SUSTAINABLE MODEL VILLAGE THROUGH VILLAGE INTEGRATED COMMAND AND CONTROL CENTER – DIGIGRAM

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ABSTRACT

This investigation delves into the transformative potential of advanced digital frameworks in rural India, through the implementation of the novel DigiGram platform. This platform redefines rural ecosystems by deploying a hierarchical technology architecture that includes advanced Infrastructure, Central Command System (Village Integrated Command and Control Platform), and comprehensive Service Systems. Distinct from existing models primarily focused on generic digital applications, this paper introduces an innovative integration of custom AI solutions, IoT capabilities, and real-time data analytics tailored to the specific socio-economic conditions of rural Indian communities.

Our research integrates novel empirical data from diverse implementations across the region, showcasing substantial improvements in agricultural efficiency, healthcare accessibility, commerce and educational resources. The study moves beyond traditional digital transformation narratives by incorporating a sustainable development approach that aligns with India's national goals of bridging the rural-urban divide.

The findings illustrate the critical role of adaptive digital technologies in stimulating socio-economic development and propose a scalable model for other developing regions. Model not only emphasizes technological adoption but also advocates for community-centric governance and sustainable ecological practices, positioning the DigiGram initiative as a blueprint for future rural development projects worldwide. This refined approach offers a comprehensive blueprint that can guide similar initiatives globally, ensuring that digital transformation in rural settings is both innovative and inclusive, leading to sustainable development that is deeply integrated with the cultural and economic fabric of local communities.

Keywords – Digital Transformation, Rural Development, Artificial intelligence, cloud computing, Internet of Things, UN agenda for sustainable development.

1. INTRODUCTION

The escalation of urbanization and industrialization has brought significant challenges to rural economies, ecosystems, and cultural landscapes globally. This transition has induced demographic shifts, notably an aging population and migration from rural to urban areas. These changes have exacerbated existing issues such as inadequate infrastructure, limited healthcare access, and restricted educational opportunities, contributing to the decline of rural communities. These challenges necessitate a comprehensive revamp through digital technology integration, which has shown promise in revitalizing these areas by reducing the urban-rural divide.

The digital economy's rapid expansion, accelerated by advancements in artificial intelligence, blockchain, cloud computing, and big data, has become central to industrial and social innovations. The COVID-19 pandemic highlighted the critical role of digital technologies in economic and social resilience, propelling initiatives aimed at infusing rural areas with digital innovations. Programs like the European Union's Sustainable Model Villages initiative and India's Digital India and Bharat Net Programme exemplify efforts to enhance rural life quality and productivity through technology.

The "Sustainable Model Village" concept represents a strategic approach to rural development, integrating digital and information technologies tailored to the unique needs of rural areas. This model fosters sustainable and inclusive growth, leveraging digital tools to enhance agricultural practices, healthcare, education, and governance, thereby uplifting entire communities. This paper explores the Sustainable Model Village initiative as proposed in 2023, which strives to bridge the digital divide and hasten the digital inclusion of rural areas. Successful pilot implementations of this model have showcased significant transformations, supporting India's broader economic objectives, including the aim to grow its GDP to 5 trillion USD. Such developments affirm the pivotal role of rural areas as critical contributors to national prosperity.

Digital technologies in Sustainable Model Villages have revitalized rural economies, as evidenced by e-commerce platforms that eliminate geographic barriers, allowing direct market access for rural producers and alleviating poverty. Additionally, these technologies have transformed agricultural practices, boosted productivity and fostered sustainable economic practices.

The framework proposed in this paper seeks to align rural sustainable development with the Sustainable Development Goals outlined by the United Nations, offering a detailed, replicable model for digital transformation in rural settings. It introduces a systematic approach involving a hub and spoke system, where Gram Panchayats act as central nodes and Revenue Villages as peripheral ones, facilitating the spread of digital solutions. Structured to methodically address these topics, the paper begins with a literature review on Sustainable Model Villages and digital empowerment, followed by the development of a Sustainable Model Village technology architecture. It then discusses the foundations of rural digital transformation and presents a strategic pathway for practical implementations with discussion of multiple use cases and solutions to on ground issues. The concluding sections summarize the findings and suggest directions for future research.

This comprehensive study aims to deepen the understanding of Sustainable Model Villages and their role in rural sustainable development, providing actionable insights for stakeholders interested in deploying similar strategies globally. This introduction lays the groundwork for an exploration into the transformative impact of digital technologies on rural revitalization, highlighting the need for strategic, integrated approaches to development in the digital era.

2. LITERATURE REVIEW

2.1 Digital village, infrastructure & services

The concept of a "Sustainable Model Village" integrates digital infrastructure and services into rural settings to bridge the urban-rural divide. Data from Annamalai, K. and Rao, S. 2003 in" What works: ITC's e-Choupal and profitable rural transformation" emphasizes the critical role of comprehensive digital infrastructure in transforming rural areas into digitally empowered communities. The VICCC, or Village Integrated Command and Control Center System, such as "DigiGram," offers an architectural blueprint for such transformation. It focuses on developing robust digital infrastructures, like high-speed reliable internet connectivity, digital healthcare services, and e-education platforms, which are essential for rural areas to partake in the digital economy. Implementing advanced ICT tools in rural regions can significantly accelerate access to essential services, thereby improving the living standards of rural populations. This technological upliftment is aimed at ensuring that the benefits of digital innovation reach the last mile, thus fostering an inclusive growth model that can contribute significantly to the national GDP.

2.2 Rural sustainable development

The pursuit of rural sustainable development is inherently complex, demanding integrated strategies and robust infrastructure. The Digital India initiative represents a significant step towards bridging the digital divide and fostering inclusive growth. As highlighted in "Towards an inclusive digital literacy framework for digital India," the establishment of a reliable digital infrastructure is a cornerstone for providing high-speed internet and digital services to rural areas, thereby facilitating access to education, healthcare, and e-governance. Network systems and procedures, such as the one depicted, illustrate the complex interplay of systems necessary to ensure seamless connectivity and service delivery. Such infrastructure is vital for integrating rural populations into the digital economy and achieving sustainable development goals (SDGs).

Furthermore, the requirements for IoT development and standardization of implementation approaches are crucial in this context. As discussed in "Internet of Things: Applications and Challenges in Technology and Standardization," IoT technologies provide significant opportunities for advancing rural development by enabling efficient resource management, real-time monitoring, and improved service delivery through interconnected devices and systems. Standardizing these technologies ensures reliability, security, and interoperability, which are essential for the successful integration of IoT in rural areas and for supporting sustainable development.

2.3 Digital empowerment

Digital empowerment in rural areas equips the local population with the skills and technologies needed to fully participate in the digital economy. Providing access to digital technologies and the internet can dramatically alter socio-economic dynamics, creating significant employment and entrepreneurial opportunities through digital literacy programs, local language content, and vocational training. Platforms like DigiGram democratize data and connectivity, fostering an informed citizenry capable of advocating for their rights and contributing to governance processes.

Integrating artificial intelligence (A.I.) enhances these benefits by promoting ethical standards, data protection, and human rights, as highlighted by Cath, Wachter, Mittel Stadt, Taddeo, and Floridi (2017) in their research paper "Artificial Intelligence and the 'Good Society': the US, EU, and UK approach." Fair, transparent, and accountable AI systems maintain public trust and social stability. Policy recommendations include adaptable regulatory frameworks, ethical AI research, and public engagement, aligning with digital empowerment goals. This ensures that AI and digital technologies drive community-led initiatives and equitable growth. Technological literacy is critical for the next step in the evolution of mankind, as it ensures prepared individuals for a rapidly advancing digital future (Freeman, Park, & Middleton, "Technological literacy and interrupted internet access").

3. MODEL VILLAGE ARCHITECTURE

The concept of a Sustainable Model Village represents the comprehensive integration of digital technology with rural life, which is crucial for villages to thrive in the era of the digital economy. The process of implementing Sustainable Model Villages spans numerous sectors, with the most effective method being to start with pilot project (implemented in village Dhorra of District Lalitpur, Uttar Pradesh, India) in specific areas before expanding to others. However, varying digital technology applications across different sectors can lead to overlapping efforts and diminish the effectiveness of digital integration if not coordinated under a unified strategy. In India, some villages have begun to experiment with Model Village as proof of concept (PoC) by various government and private entities, yet the outcomes vary significantly due to the sporadic nature of these implementations. Thus, establishing a clear technical architecture for digital village initiatives is essential. This architecture should guide all activities, promoting coordinated planning and reducing the financial burdens of unnecessary overlaps.

As illustrated in Figure I, the proposed digital village technology architecture in this study is organized into three hierarchical levels: Physical Infrastructure, CEQU Medha (Micro Edge Data Center System), and DigiGram Platform Service System. Effective digital village implementation requires the integration of all three levels. While the application service system level may vary based on field-specific needs, the implementation strategies for the other two levels should be aligned to meet the overall objectives of application development.

3.1 Infrastructure System

The infrastructure system is the foundational layer in creating a digital village, designed to facilitate seamless integration of technology into rural life. It consists of five critical components that together build a robust framework to support the varied functionalities of a digital village.

3.1.1 Network

The network infrastructure acts as the backbone of the digital village, providing essential connectivity across the community. This includes a combination of wired networks for stable, high-speed internet access and wireless solutions to extend reach where physical cables cannot go. This dual approach ensures comprehensive coverage, enabling constant communication and the effective operation of digital applications throughout the village.

3.1.2 Surveillance

Integrated into the network are systems for IoT perception and surveillance. This setup not only enhances security through continuous monitoring but also facilitates the collection of real-time data across the village. Surveillance cameras, coupled with IoT devices, gather and relay information that is critical for both everyday management and emergency responses, ensuring a safe and informed community environment.

3.1.3 Public Communication

Public communication systems, including public address systems and digital signage, play a vital role in disseminating information swiftly to all villagers. These systems are used for everything from emergency alerts to community announcements and educational broadcasts, helping to keep the community engaged and informed about local issues and developments.

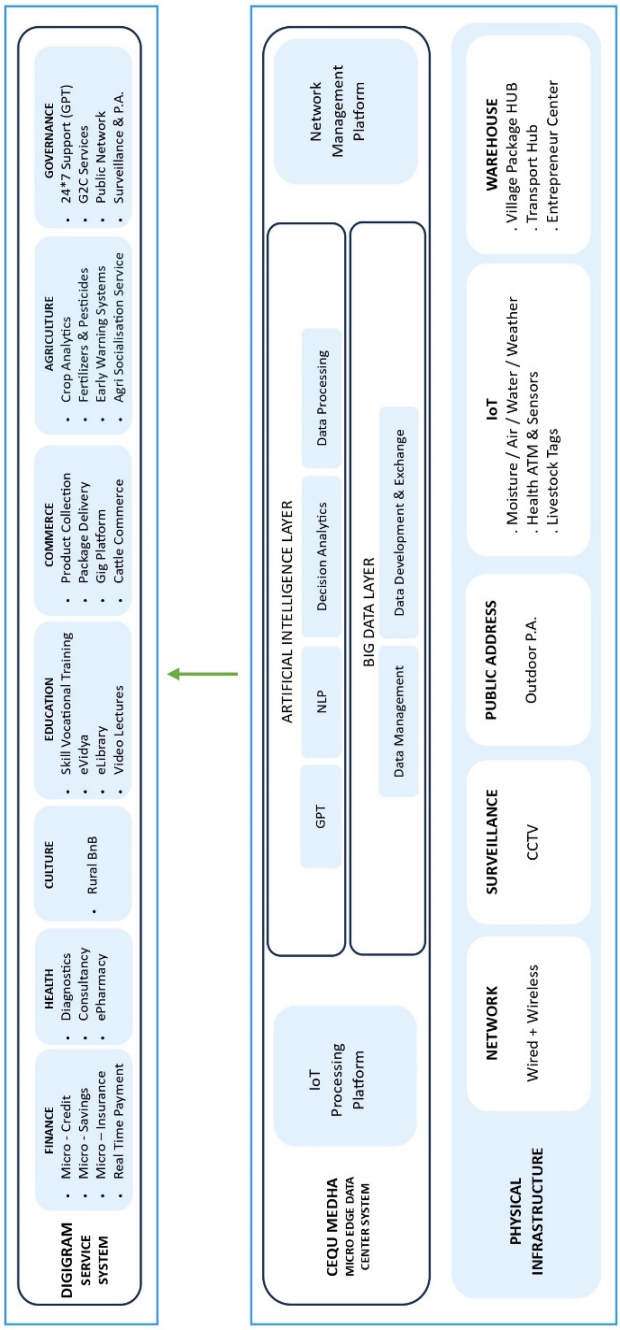


Figure I
DIGITAL VILLAGE TECHNOLOGY ARCHITECTURE

3.1.4 IoT Sensors

A variety of IoT sensors are deployed throughout the village to monitor environmental and agricultural conditions, such as soil moisture, air quality, water safety, and weather patterns. This information is crucial for optimizing agricultural practices and managing natural resources efficiently. Additionally, Health ATM machines and related health sensors provide essential healthcare services, offering preventative care and basic diagnostic tools to the community. Livestock tags and sensors also contribute by monitoring the health and well-being of farm animals, thereby supporting the local agricultural economy.

3.1.5 Village-Level Warehouse

The final component is a village-level warehouse that serves as a hub for package storage and the local transportation network, facilitating the distribution of goods and services within and beyond the village. This hub also acts as an entrepreneurship center, where local residents can learn about business management and logistics, providing training and employment opportunities and fostering a spirit of entrepreneurship within the community.

3.2 Medha (EDC)

It embodies a crucial technological advancement that leverages a myriad of sophisticated technologies including big data, artificial intelligence, and real-time data processing. This system is engineered to enhance rural decision-making capabilities and automate business processes, pivotal for the digital transformation of village infrastructures.

3.2.1 IoT Perception Platform

The IoT perception platform centralizes the management of data collected from various IoT devices across the village. It employs advanced visualization technologies to present this data clearly and comprehensively, thus facilitating the creation of a rural big data ecosystem. This platform ensures that foundational perception data is available, which is vital for informed decision-making and strategic planning in subsequent stages.

3.2.2 Big Data & AI Integration Platform

This platform utilizes a suite of tools for data sharing, exchange, management, and development, alongside big data resource pools. Its primary function is to dismantle silos between industry-specific data sets, enabling the integration and sharing of diverse, heterogeneous data sources. This integration transforms disparate data resources into valuable data assets. The Artificial Intelligence layer of this platform includes multiple advanced processing systems such as GPT for requirement processing, natural language processing for enhanced communication interfaces, real-time automation decision analytics, and comprehensive data processing algorithms. These systems are designed to extract actionable insights from both structured data from sensors and unstructured data from the big data layer. Utilizing intelligent analysis technologies such as facial recognition, object recognition, Frequent Data Consumption and license plate recognition, the visual networking platform analyzes vast amounts of video data to extract critical information. This capability not only supports intelligent analytical judgments but also lays the groundwork for innovative applications, management strategies, and model innovations. A significant aspect of this process involves the development of standardized protocols for video monitoring, which are essential for the effective sharing and utilization of video resources across various monitoring platforms.

3.2.3 Network Management & Operational Platform

This platform is tasked with the operation and management of the village's digital backbone, encompassing both the open public network and dedicated emergency networks. It ensures robust, secure, and efficient network performance, critical for maintaining connectivity and service reliability in all operational aspects of the village infrastructure.

3.3 DigiGram Platform

The DigiGram Platform Service System is strategically engineered to bolster rural development through digital transformation, aligning with sustainable development goals across seven key sectors: Finance, Health, Culture, Education, Commerce, Agriculture, and Governance. Each sector is equipped with specialized digital tools and services designed to maximize efficiency, inclusivity, and community empowerment.

3.3.1 Finance

The finance sector integrates sophisticated digital financial services to foster economic stability and growth in rural areas. This includes micro-credit facilities, savings programs, and insurance services, all anchored by the Unified Payment Interface (UPI) for secure, swift, and seamless financial transactions. This digital financial ecosystem not only enhances financial inclusion but also stimulates local economies by providing accessible capital and financial security backed by Aadhar for direct benefit transfers.

3.3.2 Health

In the health domain, IoT-enabled diagnostic tools provide precise monitoring and data collection, while real-time telemedicine capabilities like eSanjeevni connect rural patients with medical professionals. Complemented by an ePharmacy network that leverages local logistical infrastructure to ensure direct delivery of medical supplies, this significantly reduces the rural-urban health service gap, promoting better health outcomes and accessibility.

3.3.3 Culture

Cultural initiatives leverage digital platforms to showcase rural traditions and hospitality to a global audience through Rural BnB programs.

3.3.4 Education

Video Lecture Platform: Delivers aligned educational content from the national curriculum to enhance the learning experience for students across primary and secondary levels.

- Services Preparation Platform: Prepares students for competitive exams with specialized training materials, helping bridge the educational gap between rural and urban students.
- School Digitization System: Integrates digital tools into traditional learning environments to increase engagement and improve educational outcomes.
- Vocational Training: Equips individuals with modern, marketable skills to improve job prospects.
- Gig Skill Training: Training residents with monetization of traditional skills and management via platform.

3.3.5 Commerce

This sector supports the local economy by establishing hubs for the collection and distribution of goods produced by local artisans and farmers, integrating package delivery systems, and facilitating cattle trade. These platforms not only streamline local commerce but also connect rural producers to broader markets, enhancing their income potential and economic resilience.

3.3.6 Agriculture

Agricultural services utilize data analytics and IoT technologies for crop monitoring, while distribution networks for pesticides and fertilizers, coupled with early warning systems for weather and pestilence, ensure that farmers can maximize yields and minimize losses. Social platforms also foster community knowledge sharing, which is essential for innovative agricultural practices.

3.3.7 Governance

The governance sector implements digital tools to streamline public service delivery and enhance civic engagement. Real-time support via AI-driven chatbots, comprehensive G2C service portals, and robust surveillance and public announcement systems ensure that governance is transparent, responsive, and efficient.

4. USE CASES

In FIGURE II, the agricultural sector's shift from a conventional village to a CEQU DigiGram Sustainable Model Village is profound. Traditional challenges that farmers face, such as access to credit and being forced to accept substandard agricultural inputs due to financial constraints, are addressed head-on. In a DigiGram Sustainable Model Village, the financial engagement between farmers and banks is realigned with agricultural cycles, offering more favorable credit terms. This strategic financial structuring is complemented by a technology-driven vendor selection process that elevates the quality of farming inputs. The result is an environment where farmers are empowered to invest in higher quality seeds, equipment, and services, leading to improved yields and sustainable farming practices.

For Gig workers, the DigiGram platform transforms the employment landscape. Where non-standardized work once led to inconsistent income and exploitative labor practices, DigiGram introduces regulated, standardized job structures, backed by continuous skills development. Gig workers benefit from a clear framework that defines the quality of products and services, with opportunities for regular work and fair compensation. This not only enhances the dignity of labor but also cultivates a skilled workforce capable of driving innovation and growth within the rural economy.

The consumer experience within DigiGram Sustainable Model Villages also undergoes a substantial transformation. Moving away from reliance on private lenders and outdated products, consumers are introduced to a streamlined market experience. The integration of EMI payment options democratizes the affordability of modern goods, while the local warehousing system optimizes the supply chain, dramatically reducing delivery times. This efficiency opens up access to a broader range of products, allowing consumers to enjoy the benefits of current market trends and innovations without undue delay. The DigiGram ecosystem, therefore, revitalizes the consumer market in rural areas, making it more dynamic and responsive to the needs and aspirations of the community. These are a few examples of many on how the DigiGram can be a game changer in making villages self-sustainable.

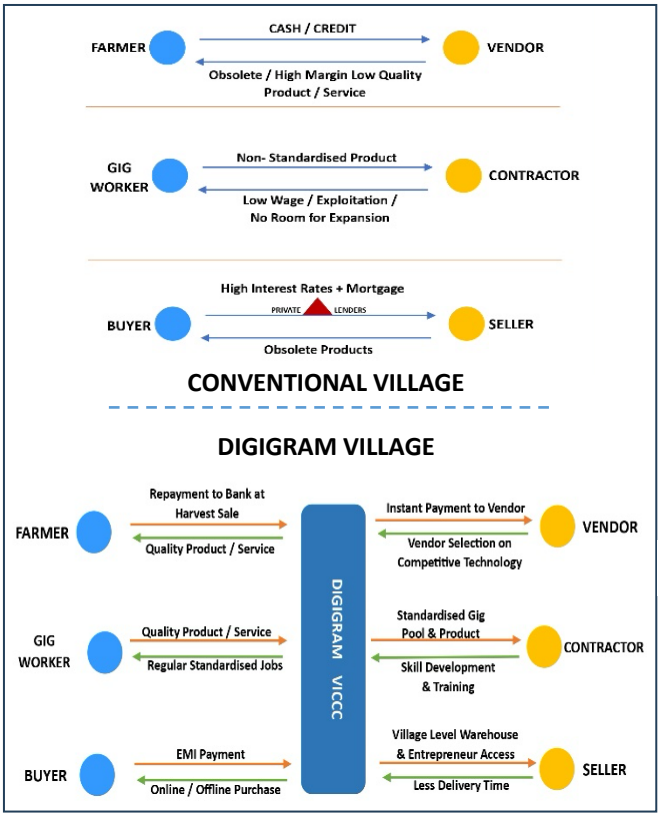


Figure II
Conventional vs DigiGram Model Village

4.1 Use Case 1.2

In Figure III, IV & V, the team has conceptualised an emergency response mechanism where, when a villager encounters an emergency, they can quickly send a voice note to the 'Gram-SAMWAD' bot. Integration of Bot with Emergency Response team conceptualized with the technical insights of Senior Official, DoT, GoI. It is designed to swiftly transcribe the voice note and determine the nature of the emergency using advanced language processing techniques. Upon recognizing the distress signal, the bot accesses the GPS data from the sender's phone to ascertain the exact location. This triggers an immediate response protocol, dispatching the Emergency Response team, ensuring it arrives at the emergency site promptly and safely. As the team reaches the location, it begins the safety operations.

Meanwhile, the 'Gram-SAMWAD' bot can automatically create a situation mitigation SoP, providing team with precise location details and relevant data required for mitigation. This integration ensures that help is on the way, equipped with the knowledge of what to expect upon arrival.

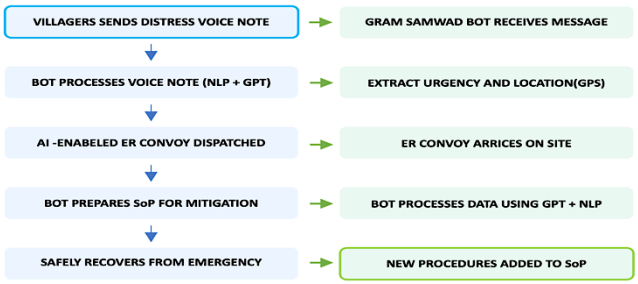


Figure III: USECASE 1.2

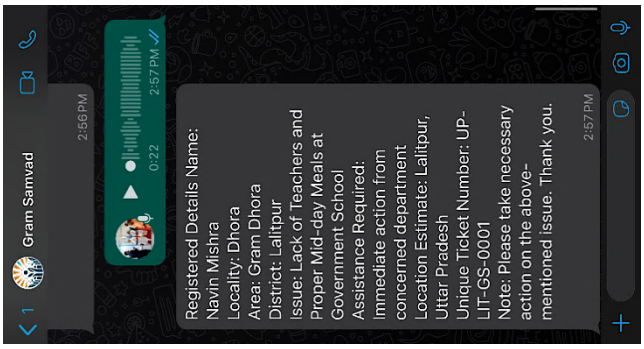
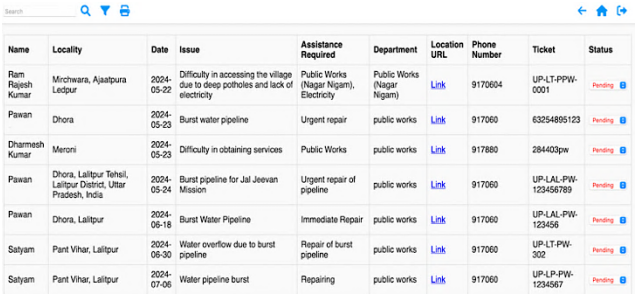


Figure IV: Grievance Registration



Name	Locality	Date	Issue	Assistance Required	Department	Location URL	Phone Number	Ticket	Status
Ram Rajesh Kumar	Mirchwara, Ajaatpura Ledpur	2024-05-22	Difficulty in accessing the village due to deep potholes and lack of electricity	Public Works (Nagar Nigam), Electricity	Public Works (Nagar Nigam)	Link	9170604	UP-LT-PPW-0001	Pending
Pawan	Dhora	2024-05-23	Burst water pipeline	Urgent repair	public works	Link	917060	63254895123	Pending
Dharmesh Kumar	Meroni	2024-05-23	Difficulty in obtaining services	Public Works	public works	Link	917880	284403pw	Pending
Pawan	Dhora, Lalitpur Tehsil, Lalitpur District, Uttar Pradesh, India	2024-05-24	Burst pipeline for Jal Jeevan Mission	Urgent repair of pipeline	public works	Link	917060	UP-LAL-PW-123456789	Pending
Pawan	Dhora, Lalitpur	2024-06-18	Burst Water Pipeline	Immediate Repair	public works	Link	917060	UP-LAL-PW-123456	Pending
Satyam	Pant Vihar, Lalitpur	2024-06-30	Water overflow due to burst pipeline	Repair of burst pipeline	public works	Link	917060	UP-LT-PW-302	Pending
Satyam	Pant Vihar, Lalitpur	2024-07-06	Water pipeline burst	Repairing	public works	Link	917060	UP-LP-PW-1234567	Pending

Figure V: GREVIENCE DATA DASHBOARD

4.2 Use Case 1.3

"Gram-Samwad," developed by CEQU Labs was initially envisioned as a WhatsApp bot aimed at improving communication between village administrations and their residents. Building on its success by collaboration with IAS Ashish Kumar, the application has now integrated a grievance redressal module that extends to social media platforms. This feature allows villagers with authenticated accounts to post their issues directly into the system via multiple channels. A.I. and GPT Module automatically categorize these grievances based on urgency and type with dashboard like in Figure V, routing them to the appropriate department for swift action. This multi-channel approach not only streamlines the resolution process but also enhances transparency and accountability in public service, fostering a stronger bond of trust and engagement within the community.

4.3 Use Case 1.4

In Figure IV, when a passenger on public transportation encounters a crisis, they have two swift options to signal for help using the "Gram-SAMWAD" GPT bot: a concise voice notes describing the emergency or pressing a specially designed Automated panic alert within the bot interface. This system, ideated for rapid crisis management, leverages the ubiquity of WhatsApp to ensure accessibility and ease of use. Upon receiving the distress signal, "Gram-SAMWAD" utilizes natural language processing to interpret the voice note's content or recognizes the panic alert activation as an immediate call for assistance. It then swiftly retrieves the precise current location of the distressed passenger through their smartphone's GPS. The bot interfaces with the public transport vehicle's system and city's surveillance network, instantly directing all nearby CCTV systems to focus on the path of the distressed vehicle. This integration allows for real-time tracking and situation assessment.

Simultaneously, emergency response vehicles are automatically notified with the vehicle's location and a predicted path, calculated using real-time traffic and the vehicle's known routes. The situational awareness provided by the bot's quick analysis of the voice note and live surveillance feeds ensures that the emergency team is well-informed on the approach. This case study outlines how a strategic collaboration with government authorities to create a responsive and intelligent emergency management system within the public transport network.

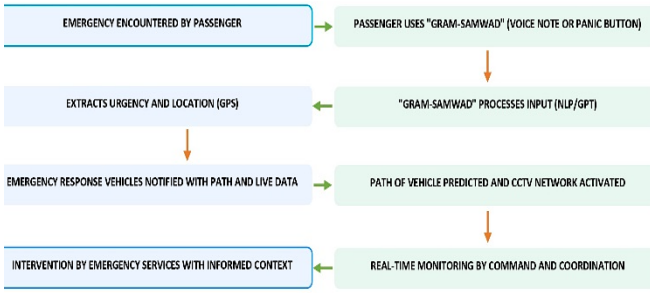


Figure VI: USECASE 1.4

5. CASE STUDY: MODEL A.T. 40

GP Dhorra, situated in the Lalitpur district of Uttar Pradesh, was chosen as a pilot locale for the revolutionary DigiGram VICCC project, implemented under the leadership of IAS Akshay Tripathi, District Magistrate of Lalitpur. The village's transformation into a digital hub was conceptualized to foster economic growth, improve living standards, and facilitate sustainable development. This case study delves into the technical intricacies, challenges, and outcomes of the project.

5.1 Pre-Implementation Assessment

An initial assessment revealed that GP Dhorra's infrastructure, healthcare, education, agriculture, and governance were primarily traditional, with minimal digital influence. Farmers relied on conventional practices, healthcare was basic with limited access, education was hindered by resource constraints, and local governance lacked citizen engagement.

baseline observations

Sector	Pre-Implementation
Agriculture	Traditional Methods
Healthcare	Basic Primary Health Center
Education	Physical Non-Equipped Methods
Economic Growth	Sweatshop Workers / Informal Workers
Governance	Physical / Call based GMS

5.2 Project Rollout

The DigiGram VICCC rollout consisted of several phases, incorporating infrastructure development, sector-specific solutions, and a robust support system to ensure sustainability and adaptability. Each phase was meticulously planned and executed, with ongoing community engagement and feedback mechanisms.

5.3 Infrastructure Development

The cornerstone of the DigiGram project was the establishment of a resilient digital infrastructure. High-speed internet was deployed via a mix of fiber-optic and wireless technologies.

A local micro edge data center, MEDHA at Panchayati Raj Office, Lalitpur, was installed to manage the Dhorra VICCC, ensuring local data processing and storage with real-time analytics capabilities. Each key sector of the village economy was addressed through tailored digital interventions:

a. Agriculture: IoT-enabled Platform for prediction was introduced to optimize resource use and crop yields.
b. Healthcare: Telemedicine facilities like Portable Health ATM and an ePharmacy network in Figure VII at Panchayat Office were set up, leveraging the central warehouse for logistical efficiency.
c. Education: in Figure VIII, Open digital learning platforms were established over network, increasing educational resource availability.
d. Governance: Figure IV, V & XI, Digital governance tools were implemented to enhance transparency and civic engagement.

5.4 Post-Implementation Impact

The post-implementation period showcased significant improvements across all sectors. Analyzing data in a time span of 1 month:

change

Sector	Post-Implementation	Δ User
Agriculture	Central IoT Platform, Weather, Agri IoT	**11**
Healthcare	eHealth ATM, ePharmacy	**6**
Education	Open Vidya Digital Classes, Digital Learning Access	**186**
Economic Growth	Market Collaboration, GiG Standardized Workers	**5**
Governance	Regular Public Connection, GPT A.I. Based Redressal	**5000**

impact

Sector	Impact	Result
Agriculture	Weather Prediction, Informed Decisions	**Significant**
Healthcare	Pre-Disease Assessment & follow-ups increased, reduced response time	**Significant**
Education	Increased in students accessing eEducation Systems, Open WIFI Consumption increase.	**82% Access**
Economic Growth	Skilling by Manufacturers and Product Standardization	**5 Users / Month** ⬆
Governance	Grievance Reporting & Increase in Citizen Engagement	**5000 Users** ⬆

Figure VII: eHealth remote consultation

Figure VIII: eEducation Vidya platform

5.5 Challenges And Resolutions

The DigiGram project (Figure X), faced numerous technical and operational challenges, including resistance from technology-averse segments, power infrastructure issues, and the need for continual technical support. These were addressed through targeted community education programs (Figure XI), the integration of solar solutions with battery storage for reliable power, and the establishment of a local IT task force in collaboration with the District Administration. Additionally, the installation of fiber optic cables was essential to provide high-speed internet connectivity, despite the logistical challenge posed by a railway line dividing the village into two parts. This required strategic planning and specialized equipment to ensure seamless connectivity. The Village Information and Communication Coordination Center (VICCC) project in Gram Panchayat Dhorra exemplifies the impact of strategic digital interventions, utilizing devices such as network routers, IP cameras for surveillance, and eHealth kiosks. These interventions have led to enhanced productivity, healthcare access, educational resources, economic stability, and governance engagement.

A central management system and edge data center installed at the Panchayati Raj office are crucial for processing data and integrating all villages on one platform, enabling inclusive management and development. This system ensures efficient data handling and real-time decision-making, enhancing the overall effectiveness. To decrease maintenance costs, a new Fixed Wireless Access (FWA) based communication system for local IoT communication is being adopted, replacing fiber optic cables. Moving forward, the focus will be on scaling the project to adjacent villages, upgrading data center capabilities to handle increased data loads, and fostering a culture of innovation and entrepreneurship, thereby setting a benchmark for rural digital transformation.

Figure IX: CCTV view of Dhorra

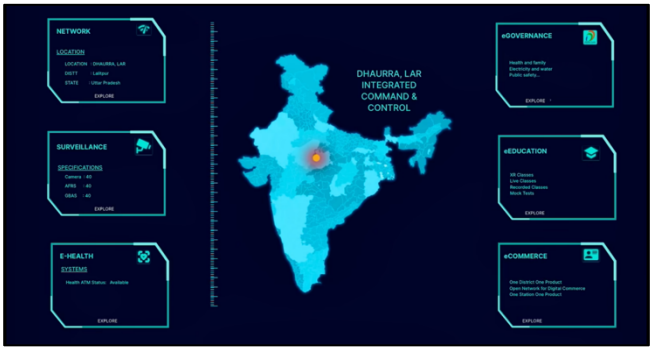


Figure X: DigiGram platform

Figure XI: All Stakeholder Meeting

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