QR MALL CONNECT: YOUR DIGITAL MALL GUIDE

A Mini Project Report

Submitted by

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to the APJ Abdul Kalam Technological University in partial fulfilment of the requirements for the award of the Degree

of

Master of Computer Applications

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Declaration

I undersigned hereby declare that the project report **QR MALL CONNECT: YOUR DIGITAL MALL GUIDE** submitted for partial fulfilment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala, is a Bonafide work done by me under supervision of **Mrs. RESHMI K** ASSISTANT PROFESSOR Department of Computer Applications. This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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06/08/2025

DEPARTMENT OF COMPUTER APPLICATIONS

MES COLLEGE OF ENGINEERING, KUTTIPPURAM

CERTIFICATE

This is to certify that the report entitled **QR MALL CONNECT: YOUR DIGITAL MALL GUIDE** is a bona fide record of the Mini Project work during the year 2025-26 carried out by **SETHULAKSHMI K (MES24MCA-2050)** submitted to the APJ Abdul Kalam Technological University, in partial fulfilment of the requirements for the award of the Master of Computer Applications, under my guidance and supervision. This report in any form has not been submitted to any other University or Institution for any purpose.

Internal Supervisor

Head of The Department

Acknowledgment

I would like to begin by expressing my deep sense of gratitude to the Almighty, whose blessings and guidance have been a constant source of strength and inspiration throughout the completion of my project work titled “QR MALL CONNECT: YOUR DIGITAL MALL”, undertaken as part of the requirements for the degree of Master of Computer Applications at MES College of Engineering, Kuttippuram, under APJ Abdul Kalam Technological University, Kerala.

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Abstract

The Smart Mall QR-Based Store Information System is a web-based digital platform developed to enhance the in-mall shopping experience by providing real-time access to store related information through a single QR scan. This system addresses common shopper challenges, such as difficulty locating stores, finding specific products, or being unaware of current promotions. By scanning a QR code placed at key entry or intersection points within the mall, users are instantly directed to a centralized web application that displays all necessary details including store names, product listings, prices, floor-wise locations, and special offers.

At the heart of this system is a robust and scalable architecture built using modern web technologies. The frontend is developed using HTML, CSS, and JavaScript to ensure responsiveness and interactivity, while the backend utilizes Python with Django for smooth data handling and secure server-side operations. An SQLite database manages the store and product information, ensuring fast and reliable access to dynamic content. The system supports core functionalities such as QR code scanning, search and filter options by category, and a dedicated admin panel for updating store data and managing promotions.

This platform not only improves navigation and decision-making for shoppers but also serves as a powerful tool for mall administrators to maintain up-to-date information and promote store visibility. By reducing the time and effort spent in physically locating products or offers, the system provides a more organized and engaging shopping journey. It also encourages the integration of digital tools in everyday environments, promoting smart infrastructure within commercial spaces.

With emphasis on usability, real-time data access, and ease of maintenance, the Smart Mall QRBased Store Information System is a forward-thinking solution aimed at transforming traditional mall visits into efficient, informed, and digitally enhanced experiences. As malls continue to grow in size and complexity, this system is designed to scale and adapt, making it a valuable asset for smart retail environments..

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Chapter 1. Introduction

As digital technologies continue to reshape consumer behavior, traditional retail spaces like shopping malls must adapt to meet the growing demand for convenience, personalization, and real-time information. Shoppers today expect seamless access to store details, product availability, and promotional offers without the hassle of navigating large, complex environments. The **QR Mall Connect** system is a forward-thinking solution designed to bridge this gap by transforming the mall experience into a digitally enhanced journey.

At the core of this system is a **QR-based access model**: shoppers simply scan a single QR code placed at strategic entry or intersection points within the mall to instantly access a centralized web application. This platform provides comprehensive store-related information—including prices, offers, product listings, and floor-wise locations—enabling users to make informed decisions quickly and effortlessly.

The system is built with a **user-friendly architecture**, leveraging modern web technologies for optimal performance. The frontend uses **HTML, CSS, and JavaScript** to ensure responsiveness and interactivity, while the backend is powered by **Python with Django**, offering secure and efficient data handling. An **SQLite database** manages dynamic content such as store inventories and promotional data, allowing for real-time product search and updates.

Beyond navigation, QR Mall Connect simplifies the process0 of finding specific products, saving time and enhancing shopper satisfaction. It also empowers **mall administrators** with a dedicated admin panel to manage store data, update offers, and maintain accurate listings. Additionally, the platform supports **user-generated reviews**, helping other shoppers make better decisions based on shared experiences.

1.1 Motivation

Modern shopping malls are expansive and often overwhelming, especially for visitors trying to locate specific stores, products, or ongoing promotions. Despite the presence of physical directories and signage, shoppers frequently face confusion, delays, and missed opportunities due to outdated or incomplete information. This not only affects customer satisfaction but also limits the visibility and reach of individual stores within the mall.

The motivation behind the **QR Mall Connect** system stems from the need to simplify and digitize the in-mall shopping experience. By offering a centralized, QR-based access point, the system empowers users to instantly retrieve accurate and up-to-date store information, including pricing, offers, and floor-wise locations. This eliminates the need for manual searching or wandering, saving time and reducing frustration.

Furthermore, the platform enhances digital navigation and promotes smarter decision-making through features like real-time product search, user reviews, and category-based filtering. It also provides mall administrators with a powerful tool to manage store data, update promotions, and engage directly with shoppers. In doing so, QR Mall Connect not only improves operational efficiency but also fosters a more connected and satisfying retail environment.

1.2 Objectives

The **QR Mall Connect** system is designed to revolutionize the in-mall shopping experience by integrating smart digital tools that simplify navigation, enhance decision-making, and improve overall user satisfaction. The key objectives of the system are:

- **Instant Access Via QR Code Scanning :** Shoppers can scan a single QR code placed at strategic points within the mall to instantly access a centralized web application. This eliminates the need for physical directories or manual inquiries, providing immediate access to store names, product listings, prices, and promotional offers.

- **Smart Search Functionality** : The system includes a powerful search feature that allows users to quickly locate specific products or stores. Shoppers can filter results by category,

- brand, or floor level, making it easier to find what they need without wandering through the mall.

- **Real-Time Data Management through Admin Panel** : Mall administrators have access to a secure backend panel where they can update product details, pricing, and promotional offers in real time. This ensures that shoppers always receive accurate and current information, enhancing trust and reliability.

- **Reduced Time and Confusion in Product Discovery** : By centralizing store information and enabling smart filtering, the system significantly reduces the time and effort required to locate products or offers. This leads to a smoother, more efficient shopping journey and minimizes frustration for visitors.

- **Enhanced User Experience through Reviews and Feedback** : Shoppers can share their experiences by posting reviews and ratings for stores or products. This peer-driven feedback helps others make informed decisions and fosters a sense of community within the mall ecosystem.

1.3 Contributions

Centralized QR-Based Access – Provides shoppers with instant access to all store-related information—including product listings, prices, offers, and locations—through a single QR code scan, eliminating the need for physical directories.

- **Smart Search and Filter Options** – Enables users to quickly find specific products or stores using category-based and floor-wise filtering, improving navigation and reducing time spent searching.

- **Real-Time Data Updates via Admin Panel** – Allows mall administrators to update store details, product information, and promotional offers instantly, ensuring accuracy and enhancing operational control.

- **User Review System** – Integrates a review feature where shoppers can share experiences and rate stores or products, helping others make informed decisions and boosting engagement.
- **Responsive Web Interface** – Built using HTML, CSS, and JavaScript for the frontend, ensuring a smooth and interactive user experience across devices.
- **Secure Backend Architecture** – Utilizes Python with Django and SQLite for robust data handling, secure operations, and scalable content management.
- **Improved Shopper Satisfaction** – Reduces confusion and manual effort in locating products or offers, streamlining the shopping journey and enhancing overall satisfaction.

1.4 Report Organization

The project report is organized into five chapters:

- **Chapter 1: Introduction** – Covers the background, motivation, objectives, contributions, and structure of the report.
- **Chapter 2: System Study** – Reviews existing mall navigation systems, their limitations, and introduces the proposed QR-based solution.
- **Chapter 3: Methodology** – Details the design approach, technologies used, module breakdown, and sprint-wise development process.
- **Chapter 4: Results and Discussions** – Presents implementation outcomes with screenshots and evaluates how the system meets project goals.
- **Chapter 5: Conclusion and Future Work** – Summarizes contributions, highlights system benefits, and suggests future enhancements.

Chapter 2. System Study

Traditional shopping malls often lack efficient navigation tools, making it difficult for shoppers to locate stores, products, or ongoing offers. This leads to confusion, wasted time, and reduced customer satisfaction. The proposed system, **QR Mall Connect**, addresses these issues by offering a centralized, QR-based digital guide that provides instant access to store information, product listings, and promotions through a single scan.

2.1 Existing System

In most shopping malls, shoppers depend on static tools such as physical directories, signboards, and manual assistance to locate stores. To access product details or pricing, they must visit each store individually, which is time-consuming and inefficient. Offers and promotions are typically displayed on posters or brochures that may be outdated or poorly placed, leading to missed opportunities. These limitations result in a fragmented shopping experience with minimal digital support. To address these gaps, the proposed QR Mall Connect system introduces a centralized, QR-based platform that offers real-time access to store information, product listings, and promotions enhancing user satisfaction.

2.2 Proposed System

The proposed system, **QR Mall Connect**, is a QR-based digital guide designed to simplify and enhance the shopping experience within malls. By scanning a single QR code placed at key entry points, shoppers gain instant access to a centralized online platform that displays real-time information about store locations, product listings, prices, and promotional offers. The system also includes smart search features that allow users to quickly find specific products or filter results by category or floor, reducing confusion and saving time.

In addition to navigation, the platform enhances user engagement through review and sharing options, helping shoppers make informed decisions. Mall administrators benefit from a secure admin panel that enables real-time updates of store data and promotions. Built using modern web technologies, the system ensures responsiveness, scalability, and ease of maintenance. The targeted users include mall visitors seeking quick access to store information and administrators aiming to streamline mall operations and improve customer satisfaction.

2.3 Functionalities of Proposed System

1. Code Scanning:

The system enables shoppers to scan a single QR code placed at strategic mall entry or intersection points. Upon scanning, users are directed to a centralized web application that instantly displays store information, product listings, prices, and promotional offers—eliminating the need for physical directories or manual assistance.

2. Special Offers & Discounts:

Real-time promotional data is displayed on the platform, allowing users to view ongoing sales, exclusive deals, and seasonal offers. This helps shoppers make informed purchasing decisions and ensures they don't miss out on time-sensitive discounts.

3. Review & Sharing Features:

Users can share their shopping experiences by posting reviews and ratings for stores or products. These reviews assist other shoppers in making better choices and foster a sense of community within the mall environment.

4. Search Functionality:

The system includes a smart search feature that allows users to quickly locate specific products or stores. Filters based on categories, brands, and floor levels help streamline the search process and reduce navigation time.

5. Admin Panel:

Mall administrators have access to a secure backend panel where they can manage store data, update product details, and modify promotional content in real time. This ensures that the information presented to shoppers is always accurate and up to date.

Chapter 3. Methodology

A well-defined software methodology is essential for building reliable, scalable, and user-centric systems. It provides a structured framework for planning, designing, developing, and testing the application while ensuring that all functional and non-functional requirements are met. For the QR Mall Connect project, adopting a systematic approach helps manage complexity, track progress through development sprints, and ensure smooth collaboration between frontend, backend, and administrative modules. This chapter outlines the design strategy, selected tools, and modular breakdown used to implement the proposed system effectively.

3.1 Introduction

The Agile methodology is an iterative and incremental approach to software development. Unlike traditional models, Agile emphasizes flexibility, regular review, and collaboration between developers and stakeholders. The development process is divided into sprints, where each sprint delivers a functional module or enhancement of the system.

This methodology is well suited for the QR Mall Connect system, as features like real-time product updates, search optimization, and user review integration may evolve based on shopper and admin feedback. Agile allows developers to adapt quickly to changing requirements, ensuring the final product aligns with user expectations. It also promotes continuous testing and refinement, resulting in a high-quality, responsive, and user-friendly mall navigation platform.

3.2 Software Tools

The following software tools and technologies were used to develop the **QR Mall Connect** system (see Table 3.1):

Table 3.1: List the software tools or languages used for the project development

Operating System	Windows
Front End	JavaScript, HTML, CSS
Back End	Python
Framework	Django
Database	SQLite
IDE	Visual Studio Code
Version Control	Git
QR Code Integration	Python QR Code Libraries (e.g., qrcode)

1. Front End (HTML, CSS, JavaScript)

The frontend was developed using standard web technologies to ensure cross-browser compatibility, responsive design, and ease of use. JavaScript enhances interactivity, while CSS ensures a clean and intuitive layout for shoppers.

2. Back End (Python with Django)

Django was chosen for its robust architecture, built-in admin interface, and rapid development capabilities. It simplifies database operations, URL routing, and user authentication, making it ideal for managing real-time store data and user interactions.

3. Database (SQLite)

SQLite was selected for its lightweight nature and ease of integration with Django. It efficiently handles structured data such as store listings, product details, user reviews, and admin updates, making it suitable for small to medium-scale mall environments.

4. QR Code Integration (Python Libraries)

QR code generation and decoding were implemented using Python libraries like `qrcode`, enabling seamless access to the web platform via a single scan. This feature is central to the system's navigation and accessibility goals.

5. IDE (Visual Studio Code)

Visual Studio Code was used for development due to its rich extension support, debugging tools, and seamless integration with Python and web technologies.

6. Version Control (Git & GitHub)

Git and GitHub facilitated collaborative development, version tracking, and secure backup of the project source code, ensuring smooth progress across sprints.

3.2.1 Python

Python was chosen as the backend language for the QR Mall Connect system due to its simplicity, readability, and robust ecosystem. Its clean syntax allows for rapid development and easier maintenance, which aligns well with Agile principles. Python's extensive libraries and frameworks—particularly Django—offer built-in support for database management, URL routing, user authentication, and admin interfaces, reducing the need for manual configurations.

Moreover, Python integrates seamlessly with QR code generation libraries, making it ideal for implementing the core functionality of the system. Its scalability and strong community support ensure long-term viability and ease of troubleshooting. Overall, Python provides a powerful yet developer-friendly environment for building secure, efficient, and modular web applications.

3.2.2 Django

Django was chosen as the backend framework for QR Mall Connect because it is powerful, secure, and easy to use. It helps organize the project neatly and comes with built-in features like an admin panel, user login system, and tools to manage data and website navigation. Django also protects the system from common online threats and works well with SQLite for storing product and store information. Its support for APIs and dynamic content makes it ideal for building a fast, reliable, and user-friendly mall guide system.

3.3 Module Description

System modules are distinct functional components that work together to deliver the overall capabilities of a software application. Each module is responsible for a specific set of tasks and interacts with other modules to ensure smooth operation. In the QR Mall Connect system, the architecture is divided into two main modules: the **Admin Module** and the **User Module**. These modules are designed to handle backend management and frontend user interaction respectively.

3.3.1 ADMIN MODULE

The **Admin Module** is designed for mall administrators to manage the backend operations of the QR Mall Connect system. It provides secure access through a login interface and enables admins to maintain accurate and up-to-date product, offer, and review information. This module ensures that the data displayed to users is reliable and reflects real-time changes made by the management.

Key functionalities include:

- **Login**: Admins authenticate using a secure login form powered by Django’s built-in authentication system. This ensures only authorized personnel can access the management dashboard.
- **Product Management**: Admins can add, update, or delete product details such as name, price, rack number, floor, and location. This helps maintain a structured and searchable product database.
- **Offer Management**: Admins can create and manage promotional offers linked to specific products. Offers include discount percentages and expiry dates, which are displayed to users in real time.

- **Review Management**: Admins can view, moderate, or delete user-submitted reviews to ensure quality and relevance. This helps maintain a trustworthy review system and prevents misuse or spam.

3.3.2 USER MODULE

The **User Module** is designed to provide mall visitors with a simple and interactive experience. It allows users to access product and offer information instantly by scanning a QR code placed at mall entry points. This module focuses on ease of use and does not require login, making it accessible to all shoppers.

- **QR Code Access**: Users can scan a single QR code to open the mall's product information system. This instantly connects them to a centralized web platform where they can explore store and product details.
- **Product Viewing**: Shoppers can view essential product information such as name, price, rack number, floor, and location. The interface is mobile-friendly and easy to navigate.
- **Offer Viewing**: Users can see current offers and discounts linked to products. These offers are updated in real time and displayed alongside product details.
- **Search**: A search bar allows users to quickly find products by typing in keywords or product names. This helps reduce browsing time and improves user convenience.
- **Review Option**: Users can submit reviews without logging in. They provide their name and feedback, which is stored and displayed under the respective product. This encourages open feedback and helps other shoppers make informed decisions.

3.4 User Story

User stories are short, simple descriptions of a feature told from the perspective of the end user. They help developers understand user needs and guide the design of system functionalities. In the QR Mall Connect system, user stories are crafted to reflect the goals and actions of both shoppers and mall administrators.

Table 3.2: User Story

User Story ID	As a type of user	I Want to	So that I can
1	ADMIN	Login securely	Manage mall data safely and prevent unauthorized access.
	ADMIN	Add/Edit/Delete product information	Keep store details accurate and up-todate
	ADMIN	Upload product listings and prices.	Provide users with real-time product info
	ADMIN	Generate QR codes for mall entry points	Let users scan and instantly access product information.
2	USER	Scan a QR code at the mall entrance	Instantly get product information
	USER	Browse product names	Quickly find the type of product I need
	USER	Search for a product	Save time and avoid confusion while shopping
	USER	View product offers	Take advantage of discounts and deals

3.5 Product Backlog

The product backlog is a prioritized list of all the features, enhancements, and requirements that need to be implemented for the QR Mall Connect system. It acts as the master development plan and guides the Agile sprint cycles. The backlog includes both user-facing and adminfacing functionalities, ensuring that the system delivers a complete, efficient, and user-friendly experience for mall visitors and administrators.

Table 3.3: Product Backlog

PID	NAME	PRIORITY	ESTIMATE (hours)	STATUS
1	Project setup	high	4	Completed
2	Database setup	high	8	Completed
3	Login	high	6	Completed
4	QRcode scanning	high	6	Completed
5	Product information display	medium	10	Completed
6	Search	high	7	Completed
7	Admin Panel	high	8	Completed
8	Ui design	high	6	Completed
9	Integration	high	6	Completed
10	System testing and debugging	medium	4	Completed

3.6 Project Plan

The project plan outlines the key phases, activities, and timelines involved in the development of the QR Mall Connect system. It ensures that each module is completed systematically, following the Agile methodology. The plan includes requirement analysis, design, development, testing, and deployment stages

Table 3.4: Project Plan

User Story ID	Task Name	Start Date	End Date	Hours	Status
1,2	Sprint 1	06/08/2025	15/08/2025	10	Completed
3	Sprint 1	16/08/2025	19/08/2025	4	Completed
4,5	Sprint 2	23/08/2025	5/09/2025	14	Completed
6,7	Sprint 3	07/09/2025	20/09/2025	14	Completed
8,9,10	Sprint 4	24/09/2025	07/10/2025	14	Completed

3.7 Sprint Backlog

The sprint backlog outlines the specific tasks and features planned for each sprint during the development of the QR Mall Connect system. It is derived from the product backlog and helps the development team stay focused on delivering functional components incrementally. Table 3.3 presents the sprint-wise breakdown of activities, ensuring that both user-facing and admin facing modules are developed, tested, and refined systematically. Table 3.5 sprint backlog

Backlog Item	Status and Completion Date	Original Estimation (hrs)	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
SPRINT 1												
Abstract & Problem Statement	06/08/2025	2	1	1	0	0	0	0	0	0	0	0
Literature Review	15/08/2025	3	1	1	1	0	0	0	0	0	0	0
Requirement Analysis & Use Cases	24/08/2025	3	1	1	1	0	0	0	0	0	0	0
SPRINT 2												
UI Design	02/09/2025	7	1	1	1	1	1	1	1	0	0	0
Tech Stack Documentation	11/09/2025	7	1	1	1	1	1	1	1	0	0	0
SPRINT 3												
Database Setup	20/09/2025	7	1	1	1	1	1	1	0	0	0	0
Backend Coding	29/09/2025	7	1	1	1	1	1	1	0	0	0	0
SPRINT 4												

Feature Integration (QR + Search + Admin)	08/10/2025	7	1	1	1	1	1	1	1	0	0	0
Testing & Final Report/Presentation	12/10/2025	7	1	1	1	1	1	1	1	0	0	0
TOTAL		50	9	8	8	6	6	6	6	0	0	0

3.8 Database Design

The database design defines the structure of data storage and relationships between entities in the QR Mall Connect system. It ensures efficient handling of product details, offers, reviews, and admin operations. The schema supports both user-facing and admin-facing functionalities, enabling real-time updates and secure data management.

3.6 Database Design

Collection	Attributes	Purpose
Product	• Product_id(PK) • Name • Price • description • Rack_no • Floor	Stores details of each product available in the mall, including location and pricing.

Offer	• Offer_id(PK) • Product_id(FK) • Title • Discount_percentage • Valid_until	Manages promotional offers linked to products
Review	• Review_id(PK) • Product_id(FK) • Reviewername • Rating • comments	Stores user-submitted reviews for products.

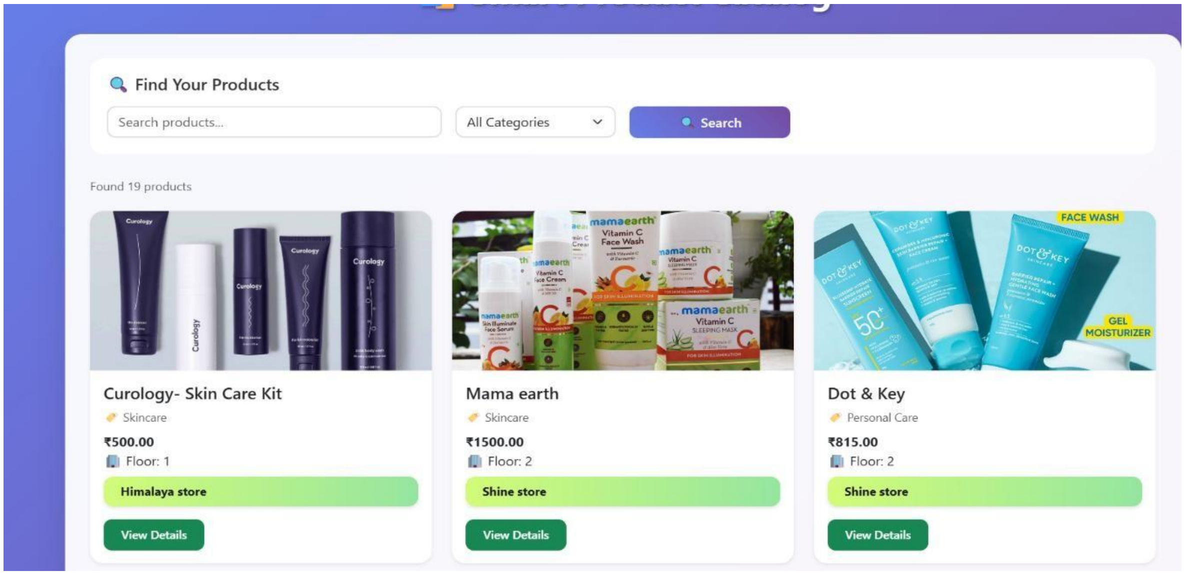
Category	• Category_id(PK) • Name • description	The **Category** table stores predefined classifications for products, such as Skincare, Cosmetics, and Personal Care
Admin	• admin_id(PK) • username • password	The **Admin** section provides backend control for managing products, offers, reviews, and overall system content efficiently.

Chapter 4. Results and Discussions

This chapter presents the outcomes of the QR Mall Connect system and analyzes its performance based on the implemented features and user interactions. It highlights how the system meets the defined objectives, including seamless product access via QR code, efficient admin management, and user-friendly browsing and review functionalities. The discussion also reflects on the effectiveness of the design choices, the responsiveness of the interface, and the accuracy of data handling across modules. Through this evaluation, the chapter demonstrates the practical viability and impact of the system in a real-world mall environment.

4.1 Results

Figure4.1: HomePage



Found 19 products

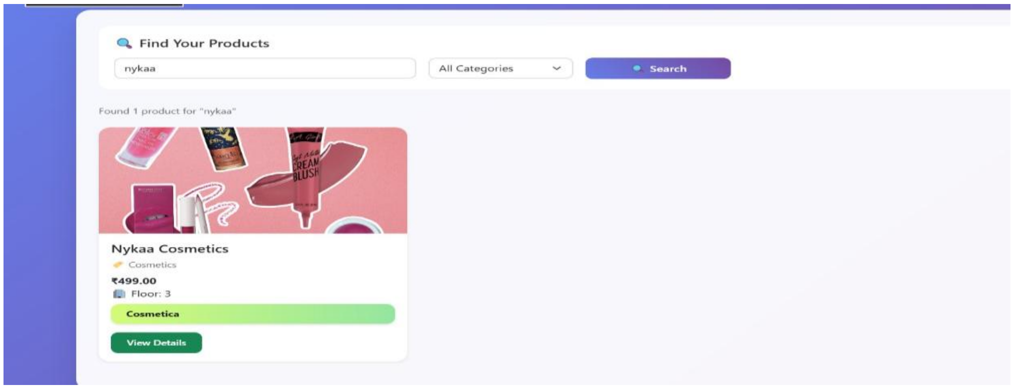
Curology- Skin Care Kit
Skincare
₹500.00
Floor: 1
Himalaya store

Mama earth
Skincare
₹1500.00
Floor: 2
Shine store

Dot & Key
Personal Care
₹815.00
Floor: 2
Shine store

Figure4.1 This interface allows users to search and browse products available in the mall using QR Mall Connect. The form includes a search bar labeled “Find Your Products,” where users can filter items by product name and category. Upon searching, relevant products are displayed with details such as name, category, price, and floor location. Each product listing includes an image and a “View Details” button for accessing more information.

Figure4.2: Search Products page



Find Your Products

nykaa

All Categories

Search

Found 1 product for "nykaa"

Nykaa Cosmetics

Cosmetics

₹499.00

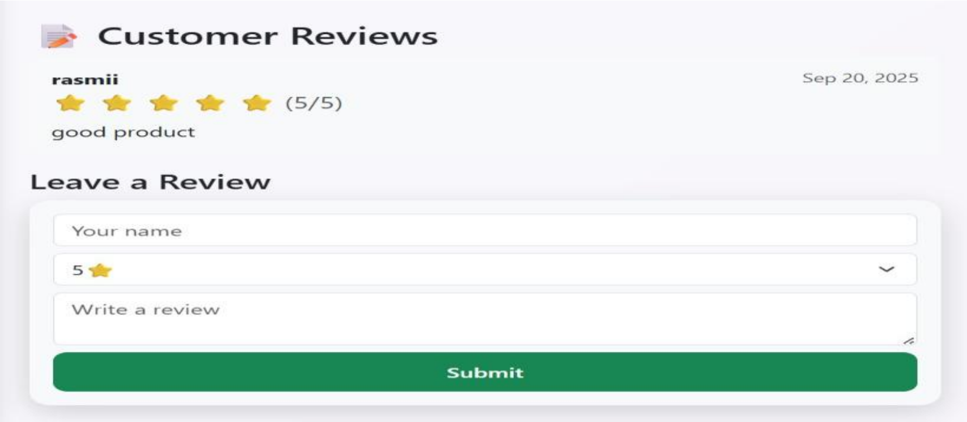
Floor: 3

Cosmetica

View Details

This section illustrates the search functionality of the QR Mall Connect system, allowing users to find products by name and category. It enhances user convenience by providing quick access to detailed product information within the mall.

Figure 4.3: Review Option



Customer Reviews

rasmii

Sep 20, 2025

★★★★★ (5/5)

good product

Leave a Review

Your name

5 ★

Write a review

Submit

This section displays user reviews for products and allows visitors to submit their own feedback. It enhances user engagement and helps future shoppers make informed purchase decisions.

Chapter 5. Conclusion

The QR Mall Connect system was developed as a smart, QR-based mall guide platform aimed at enhancing the shopping experience by enabling users to easily locate products, view offers, and submit reviews without the need for login or third-party applications. Unlike conventional mall directories or static signage, this system empowers administrators with full control over product listings, promotional content, and user feedback, while offering shoppers a seamless and interactive interface. Key features such as QR code access, product and offer browsing, review submission, search functionality, PDF generation, and a secure admin dashboard were successfully implemented and tested. The results demonstrate that the system meets its primary objectives by improving user convenience, increasing mall engagement, and streamlining backend operations. Customers benefit from real-time access to product information and offers, while administrators gain efficient tools for content management and review moderation. However, the project faced certain limitations, such as the absence of mobile app integration and advanced analytics for store performance. These constraints were primarily due to time limitations and the scope defined during initial planning. Future enhancements could include mobile responsiveness, integration with inventory APIs, and data visualization dashboards to provide deeper insights and scalability. Overall, QR Mall Connect stands as a practical and innovative solution for digital transformation in retail infrastructure.

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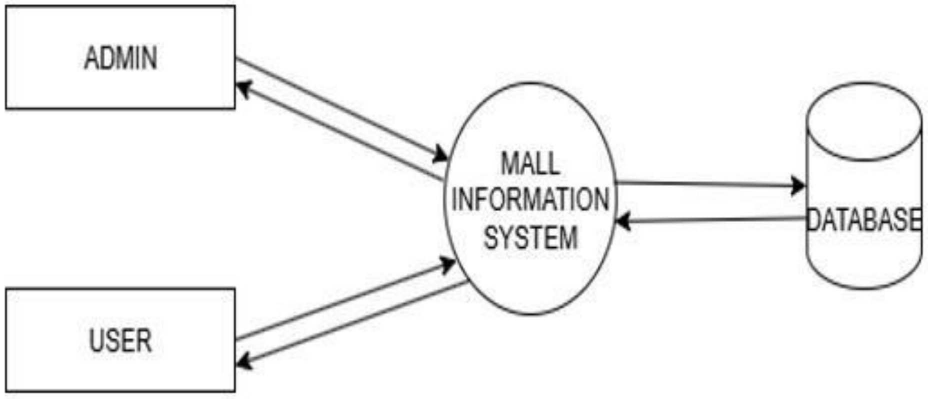
Appendix

Appendix A Data Flow Diagram

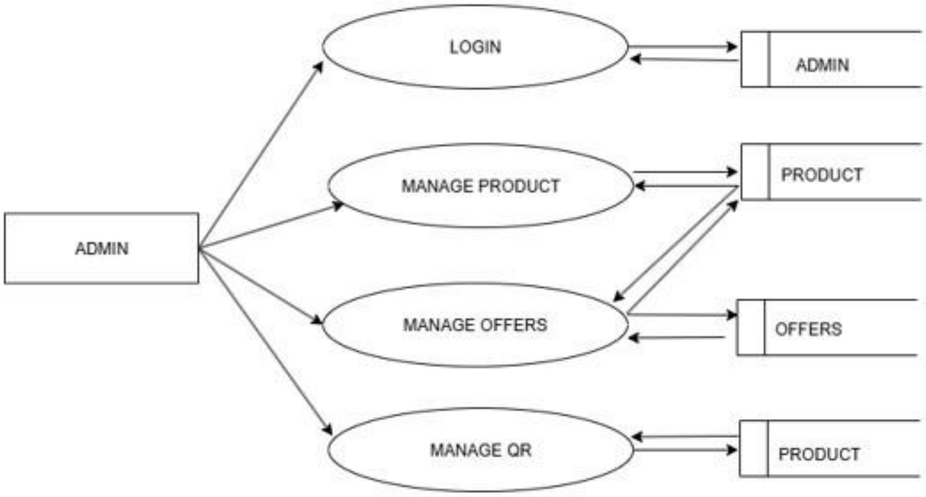
DFD level 0

- LEVEL 0



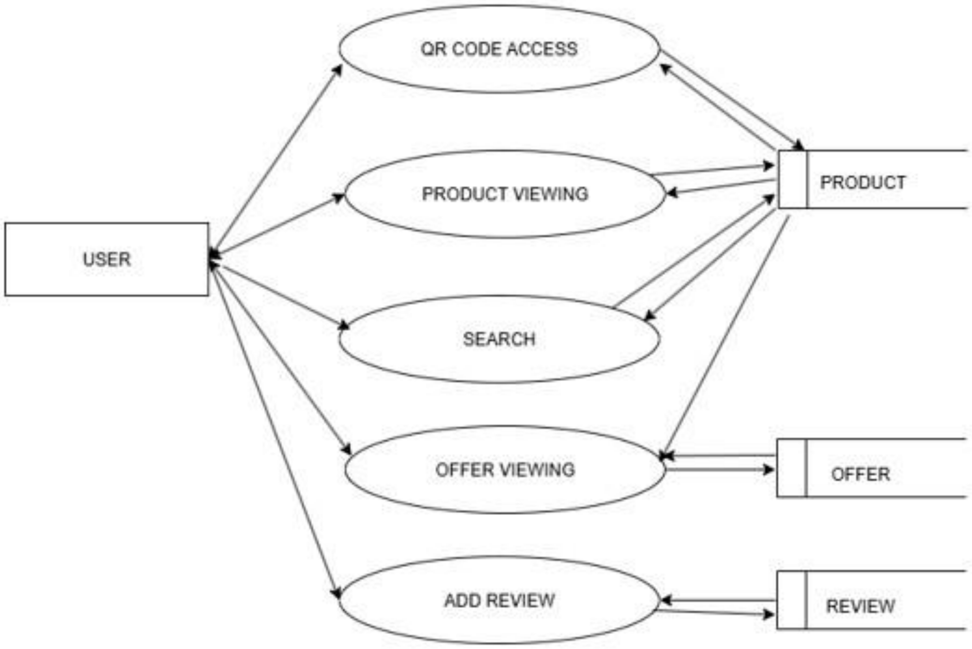
DFD Level 1.1

- Level 1.1

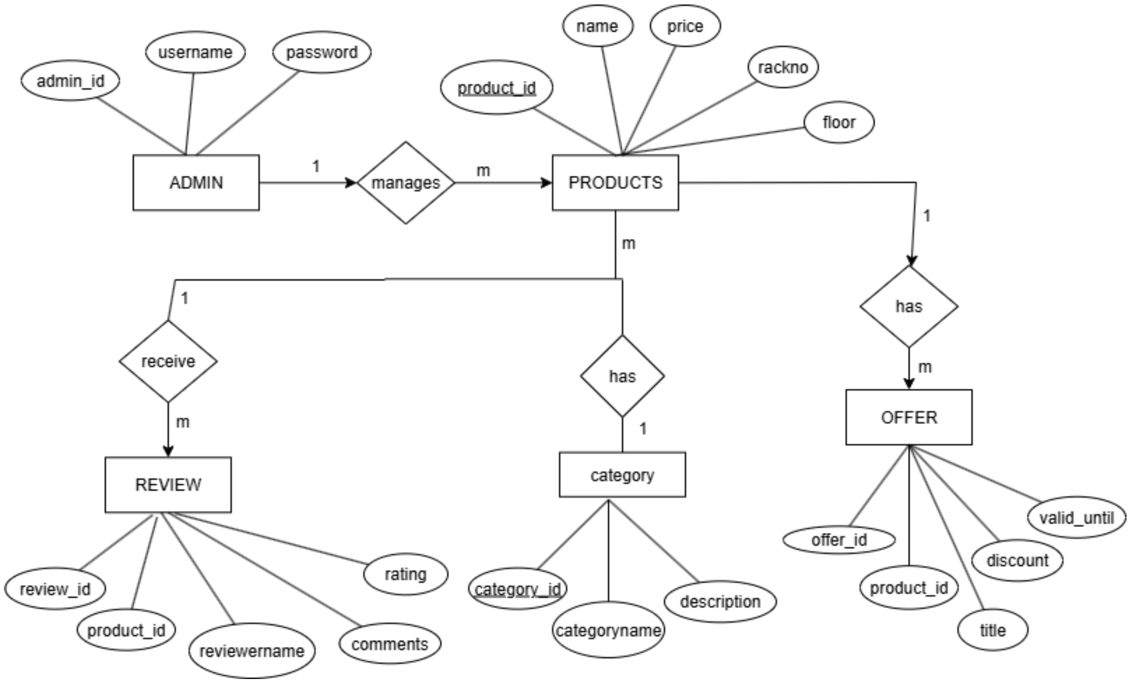


DFD Level 1.2

- Level 1.2



Appendix B ER Diagram



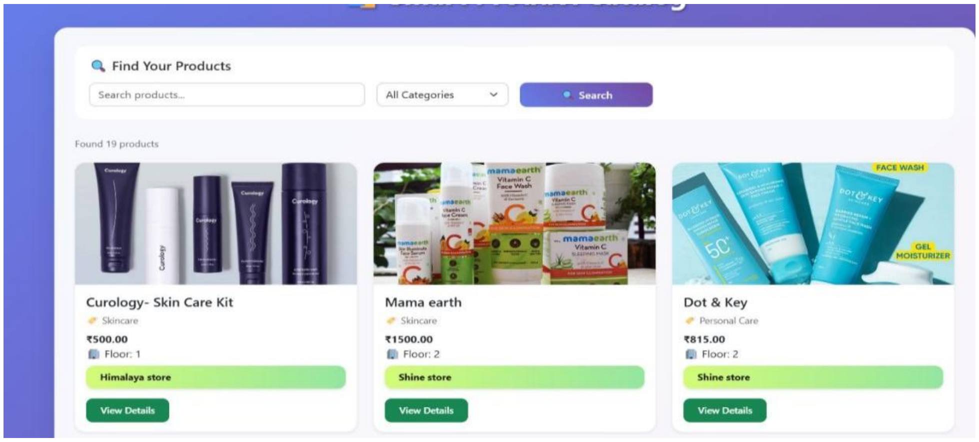
Appendix C Source Code

Views.py

```
from django.shortcuts import render, get_object_or_404, redirect
from django.db.models import Q, Count
from django.http import HttpResponse, JsonResponse
from django.core.paginator import Paginator
from django.views.decorators.cache import cache_page
from django.views.decorators.vary import vary_on_headers
import qrcode
import io
import base64
from .models import Product, Review, Category


# Product List + Search + Filter + Pagination
def product_list(request):
    q = request.GET.get('q', '')
    category_id = request.GET.get('category', '')
    sort_by = request.GET.get('sort', 'name')

    products = Product.objects.filter(available=True)

    # Enhanced search by name, or category
    if q:
        products = products.filter(
            Q(name__icontains=q) |
            Q(description__icontains=q) |
            Q(category__name__icontains=q)
        ).distinct()

    # Filter by category
    if category_id:
        products = products.filter(category_id=category_id)

    # Pagination
    paginator = Paginator(products, 30)  # Show products per page
    page_number = request.GET.get('page')
    page_obj = paginator.get_page(page_number)
    # Get all categories for filter dropdown
    categories = 
Category.objects.annotate(product_count=Count('product')).filter(product_count__gt=0)

    # Get popular searches (this would be enhanced with a proper analytics model)
    popular_categories = categories.order_by('-product_count')[:5]

    context = {
        'products': page_obj,
        'categories': categories,
        'popular_categories': popular_categories,
        'q': q,
        'selected_category': category_id,
        'sort_by': sort_by,
        'total_products': products.count(),
    }
    return render(request, 'products/list.html', context)


# Product Detail + Reviews + Offers
def product_detail(request, pk):
    product = get_object_or_404(Product, pk=pk)

    # Handle review form
    if request.method == 'POST':
        name = request.POST.get('name', 'Anonymous')
        rating = int(request.POST.get('rating', 5))
        comment = request.POST.get('comment', '')
        Review.objects.create(product=product, name=name, rating=rating, comment=comment)
        return redirect('product_detail', pk=pk)

    offers = product.offers.all()
    reviews = product.reviews.all()

    # Generate QR code for product
    product_url = request.build_absolute_uri()
    qr = qrcode.QRCode(version=1, box_size=10, border=5)
    qr.add_data(product_url)
    qr.make(fit=True)

    # Create QR code image
    qr_img = qr.make_image(fill_color="black", back_color="white")
    buffer = io.BytesIO()
    qr_img.save(buffer, format='PNG')
    qr_code_base64 = base64.b64encode(buffer.getvalue()).decode()

    return render(request, 'products/detail.html', {
        'product': product,
        'offers': offers,
        'reviews': reviews,
        'qr_code': qr_code_base64,
    })


def generate_product_qr(request, pk):
    """Generate customizable QR code for a specific product"""
    product = get_object_or_404(Product, pk=pk)
    product_url = request.build_absolute_uri(f'/{pk}/')

    # Get customization parameters
    size = int(request.GET.get('size', '10'))
    border = int(request.GET.get('border', '4'))
    fill_color = request.GET.get('fill_color', 'black')
    back_color = request.GET.get('back_color', 'white')

    # Create QR code with custom settings
    qr = qrcode.QRCode(
        version=1,
        error_correction=qrcode.constants.ERROR_CORRECT_M,
        box_size=size,
        border=border
    )
    qr.add_data(product_url)
    qr.make(fit=True)

    # Create image with custom colors
    try:
        img = qr.make_image(fill_color=fill_color, back_color=back_color)
    except:
        # Fallback to default colors if custom colors are invalid
        img = qr.make_image(fill_color="black", back_color="white")
    # Return as HTTP response
    response = HttpResponse(content_type="image/png")
    img.save(response, "PNG")

    # Clean filename
    clean_name = ".join(c for c in product.name if c.isalnum() or c in (' ', '-', '_')).strip()
    response['Content-Disposition'] = f'attachment; filename="QR_{clean_name}.png"'
    return response


# Search Suggestions API
@cache_page(60 * 5)  # Cache for 5 minutes
def search_suggestions(request):
    query = request.GET.get('q', ")
    suggestions = []

    if len(query) >= 2:  # Only suggest after 2+ characters
        # Get product name suggestions
        products = Product.objects.filter(
            Q(name__icontains=query) | Q(description__icontains=query)
        ).values('name')[:5]

        # Get category suggestions
        categories = Category.objects.filter(
            name__icontains=query
        ).values('name')[:3]

        # Combine suggestions
        suggestions.extend([p['name'] for p in products])
        suggestions.extend([f"Category: {c['name']}" for c in categories])

    return JsonResponse({'suggestions': suggestions[:8]})


# Batch QR Code Generation
def batch_qr_generation(request):
    """Generate QR codes for multiple products"""
    if request.method == 'POST':
        product_ids = request.POST.getlist('product_ids')

        if not product_ids:
            return JsonResponse({'error': 'No products selected'}, status=400)

        products = Product.objects.filter(id__in=product_ids)
        qr_data = []

        for product in products:
            product_url = request.build_absolute_uri(f'/{product.id}/')

            # Create QR code
            qr = qrcode.QRCode(version=1, box_size=10, border=4)
            qr.add_data(product_url)
            qr.make(fit=True)

            # Create image
            img = qr.make_image(fill_color="black", back_color="white")

            # Convert to base64
            buffer = io.BytesIO()
            img.save(buffer, format='PNG')
            qr_code_base64 = base64.b64encode(buffer.getvalue()).decode()

            qr_data.append({
                'id': product.id,
                'name': product.name,
                'qr_code': qr_code_base64
            })

        return JsonResponse({'qr_codes': qr_data})

    # GET request - show batch generation form
    products = Product.objects.filter(available=True).order_by('name')
    return render(request, 'products/batch_qr.html', {'products': products})
```

Appendix D. Screenshot

Home Page



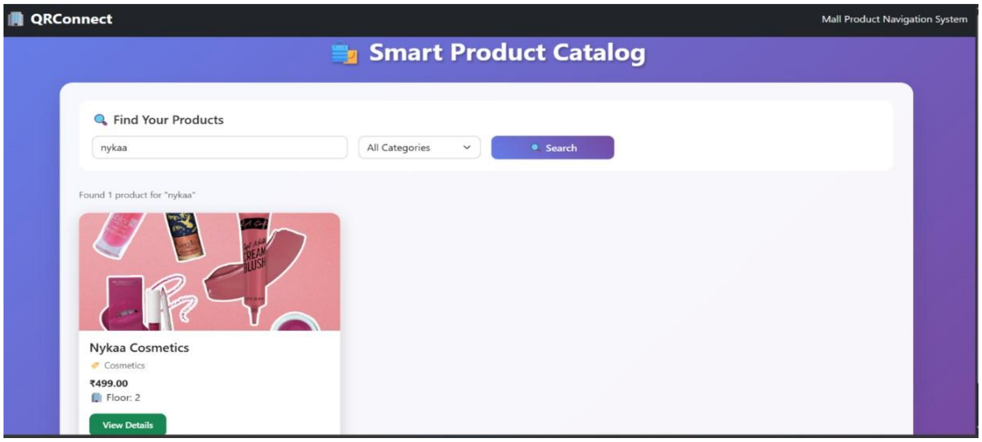
Found 19 products

Curology- Skin Care Kit
Skincare
₹500.00
Floor: 1
Himalaya store

Mama earth
Skincare
₹1500.00
Floor: 2
Shine store

Dot & Key
Personal Care
₹815.00
Floor: 2
Shine store

Search Product

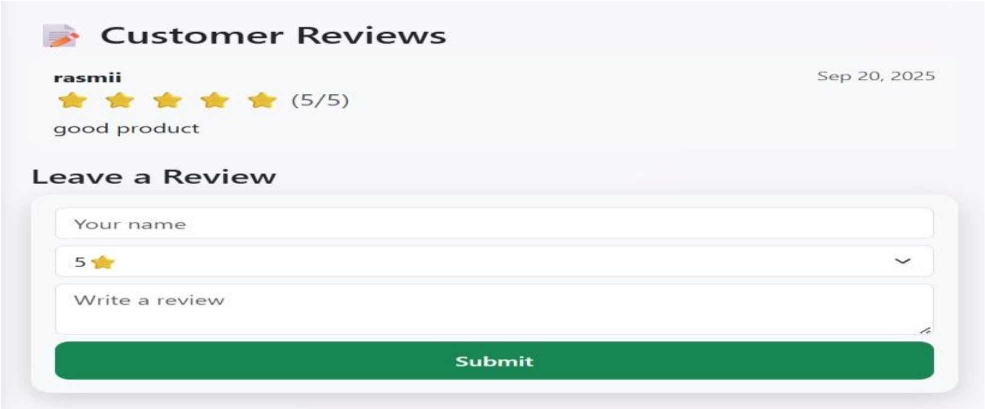


nykaa

Found 1 product for "nykaa"

Nykaa Cosmetics
Cosmetics
₹499.00
Floor: 2

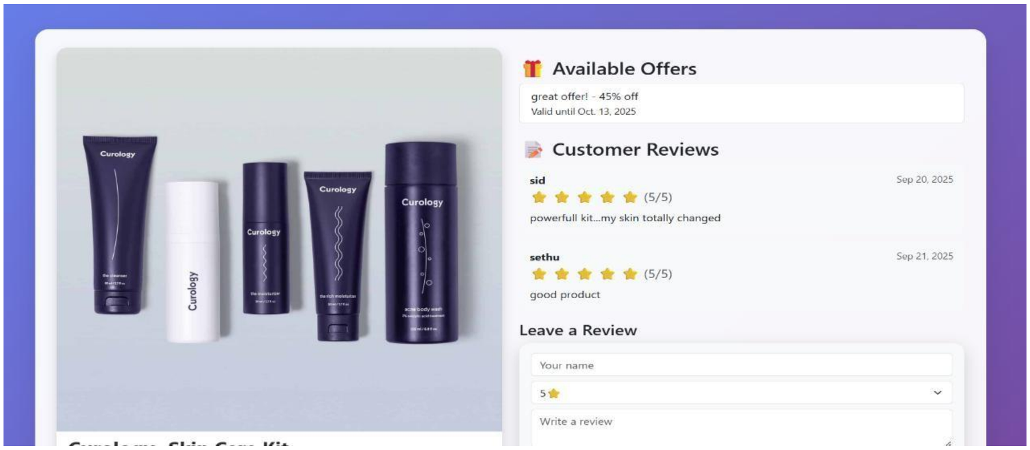
Customer Reviews



rasmii Sep 20, 2025
★★★★★ (5/5)
good product

5 ★

Available Offers



🎁 Available Offers

great offer! - 45% off
Valid until Oct. 13, 2025

Customer Reviews

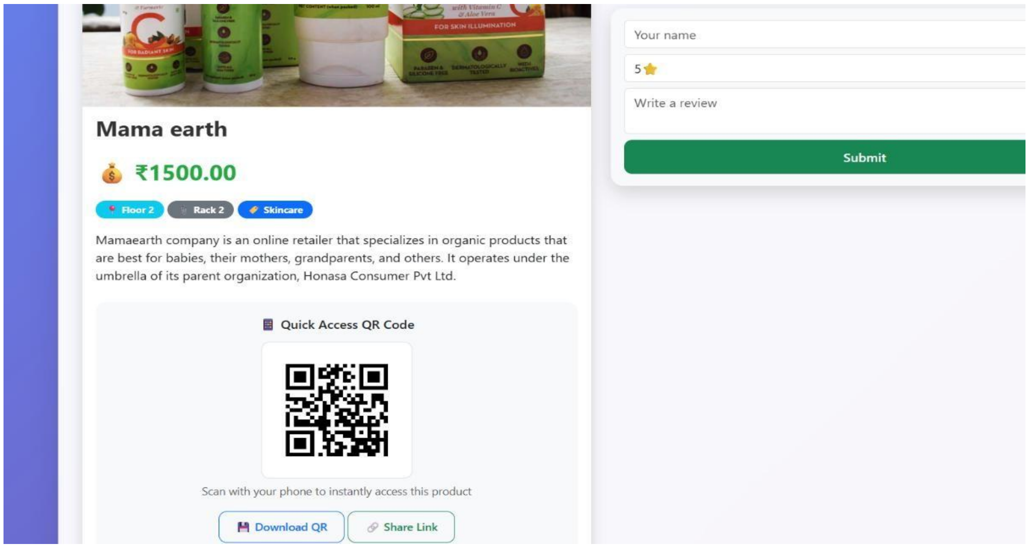
sid Sep 20, 2025
★★★★★ (5/5)
powerfull kit....my skin totally changed

sethu Sep 21, 2025
★★★★★ (5/5)
good product

Leave a Review

Your name
5⭐
Write a review

View Details



Mama earth

💰 ₹1500.00

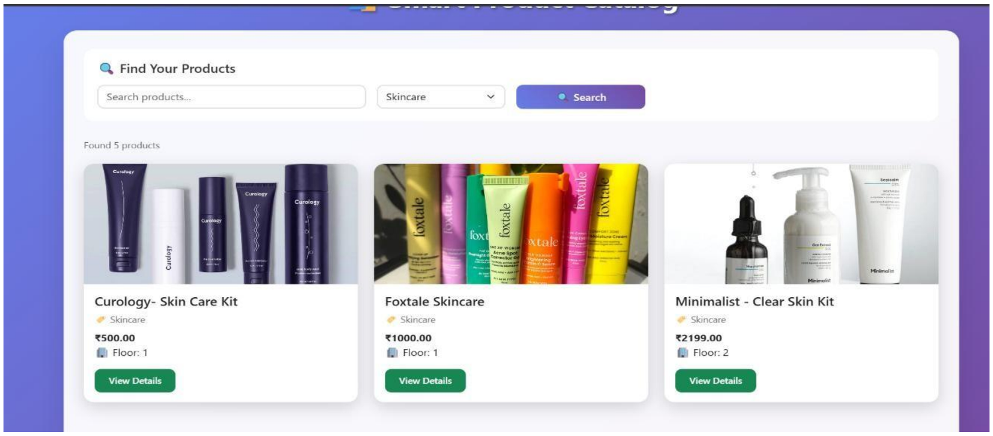
Floor 2 | Rack 2 | Skincare

Mamaearth company is an online retailer that specializes in organic products that are best for babies, their mothers, grandparents, and others. It operates under the umbrella of its parent organization, Honasa Consumer Pvt Ltd.

Quick Access QR Code

Scan with your phone to instantly access this product

Category Wise Searching



🔍 Find Your Products

Found 5 products

Curology- Skin Care Kit	Foxtale Skincare	Minimalist - Clear Skin Kit
Skincare	Skincare	Skincare
₹500.00	₹1000.00	₹2199.00
Floor: 1	Floor: 1	Floor: 2
View Details	View Details	View Details