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Tech4Village – A DIGITAL PLATFORM FOR SMART AND INCLUSIVE RURAL DEVELOPMENT

Dr. M S Shashidhara, Gagana N

Professor & HOD, Department of MCA, AMC Engineering College, Bengaluru, India

Student, Department of MCA, AMC Engineering College, Bengaluru, India

ABSTRACT: The Tech4Village - A Digital Platform for Smart and Inclusive Rural Development is an ecosystem for a mandatory delivery platform for citizens in a digital e-governance environment where the rural urban divide is ever increasing. It provides a pathway for citizens to contact local administration and visa versa, for solutions, which benefit both participants - grievance redress service, health services, asking for documentation that is required, and employment. This platform is integrated to provide role based access control for users as citizens and local facilitators; to provide real time notifications for both to engage on accessed services, and storage of documents in the cloud. The outcomes of this integrated platform was for government services to develop opportunities for good governance through transparency, and citizens ability to engage for the information can provide diversity in local citizen development of information. The dashboard were good functional management of services as also provides on-going ability to broadcast announcements, in real time, to the local citizenry. In developing this integrated photogenic solution, we used Django as our framework and programs (HTML, CSS, SQLite), and of course provided for lesser resource capacity - as a service to ensure consistency in the citizen engagement.

Platform for Smart and Inclusive Rural Development will digitize people, build the digital inclusion, effect marginalization in a disadvantaged community towards sustainable rural economic development.

KEYWORDS: Smart Village, e-governance, Rural Development, Digital Inclusion, role-based access, grievance redressal, health services, requests for required documentation, employment. Django.

I. INTRODUCTION

Rural areas often have a limited amount of access to vital public services as these areas typically have fragmented service systems and limited digital architecture. Rural residents frequently experience delays or denial of services that maintain grievance redressal, health supports, or document processing.

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Development provides an answer to this problem by providing a digital platform, creating a link between villages and administrators in a centralized location. Villagers can request services through an online portal, while administrators can see all requests and respond through their hub. The Tech4Village – A Digital Platform for Smart and Inclusive Rural Development was created using Django, HTML and SQLite. The digital interface additionally has role-based access, real-time notifications and secure document uploads.

This creates increased transparency, efficiency and worker engagement and ultimately enables digital governance to advance and improve rural development.

II. LITERATURE SYRVEY

The digital divide in rural India has only limited access to some very basic amenities and services, such as grievance redressal, health assistance, and document processor service access. Sharma et al [[1]] introduced an ICT-based governance model of service delivery that integrated transparency, and improved the organization of services for rural systems. Visualizing a single digital portal has led to a reflective conceptual reorganization of the Smart Village

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Development Hub.
The evaluation of smart villages was elaborated within the Journal of Rural Technology and Innovation [[2]]. In it, enablers of digital infrastructure, localized governance and community engagement were integrated as macro approaches for rural empowerment. Their framework illustrated the need for a platform that would allow both citizens and administrators to engage positively in the process.

What about security in e-governance platforms? Bharathi et al [[3]] proposed a hybrid model of cryptography employing receivers of both symmetric and asymmetric key models, presenting best practices for protecting sensitive information, as well as how to develop safe and secure remote file handling in cloud based systems. Their sophisticated work including recommendations and proposals, formed our secure documentation methodology.

Arora and Atrey [4] conducted research on SecureC2Edit a secure environment for collaborative editing that incorporated roles with role-based access for all user interactions, which affected our admin control and service tweeting functions. User behaviours by Thukral et al. [5] in the second section intended to influence the grievance and feedback methods of user interactions to outcome-oriented user engagement and responsiveness.

In addition, Yamamoto and Hirotsu [6] implemented access-controlled file systems, and Rawal and Vivek [7] discussed encryption modelling.

EXISTING SYSTEM
There are existing rural digital governance platforms like e-Gram Swaraj, Digital Grama and e-Panchayat but they provide limited engagement for the public. Users can access basic services, such as grievance submission or performing some activities related to documentation. Most rural engagements, however, cannot be satisfied. The existing platforms do not typically have, real-time two-way communication for health services, integrated employment or synchronous methods. Likewise, there are no dashboards for administrators, nor secure role-based administration access for users, which means it can be quite a manual task to manage or account for the volume of requests that are to be administered collectively. With the absence of user engagement mechanisms, there are limited avenues for transparency which would limit the number of instances of delays, duplication and redundancy in the disposition of services or policies. All of this indicates the need for a more integrated and responsive digital governance platform for Disposition of rural issues.

PROPOSED SYSTEM
The Tech4Village - A Digital Platform for Smart and Inclusive Rural Development offers a unique and inclusive digital platform to change the rural governance space. In this approach, we create a dedicated space for villagers, to engage and share information related to government services in a secure, safe and organized manner. Smart Villagers will be able to lodge complaints, chat, request health services, find and apply jobs, smart certificates and documents, at one accessible place. The Smart Villages Development Hub also has a robust web-based dashboard giving control and powers to administrators enabling citizen request control, government service announcements, health service monitoring, and communicate with citizens being served in the most real time as possible. The service provided mounts up role based access managed provision for citizens, our intended secure provision within transparency, and scalability is in mind as to how projects and services could expand, designed using Django and SQLite. The whole proposal has capability and potential to embrace and initiate digital literacy, lessen paper work, and establish a fitting, accountable, and citizen led governance processes in rural parts of Canada.

III. SYSTEM ARCHITECTURE

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Developments organized into four logical layers: Presentation Layer, Business Layer, Service Layer, and Data Service Layer. This multi-layered architecture allows for a modular system that is easy to maintain and a secure flow of information throughout the platform.

The Presentation Layer is the user interface that allows villagers and administrators to engage with the platform. The Business Layer governs the roles of the end users and their respective permissions. The Service Layer includes the major modules of the platform, such as users and workspaces, files, forums, and documents. The Data Service Layer provides persistent data storage securely with SQLite. (fig haak) This layered design allows service requests from users to flow logically from a human interface through the various layers to the database. Each layer can apply the

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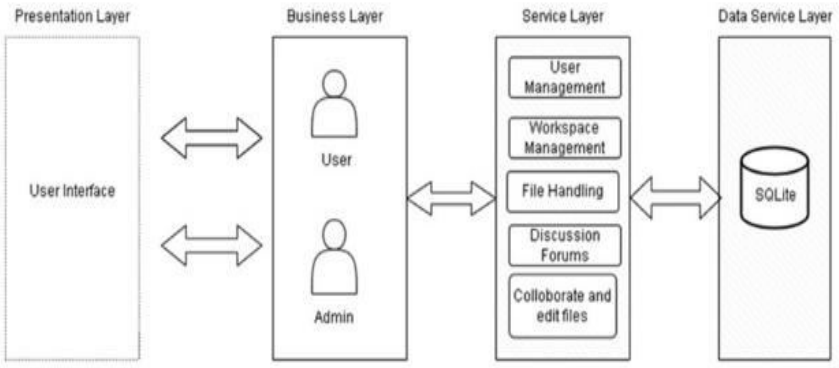
proper security (authentication and validation) and role-based controls. Presentation Layer: This refers to the user interface for a user who could be a villager or an administrator. The interface needs to be simple enough for villager users to understand, and flexible enough for device utilization on, but it also must be responsive. In other words, it needs to be flexible enough for mobile access, and also flexible enough for desktop access. It connects to the business layers and accesses information that is relevant (and permissible) for the user to see and use based on their role.

Business Layer: This layer includes the basic logic and role based access control. Users are distinguished as either villagers, or administrators. Depending on the role of the user, the business layer either routes requests for services, or restricts permissions, or provides formal access for use of specific functionality of the API.

Service Layer: The service layer is at the core of the platform. This is where all service modules run. We have different service modules for user management, request management, workspace management, file upload and management, conversations, and collaboration services. All actions for the business take place here, before being stored in or read from the data servicelayer.

Data Service Layer: The data service layer is responsible for the storage and retrieval of data - it deploys a SQLite data base system as our data storage system. The data service is responsible for the management of - user profiles, service requests, documents, resident feedback, and logs from the data service layer. The data service is responsible for ensuring the security of all data processing and managing interactions with the service level via secure APIs.



IV. METHODOLOGY

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Development was created using a nimble, relevant, user-focused methodology. Initial requirements was gathered based on common rural governance needs in terms of grievance redressal, access to documents and health services requests. The Hub was designed with a modular architecture with presentation, business, service, and data layers.

Development was completed using Django for back-end development (and Python for tinkering on a development server), front-end design with HTML/CSS/JavaScript, and SQLite for data storage. These features over time and in phases of development included role-based access, real-time notification to users, and secure transmission of potentially private documents. Throughout the development phase, opportunities for testing and ongoing user feedback were put in place so the Hub could be kept simple, relevant, and usable for village users and administrators.

V. DESIGN AND IMPLEMENTATION

The Smart Village Development Hub's architecture involves a layered separation of user interface, business logic, services, and data layers, in order to create smart, modular and scalable software. The user interface created is built with HTML, CSS and Javascript to create a modern, responsive and accessible front end experience. All of the backend logic and routing was built using Django (a web framework built using Python) while SQLite (a lightweight database) was used to store the user's information, requests and records of services.

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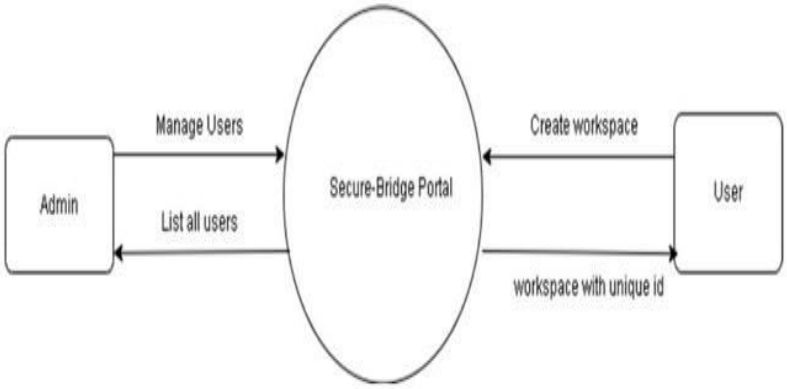
This platform has a highly secure login system to identify whether a user is a villager or an administrator. Villagers can submit requests, create workspaces and receive updates based on notifications. Administrators will be able for example to manage user information, respond to requests for service, and post. Each module has been built, tested and debugged separately before integrate them together, allowing for proper and efficient time to debug, test and optimize features across the various modules in development process separately.

Figure 5.1: depicts a simplified conceptual view of the data flow, featuring the relationship between user/administrator interfaces within the Smart Village Development Hub. The user interface enables villagers to create a workspace and receive a unique ID. The administrator interface allows them to view manage users and retrieve villagers through the interface, allowing for organization within the user base.



VI. OUTCOME OF RESEARCH

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Development tackled the essential rural governance challenges of multiple agency services by offering a single portal for locals. Users of the Hub engaged with multiple forms including sending grievances, applying for documents, requesting health services, and employment interested as an example of rural governance integration. The admin dashboard improved response time, speed of service tracking and portals with more functionality on offer.

Testing indicated that the product was easy to navigate, even for users with very limited levels of digital skill. Some aspects of the user experience i.e., near real time notifications, secure digital data handling and role-based access were also well understood and accepted by users. This project output supported the potential that low resource, open-source tools can exist together, such as Django in conjunction with SQLite, to deliver digitally-enabled empowerment for rural development.

VII. RESULT AND DISCUSSION

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Developmentreally provided a central point of access for rural services. Users were able to access health and job services, file complaints and request documents. The system was user-friendly, secure and responsive.

Testing confirmed that users (villagers) and administrators were able to use the system in an interactive way. Role-based access, real-time alerts, and notifications, along with a functioning dashboard for users improved transparency and service delivery. Overall, the system created improved digital governance of rural remote communities.

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VIII. CONCLUSION

The Tech4Village – A Digital Platform for Smart and Inclusive Rural Development satisfies a requirement for an integrated digital platform that allows for the provision of basic services through a single point of access and improved engagement and communication between citizens and administrators, and makes it accessible equitable (on data-based decisions), more efficient, transparent and inclusive possible way to serve in rural governance. The solution was based on open source tools, making it affordable and able to be practical in a scalable process in real rural areas.

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