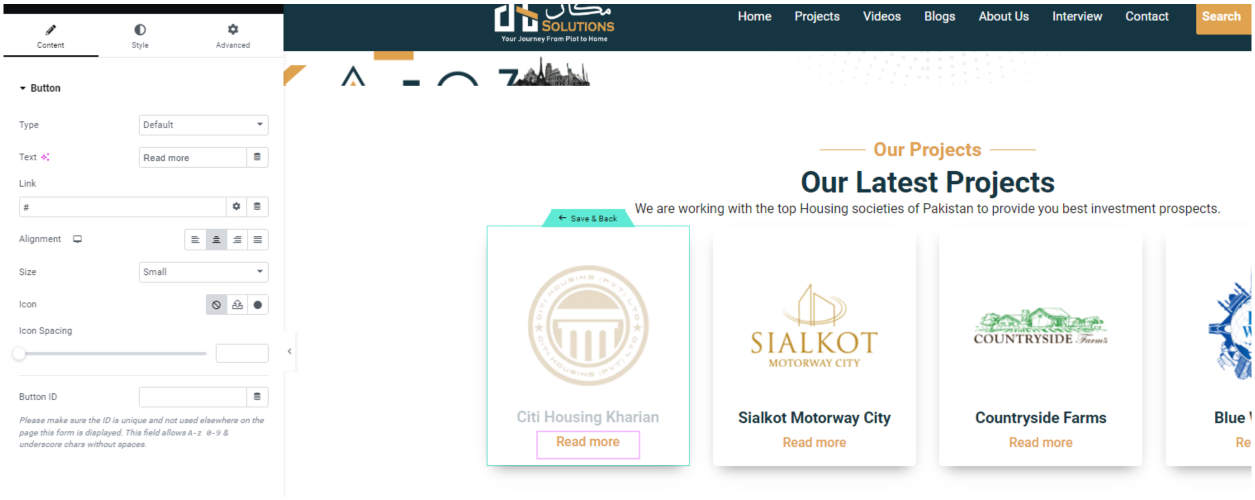
Add your own custom CSS here

Custom CSS

```
1 |
```

Use "selector" to target wrapper element. Examples:
selector {color: red;} // For main element
selector .child-element {margin: 10px;} // For child element
.my-class {text-align: center;} // Or use any custom selector

3- Use Configuration Files and Implement Templates.



Button

Type: Default

Text: Read more

Link: #

Alignment

Size: Small

Icon

Icon Spacing

Button ID

Please make sure the ID is unique and not used elsewhere on the page this form is displayed. This field allows A-z 0-9 & underscore chars without spaces.

Our Projects

Our Latest Projects

We are working with the top Housing societies of Pakistan to provide you best investment prospects.

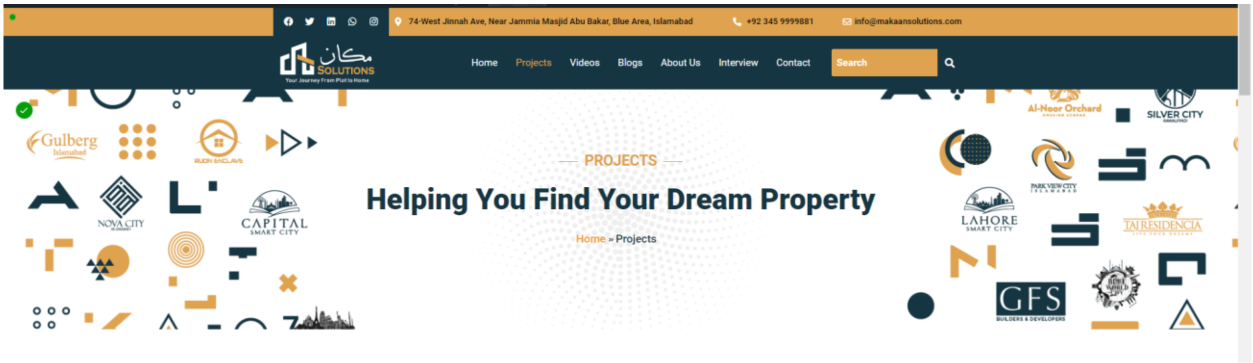
Citi Housing Kharian

Sialkot Motorway City

Countryside Farms

Blue

New Design:



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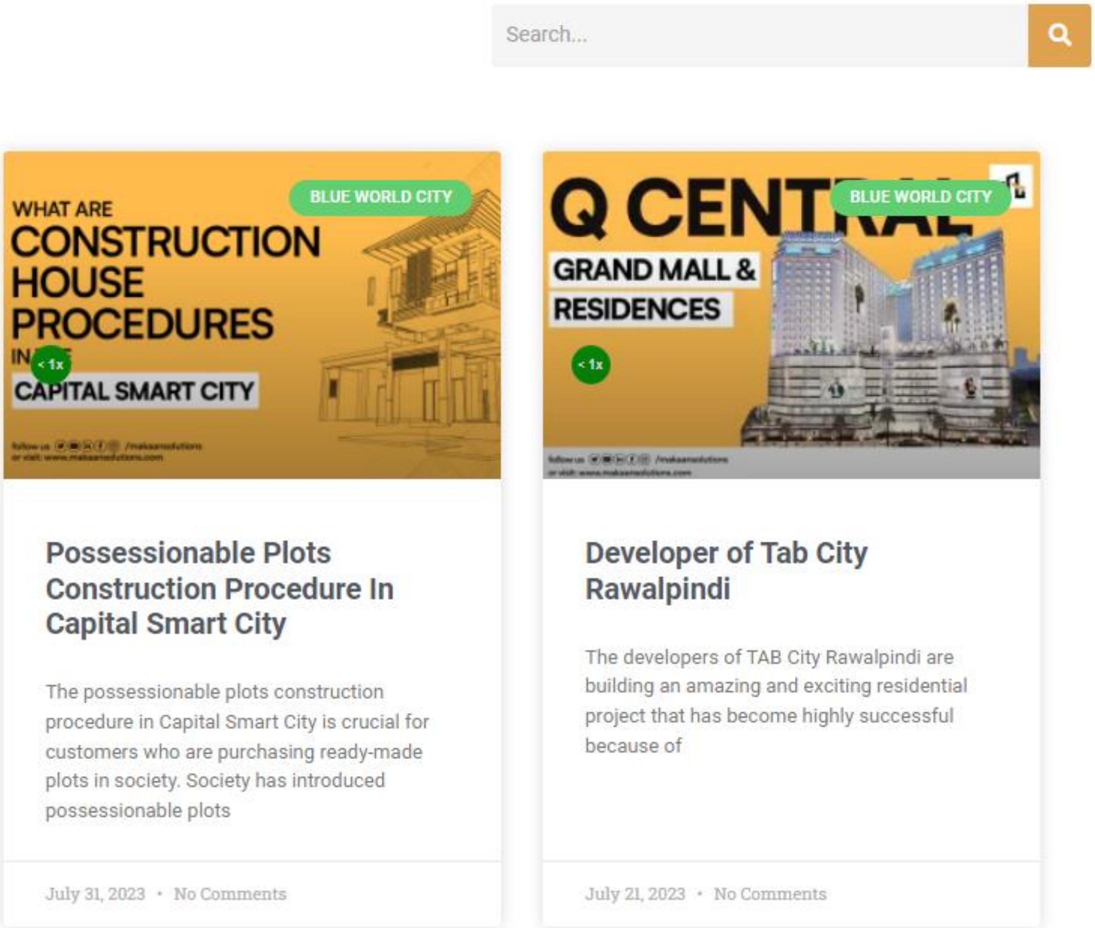
PROJECTS

Helping You Find Your Dream Property

Home » Projects



Possessionable Plots Construction Procedure In Capital Smart City

The possessionable plots construction procedure in Capital Smart City is crucial for customers who are purchasing ready-made plots in society. Society has introduced possessionable plots

July 31, 2023 • No Comments

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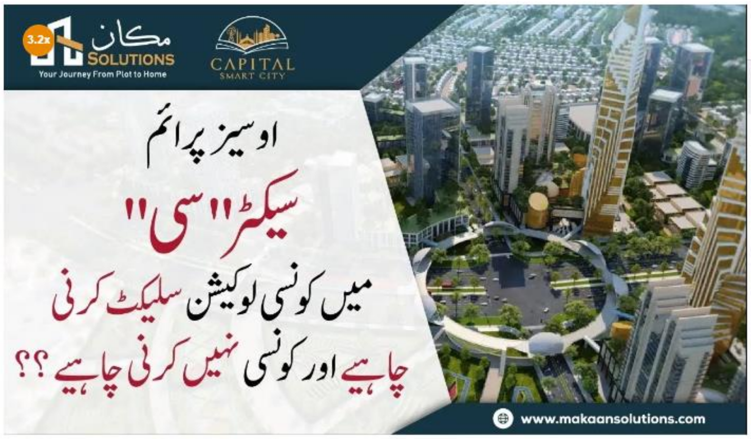
July 21, 2023 • No Comments

Our Projects

Capital Smart City

The first smart city of Pakistan located in the lush green capital, Islamabad.


3.2x
مکان SOLUTIONS
Your Journey From Plot to Home
CAPITAL SMART CITY
اوسیز پرائم
سیکٹر "سی"
میں کونسی لوکیشن سلیکٹ کرنی
چاہیے اور کونسی نہیں کرنی چاہیے ؟؟
www.makaansolutions.com

Development update	10 Videos
Capital smart city Islamabad |...	10:05
Actual Develop land by Capita...	22:39
Capital smart city Islamabad |...	10:26
Capital smart city Islamabad 5...	6:01
Capital smart city Islamabad R...	5:16
Capital smart city Islamabad ...	17:51
Capital smart city Islamabad ...	14:42

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Countryside Farms
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Blue World City
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Nova City Islamabad
Read more

Prime Valley Islamabad
Read more

Lahore Smart City
Read more

Capital Smart City
Read more

Name *

Your Name

Email *

Your Email

Phone *

Your Phone

Message

Your Message

Submit

Contact Us

Let's Ge In Touch

We would be happy to answer any questions you might have and provide you with further information. Please fill in the form so we can direct your inquiry to the development officer.

Head Office
051 616 7777

Islamabad Office
92 333 1127539

Rawalpindi Office
92 312 4444 084

Lahore Office
92 345 4440194

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The Problem at Hand:

The project aims to enhance various aspects of the existing system to improve its usability. The interpretation of the problem is derived from an in-depth analysis of the current state of the system, focusing on multiple dimensions such as user experience.

User Experience Enhancement:

- ❖ Core Problem: The user experience is suboptimal due to styling issues and a lack of responsiveness in the user interface. This affects user engagement and satisfaction, leading to a need for interface improvements.
- ❖ Complexities: The complexities involved include addressing development challenges associated with correcting styling components. Additionally, compatibility issues may arise with different devices, browsers, and user adaptation to the redesigned interface.
- ❖ Goals: The goal is to not only fix the existing styling problems but also to ensure that the system provides a seamless and responsive user experience across various platforms.

---------------- A Mapping of Reengineering Patterns --------------

1- **Setting Direction:**
  - ✓ Establish a clear direction to identify improvement areas.
  - ✓ Define a roadmap for refactoring and improvements.
  - ✓ Prioritizing tasks such as usability and performance.

2- **First Contact:**
  - ✓ Identifying the Strengths and weaknesses.
  - ✓ Perform analysis using Legacy code techniques.
  - ✓ Identify the risks readability to establish a foundation for further improvements.

3- **Initial Understanding**
  - ✓ Speculate about Design Patterns
  - ✓ Speculate about Architecture
  - ✓ Visualizing Metrics
    - ▪ Component Diagram

4- **Detailed Model Capture**
  - ✓ Tie Code and Questions (Annotate the code)
  - ✓ Refactor to Understand
  - ✓ Step Through the Execution (run-time architecture)

5- **Test: Your Life Insurance**
  - ✓ Write Tests to Enable Evolution
  - ✓ Use a Testing Framework (page speed)
  - ✓ Test the Interface, Not the Implementation

6- Migration Strategies

- ✓ Plan for a smooth transition from the current state to the desired state.
- ✓ Static code to Dynamic code.

7- Detecting Duplicated Code

- ✓ Management operations are the same in each module.

8- Redistribute Responsibilities

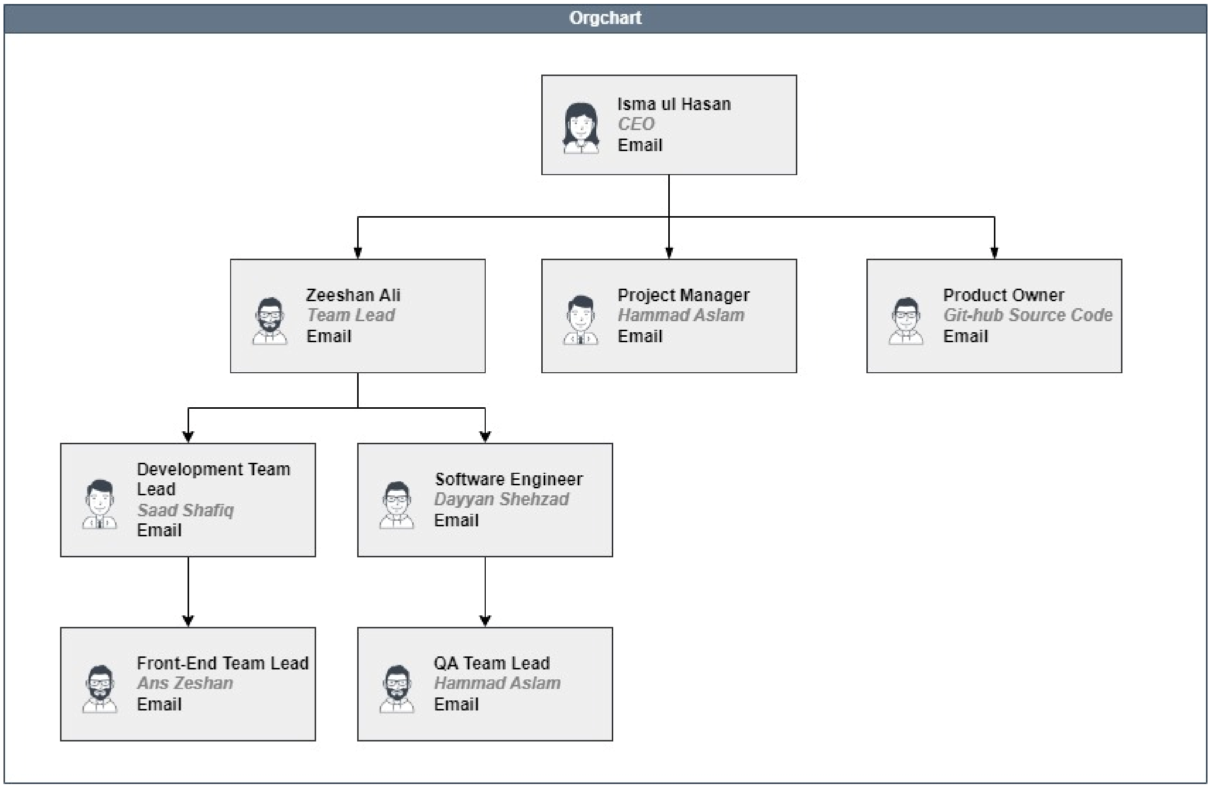
- ✓ Move Behavior Close to Data
- ✓ Transformation
- ✓ Detection strategy
- ✓ Reevaluate modular and maintainable architecture.
- ✓ Refactor code to encapsulate functionalities into functions or classes.

9- Transform Conditionals to Polymorphism

- ✓ Transform Conditional into Registration
  - ✓ Long methods which tools to invoke based on (file extension)
  - ✓ Transformation

-------------------- Project Management ------------------------

Organizational structure:



-------------------- Software Reengineering Aspects --------------------

Tests:

Verification Methods:

Unit Testing:

- ✓ Objective: Validate individual components or functions in isolation.
- ✓ Rationale: Ensures that each unit of code works as intended and helps catch any isolated issues early in development.

Performance Testing:

- ✓ Objective: Evaluate system performance under various conditions.
- ✓ Rationale: Ensures the system can handle expected loads and performs optimally under different scenarios.

Testing Strategy:

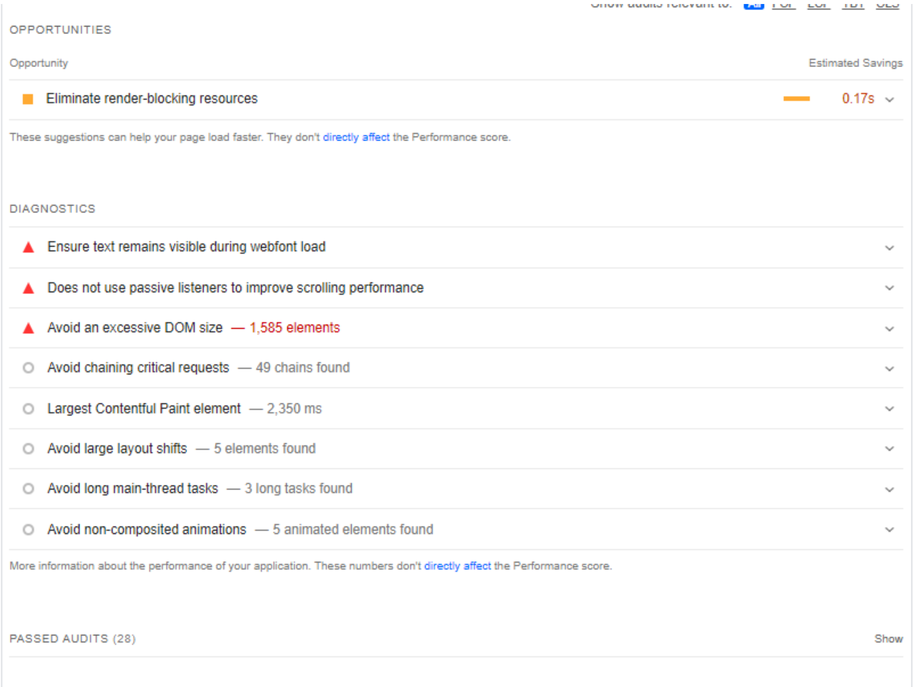
Test-Driven Development (TDD):

- ✓ Rationale: Writing tests before writing the actual code ensure that the code meets the specified requirements. It provides a clear set of criteria for successful implementation.

Confidence Level Assessment:

Performance and Security Testing: Moderate Confidence

- ✓ Performance and security testing contribute to moderate confidence, but real-world scenarios may reveal additional challenges.



OPPORTUNITIES

Opportunity	Estimated Savings
■ Eliminate render-blocking resources	0.17s

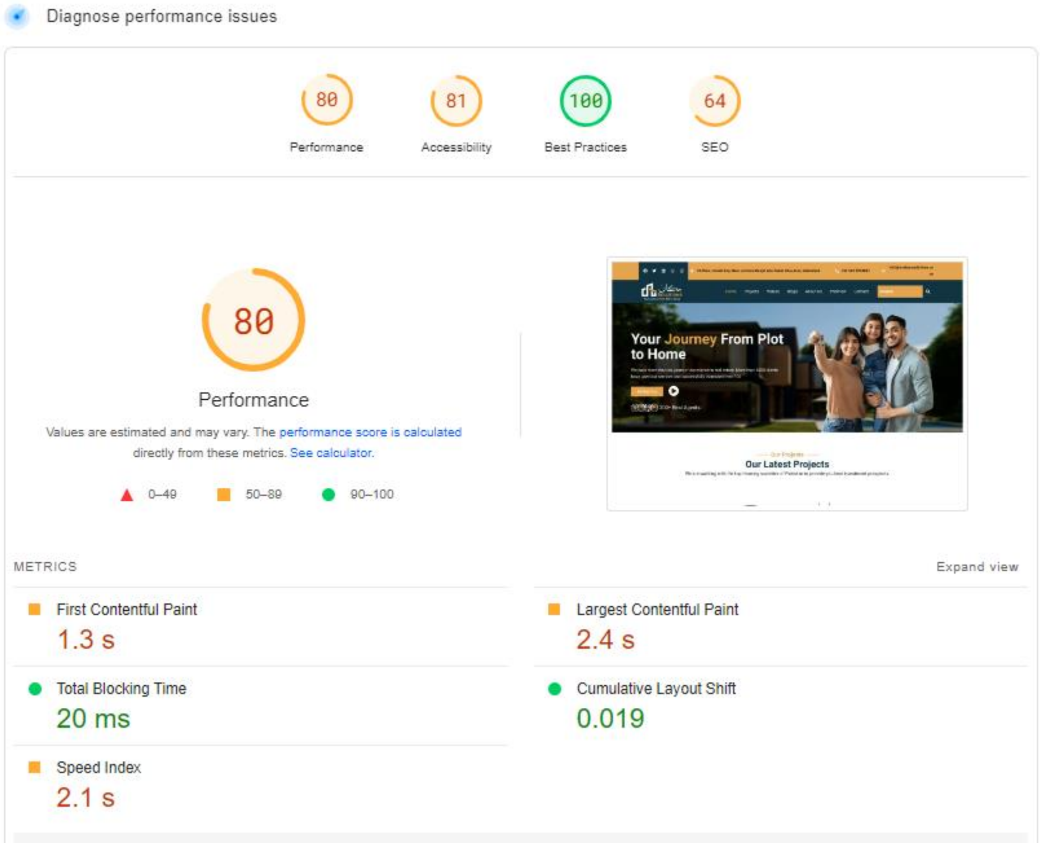
These suggestions can help your page load faster. They don't directly affect the Performance score.

DIAGNOSTICS

- ▲ Ensure text remains visible during webfont load
- ▲ Does not use passive listeners to improve scrolling performance
- ▲ Avoid an excessive DOM size — 1,585 elements
- ○ Avoid chaining critical requests — 49 chains found
- ○ Largest Contentful Paint element — 2,350 ms
- ○ Avoid large layout shifts — 5 elements found
- ○ Avoid long main-thread tasks — 3 long tasks found
- ○ Avoid non-composited animations — 5 animated elements found

More information about the performance of your application. These numbers don't directly affect the Performance score.

PASSED AUDITS (28)



Diagnose performance issues

80	81	100	64
Performance	Accessibility	Best Practices	SEO

80

Performance

Values are estimated and may vary. The performance score is calculated directly from these metrics. See calculator.

▲ 0–49 ■ 50–89 ● 90–100

METRICS

Expand view

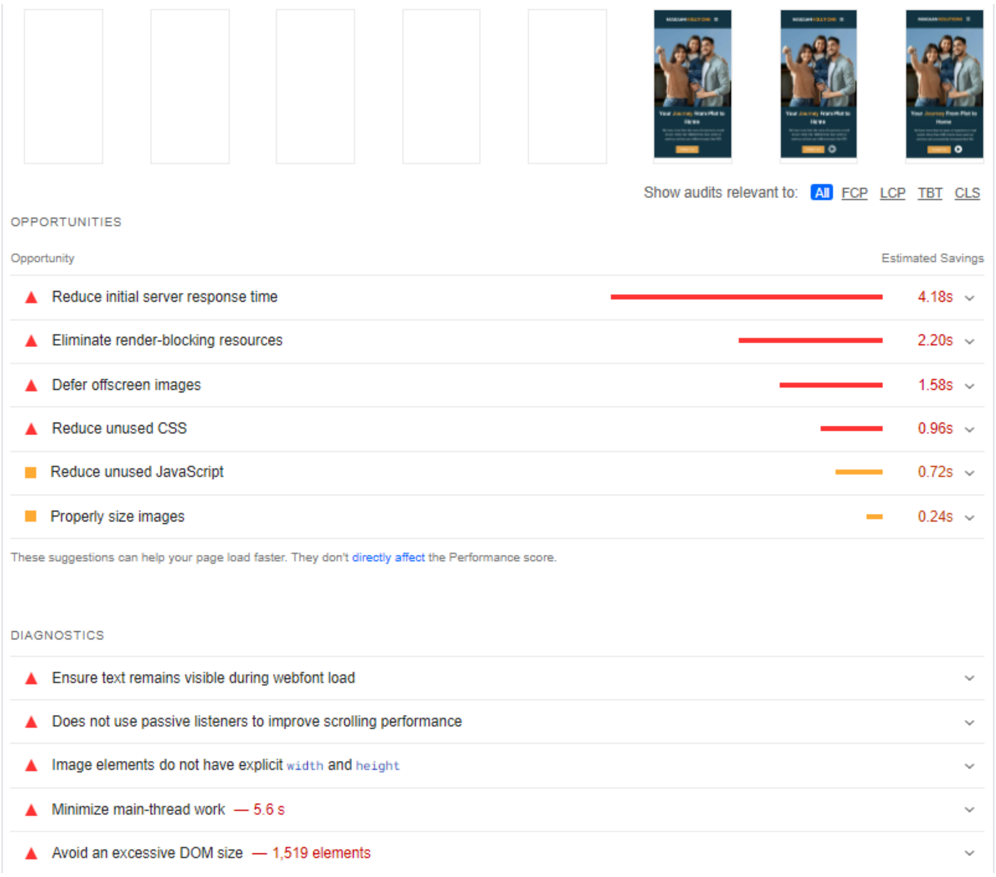
■ First Contentful Paint
1.3 s

■ Largest Contentful Paint
2.4 s

● Total Blocking Time
20 ms

● Cumulative Layout Shift
0.019

■ Speed Index
2.1 s



Show audits relevant to: All FCP LCP TBT CLS

OPPORTUNITIES

Opportunity	Estimated Savings
▲ Reduce initial server response time	4.18s
▲ Eliminate render-blocking resources	2.20s
▲ Defer offscreen images	1.58s
▲ Reduce unused CSS	0.96s
■ Reduce unused JavaScript	0.72s
■ Properly size images	0.24s

These suggestions can help your page load faster. They don't directly affect the Performance score.

DIAGNOSTICS

- ▲ Ensure text remains visible during webfont load
- ▲ Does not use passive listeners to improve scrolling performance
- ▲ Image elements do not have explicit `width` and `height`
- ▲ Minimize main-thread work — 5.6 s
- ▲ Avoid an excessive DOM size — 1,519 elements

Overall Impact on Support of Newly Intended Features:

Code Readability and Maintenance:

- ✓ The refactored codebase is more readable, modular, and maintainable, providing a solid foundation for the incorporation of new features without introducing complexity.

Modular Components:

- ✓ The creation of reusable functions and the use of templates result in modular components that can be easily integrated into new features, promoting code reusability.

Flexibility and Adaptability:

- ✓ Externalizing styles, using configuration files, and separating concerns contribute to the system's flexibility, making it easier to adapt to new requirements and design elements.

Overall, these refactoring efforts aim to create a more robust, flexible, and maintainable codebase, providing a solid foundation for the support and integration of newly intended features in the future development of the project.

------------------- The End --------------------