Gram Vaani: Community Powered Technologies for Development

OnionDev Technologies Pvt Ltd

Platform & Technology Offerings
Vernacular users find voice a natural way of interacting with technology*

Text vis-à-vis voice medium: Key findings from a survey of 200+ users of Gram Vaani platforms showed that of all smartphone users:

- **75% use voice commands** for dialing phone numbers and Google searches
- **43% said** that they are not able to use the Internet effectively because of **poor English**
- **74% of all users preferred audio over text** for reasons such as being able to listen while doing other work, and that it was easier to discuss in groups
- In another simple experiment with male and female youth divided into two groups, one of which was played an audio about nutrition practices and the other was given the same information in text; **the audio group was able to more quickly and accurately answer recall-based questions**

---

**Vernacular**

**72% of Internet Users in India prefer non-English language**

**Voice Vs Text**

Voice is **3.7 times faster** compared to typing especially in Indic languages

**Large user base**

**600M-700M Vernacular internet users expected by 2025**

**Growing rapidly**

Voice growing rapidly - **400% increase** in Hindi Voice searches

---

*Ref: Google ‘Building for Voice’, VoiceBox – ‘Give your brand a Voice’*
We are a voice-first social-tech enterprise creating innovative bottom-up participatory tech platforms that empower underserved communities in low-resource & remote regions.
BRIEF ABOUT GRAM VAANI
MULTI-LAYERED APPROACH TO TECHNOLOGY- MEDIA - DEVELOPMENT

5 Countries Presence
3 Million Lives touched
150+ Partners
15.5 M Calls
100 K+ Unique users/month
2 K+ Impact stories

Member of Million Lives Club - for innovators & social entrepreneurs who are reaching new horizons of impact and improving the lives of those living on less than $3 a day.

Winner of World Bank #MissionBillion Challenge 2020
Winner under the category of ‘Building beneficiary awareness’ as part of the Ayushman Bharat- PMJAY Start-up grand challenge 2020.
Finalist for the Shamnad Basheer Citizenship - Agami Prize 2020
Knight News Challenge, 2008 for low-cost technology for community radio stations
NASSCOM Social Innovation Forum Challenge 2016 for our multi-layered development model through tech
Winner of USAID’s WomenConnect Challenge Round One in 2018

VAANI
VOICE-BASED PARTICIPATORY MEDIA PLATFORMS
ACCESSIBLE VIA IVR FROM BASIC FEATURE PHONES
OR THROUGH AN ANDROID APP AND WHATSAPP FOR THOSE WITH SMARTPHONES
TO EMPOWER UNDERSERVED COMMUNITIES IN DEVELOPING ‘MEDIA DARK’ REGIONS.
THROUGH LOCAL NEWS AND INFORMATION ABOUT RELEVANT SCHEMES AND SERVICES, TO STRENGTHEN GRASSROOTS DEMOCRACY

FOR FARMERS, WOMEN’S SELF HELF GROUPS, INFORMAL SECTOR WORKERS, INDUSTRIAL WORKERS, YOUTH, AND ADOLESCENT BOYS AND GIRLS
ACROSS 20+ STATES. OVER 20% LISTENERS ARE WOMEN, AND THEY REPORT HIGH EASE OF USING THE MOBILE VAANI PLATFORM, EVEN WHEN USING A SMARTPHONE OR WHEN THEY’RE USING A PHONE SHARED WITH A FAMILY MEMBER.
Users can engage with wide ranging content through IVR or a **Mobile App** or **WhatsApp**

Content is focused on Health & Health Tech, Women & Child Development, Governance, Workforce & Labor Rights, Livelihoods & Agriculture, Education & Youth Engagement.
Our community centric tech stack enables inclusive engagement

Interactive Voice Response
- vForum- Platform for people to listen & share content
- vSurvey- Tool to collect structured data
- vHelp- Mobile call center
- vCaseHandler- Query Management System
- vScheduler -Intelligent mechanism to schedule calls as per predefined rules

Smart Phone Mobile App
- Smartphone mobile application for access to all IVR content, sharing to non-smartphone users

Data Digitization Solutions
- Smart forms to aid field teams & first responders engaging with communities, helping easily digitize user data and enable intelligent onboarding
- Digitization & onboarding of user data helps with faster go to market, especially while penetrating new geographies & communities

Voice Tech Innovations
- Voice bot over IVR using automatic speech recognition and Dialog Flow integration for data collection and natural conversation with users using conditional flows.
- Voice-Based Quora over IVRS to answer user queries in real-time
- A large corpus of FAQs under multiple themes curated to answer user queries.
- State of the art ML models trained to match user queries with the appropriate answers using the curated FAQ database
**Powerful Voice Applications**

**Interactive Voice Response System (IVRS)** based on community needs
- vForum – Discussion forum where people listen and share content
- vSurvey – Tool to collect structured data over IVRS
- vHelp – Running a mobile Call Centre
- vCaseHandler – Query Management System
- vScheduler – Intelligent mechanism to schedule calls as per predefined rules

**Demo: Call one of the following numbers to try out the system**
- Krishi Vaani +91-9278704369 – Address the needs for the Farmer Community
- YuVa Junction +91-9582047666 – A Thematic Youth Centric Channel

A smartphone mobile application where users can access all IVR content, contribute and share content over WhatsApp and Facebook, and even forward to non-smartphone users

Mobile Vaani services also available through **WhatsApp** – Content search, Ask Questions, Share feedback & Grievances etc.

Hyperlocal, relevant & contextual info | Voice based | Simpler navigation | Foster community peer-to-peer learning
Automated Question Answering

User speaks a question
Converted to Text with STT

BERT Models
Answer Lookup Service

Q & A Database
Top 3 Answers Played

Ask if answers helped

Register Questions for Experts to Answer

No

Accuracy Levels
- Cleaning up junk audio – Blank audio 98%
- Success rate @ 3 –
  - Accuracy 77%
  - Topic classification 70%

Varied Domains
- Adolescents: Sexual and Reproductive Rights
- Students: Career Counselling and Exams
- Farmers: Information on Cash Crops
- Mothers: Child and Maternal Health
- Workers: Labour Rights

Voice-based Q&A: Using innovative voice technologies (AI/ML) to simplify information discovery
Distributed Moderation

Enable **local communities to moderate** and regulate the platform on their own, answer questions that could not be satisfactorily answered automatically.

Bring **decentralized control** and **community ownership** of the platform and the content.

Moderation using an App or Web Interface that **simplifies tracking, monitoring, and archiving** of the content.

Moderators can **add specific details, classifiers, comments, and link content** with relevant images and videos.

Facilitates **tagging, rating, and proper categorization** of content. Also helps in publishing the best items on social media.
Mobile Application and Chat Bot

Alternate mode of accessing content for advanced users who have migrated to Smartphones

Content Feed organized based on User Interests
• Users can edit Interests by selecting and deselecting topics from Filter view

In-App Guide to help users walk through the app and develop a better understanding of the features.

Chat Bot Assistant provides a step-by-step guide to complete common tasks like Adding a New Post.
Voice Bot for Data Collection

- 89% of Users prefer Voice over Keypress
- Better Accuracy than DialogFlow even with custom vocabularies
- Use POS (Part of Speech) based Extraction, Custom Rules, and Data from sources like Census

<table>
<thead>
<tr>
<th>Entity</th>
<th>Dialogflow</th>
<th>GramVaani</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>78.28%</td>
<td>95.95%</td>
</tr>
<tr>
<td>Month</td>
<td>77.77%</td>
<td>87.87%</td>
</tr>
<tr>
<td>Year</td>
<td>72.22%</td>
<td>92.42%</td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State</td>
<td>51.81%</td>
<td>87.78%</td>
</tr>
<tr>
<td>District</td>
<td>51.15%</td>
<td>75.57%</td>
</tr>
<tr>
<td>Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, Member Count, ...</td>
<td>90.37%</td>
<td>95.72%</td>
</tr>
</tbody>
</table>
Build Highly Customizable and Complex Voice Applications

Training and Assessment Engines with 300+ questions, 20 modules

Plug Surveys and Quizzes into discussions

Community Feedback e.g. IVR based monitoring to crowdsource data on quality of health services
Optical Character Recognition

94% numerical string level accuracy; More than 99%-digit level accuracy

- **Deep learning approach used**: Attention Recurrent Neural Network (RNN) model
- **Intelligent transformation** of images including eliminating background noise
- The robustness is obtained by a state-of-the-art Computer Vision pipeline owing to the Scale Invariant Feature Transform (SIFT) algorithm.
- Extracting relevant Regions of Interest (ROIs) from card for further processing
- Extract features using CNN (Convolutional Neural Networks) and arrange in grid (Encode using RNN)
- Decoder is trained on top of a known vocabulary which predicts the most likely result
- Use **OCR for User Registration** e.g. Phone numbers of SHG members & Additional metadata through **Optical Mark Recognition (OMR)** – e.g.: Name, Village, Panchayat etc.
Data Analytics

Visualization of data for easy interpretation and insights

Near real-time ETL updates

Call Engagement Metrics
• Hourly call volume, Average call duration on per day / week basis

Project Outreach Metrics
• Unique listeners by month

Integration with data entered through other channels like ODK
• MIS of project activities, user details
SaaS Infrastructure

Scalable Infrastructure with current capacity of
• 900 SIP Channels
• 10,000 Calls per day

Physical Service Layer to reduce latency and optimized performance

Data synced to the Cloud for all Customer facing features and faster access to Content
Use Cases

Use Cases addressed by Open-Source Strategy powering the MV Stack
Use Case: vSurvey for Monitoring and Evaluation

Example: Surveys for Parents and Students

**Partners**: RangDe, IFMR, Dasra, SunEdison and also other research organizations

Welcome Message

**Question 1**: Teacher Attendance

**Question 2**: School Facilities

**Question 3A**: Protection from Rain

**Question 3B**: Toilet Facilities

**Question 4**: Quality of Education

**Settings**

How frequently does the teacher take classes?

1: Regularly
2: Not Regularly
3: Never

From Feb 1 until Feb 15
On Saturday or Sunday
Between 6 and 8 PM

Retry 3 times
2 day between retries

*Examples of partners whose programs have used these applications. This is not an exhaustive list
Use Case: vScheduler for Scheduled Reminders

Example: Reminding Users about TB DOTS
- Upload Contact numbers and Date of first DOTS
- Define time gap for reminder calls
- System automatically makes reminder calls based on defined schedule.

Partners*: DHIS, JHPIEGO, Save the Children, Arogya World
(e.g., Organizations in the health, financial services domain sending periodic reminders & messages to the target communities)

<table>
<thead>
<tr>
<th>User</th>
<th>Phone Number</th>
<th>Treatment Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9899910042</td>
<td>Jan 1</td>
</tr>
<tr>
<td>2</td>
<td>9810261616</td>
<td>Feb 5</td>
</tr>
<tr>
<td>3</td>
<td>7840023400</td>
<td>Mar 7</td>
</tr>
</tbody>
</table>

*Examples of partners whose programs have used these applications. This is not an exhaustive list
Use Case: vManch for Community Building and Communication

- Simple Record and Send Message Interaction
  - Role of Sender defines Audience for Message
  - Messages pushed to Mapped numbers

Partners*: JEEViKA (BRLPS, Gov of Bihar), CCD (Center for Collective Development), Sa-dhan (SRO)

(e.g., FPO’s, SRO’s & Organizations promoting community Health/Agriculture/Financial Inclusion through community responder teams)

*Examples of partners whose programs have used these applications. This is not an exhaustive list
Use Case: vHelpline for Query Resolution by Experts

Example: Helpline to connect caller with Experts

- Assign Experts to Topics / Tag. Redirect calls to them accordingly
- Experts define availability based on a Calendar
- Experts can call back Users with answers or to ask more details

Partners*: COVID-Telemedicine/Vaccine Helplines, Sato (Rural Sanitation), Labor helpline (WPC)

(e.g., Organizations looking to generate leads, registrations & offer Customer Service support)

*Examples of partners whose programs have used these applications. This is not an exhaustive list
Use Case: vConsent for Automated Gathering Consent

Example: Securing recorded consent for a large number of people

- Play Explanation Message
- Ask for Consent and then record response (Keypress or Audio)
- Save and lookup individual consent
- Reports of Response Rate / Consent Rate

**Partners**: JEEViKA (BRLPS, Gov of Bihar), University of Virginia

(e.g., FPOs to buy or sell produce / commodities, Research agencies, Gov - Citizen ID platforms etc.)
Technology Outline

Scalable and API driven Architecture
Users access the platform by placing a missed call.

Outbound calls can be pushed to the users with relevant info.

Pre-recorded audio content is hosted on IVRS/APP.

Listen only app
Outbound Campaign (OBD) APIs

Schedule

/api/v1/projects/{projectID}/schedules
Create / Modify Call Schedules

/api/v1/.../schedules/{scheduleID}/recipients
Create / Modify Call Schedules

/api/v1/.../schedules/{scheduleID}/apps
Add / Remove App to be triggered

/api/v1/.../schedules/{scheduleID}/stats
List Stats for the Call Schedule

Users

Apps

Pre-recorded audio content is hosted on IVRS/APP

Outbound calls can be pushed to the users with relevant info

Users access the platform by placing a missed call

Listen only app
Discussion Forum Application

Users access the platform by placing a missed call.

Users record their experiences, grievances.

A team moderates the platform.

User voices relevant for the wider community, are published back on the platform.

Discussion forum app

Audio Items:

/api/v1/.../apps/forum/{appID}/items
List / Create / Update Items

List / Modify Jumps / Speed

Create / Configure Channels

Add / Remove Channel Items

List Stats for Channel / Items

Gram Vaani | 2022
Data Collection Survey Configuration

<table>
<thead>
<tr>
<th>Forms / Surveys</th>
<th>/api/v1/.../apps/forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>List / Create / Modify Forms</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Questions</th>
<th>/api/v1/.../apps/forms/{appID}/fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>List / Create / Modify Forms Fields</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Branching Logic</th>
<th>/api/v1/.../apps/forms/{appID}/branches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create / Update Conditional Logic</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>/api/v1/.../apps/forms/{appID}/config</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modify Form Config</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>/api/v1/.../apps/forms/{appID}/stats</th>
</tr>
</thead>
<tbody>
<tr>
<td>List Stats for Forms / Questions</td>
<td></td>
</tr>
</tbody>
</table>

Users participate in various dynamic surveys. Users access the platform by placing a missed call. All the user responses are collated. Data is presented through a live dashboard to draw community level inferences.
**Case Management Application**

- Users access the platform by placing a missed call.
- User shares their grievances.
- Each case gets assigned to a case handler.
- Repository of complaints is maintained & can be analyzed for research and policy advocacy.
- Handlers provide updates to users as the grievance transitions through various stages.
- Live dashboard helps track the status of each assigned case.
- Case handling app.

**Case**

- **/api/v1/.../apps/casemgr/{appID}/cases**
  - List / Create / Modify Cases

**Handlers**

- **/api/v1/.../apps/casemgr/{appID}/configs**
  - Modify Case Manager Config

- **/api/v1/.../apps/casemgr/{appID}/users**
  - Add / Remove Case Handlers

- **/api/v1/.../apps/casemgr/{appID}/stats**
  - List of Case Stats
What Next?

Modular and Pluggable Architecture

An Open System to support Interoperability across the Ecosystem
Layers, Modules, and Apps

Apps
- Campaign Management App
- Case Management App

Modules
- Form / Survey Module
- Chat Bot Module
- Content Delivery Module
- Q & A Module
- User Registration Module

Channels
- Voice Service
- WhatsApp Service
- Mobile App

Analytics and Reporting
Content Moderation Tools
Planned improvements: Modular and Pluggable Architecture

- System broken down into smaller modules and layers
- External Applications can plug-in with any layer
- Expose same functionality via multiple channels (Voice, App, WhatsApp)
Self Service UI

- User Interface to manage Applications and Projects
- Built on top of APIs to enable Self Service by Program Teams
- Introduce the Concepts of Campaigns
- Precursor to a completely Open System – Pluggable and Modular

![Awareness Campaign Diagram]

- vSurvey
- mNews
- mNews
- mNews
- vSurvey
Composable Campaigns

- Allow User to design and manage Projects, Campaigns, and Phases
- Combine multiple Modules to create a Campaign or Program
- Define relationships and schedules across Modules and Campaigns

Awareness Campaign

- User List
- Registration Form → Registered
- Week 1 Content → Week 1 Completed
- Week 2 Content → Week 2 Completed
- Week 3 Content
- Survey → Registered

Content Delivery Schedule
Configurable Modules

- Configure each module to define the data that it captures, constraints, validators, and sub-fields.

<table>
<thead>
<tr>
<th>Registration Form</th>
<th>Name</th>
<th>Age</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Data Type : <strong>Text</strong></td>
<td>Data Type : <strong>Number</strong></td>
<td>Data Type : <strong>Location</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Validators : <strong>Range (14, 18) YRS</strong></td>
<td>Constants : <strong>Country = INDIA</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Errors: <strong>LESS_THAN_MIN</strong></td>
<td>City</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>MORE_THAN_MAX</strong></td>
<td>Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>INVALID_VALUE</strong></td>
<td>District</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>State</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Country</td>
</tr>
</tbody>
</table>
Module Configuration for Channels

- Tools to configure Modules based on how they are exposed on Various Channels
  - Voice, WhatsApp, ODK (Open data kit)

### Registration Form
- Name
- Age
- Location

### Voice Form Config
- Name Voice Node
- Age Voice Node
- Location Voice Node

### Voice Node Config
#### Voice Prompts
- REQUEST_FOR_INPUT
- NO_INPUT_PROVIDED

#### Audio Mapping
- LESS_THAN_MIN : STT (Must be older than 14 years of age)
- MORE_THAN_5 : STT (Must be younger than 18 years of age)

#### DTMF Input
- Num Digits : 1
- Wait Duration : 5 sec
- Retry Attempts : 2
Analytics and Reporting

- Capture Analytics Across Channels
  - Registration Rate
  - Response Rate by Phase and Channel
  - Completion Rate – Total and By Channel

- Support for A/B Test of Campaigns & Concurrent monitoring toolkit

- Extract Reports
  - List of Registered Users
  - Content Consumption Stats
  - Number of UGC (User generated content) Creators

- Application Specific Stats
  - Grievances Raised and Resolution Rate
  - Grievances Distribution by Type
  - Questions Asked, Answer Count, Repeat Rate
  - Top X Questions by Frequency

Call stats – Graphical rep

Acquired Vs Active Users

Grievances Raised and Resolution Rate

Questions Asked, Answer Count, Repeat Rate

Top X Questions by Frequency

Gram Vaani | 2022
GRAM VAANI
TECH INNOVATIONS POWERING COMMUNITY-LED DEVELOPMENT FOR THE NEXT BILLION
Appropriate | Ethical | Agile
Tech innovations powering community-led development for the next billion

Appropriate | Ethical | Agile

www.gramvaani.org

contact@gramvaani.org

@GramVaani