ammachi labs

Amrita Multi Modal Applications and Computer Human Interaction
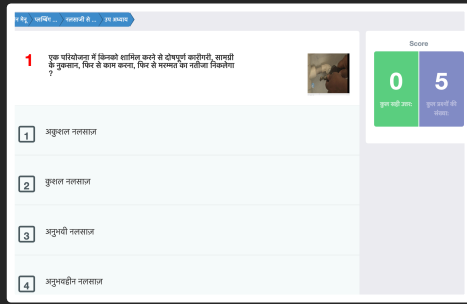
Chancellor and Humanitarian Leader, Amma
Mandates research for Societal Impact

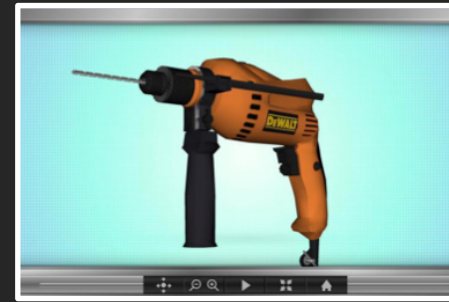VIDEO LECTURES

ASSESSMENTS

INTERACTIVE GAMES

3D GLOSSARY

SIMULATORS

PROGRESSIVE DISCLOSURE

OUR CVET METHODOLOGY

VOCATIONAL TRAINING

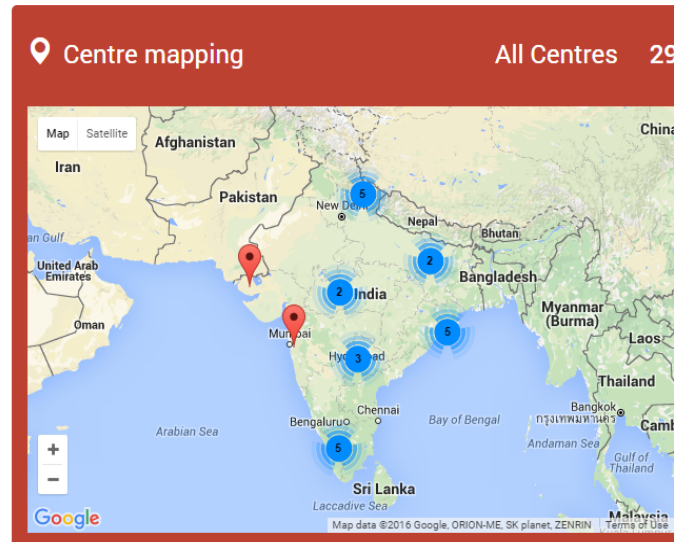LIFE SKILLS TRAINING

MOTOR SKILLS TRAINING

- Technical and non-technical courses
- Available in 8 languages
- Catered towards low-literacy audiences

ammachi labs

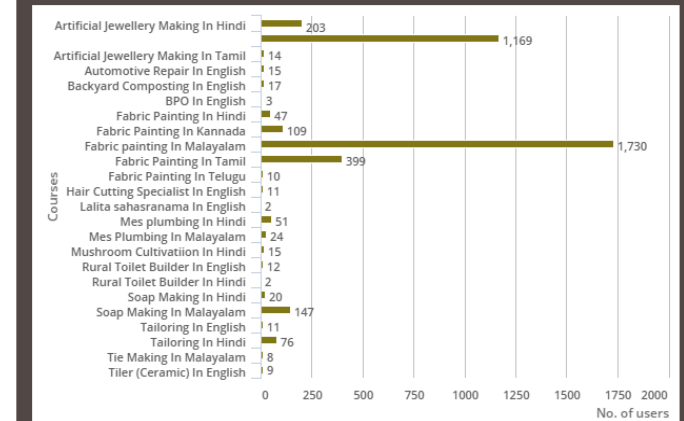TRANING CENTER MANAGEMENT VIA MYSANGHAM

ZONAL LEAD TO FACILITATOR COMMUNICATION VIA WHATSAPP

REMOTE MONITORING VIA AVIEW

COMMUNICATING ACHIEVEMENTS VIA FACEBOOK

MONITORING & EVALUATION

Current

➢ Skill Metrics Analysis

➢ Skill Assessment & analysis reports

➢ Data mining

➢ Tracking skill improvement

➢ Performance Prediction

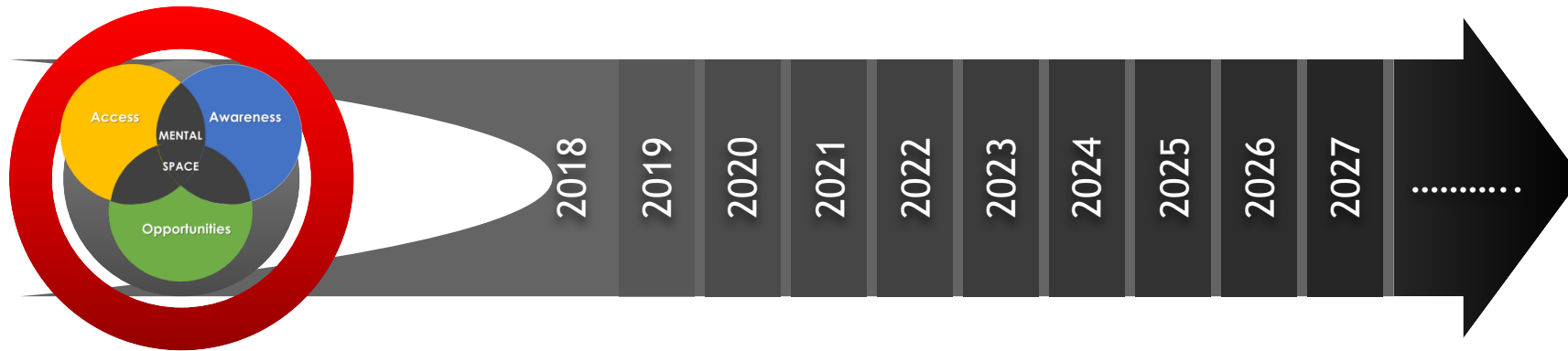➢ Performance Modelling

➢ Customized feedback
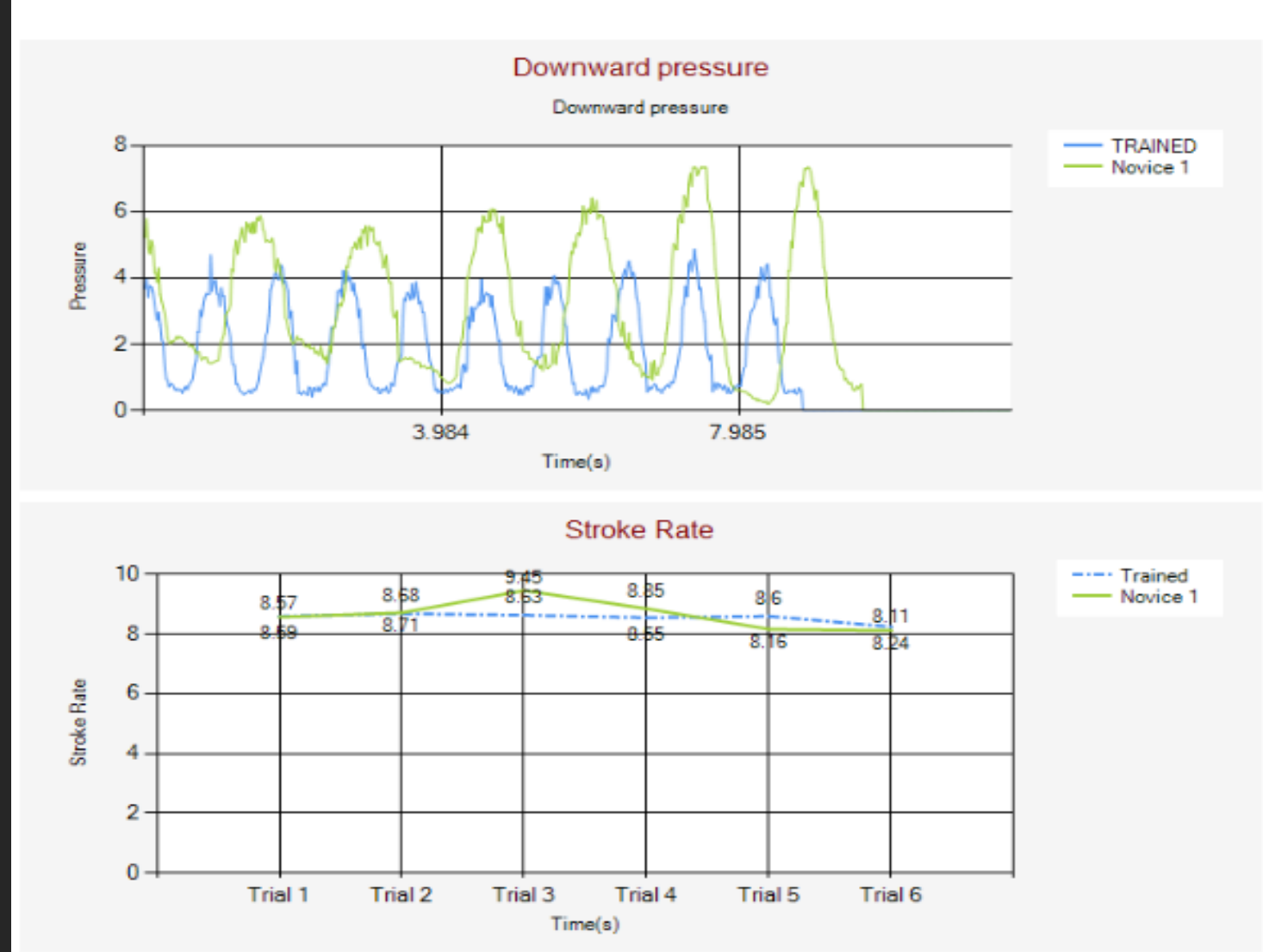
Accurate comparison of Expert and Novice performance

WE is a process
that is
continuously
changing …
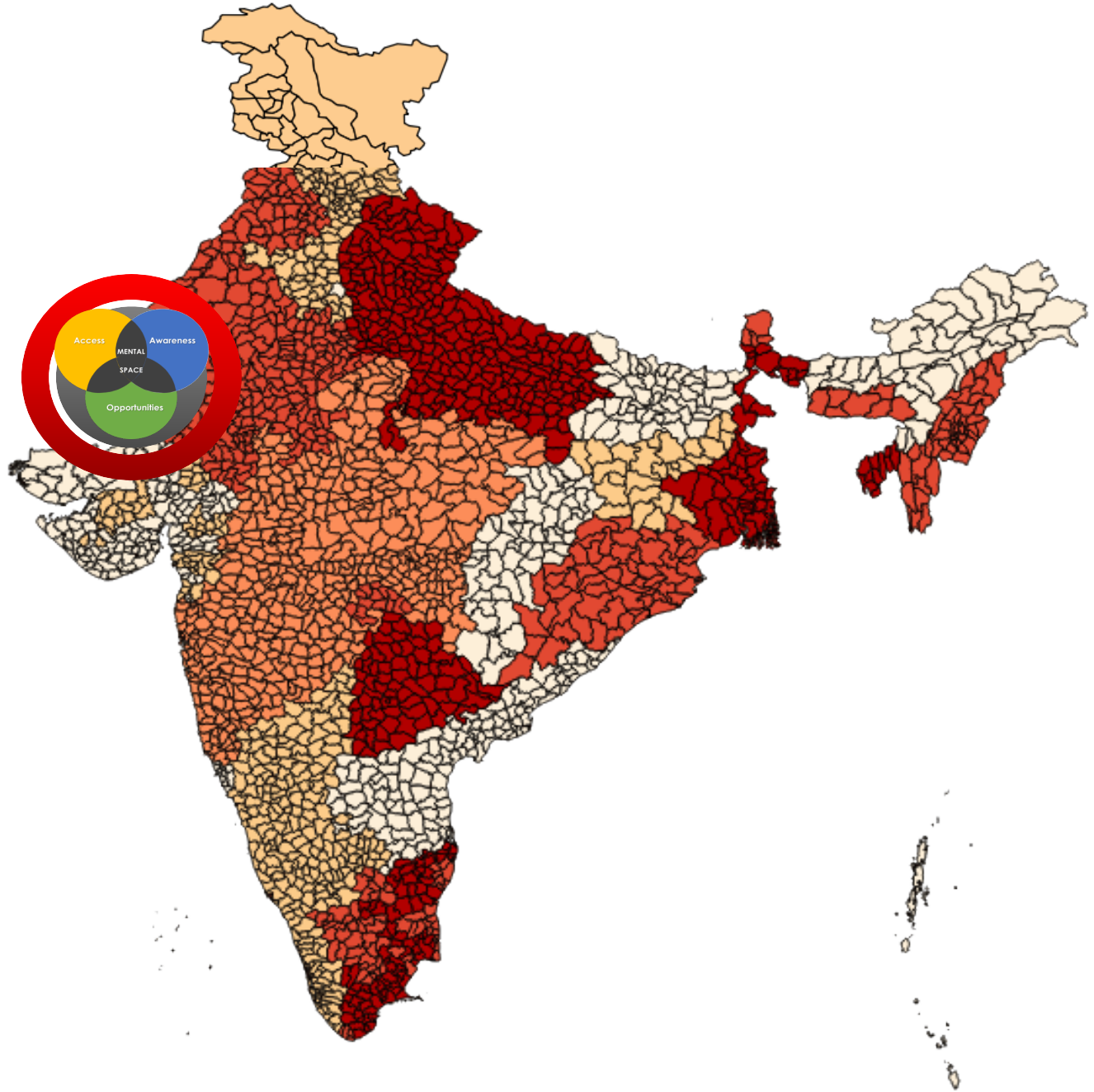
.… over geography

WE is a process that is continuously changing ...
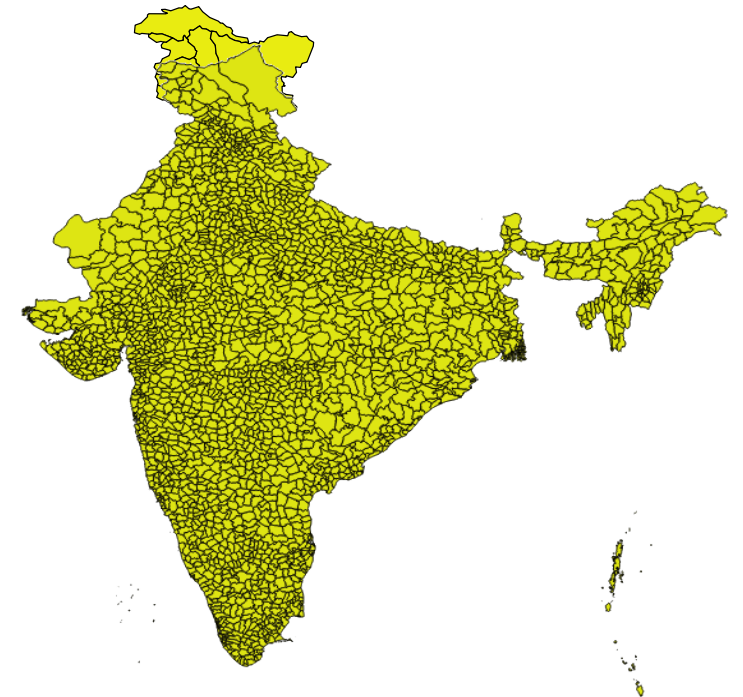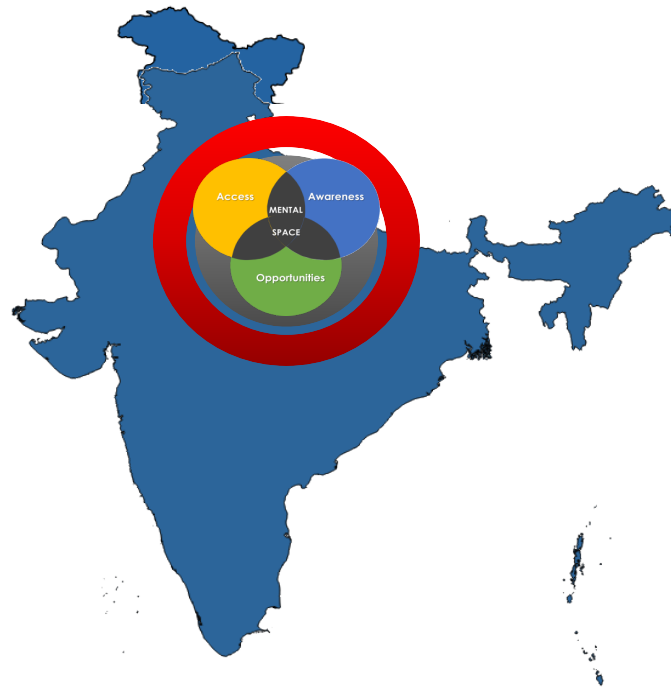
.... and between contexts
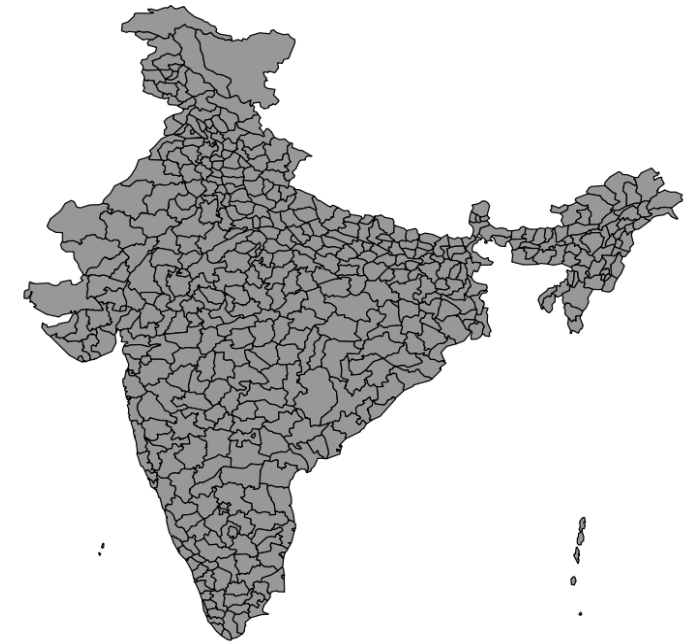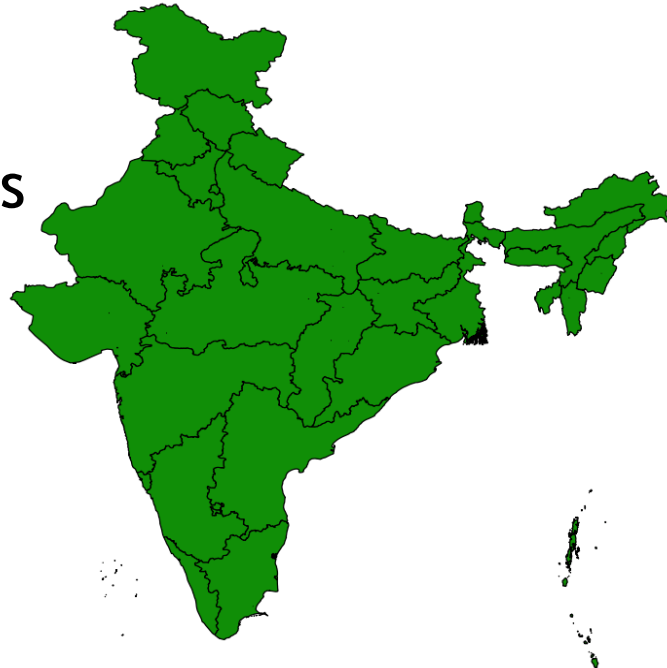
Women's Empowerment

The process of increasing women's choices & capacity to make discerning decisions towards sustainability & resilience

The range of elements (including the right or privilege) impacting ability to obtain or make use of opportunities related to women empowerment.

ACCESS

MENTAL SPACE
Range of beliefs, norms, or values held by individuals or groups or entire society, which affect attitude and behavior towards elements or processes influencing women empowerment

The range of resources or assets (material, financial, human, social, political, etc.) that are available to empower individuals, groups, or communities.

OPPORTUNITIES   AWARENESS

elements that reflect the consciousness, knowledge and understanding of factors, constrains, and processes surrounding women empowerment.

Domains of WE

Contexts of Women Empowerment

The scale or level at which women empowerment is observed or measured.

WOMEN - DIMENSIONS

Economic Vitality

Social, Political, Cultural

Environmental Quality

Safety & Security

Education & Skills

Health

06

01

05

02

04

03
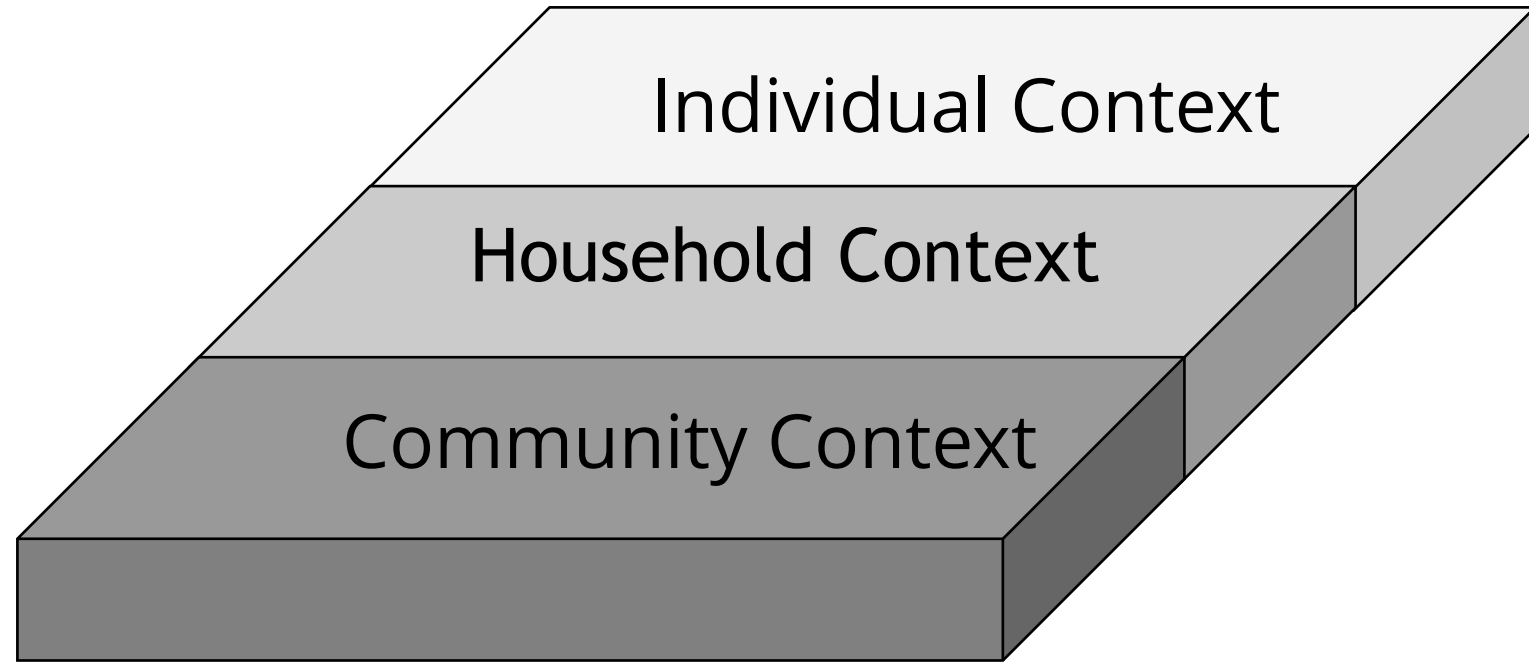
Hurdles to Overcome?
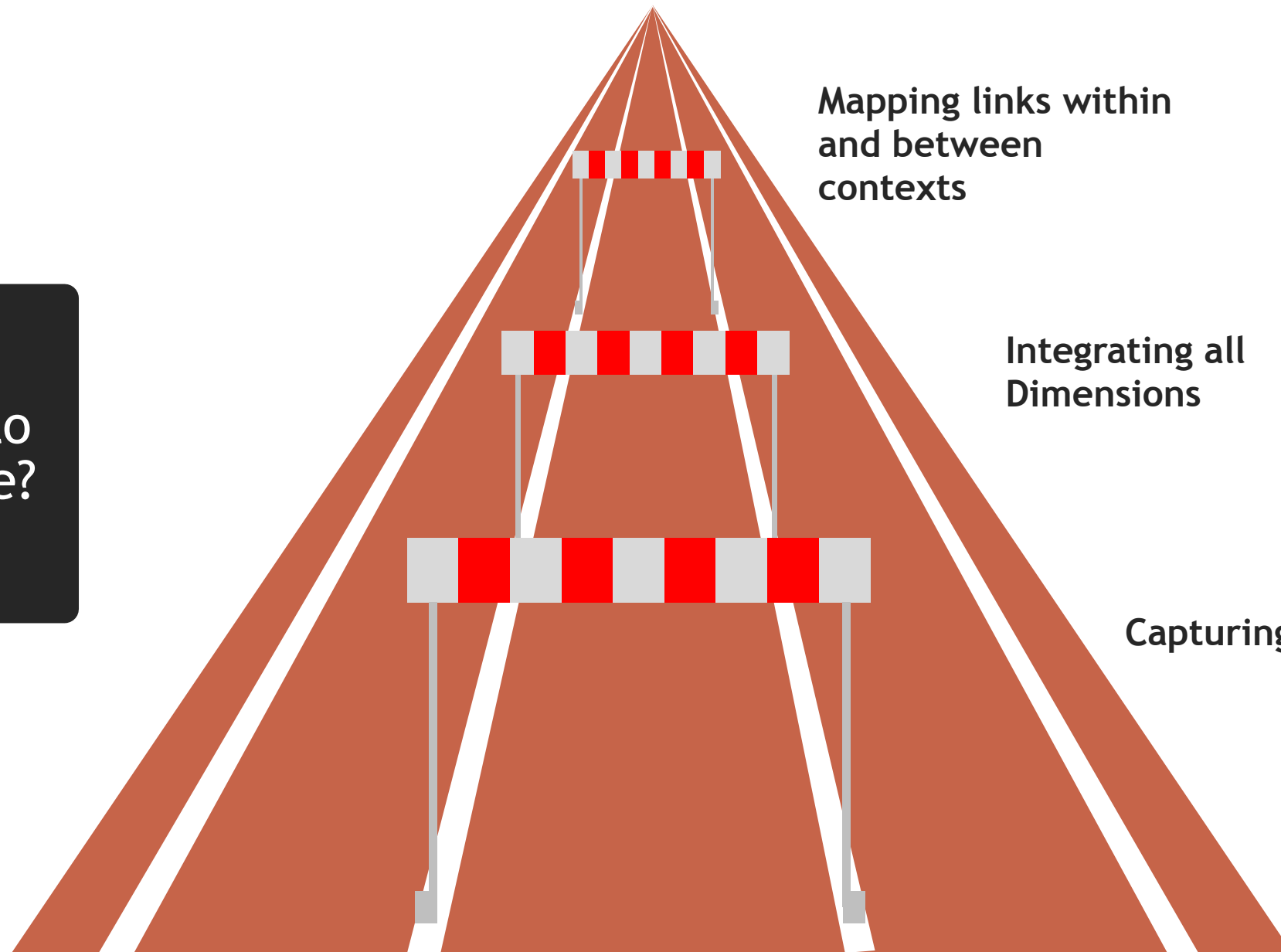
Mapping links within and between contexts

Integrating all Dimensions

Capturing all Domains

Introducing AWESOME!!
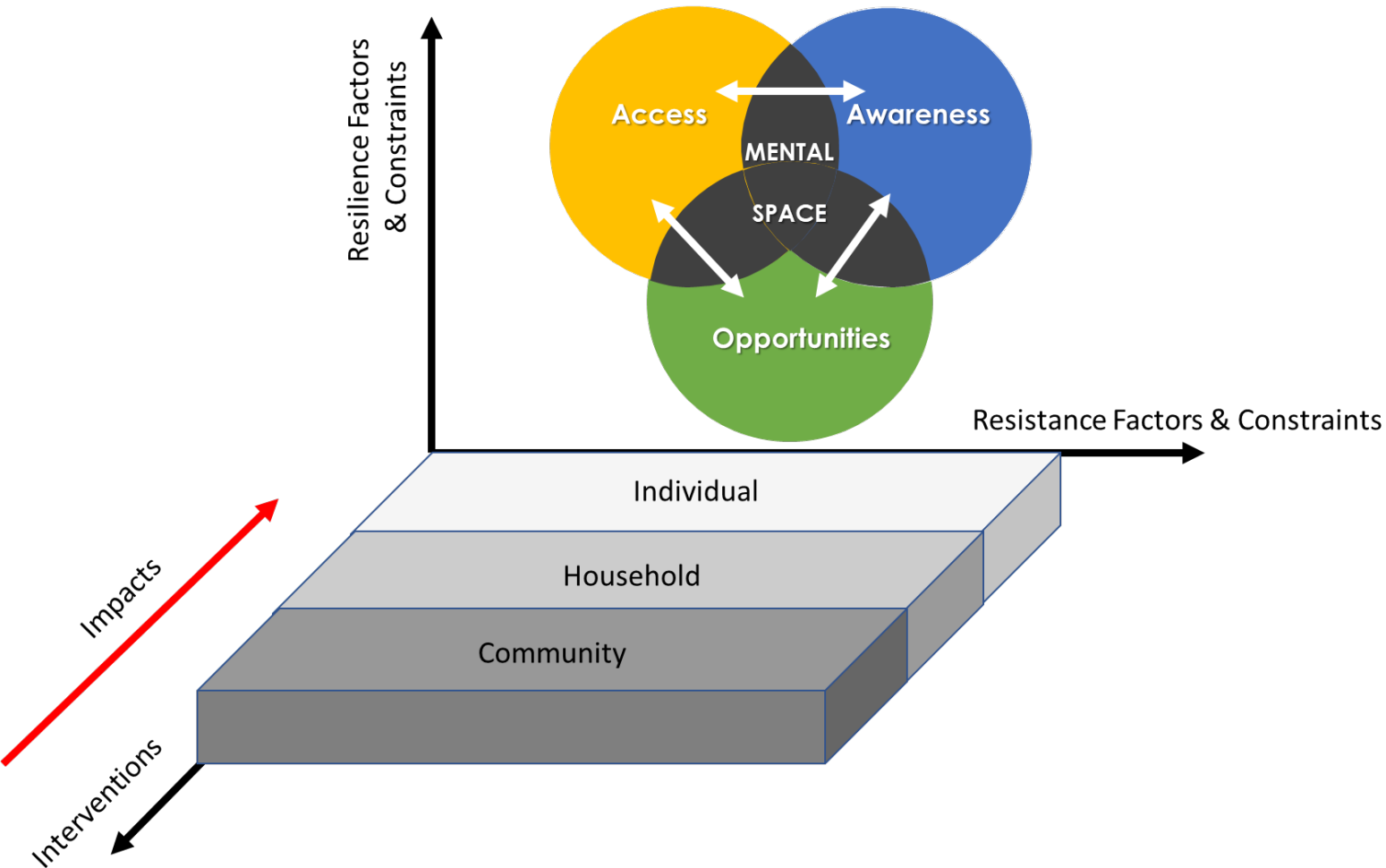
Resistance: elements or processes increasing or preventing women's ability to maintain psychological, financial, social, health and welfare balance and to make discerned decisions **when faced with external shocks or stressors.**

Resilience: elements or processes increasing women's speed of recovery from stresses or hard circumstances.

Intervention: Element, event, process, and/or action resulting in the change within empowerment domains and their interrelations.

Impact/Feedback: A change occurring within and between empowerment domains because of an intervention leading to either increase or decrease on the overall status of women empowerment at a given context(s).

Introducing AWESOME!!
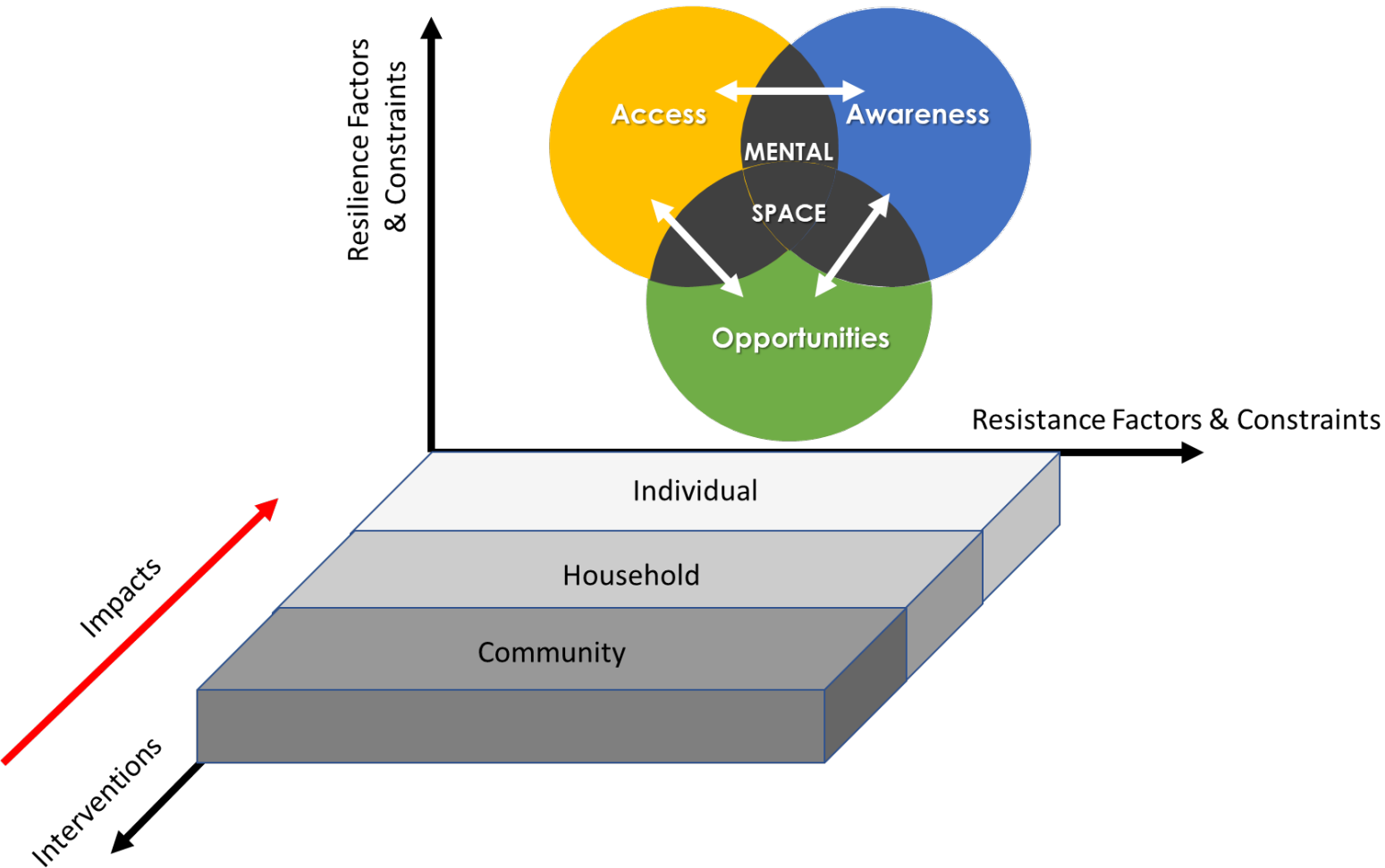
Women Vulnerability: A state of women empowerment at <u>a given point of time</u>, determined as the net product of interactions between **factors**, **constrains**, **interventions**, and **impact feedback** shaping the ability of women's choice and decision-making capacity at the **individual, household and community levels**

AWESOME Goals

CLARITY	REQUIREMENTS	Individual Context / Household Context / Community Context	quantifiable	INTERVENTION
Provide clear definitions and semantics for WVM and WE related concepts	Define women vulnerability mapping requirements at various contexts, dimensions, and domains	Effectively delineate context relations and interdependence	Ability to measure and monitory progress overtime in quantifiable terms	Set a solid foundation to propose interventions and model their impacts in advance over time, context, and geography
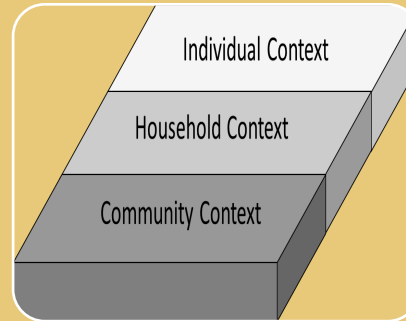
Guiding Theories

Challenge

Systems Theory

Change

Decision Making Science

AWESOME

Theory of Change

Chance

Complex System Thinking

- A functioning whole is more than the sum of its part.

- Hierarchical systems evolve from the bottom up. The purpose of the upper layers of the hierarchy is to serve the lower layers.

- The behavior of a system (e.g., increase or decrease of WE) is determined by the collective state of its subsystems and by how they interrelate.

- Systems behavior is fueled by flow of information and feedback loops among its subsystems. An imbalance in such flow affects the stability of the system leading to either growth or decline.

- Complex systems are intrinsically hazardous, containing a changing mixtures of failures hidden within them.

Theory of Change

- Provides a systemic process to design and achieve desired changes through a "causal pathway" that maps the desired changes backwards to the preconditions (activities, context and outcomes) that need to exist to result in the changes

- Helps achieve a shift from ad hoc reactions to farther-reaching and longer-term solutions

- Changes at various levels:
  - Individual, Collective
  - Top-down, bottom-up

Participatory Decision Making

- A proactive approach to identify chronic and acute threats and challenges, then deal with them
  - Economic
  - Governance/ Institutional
  - Societal
  - Environmental

- Enforces resilience by increasing the "immunity" of societies either by eliminating risk threats or reducing vulnerability to them.

Some services using AI

- Lens to look at the community as a whole
  - A relative assessment of women's empowerment across communities
  - What are the indicators of women's empowerment?
  - Indicators and their scores revealing the strengths and weaknesses of a community

- Gain insights on women's problems and its roots in a holistic way
  - What are the factors that empowers women?
  - What constraints the empowerment of women?
  - How does women network (interactions) within their community?

- Focused lens on the individual vulnerabilities
  - How far women is vulnerable to their health issues?
  - Does involvement in community activities make them feel more empowered?
  - Which are the leverage points to bring in a behavioral change towards sanitation?
  - What triggered the improvement in girls education?

- Intelligent tools for data collection, integration and knowledge dissemination

Whom can be benefited?

1. NGOs
2. Policy Makers
3. Social Workers
4. Government bodies
5. Local administration bodies
6. Researchers
7. Women in a community

Some Applied domains of AI in WE

Technical Domain	A scenario from the domain of WE
Spatio - Temporal Analysis	Analyse empowerment across geography and time
Exploratory Experiment Design and Analysis	Determine different factors of empowerment and their interplay
Natural Language Processing	Knowledge extraction from textual data like documents, messages, feedbacks etc.
Fuzzy models	To assess and measure relative concepts like 'empowerment'
Analytical Social Networks	Women in the community as a network where their interactions forms the links
Simulation Modeling and Decision Support	To assess and measure the impact of the implementation of an intervention

Case Study - I

To Derive dominant factors and constraints for the current state of women empowerment

Location: Nellarachal, Wayanad, Kerala
Fieldwork: 94 houses, 10 Colonies

Implementation Phases

Collect Primary Data

Statistical Validation of Loops

Revised AS-IS Systems Maps

Consolidate into One Map System

Drive Hot & Cold Spots of WE
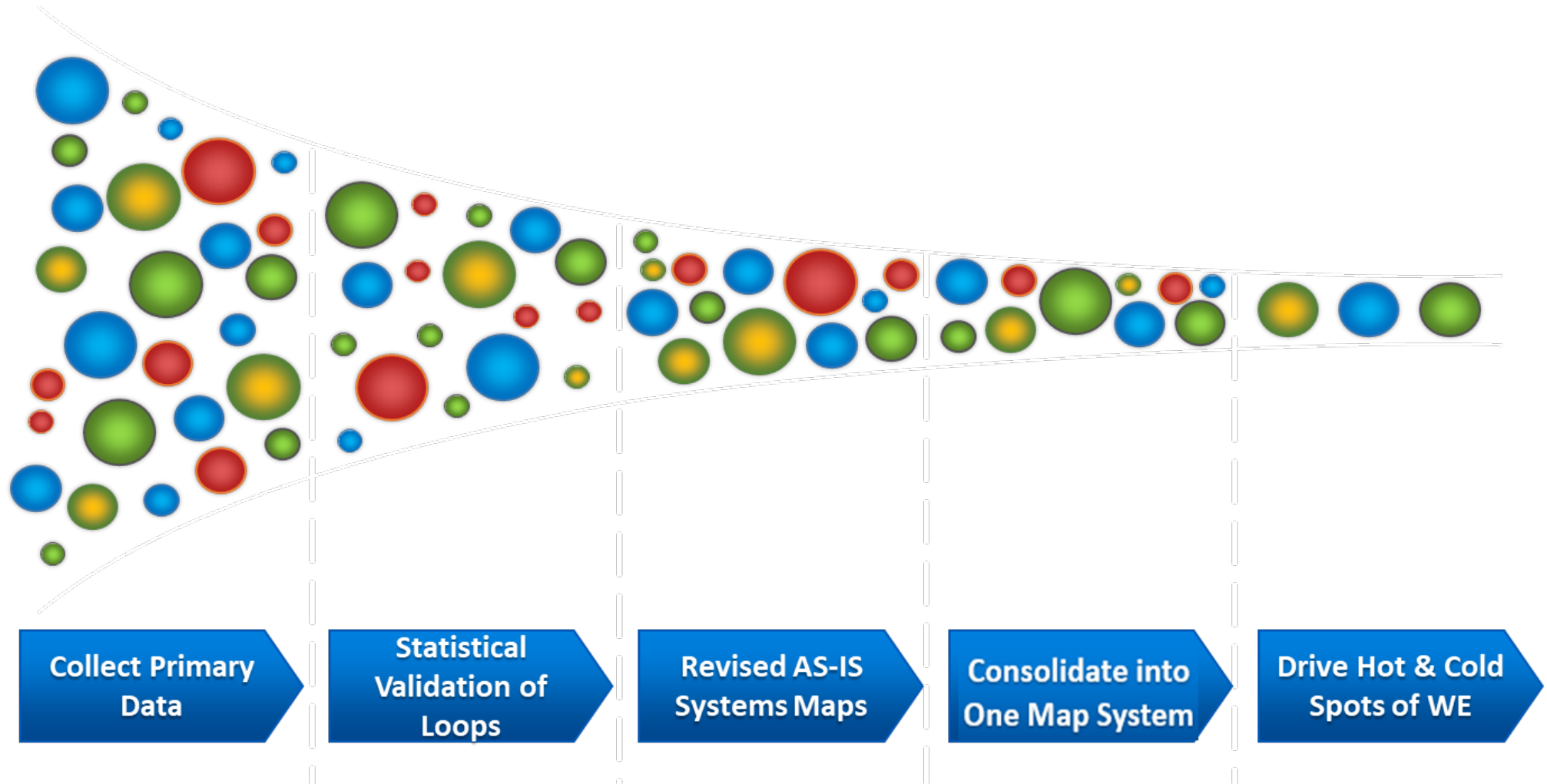
The Individual Context: Initial AS-IS map for Education
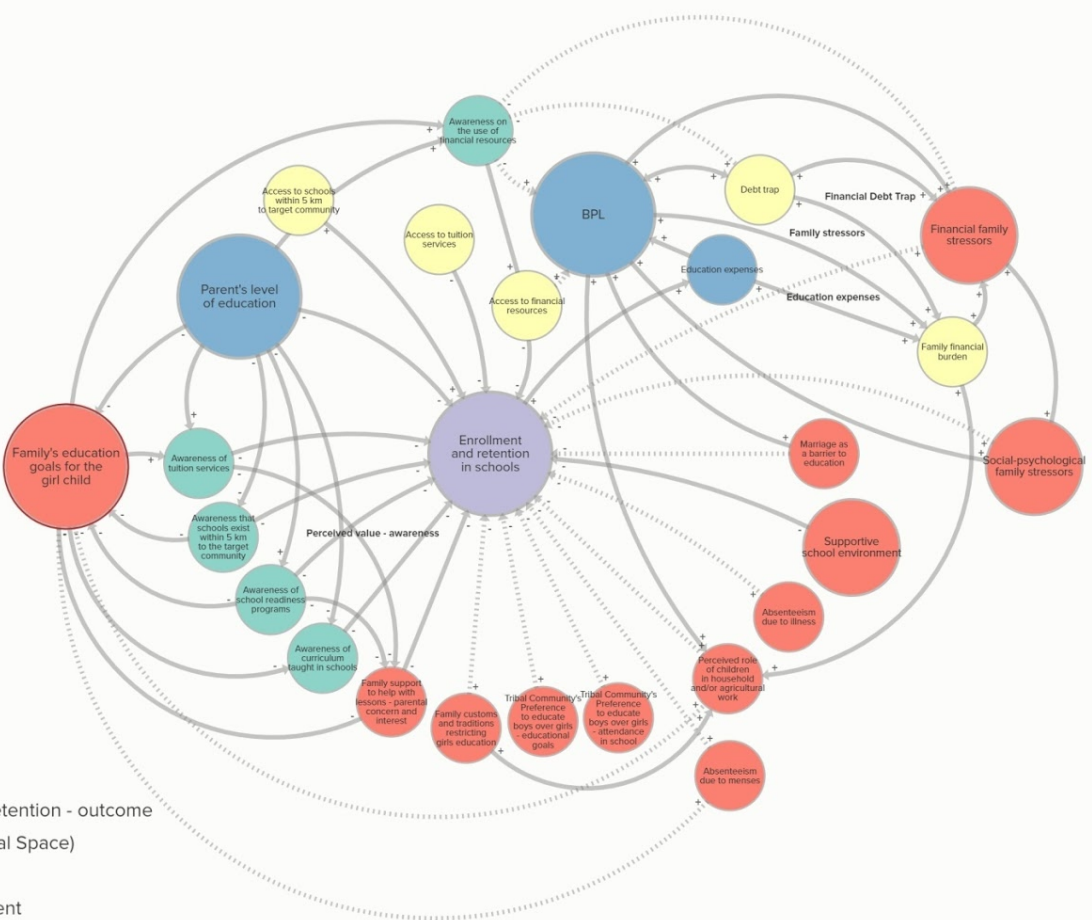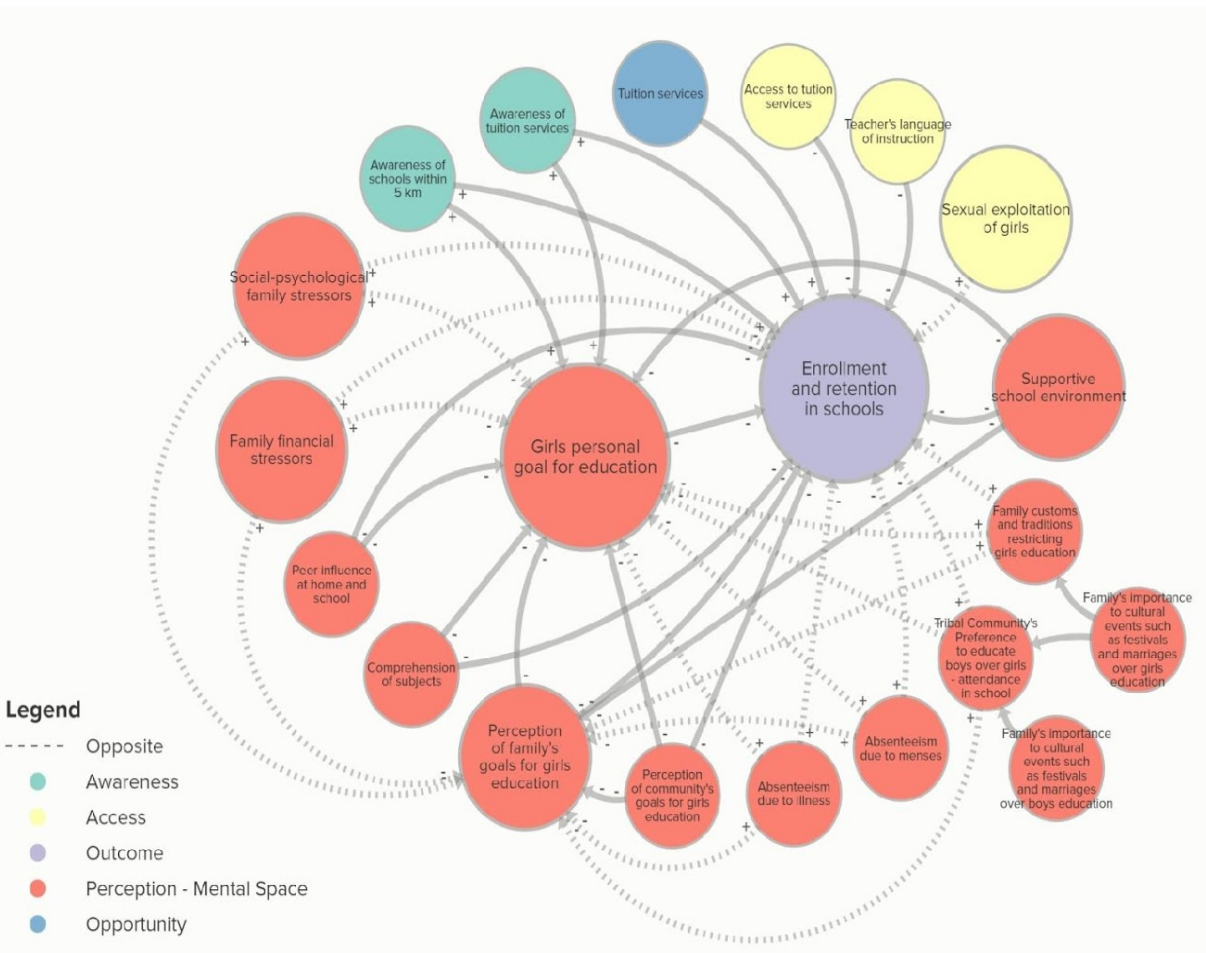
The Family Context: Initial AS-IS map for Education

Legend
- Opposite
- Awareness
- Access
- Enrollment and retention - outcome
- Perception (Mental Space)
- Opportunity
- School environment

Legend
- Opposite
- Awareness
- Access
- Outcome
- Perception - Mental Space
- Opportunity

Initial AS-IS System Maps for other WE dimensions

Economic Vitality

Education

E-Governance

Organic Farming

Final integrated AS-IS systems map
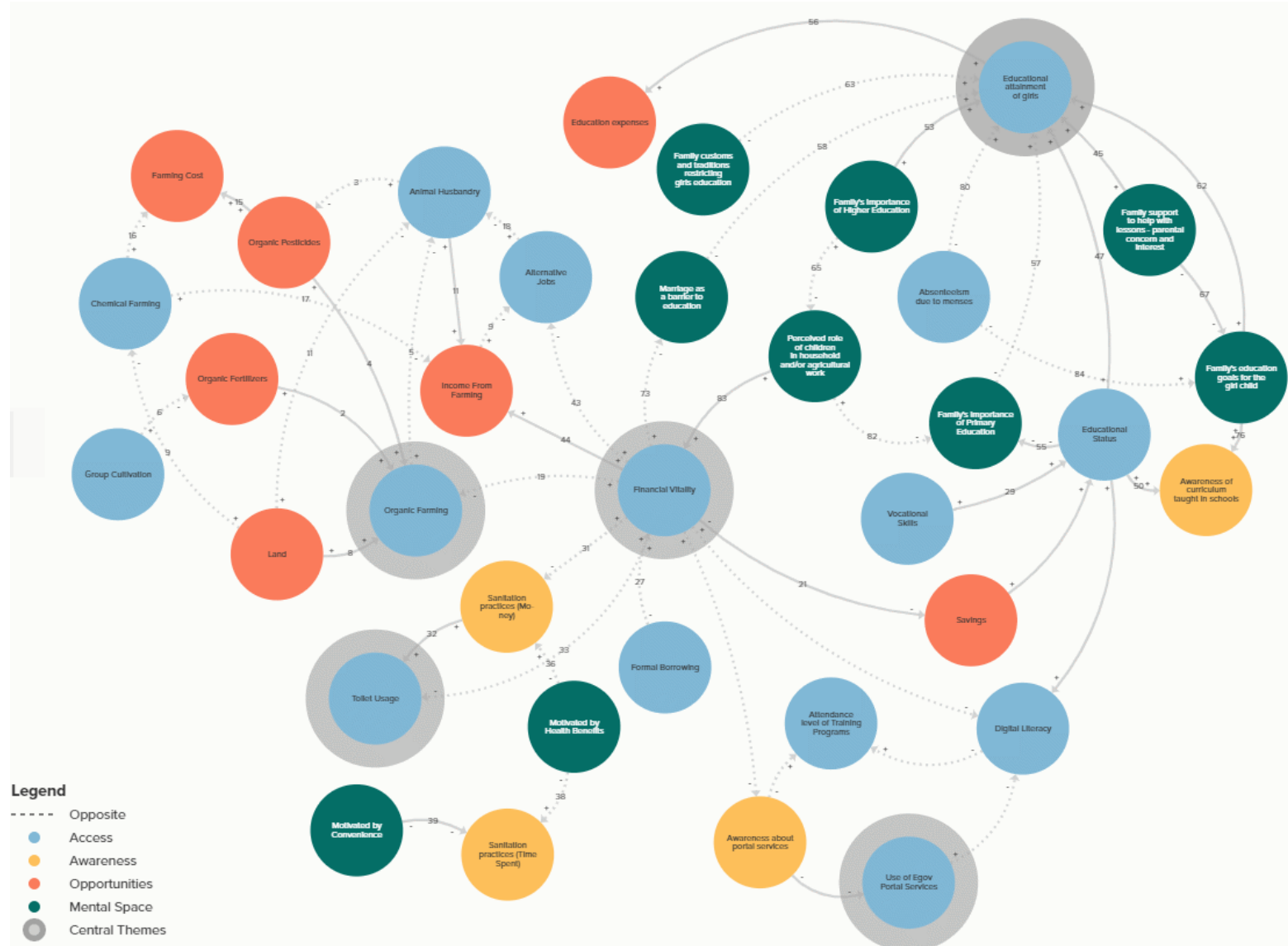
Delineate Hot & Cold Spots of Women Empowerment

Hot Spot: Represents elements (individual, household and/or community) that rank lowest in one or more WE dimensions **RELATIVE** to the given context (i.e., a specific village) (that is, the one that should be prioritized for empowerment in a given dimension)

Cold-Spot: Represents elements (individual, household and/or community) that rank highest in one or more WE dimensions **RELATIVE** to the given context (i.e., a specific village)

Delineate Hot & Cold Spots of Women Empowerment

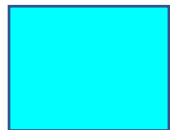**Hot Spot**: Represents elements (individual, household and/or community) that rank lowest in one or more WE dimensions **RELATIVE** to the given context (i.e., a specific village) (that is, the one that should be prioritized for empowerment in a given dimension)

Cold-Spot: Represents elements (individual, household and/or community) that rank highest in one or more WE dimensions **RELATIVE** to the given context (i.e., a specific village)

Process Steps Ahead

Apply machine learning to hotspots and coldspots to delineate underlaying factors contributing to differential WE over space

↓

Apply machine learning to determine patterns of and factors contributing to WE state transition overtime

↓

Use derived rules to simulate the impacts of interventions and possible leverage points of Women Empowerment

↓

Identify the best intervention specific to the context of Nellarachal ward

■ Economy Hotspot (Lowest Finical Vitality)

■ Economy Cold-spot (Highest Finical Vitality)

100 0 100 200 300 400 m

Process steps ahead

Apply machine learning to hotspots and coldspots to delineate underlaying factors contributing to differential WE over space
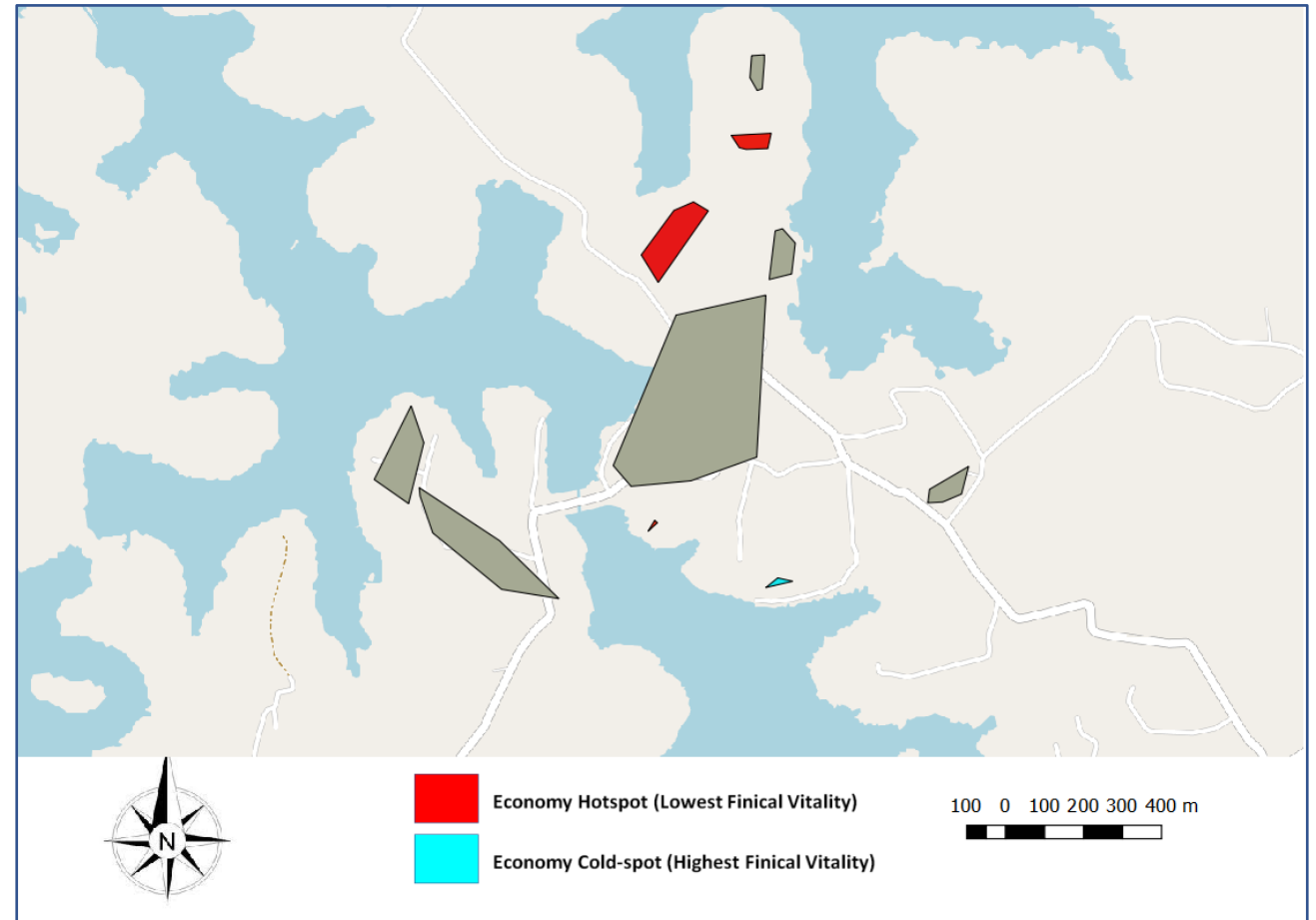
↓

Apply machine learning to determine patterns of and factors contributing to WE state transition overtime

↓

Use derived rules to simulate the impacts of interventions and possible leverage points of Women Empowerment

↓

Identify the best intervention specific to the context of Nellarachal ward

Implementation Phases

STEP -5

Evaluate possible interventions and evaluate their potential impacts

THEORY OF CHANGE

EVALUATION

An intervention represents any event, process, and/or action inducing change within empowerment domains and their contextual interrelations

Implementation Phases

STEP -6

Select interventions

Participatory Decision Making

Case Study - II

To design and implement software solutions for data collection, integration and dissemination

Project: Vocational Skill Training Programs

Tracking and Monitoring Skill Training Programs

Name of the Project

Pradhan Mantri Kaushal Vikas Yojana (PMKVY)

Reachability

Skill Training Programs - **4**
Training centers - **10**
Tainers - **45+**
Students - **450+**

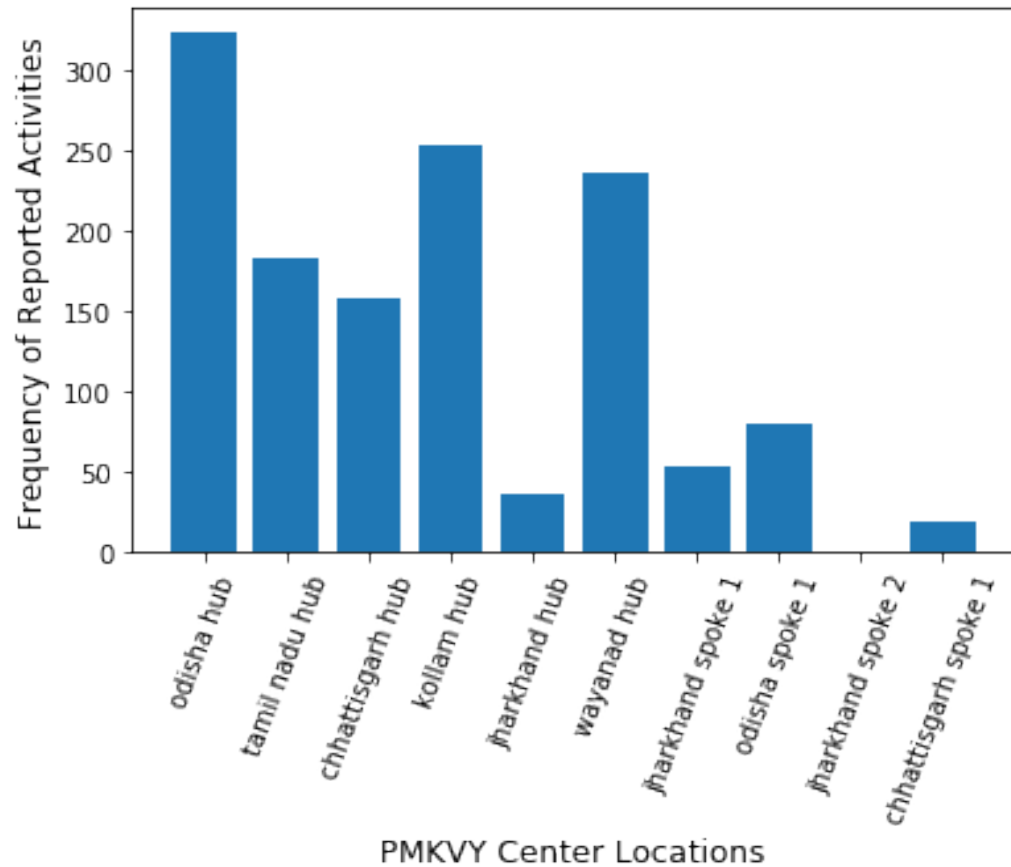### Software Package as a solution

- ❖ Mobile App for Data Collection
- ❖ Web based data portal
- ❖ Cloud based data storage

Major Functional Support

- ❖ Day-to-day activity log
- ❖ Supports different types of activities
  - ➢ (Training session, Center administration, Student Registration, Maintenance)
- ❖ Offline & Online support
- ❖ Reports Generation
- ❖ Analysis of feedbacks using NLP

Frequency of Reported Activities vs **PMKVY Center Locations**

(Bar chart x-axis labels: odisha hub, tamil nadu hub, chhattisgarh hub, kollam hub, jharkhand hub, wayanad hub, jharkhand spoke 1, odisha spoke 1, jharkhand spoke 2, chhattisgarh spoke 1)

Given below is the screenshot of the mobile app that facilitates data gathering

- ❖ 2500+ updates
- ❖ Open ended & Closed ended questions
- ❖ Image data
- ❖ Hashtags to support labelling

Above graph demonstrates the daily updates logged through the software across the centers

- ❖ Odhisha Hub being the first center, reports maximum number of activities.

Add New Activity

*Role
Facilitator

*Choose the Center
Headquarter

Activity Type
Monitoring Activities

Activity Start Date   Activity End Date
2019-06-29   2019-06-29

Next

Add New Activity

Activity Start Time   Hour   Mins   am/pm
                      8   00   AM

Activity End Time   Hour   Mins   am/pm
                      6   00   PM

Upload image or video or audio related to the event

Select the first image\video or audio
Image_1   OR   Video_1   OR   Audio_1

Select the second image\video or audio
Image_2   OR   Video_2   OR   Audio_2

Select the third image\video or audio
Image_3   OR   Video_3   OR   Audio_3

Previous   Next

Add New Activity

Choose hash tags
(type '#' to list all the available tags)
Enter text...

What activities did you complete today?
Enter text...

I was able to follow the Amrita-PMKVY curriculum
[choose one]
Do not know

Please list what topics were covered today?
Enter text...

What went well? Please explain why. [600 characters]
Enter text...

Text Processing to check quality of data
[Application of NLP]

Techniques for Improving Value of Data

- ❖ Handling mix up of languages
- ❖ Removal of meaningless words
- ❖ Removal of stop words

TABLE I: Summary of text data collected across the centers.

Centers	#Activities	#Feedback	#Challenges
odisha hub	323	25	57
tamilnadu hub	184	4	11
chhattisgarh hub	158	6	17
kollam hub	254	7	14
jharkhand hub	36	7	13
wayanad hub	237	42	136
jharkhand spoke 1	54	1	6
odisha spoke 1	81	2	3
jharkhand spoke 2	1	1	0
chhattisgarh spoke 1	19	0	1
Total reported	*1307*	*1198*	*1203*
Total after cleaning	*1307*	*94*	*258*

Observations

Even though 323 activities were reported from Odisha Hub,

- ❖ 25 of them included a meaningful feedback
- ❖ 57 of them reported challenges meaningfully

Lesser activities reported by Wayanad Hub, but they have reported their feedback and challenges much more effectively
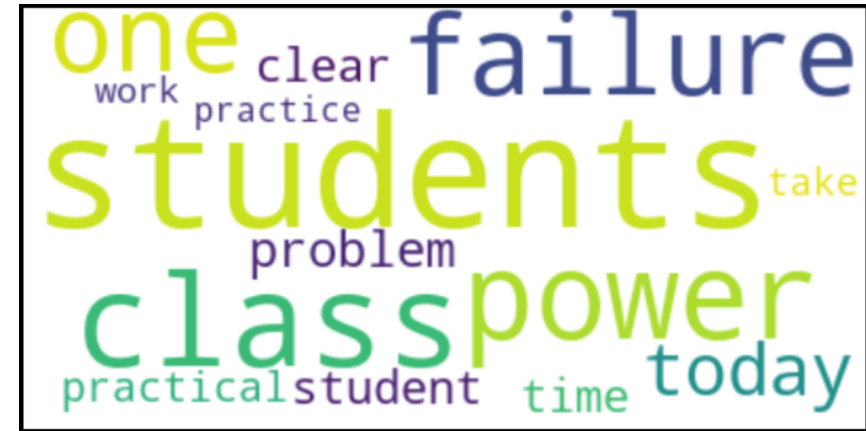
Word Frequency Analysis
[Application of NLP]

(a) Word cloud generated for the Feedback given by the users across all the centers

❖ The general feedback of the users reflected how the training programs were running in an over all good manner.

(b) Word cloud generated for the challenges reported by the users across all the center

❖ Power Failure was one of the main challenge faced
❖ High frequency of the word 'one' in the challenges. Indicates a common scenario - One student finding it difficult to follow through the training

Sentiment Analysis to assess trainer's satisfaction
[Application of NLP]

❖ we applied sentiment analysis on the challenges data provided by the trainers at the training centers

❖ "Sentiment analysis is a contextual text mining technique that analyzes and extracts sentiments, peoples opinions, attitudes, emotions that helps to understand their sentiments towards the product, organizations, topics, events and issues"

❖ One third of the feedbacks where found positive