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Technological Measures to Help Rural Areas Achieve Self-Sufficiency and Remove Dependencies.

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Abstract: Indian rural areas lie considerably behind in technology, awareness and other factors that majorly influence development in the contemporary world. Such areas, primarily poverty-ridden, remain in the rain-shadow of development extensively due to the substandard economic conditions of their inhabitants. Poverty not only prevents rural inhabitants from consuming sufficient food but also puts their education, employment, and health facilities at sake. Rural economies are mostly agriculture-based and farming is the cardinal source of income. But primitive methods and mindsets both have restricted innovations in farming. This inordinate dependency creates a dearth of alternative employment opportunities. Besides, lack of education and awareness worsens the grim situation as villagers struggle to find skilled employment. The need is not to make villages competent to urban cities, but to make them self-sufficient and equipped enough to satisfy their own needs. Poverty, education, and unemployment are the prime reasons and devising a solution to curb them first will pave way for further development. Developing technical means to achieve self-sufficiency and removing dependencies will aid villages in adequately satisfying all their basic necessities. We also need to create skilled, social, aware, methodical, responsive and technology-equipped villages using strong yet uncomplicated digital and tangible modes.

Keywords: Self-sufficiency, Agriculture, Smart Village, Rural development, Removing dependencies

1. INTRODUCTION

There are around 6 lakh villages that subsist within the Indian landmass. These villages, spread across the length and breadth of the country, contribute about 66.46% to the total Indian population. Quite evidently, India shares a major populace in its rural inhabitants. This rural setup though lies considerably behind in technology, awareness and other factors that majorly influence development in the contemporary world. Even after 70 years of independence, people in rural areas struggle to find steady livelihood. The struggle is discernibly seen in their efforts to gather even the most basic necessities of life- be it stable diet, health facilities, water, education and employment. There are a number of facets which have thwarted the reach of development in these areas.

Rural areas, primarily poverty ridden, remain in the rain-shadow of development extensively due to the substandard economic conditions of their inhabitants. This poverty, denies them access to most amenities as quality education, comprehensive healthcare, proper food, technology et al. Poverty directly impacts their quality of life. Not only it prevents a rural family from consuming sufficient food but also puts their education, employment and health facilities at sake.

Rural economies are mostly agriculture-based and farming is the cardinal source of income. But primitive methods and mindsets both have restricted innovation in farming. Farmers prefer only one or two crop choices and are entirely dependent on them. In case of crop failure, there are no backup plans to stabilize the already

thin economic condition. Additionally, farmers avoid soil testing initiatives and other aids such as KisanMitra made available to them.

This inordinate dependency on farming creates a dearth of other employment opportunities that people should alternatively look to. Besides, lack of education and awareness worsens the grim situation as villagers struggle to find employment in areas that require skills. They have to then resort to farming or work on daily wages. The rate of education and literacy, though improving is still meagre in rural areas. Inadequate academic institutions and lack of well qualified staff are not only restricting educational developments but are also proving as obstacles towards awareness and opportunities.

Image 1.1 Typical Indian Village – 1

Medical facilities are quintessential for better livelihood at any place but optimum healthcare is yet to reach rural areas. As a result, villagers struggle to get proper medical cure even in cases of emergencies. Local medical centers have little role to play and lack of quick-response ambulances or other vehicles create grave situations.

Image 1.2 Typical Indian Village – 2

Technology and Connectivity too remain farfetched from rural areas, seldom do we have better network coverage or availability in such regions. Low technological advancements combined with insufficient education creates a learning curve high enough to be scaled if not tackled early. The same applies to electric supply as well and long hours of load shedding is recurrent in villages even today. Moreover, there are not adequate roads that help villages establish connectivity with the mainland. It is quite common for the villagers to travel to urban areas for weekly markets and other necessities that have not been made available in villages yet. They also face

lack of adequate public transport facilities and petrol pumps. Intra-village connectivity and on road emergency assistance are issues left unaddressed.

The rural backdrop of our country though bestowed with beautiful landscape and natural gifts, lacks technological advancement and infrastructure required to keep pace with this fast growing world. The need, though, is not to make villages competent to urban cities, but is to make these villages self-sufficient and equipped enough to satisfy their own needs. Changing the technological scenario of Indian rural setup also requires a change in the mindset of native people. Rural inhabitants have learnt to live and adopt to their situations as they are, seldom going for path breaking changes. Poverty, education and unemployment are the prime reasons to be traced and devising a solution to curb them only will pave way for further development. The population is, was and will always remain an asset.

2. STATEMENT OF PROBLEM

Formulating a technological solution to resolve the concerns of rural poverty, dearth of education & awareness, improper healthcare system, unemployment and provide basic amenities as transport & sufficient food. Moreover, cases of governance, sources of energy and cleanliness have to be tackled using the same solution as above.

3. RESEARCH

3.1 Present methods of tackling the problem.

There are numerous methods present to tackle the aforesaid issues but are not completely effective so as to provide efficient solutions to the existing problems.

1. *Poverty*: Poverty, so evidently heavy in rural areas has not found an ideal solution. People resort to loans and mortgages as temporary solutions but lack of alternatives converts them to debts. Moreover, government schemes are available to reduce the effect of poverty but initial investments and complicated paperwork take their effects beyond the reach of poor rural people. The per capita income in urban India was 101,313 in 2011 compared to 40,772 in the rural sector.

2. *Farming and food security:* The presence of Farmer-aid centers, government schemes and initiatives as the Kisan credit card, Krushi Mitra have allowed some assistance to farming methodology. However, sticking to old school practices have resulted in lower acceptance of these novel concepts. Also, basic food entities and rations have been subsidized and made available by the government at control centers. The concept of MSP proved useful to both- the producers and consumers of food crops but black marketing and adulteration has proved fatal for this initiative.

Image 2.1 Makeshift Methods in Rural Agriculture

3. *Health:* Primary medical centers have been set up by government in rural areas for basic health dispenses. Also Anganwaadis provide maternity healthcare amenities. But child delivery and other higher medical concerns make these centers run out of utility. Besides, mobile medical vans conduct monthly checkups and camps in rural areas. The doctor- patient ratio in India is about 1:2000; in rural India, the number of doctors is one-fourth of the doctors in urban areas.

Image 2.2 Rural Public Health Centers

4. *Education:* Educational institutes up to primary level have been mandated in all regions, but lack of dedicated and qualified staff, higher institutes, resources and knowledge is still a concern in such areas. With the advent of well-equipped CBSE schools, students have managed getting access to education but at a higher cost. Also, CBSE and Zilla Parishad schools are directly competing for strength of students. Education, though available is not yet affordable. And availability has also come at the stake of quality. Literacy rate is just 71% in rural areas as compared to 86% in urban areas.

Image 2.3 Digital Infrastructure in Rural Areas

5. *Quality of life:* Villagers have looked towards biogas as source of energy but the overall implementation has been on small scale. The installation of solar units for street lighting has been in progress. Also, organic farming and composting are being practiced. The usage of all aforementioned practices has been on small scale and a wider approach needs to be adopted soon.

Image: 2.4 Solar Panels have come up in some areas

6. *Governance:* Decentralized government bodies are continually trying to match good governance standards by implementing newer community applications. They too face a restriction when it comes to digital information dissemination and increasing participative awareness.

Overall, there are development methods in place but they face implementation issues and we still cannot regard them as full-proof.

3.2 Proposed Solution:

The proposed technical solution is in the digital space in the form of a multi-tier website. This website, besides acting as a Smart Village Portal, will also serve to resolve the issues of meeting basic requirements in rural areas. The website will be equipped with a digital monitoring system that will validate the execution of every tangible activity thereby preventing lag and ensuring completion. Moreover, all the features will be made available to the users in the form of a mobile application.

1. *Poverty, Farming and Food security:* The foremost objective of the smart village portal is to curb poverty by assisting rural population to meet all their basic requirements, produce enough for local consumption and achieve self-sufficiency.

The premier step here is to evolve farming practices- regular soil testing, adopting organic farming methods, crop rotation, contour farming, planting commercial crops, using compost pits and more methods, the details of which will be provided on the website.

The website will be responsive enough to judge the physical conditions of a given area and suggest crops, practices and methods best suited to a given environment.

Image 3.1: Date Plantation

Video tutorials for hybrid farming with commercial crops will also be available on the website. Moreover, a direct market window will be provided by the website to the farmers to sell their produce at optimum prices.

Farming should be carried on alongside alternative measures as livestock, dairy farming, poultry farming, and bee-keeping. Every farming place requires livestock and using the same for dairy production will aid their income. The website will identify potential customers for milk, milk products, honey, poultry and other outputs. Also, community practices will be encouraged to maximize profits to the villagers.

Image 3.2: Poultry Birds on Farm

Food security will be tackled by encouraging organic kitchen gardens in every household so as to meet the local family food requirements. The surplus yield will be marketed directly through the website to urban customers.

Doing so, the standards of farming will improve and income will get steady, alternative approaches will balance expenses and kitchen gardens will help satisfy personal requirements, thereby gradually eliminating poverty, food security and farming issues.

2. Education: The Smart Village Portal looks to deliver digital education to students in rural areas based on two-way interactive learning.

The website will store an inventory of video lectures of common curriculum topics along with translations in native languages to ease the process of learning.

To encourage Digital Literacy in rural areas, the website will offer simplified cyber education tutorials to rural inhabitants. These tutorials, along with all others, will also be made available in sign language conventions to have increased accessibility among people from all walks of life.

A section of the website will be dedicated towards educating the population in using the website and its features. Markers and tutorial guides will be provided to make access easier for rural people.

Besides, each institution will be provided with adequate local geographic and historic information, which in turn is to be digitally delivered to the students. Additionally, historical legends will be narrated to the students in interesting documentary/animation formats that will give them a complete insight of historical developments.

Also, conceptual subjects as Physics and Mathematics will be aided through physical activities to further enhance interactive learning.

Lectures on farming methods to understand soil structure, Geology and Botany will be complemented with actual farming practices. Moreover, some assistance from local Anganwaadis and health centers should be afforded for deeper insights of Zoology.

For composition and Chemistry, the concepts of cooking and farming should be used as practical references and involvement in such activities will also ensure enough work experience.

The website will encourage work experience activities and workshops by local weavers, craftsmen, etc. should be conducted on weekends for the students.

All the above objectives require recruitment of a lot of individuals from all educational fields thereby boosting employment opportunities.

The emphasis here is completely on digital and interaction based learning. The curriculum will be supplemented with the existing text book syllabus and will allow the students to think outside the text book.

3. Health: The Smart Village Portal proposes the setting up of fully equipped medical centers in villages for complete medical assistance. The monitoring, setup, availability, common diseases and other demographics typical of every village will be provided on the website. In rural India, the number of Primary health care centers (PHCs) is limited, 8% of the centers do not have doctors or medical staff, 39% do not have lab technicians and 18% PHCs do not even have a pharmacist.

The medical centers should be equipped with 2 trained practitioners, premium health care facilities and functioning ambulances to urgently transport patients to a larger facility.

The portal will assist all villagers in increasing their awareness about organ donation and will help establish direct contacts with nearby donation banks. Besides, proper provisions for visually-impaired, speech-impaired and people with other disabilities will be made so as to extend the benefits to them.

The website will also help the medical centers in establishing contact with higher practitioners through video conferencing. Also, contact details and availability of nearby specialists will be aptly stated on the website.

Regular updates on health schemes, diagnosis methods and health insurance policies will be effectively communicated by the Smart Village Portal.

4. Quality of life: The Smart Village Portal will encourage the use of non-conventional energy sources in rural areas. The prime resource being Biogas plants, as cow dung, organic waste and slurry are materials readily available in rural areas, they can be put to better use. The website will provide proper information for use of such energy resources.

The biogas plants should operate on community basis and after regular production should support cooking gas and basic lighting. The information about positive effects of biogas will be displayed on the website to provide reference to other communities to employ the same. The portal will also collaborate with government's scheme of using Solar Panels for street lighting.

The use of such modern energy methods will relent the blow of heavy bills and taxes levied on various energy sources thereby minimizing poverty issues in the long run.

Involving students in studying the operation of biogas plants will aid their academic learning. The positive effects of community building will also come to fore as all initiatives press on adopting a communal approach for development.

5. Governance: The Smart Village portal will also maintain a record of all Government Schemes, the information of which will be disseminated regularly to all the villagers. Also, the portal will provide direct

means of accessing the benefits of such schemes digitally thereby significantly reducing paperwork and maximizing outreach.

Digital governance through Smart Village portal will also include conducting of digital panchayats. The process of communicating decisions, notices, reminders and invitations will be assisted by the portal itself at all decentralized levels.

6. Transport: Most essentially it is required to establish road-route connectivity in rural areas, which is possible through construction of roads and/ or pathways in unsuitable terrains. The Smart Village portal will convey relevant information regarding absence of proper roads, length of path to be covered, and suitability of terrain & nearest highway available so as to facilitate the authorities in construction.

Further, it is proposed to provide proper on-road assistance in rural areas using emergency help telephone booths at selected checkpoints along with multi-utility mobile vans that can rush in times of on-road emergency. The website will contain proper information about availability of nearest checkpoints and mobile vans using its geotechnical utility.

A functional petrol station common to multiple (3-4) villages should be made available for the probing issue of non-availability of fuel close to rural areas. This station will also house the multi-utility vans and will directly receive all calls from the emergency phone booths. All the required monitoring, status and tracking will be done through the website.

An increase in the number of public transport vehicles plying to the village is utterly required. The transport time table, general information and availability of buses will be provided by the website. Besides, the multi-utility van has to provide villagers with pick-and-drop facilities when traveling together for common purposes as selling of farm-produce or market visits.

3.4 Alternate Solutions and Approaches:

The possibilities of having alternative approaches to some of the methods described above could be as follows, the role of Smart Village portal though remains the same:

A common educational center for schooling and industrial training should be started for the whole village community.

A combined medical facility for groups of 4-5 villages should be constructed within a reachable radius of all villages. The local Anganwaadis will communicate the specific requirements of respective villages and aid their medical treatment.

The provision of creating modern energy from sewage water by installing turbines at disposal centers could be implemented.

3.3 Novelty of Approach:

Smart Village Portal provides the feature of accessing services even in absence of internet or smart phones using the USSD facility. The assurance of delivering uninterrupted services makes the portal stand out from rest.

Additionally, individuals will be provided with customized login profiles that will manage specific schemes, eligibility, health benefits and other exclusive content for that individual user thereby ensuring personalized communication.

Approaches like documentary-animation based teaching, work experience activities, medical video conferencing, assistance check points, community training activities, digital panchayat etc. ideate novelty and add impetus on execution.

The concept of online monitoring and reporting provides a system that keeps in check the progress of all activities by all its stakeholders. It time-bounds all entities, increases accountability and also prevents delay and corruption.

The novelty of Smart Village Portal lies in its approach of being a one-stop digital solution for the development of smart villages. The Portal focusses primarily on achieving principal objectives of fulfilling basic requirements, self- sufficiency and community building through a simple effective digital platform.

Smart village portal has taken into consideration the mindset and attitude of rural inhabitants and then accordingly suggested the above solution. Care has been taken to ensure that this technical method should not appear alien to the layman end user.

4. TECHNICAL REPORT

4.1 Description of Concepts and theories involved in the solution

1, Poverty, Farming and Food Security: The issues of poverty, farming and food security were observed to be interrelated. Better farming would ensure better production and stable economy. Organic farming and kitchen gardens were encouraged to inculcate novel yet strong practices, besides they also help curb food security problems.

Additionally, the suggested online platform will help all producers get legible prices for their produce. It will also help them expand their outreach.

2. Education: The basic theory involved in education was to make unconventional yet concrete digital approaches to strengthen academic concepts. It also involved more practical approaches to help students grasp and comprehend quicker.

The mode of all communication will be kept in regional languages to ensure better adaptability and rooted reach.

4.2 Technical Aspect of proposed solution:

People in rural areas do not have proper access to internet connectivity. It was observed that every ‘Gram Panchayat’ has a computer with a proper internet connection. But village residents still use mobile phones lacking proper connectivity. So a website is the only feasible mode of information dissemination which will be monitored by the governing members along with the members of villages in Panchayat. Website’s architecture is designed in a way to behave as a two-way handshake protocol in working. Direct communication with the village representative in the panchayat will be made through the portal and people will be notified about the activities and services available to them via calls and SMS alerts.

4.3 Detailed Technical Specifications:

Website is a community based system which is dynamic in its state. Every website has two faces to show: client-side and server-side. Website’s client-side is to be written in HTML, CSS with in depth use of Bootstrap and JavaScript to make it user friendly.

Understanding the depth in technology used in front-end i.e client-side, HTML works as a visual component of website which take care about the way website must look. CSS and Bootstrap are languages in field of website development contributes towards styling and making the visual perspective of website more attractive.

The back-end of the system is to be handled under PHP which indeed is the common and one of the easy languages covering server-side scripting of website.

As we called HTML to be the visual component of website, PHP stands as the functioning component of the website. The data that users enter onto our website is to be handled and fed to the database. Also as we are with some crucial information about the people, Security is one of the important aspect that should not be ignored. PHP is a server-side scripting languages and it's everyday welcoming updates are fruitful enough in field of security we are required to keep the data secure on our website.

As the website is informative and community based, our simple database won't be of great help. Database is big enough, so technically it needs a stable database. In such cases, Hadoop technology is the best technology capable of handling dynamic data.

Hadoop is actually a JAVA based framework which is designed especially for handling large amount of data, certainly in zettabytes. It is designed to scale up from single servers to thousands of machines, each offering local computation and storage. The library in hadoop is designed to detect and handle failures at the application layer. Thus when we are up with data that involves the presence of 83 crore people, certainly this is the best technology we need to work with.

4.4 Flow of operations and functionality:

The website will cater to two kind of audiences: Users and Servitors.The users, primarily the beneficiaries in all the mentioned sections will get direct access to the website through a common system installed at the community information center.

Additionally, this website will be accessible on mobile platforms as well- in the form of a responsive web app or as an integrated mobile application.

The website will act as a medium to allow these servitors to identify potential groups and in turn would also inform the village authorities about volunteers from all professional sections interested in rendering services. All such servitors would also be obliged to work collectively.

For example: When a team of medical experts serves a rural community, medical students simultaneously can assist them in their work thereby gaining valuable experience.

Each section of the website is responsive as follows:

1. Poverty, Food Security and Agriculture: Assistance in agriculture through the use of efficient services and farming methods will be updated on the website. Besides, climatic conditions, suitable crops and effective solutions will be aided through the same platform. As mentioned earlier, the provision of an online market will be available on the website.

2. Transportation: Imbibing a support system for highway emergencies, on-road succor and plying modes are services which will be digitally in the transportation section. The geo-position feature along with calling options will be equipped as well.

Government policies/ schemes: An up-to-date list of all government schemes and policies will be maintained on the portal. This will be synced with the local citizen database so as to send SMS alerts to all those who are found eligible under a mentioned category.

3. Education: The website itself will be a source of eclectic academic material and will focus on interaction based activities. It will house a large collection of interesting activities to boost the dormant rural education setup. Besides it will provide complete support for languages and sign-conventions.

4. Health/ Medical: Primary digital facilities for common diseases will be made available on the website. Also the portal will connect rural and urban hospitals in a tandem which will ensure quick, responsive and effective treatment to all individuals.

Report: Basic digital monitoring of all the aforementioned services will be looked after by a check-system that would continuously scrutinize all activities and alert the audit team in case of any lag or discrepancy.

4.5 Performance Estimate of the solution:

It is expected to perform well because no provision of the existing module has been disturbed while designing the portal and it will only complement the system in achieving all its objectives but in an improved manner.

The performance is also likely to be affected by the monitoring system which is designed to keep a check on all activities in due period. Following the system will ensure proper completion of tasks and add worth to the success value of this portal

The Smart Village Portal has been designed as a dynamic website and requires proper internet connection to function in its prime.

Given the hefty amount of data that is to be fed on it, it will require a strong database backup and well-built server connection. The overall performance will be the sum of all digital and tangible activities carried out at each stage by the respective stakeholder.

4.6 Experimentation/ verification done to establish the workability of the above:

The experiments that were carried out to verify the workability of Smart Village portal yielded positive results as the website showed smooth functioning.

The Smart Village portal is responsive enough to run effectively on both- desktop and mobile platforms. The user-access and admin-control both were found to be in optimal running state.

An attempt to verify its workability in rural areas was also made – the villagers were able to view textual demographic information but absence of internet made videos and other similar content completely inaccessible to the students.

All other experimentations and tests conducted to establish the portal's workability have been discussed at length in the Results section.

5 RESULTS

5.1 Actual Findings, Significant output of tests and analysis:

All the results and analysis presented herein are the output of tests conducted at Ambazari Village (Taluka: Hingna, District: Nagpur in the state of Maharashtra). These results have been compiled in accordance with real-time demographics after surveying, data collection, conduction of tests and recordings obtained from the team's several visits to Ambazari in the months of August, September and October. The demographics of the aforementioned village were referenced from IndiKosh.com.

1. Actual findings:

Farming, Poverty and Food Security:Like most rural setups in India, Ambazari too is an agricultural economy. Farming employs a fairly large percentage of the working population.

The methods of farming are conventional and orthodox with Cotton and Soybean being prime produces. The area lacks proper irrigation facilities and farmers are still on the mercy of good rainfall for good yield. In case of inadequate rainfall, crop fails and not many alternatives are available to a farmer to sustain his already thin economic condition.

Image 4.1: Failed Agriculture Produce

Subsequently, this had led to stagnation and poverty among the farmers. They have seldom looked towards modern farming methods and they believe in continuing the same practices that have been inherited from generations. They have even neglected essential practices as soil testing.

Every household in the village keeps abundant cattle to provide assistance in farming activities and also for milk production. Due to the surplus amount of milk available in each household, the residents of Ambazari supply milk to urban areas in huge numbers. Thus, milk production is the secondary source of income in the area.

Image 4.2: Livestock was found in every household

People have not been hit too hard by poverty, but undeniably, it still exists and may even rise in case of crop failure given that there is no proper backup system.

The inhabitants of Ambazari depend on Public Distribution System (PDS) Control Units for their monthly supply of ration. By their standards, one complete meal a day is quite affordable and food security is not that evident.

Education:The number of literate individuals in the village were found to be 501 (304 men and 197 women). The male literacy rate is 77% and the female literacy rate is 64%, the overall rate being 71%. There have been significant improvements in the literacy rate, which have been depicted in the graph below:

TABLE I: CHANGE IN LITERACY RATES FROM 2001 TO 2011:

	Male	Female	Total
2001	64	49	57
2011	77	64	71
Change	13	15	14

From the findings and data collected, it was observed that people in the first two generations were mostly matriculates and only a few graduates thrived within the population.

However, children in the third generation have been mandatorily enrolled in standard CBSE schools in the vicinity of the village. The Right to Education (RTE) act has worked very well for all children here and its effects seem to have been meted out quite successfully.

But at the same time, it has also led to depleting strength in the local Anganwaadi, which is now struggling to find enough students. It can also be traced back to the presence of only one Ashram School (Residential School) for Scheduled Tribes living in and around the area, which does not leave parents with any option but to admit their wards to nearby CBSE schools.

Health: Ambazari village is bereft of a local, permanent Medical Centre and even trained practitioners. The nearest such center lies on the leeward side in a neighbouring village and so, the residents prefer to visit the Hingna Gramin Hospital (15 kilometers from Ambazari) for all their medical needs.

There are, however, monthly visits and health check-ups conducted by private hospitals for the residents.

Transport: Ambazari is perched atop a hillock and though highway-connected, it still lacks proper internal transport system. It is even deprived of a bus stop. People mostly rely on sharing vehicles or use tempos/lorries for traveling. The internal roads are still muddy lanes and the complete populace is waiting for permanent roads to be constructed as they were promised by the local Panchayat committee.

Quality of life: Residents of Ambazari have looked more towards conventional energy resources and little attention has been paid on tapping the potential of renewable ones such as Biogas and Solar Energy. With organic wastes and cow dung available in plenty, biogas is always an optimum solution to all rural energy needs. But they seem to have chosen subsidized LPG Cylinders and Thermal Power over everything else.

Governance: Most government schemes and benefits have thwarted their reach to this village and unawareness was clearly evident. The details about the system's outreach has been mentioned in detail in the section that follows

5.2 Significant Output of Tests and Analysis:

Our team had conducted a few sessions for the villagers where we had tried to disseminate information, introduce digital literacy and discuss modern farming methods.

One session was conducted for local inhabitants, workers, farmers, homemakers and the other for school children.

Test 1: Digital Literacy and Novelty in Education.

Name of School: Ahilyadevi Holkar Primary School.

The need for digital and conceptual education has been pressed upon as a part of the objectives of Smart Village portal and to demonstrate it, our team conducted a simulation of the same.

Method of conduction:

We engaged a gathering of 68 students (class 4-7) in short lectures of History, Science, English Vocabulary and Storytelling, which have been precisely described below:

History: The students were shown video lectures of the tales of ShivajiMaharaj

Science: Animations were used to describe the concept of Water Cycle

English vocabulary: General descriptions of objects around us were given using simple English words

Storytelling: Students were encouraged to weave stories from their perspective and practical experiences to demonstrate interactive learning.

Image 4.3: Interaction with School Students

Image 4.4: Digital Education Test

Output of Test:

The numbers have been presented with respect to the parameters in bold, normalized for a group of 10 students (total size: 68)

TABLE II: GRASP, PENETRATION, AND RETENTION

Method	Number of students	**A**ccuracy
Digital & Interaction-based	8/10	80%

Regular (bookish)	6/10	60%

TABLE III: PROBLEMS SOLVED AND SOLUTIONS GIVEN

	Method	Number of students	Accuracy
1	Digital	5/10	50%
2	Interaction-based, relatable	6.5/10	65%
3	Bookish	3/10	30%

TABLE IV: RELATIVE INDEX URBAN-RURAL POPULATION

	Parameter	Urban	Rural
1	Grasp, penetration & attention	7.5	4.5
2	Solutions given	7	3.5

Analysis: It was observed that the students were attracted towards digital and interaction-based learning methods and we noticed a greater grasp among them. Also we were able to catch their attention span for long because of all the new and interesting utilities involved in digital learning.

A greater degree of gratification was seen and it was relatively much higher than the one observed during regular classes as reported by the teaching staff.

Test 2: General information dissemination, Government schemes, farming methods and new approaches to employability.

Attendees: 27

Method of conduct: General information dissemination: Introducing them to the concept of “Smart Village”, knowing their approach in making it SMART, general features of our Smart village Portal, digital literacy, etc.

Government Schemes: Listing 17 common Government schemes with their benefits, eligibility criteria & applications and knowing their involvement in the same.

Farming methods: Providing them with the knowledge of modern farming methods and other provisions beneficial for them.

Image 4.5: Test Conducted at Anganwaadi for Elderly Villagers

Output of test: The numbers have been presented with respect to the parameters in bold, normalized for a group of 9 people (total size: 27)

Image 4.6: Information Dissemination and interaction during the test

TABLE IV: AWARENESS OF GOVT. SCHEMES

Scheme	Aware	Applied
Jan DhanYojana	9/9	9/9
UjjawalaYojana	8/9	7/9
FasalBimaYojana	2/9	0/9
PM Suraksha Yojana	4/9	2/9
Jeevan JyotiBimaYojana	3/9	1/9
PM AawasYojana	0/9	0/9

PM Mudra Yojana	0/9	0/9
Kaushal VikasYojana	0/9	0/9
Gram SadakYojana	0/9	0/9

TABLE V: FARMING PROVISIONS

Serial No.	Provision	Available	In-use
1	Irrigation Facilities	0/9	9/9
2	Organic Manure	9/9	3/9
3	Fertilizers & Pesticides	7/9	6/9

Analysis: The residents, quite evidently lacked proper awareness about Government schemes and other host of benefits that they are eligible for. Once provided with the information, the villagers became more active and were trying to file in nominations for majority of applicable schemes. The residents have practiced farming all their life and a sudden deviation into modern farming methods was not received very well. They were more concerned about quintessential requirements as irrigation and availability of seeds and fertilizers at lower prices. Although the provision of soil testing was one that they definitely looked interested in, given its importance. Not many people looked comfortable in adopting cooperative dairy farming. Their approach and mindsets were limited to their own benefits. On a general basis, most rural people in India have adopted to their present situations and it requires a huge psychological shift in their acceptance abilities to allow development on a smarter and larger scale. Their initial approach makes them look towards the monetary investment involved regardless of the long term benefits. The complications of fussy paperwork and endless documentation in almost every facility only takes them away from the villagers.

A better, adaptable and simplified modus operandi that not only complements their mindsets and work ethics but also resonates with our system's Smart outlook is an indispensable requirement here. This is precisely what our Smart Village portal is trying to bring in by being Smart, Simple and Effective.

5.3 Problems encountered, Credibility of results and accuracy estimates

Problems encountered: The backwardness of technology and lack of standard equipment posed problems in installation of suitable machines, projectors and other appliances.Load shedding and erratic power supply made it difficult to conduct smooth, uninterrupted sessions.Lack of technical exposure among the students and civilians posed major problems as technology (website) had to be broken down to its lowest level to help them understand. Internet being an alien entity to them made it even more difficult to explain flow of some operations.There were variations in language due to regional differences and it hindered our mode of communication many a times. Also, it affected the method of explanation to the students.All our digital approaches though necessary, seemed uninvited and far beyond to some people. Eventually they were made comfortable with it.

Credibility of results:The credibility of all results conducted for the research has been ensured using the following three parameters: Credibility – Triangulation and Member Checking, Dependability, andConfirmability.

Credibility: The team of Smart Village Portal completely ensures that the results presented are believable, rich and authentic. The values have been calculated in normalized factors to make them more comprehensive and emphasis has completely been laid on the quality and not the quantity.

Triangulation: The results of evaluation presented here have been verified by triangulation method:Industrial information was referred from IndiKosh.com. Supplementary stats were taken from various articles, reports and websites. These stats have been structured accordingly at various places in the report. The primary research data of our team was then combined with the other two, thereby completing the triangulation process.

Member checking: To allow greater credibility in our qualitative research, we shared our data and interpretations with our participants (Teaching staff at the school in Test 1 and the villagers at Anganwaadi in Test 2). The feedback generated from both the systems allowed us to refine our research..The teaching staff mentioned about having a more relatable and step-by-step approach towards digital education, whereas the villagers in Test 2 explained their perception of Smart village and suggested some ground-level initiatives of implementation. All of them have been duly incorporated in our report.

Dependability: All the results presented by our team have been reported in apt detail and can be effectively repeated for higher research. We have ensured consistency in all our collected information and thereby guarantee the dependability of data.

Confirmability: The information presented in this report is genuine and can be sent to external references. An audit or trial to confirm the existence of the complete information will only verify the above findings, given the credibility and authenticity of all results.

Accuracy of Results:To have enhanced accuracy, the standard values were converted into normalized values.The accuracy measures have been already incorporated in the earlier section - Output of tests (mentioned alongside all the test columns)

5.4 Pros and Cons:

Pros: The Smart Village Portal possesses a very simplified design and has a minimal learning curve for accessing all the wide range of benefits.

It makes all basic services available at your fingertips, thereby proving to be a one-stop solution for all SMART amenities.

The portal will not only redress service-based problems but will also help generate employment in a large number of fields, given the diversity of assets that the portal touches upon.

The portal brings villagers in direct contact with all the benefits that they have been eligible for since ages, but lack of awareness, tangled paperwork and inadequate infrastructure obstructed their accessibility. By eliminating all such dependencies, it gives our villages a greater chance of advancing towards development.

Besides these, all other pertinent advantages (pros) have been explicitly mentioned in the document.

Cons: The services of Smart Village portal are interdisciplinary in nature and thus require enormous amount of data to be fed into the system on a regular basis. This may directly hamper the portal's performance and make it slow if proper technology is not used.

The benefits though will be provided directly through the portal but each service still holds several stakeholders at each level for that specific service to be approved. (e.g. A proper source has to be found which will create and upload educational videos on a daily basis, service providers will have to manage the USSD facility, government schemes have to be first synced from all departments and then uploaded, farming volunteers will have to constantly deliver their resources etc.)

Some services, as transportation, require hefty investment and infrastructural development in deploying petrol pumps and several vans. If they are not synchronized with the expansion plans of the national bodies of road development and petroleum ministry, then might create a vacuum of dependencies.

A highly skilled technical team is required to ensure smooth functioning of the portal assisted by a backup & management team. The technology stack used has to be constantly updated and serviced to reduce overload and provide uninterrupted service.

5.5 Utility of Results:

The information provided is in real-time accordance and completely credible thereby paving way for further research.

This information will make it possible to plan better services, improve the quality of life and solve existing problems. Additionally, it will serve as a tool for the citizens to examine the decisions made by the government.

It will aid the government ministries in planning educational services, public transportation facilities and infrastructure according to the relevant needs and then eventually send this data to various ministries for budgeting.

The Gram Panchayats being the local decision making bodies, can use this information to modify its policies and implement change at a decentralised level.

6 FUTURE PROSPECTS, SCOPE AND FURTHER DEVELOPMENT

The portal can be further integrated with existing government websites (MyGov, NHAI, PMKVY portal etc.) so as to facilitate ease of operations and services that are provided to the public. All such portals are subsets of government's service and problem-redressal set and hence can be accordingly interlinked.

The market window for sale of vegetables and kitchen garden produce (mentioned in the Farming Section) can be further expanded to create an e-commerce platform.

With all the information collected by the portal when it works in a full-fledged manner, the opportunities for research are immense. Besides, daily monitoring will help analyse performance and can be an important tool ahead.

Further research can be carried in USSD facilities to tap its complete potential and include it as a part of information dissemination in rural areas.

Possibilities of expanding the network in low coverage areas has also been touched upon in the report and can be put forth for further development.

7 CONCLUSIONS

We, hereby, present our Smart Village Portal as a one-stop-solution for tackling the problems of poverty, quality education, improper health care and transportation in rural areas. In addition, the portal also addresses the issues of governance, poor connectivity and lack of employment opportunities all with the motive of leading a quality life and making our villages SMART.

The features of Smart Village Portal can be used as source of information by various bodies of government. It can assist them in extracting suitable information and then accordingly planning further development.

The content in education section can be used as generalized material for all students and not only the rural populace. Similarly, the assets provided in Employment section can be accessed by all rural and urban individuals alike.