Master Project Report

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University of Bremen, Germany

Smart Bremen - The Forgotten City

Project Report

Abstract

Smart Bremen project aimed to develop an online platform to document and manage informal practices in the city of Bremen, Germany. The platform allows public access to a database of informalities, such as graffiti, with the option for registered users to contribute additional content. The development process was carried out by three teams—Artistic, Frontend, and Backend—working collaboratively. Despite challenges, the team completed the project using a standardized framework, ensuring scalability and future development potential. This report has been written to document the development process, challenges, outcomes, and future potential of the platform.

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1. Introduction

1.1 Definition

The *Smart Bremen - The Forgotten City* project has been initiated at the University of Bremen, Germany, focusing on *Informalities* in the city of Bremen. A group of students from the University of Bremen has collaborated on this project. Initially, the concept of *Informality* is examined through the perspective of Ananya Roy. Ananya Roy is a prominent urban theorist and scholar known for her work on urban informality, global urbanism, and issues of social justice. She is a Professor of Urban Planning, Social Welfare, and Geography at the University of California, Los Angeles (UCLA).

According to Ananya Roy, informality in urban studies refers to activities, spaces, and practices that exist outside formal regulatory frameworks but are integral to urbanization. Traditionally associated with unregulated housing and economic activities, contemporary perspectives recognize informality as a system of norms that shape urban transformation (Roy, 2005). In cities like Bremen, informal urban practices, such as unregulated economic activities and community-led interventions, play a crucial role in shaping the urban fabric, emphasizing the interplay between formal governance and grassroots urbanism.

1.2 Objectives

The main objective of this project is to develop an online software platform (a website) for managing *Informalities* in the city of Bremen. In parallel with the development of this software, students systematically collect information about informal practices in Bremen through structured planning and organization. Once processed, this data is uploaded to the developed platform. Ultimately, a database of *Informalities* will be made publicly accessible on the website. In the future, registered users will have the ability to upload their own information to the system, which will be published on the website after approval by the system administrator.

1.3 Framework

During the first online session where all projects were introduced, I had the impression that this project felt like a real-world project rather than being solely limited to academic research. This sense of practicality further motivated me to choose it. Moreover, since the project is related to software development, an area I am deeply interested in and have knowledge of, it was an ideal opportunity for me to take and expand my skills in a meaningful way.

For the purpose of this project, students were divided into three main groups: the Artistic Team, the Frontend Development Team, and the Backend Development Team. Each group has a designated leader. Due to my skills and experience in web development, as well as my personal interest in this field, I joined the Backend Development Team. In the following sections of this report, I discuss the details of my contributions.

One of the main challenges faced during the project was the novelty of the *Informalities* concept for most students, as well as time constraints, since the project was designed to last only one semester. The project was launched in the Winter Semester of 2024/2025 at the University of Bremen and may continue to develop in the future.

This report is intended for an academic audience, although it may also be of interest to anyone passionate about the subject. The website being developed is publicly accessible on the internet for all users.

2. Methodology and Process

2.1 Approaches

As previously mentioned, the development of this project was carried out by three main teams, and I was a member of the back-end development team. The website development began with a discussion among the entire development team (both back-end and front-end) about the overall requirements of the website. We agreed that each team would work on its own tasks, and in the end, one member from the front-end team and one from the back-end team would collaborate to integrate the two teams' code using the API provided by the back-end team.

Additionally, we decided to hold coordination meetings throughout the project. Each team selected a leader responsible for managing these inter-team meetings. Some meetings with the design team were also necessary, and the team leader was in charge of coordinating those as well. All our online discussions and meetings were conducted via Discord.

2.2 Resources

We held an online meeting to discuss the required technologies. Based on a collective decision and considering the skills of the back-end team members, we decided to use GitHub as the version control system.

For the project, we selected PHP as the programming language, Laravel version 10 as the framework, and MySQL as the database.

After identifying all the necessary components and requirements, it was decided that I would work on the authentication system and provide the API for that section, while other team members would handle the post-upload functionality and its API. Since the sections assigned to me were prerequisites for the parts assigned to others, I and one of team members initialized the project on GitHub and invited all back-end team members to collaborate.

To ensure I stayed up to date with the latest Laravel updates, I started following an online course on Laracasts in parallel with development.

At the beginning of the development phase, we discussed and finalized the overall database structure.

2.3 Backend Team

After that, we began our internal back-end team meetings and discussed our specific tasks. The tasks assigned to me were divided into two main sections: Authentication and User Role Management.

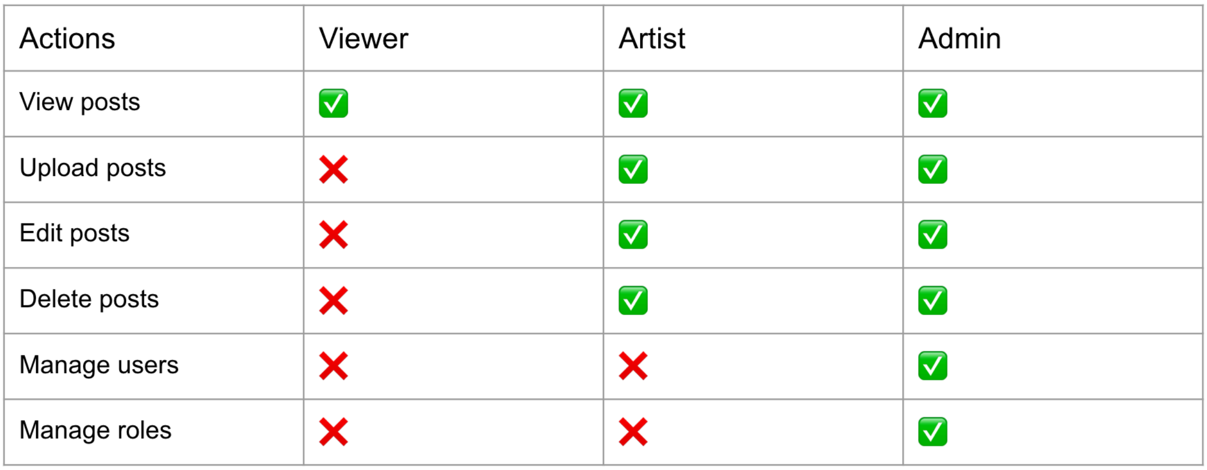
Authentication section involved implementing user registration on the website and managing user accounts, including updating names, emails, and passwords, as well as deleting accounts. Once these features were completed, to ensure that the front-end team could access these functionalities, I needed to develop an API to handle CRUD (Create, Read, Update, Delete) operations for system users. I worked directly with the front-end team leader to coordinate this, and after finalizing the code, we tested the API together in an online session. This ensured that everything functioned correctly and could be seamlessly integrated with the front end. This is the endpoints to the provided API:

- POST /api/users
  This endpoint is used to create a new user. It accepts the necessary user data (such as name, email, password, etc.) in the request body and creates a new user record in the system.
- GET /api/users
  This endpoint retrieves a list of all users in the system. It returns a collection of users with their relevant details, such as names, emails, and other associated data.
- GET /api/users/{id}
  This endpoint fetches the details of a single user by their unique user ID. It provides the information of the user specified in the {id} parameter, allowing access to their profile or other relevant data.
- PUT /api/users/{id}
  This endpoint is used to update the information of a specific user, identified by the {id} parameter. It allows modifications to the user's data, such as updating their name, email, or other attributes.
- DELETE /api/users/{id}
  This endpoint deletes a specific user from the system based on the provided {id}. Once a user is deleted, their data is permanently removed from the database.

These endpoints enable CRUD (Create, Read, Update, Delete) operations for managing user accounts in the system, providing a flexible and efficient API for user management.

User Role Management section focused on implementing role-based access control for users. The goal was to assign different content management permissions to different types of users.

- Admin users have full access to manage website content.
- Artist users can manage only the content they have created.
- Viewer users have read-only access to browse the website content.



Actions	Viewer	Artist	Admin
View posts	✅	✅	✅
Upload posts	❌	✅	✅
Edit posts	❌	✅	✅
Delete posts	❌	✅	✅
Manage users	❌	❌	✅
Manage roles	❌	❌	✅

Figure 1: Role based access table defining what operations each role can perform

Role-based access control was implemented by restricting specific website URLs to designated users. For example, the URL for the website's post management page is only accessible to admin users. Additionally, further restrictions were applied based on user roles through the use of middleware functions in Laravel. Middleware in Laravel acts as a filter for incoming HTTP requests, allowing us to apply specific conditions before granting access to certain routes. In this project, we created custom middleware to check a user's role before allowing them to access protected sections of the website (Laravel, n.d.). An admin-only middleware was implemented to ensure that only admin users could access management-related routes. Similarly, an artist-only middleware allowed artists to manage only their own content, while viewers were restricted to read-only access. By using middleware, we ensured a clean and scalable approach to handling access control, making it easy to manage and extend in the future.

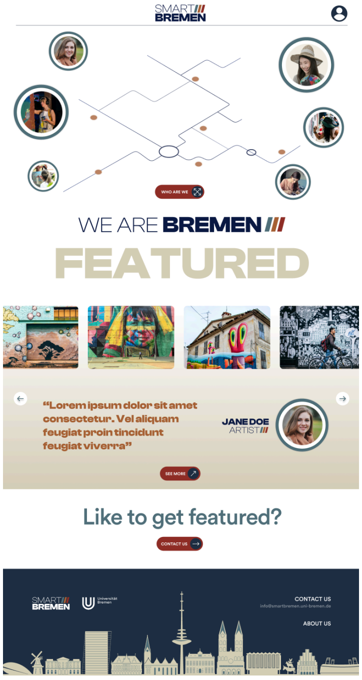
3. Challenges and limitations

During the project, the most significant challenge we faced as members of the back-end team was the time constraint. The entire project was defined for just one semester, and within this period, we had to develop all the minimum requirements of the website. Despite communication issues that arose due to most meetings being held online, we ultimately managed to complete all our tasks with teamwork. We strictly adhered to the original plan without deviations and successfully achieved all of our goals in full.

4. Results

With the collaboration of all project members and teams, the final outcome is ultimately an online website where visitors can view uploaded content on the site. This content consists of informalities in the city of Bremen, Germany (such as graffiti), along with descriptions. If visitors are interested, they can create an account on the website and upload their own content. This uploaded content will be published on the site after being approved by the website administrator.

This website is technically divided into a frontend code section (for all the visual elements of the website) and a backend code section (for the operational functions of the website), which are connected via an API. In addition to the main pages of the website, it includes dashboard pages for managing website content and users. Additionally, as part of the project, a series of photographs of the city of Bremen were taken. These images were captured in groups from different parts of the city. For example, one of the photos that I personally took are as follows. More images are available at the end of this report in the Appendices section.



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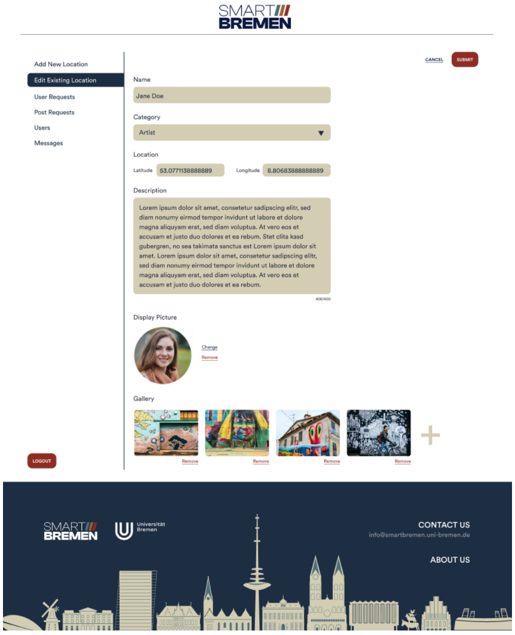
Like to get featured?

Figure 2: Website homepage



Name
Jane Doe

Category
Artist ▼

Location
Latitude 53.0771138888889 Longitude 8.80683888888889

Description
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Display Picture

Gallery

Figure 3: Website dashboard

Figure 4: Photo taken by me in Bremen city center

5. Discussion

During this project, despite having limited time and a large team, the website was fully developed with all the requirements we had discussed and agreed upon. It can also be developed in the future with additional features. Since a standard framework was used in its development, future development can be done easily and in a standardized manner. Details of my suggestions for future platform development are provided in Section 7 of this report.

Working on this project with a large team from different countries gave me the experience of collaborating in a diverse environment with different cultures, tastes, and personalities, which I found fascinating. Although I have encountered international students in other classes, this project involved practical teamwork with them, making it an extraordinary experience for me.

Additionally, from a programming perspective, this project allowed me to update my programming skills with the Laravel framework. As I previously mentioned, alongside working on the project, I followed an online course, which proved very beneficial. Furthermore, the project topic itself (informality) was new to me. Observing a city from this perspective was interesting and a valuable lesson I took away from this project.

6. Conclusion

The project successfully developed an online platform to manage and showcase informal practices in Bremen, providing a website that allows users to access and contribute to a database of informalities. By utilizing a standardized framework, the platform is easily scalable for future enhancements and developments. Despite challenges such as a tight timeline and communication barriers from online meetings, the project team worked collaboratively across three groups—Artistic, Frontend, and Backend—to meet all requirements on time. Additionally, working in a diverse, multicultural team provided invaluable insights into cross-cultural collaboration and teamwork. The project provided a new way to observe urban life, highlighting informal aspects of the city. Overall, it was a meaningful learning experience that combined technical, cultural, and observational growth.

7. Recommendations

Based on the findings and experience from this project, there are several possible next steps and follow-up actions that could further enhance the platform's functionality and user experience. These are as follows:

- Implementation of Email Verification: To improve security and ensure valid user registration, an email verification system should be implemented. This will help reduce the risk of spam or fake accounts.
- A Mobile Version of the System: As mobile usage continues to rise, developing a mobile-responsive or mobile application version of the system would significantly increase accessibility and enhance the user experience for users accessing the platform via smartphones and tablets.
- Social Media Integration to Share Posts: Integrating social media sharing functionality would allow users to share their posts or content directly on various platforms like Facebook, Twitter, and Instagram, increasing visibility and engagement.
- Advanced Role Management: Expanding the role management system to include more granular user roles and permissions would allow for better control and customization, especially for larger teams or more complex use cases.
- Advanced API with More Accessibilities for Further Development: Developing a more robust API with additional endpoints and functionalities will enable further expansion of the system, allowing for integration with third-party services and supporting future enhancements.
- Advanced Personal Profiles for Users: Enriching user profiles with more customizable options (such as profile pictures, bio, links to social media, etc.) could enhance the personalization of the system and improve user engagement.
- Section for Analytics (Most Viewed Posts, Number of Users, etc.): Implementing an analytics section to track key metrics, such as the most viewed posts, user activity, and other insights, would help administrators understand user behavior and make data-driven decisions for future improvements.

These recommendations, when implemented, could greatly improve the functionality, user experience, and scalability of the platform, making it more versatile and appealing to a broader audience.

8. References

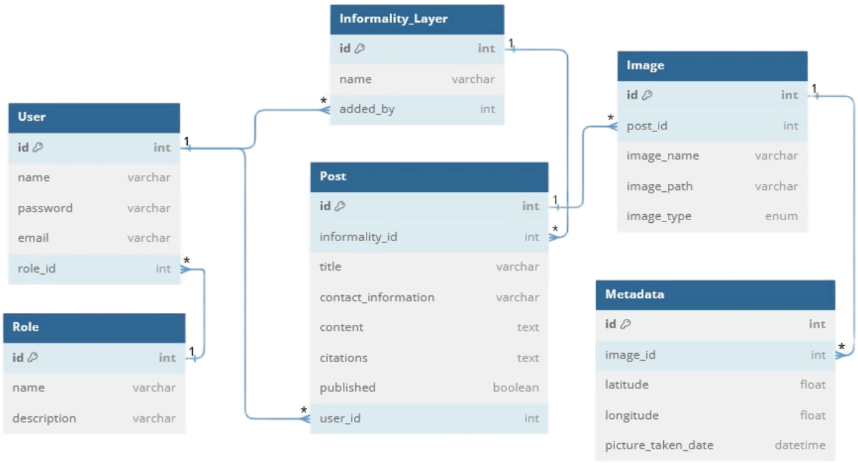
1. Roy, A. (2005). *Urban Informality: Toward an Epistemology of Planning*. Journal of the American Planning Association, 71(2), 147–158.

2. Laravel. (n.d.). *Laravel - The PHP Framework for Web Artisans.* Retrieved February 10, 2025, from https://laravel.com

3. PHP Group. (n.d.). *PHP: Hypertext Preprocessor.* Retrieved February 10, 2025, from https://www.php.net

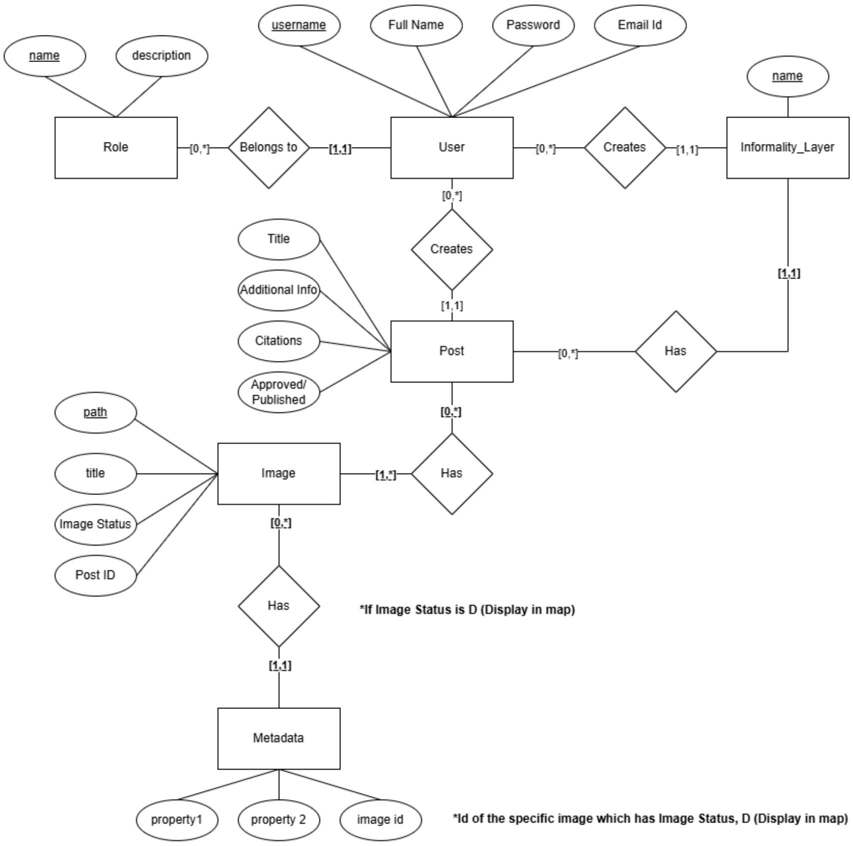
9. Appendices

Appendix A.



Database schema indicating relationships between tables

Appendix B.



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Database ER-Model