SCHEMA

Sugar Coded's Handheld Ecological Momentary Assessment
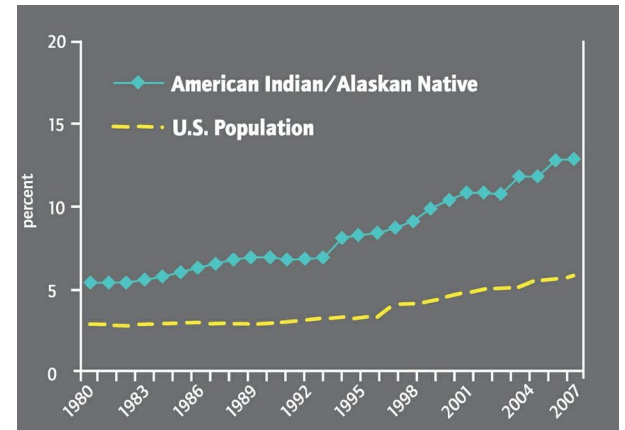
Team Sugar Coded:Chantz Spears, Julian Shak, John Bassler, and Alfonso Martinez

Mentor: Dr. Eck Doerry; SICCS Department

Diabetes Prevention Overview

- Blood disorder: glucose not effectively filtered out of the bloodstream
- Diabetes Prevention Program (DPP) offer "gold standard" for intervention
  - Focuses on moderate lifestyle and diet changes
  - Exercising 150 minutes a week, aim to lose 7% of participant's body weight
- Native Americans are the most at-risk ethnicity
- Reason for disparity unclear, further research is required

Current Research

- Dr. Natalia Dmitrieva, Developmental Psychologist
- Research goals improve understanding the mechanisms of chronic disease management in middle adulthood
- Research technique: EMA (ecological momentary assessment)
  - Collecting real-time data on participant's experiences in the moment
  - Attempts to find overeating and sedentary inclinations
  - Current implementations of EMA feel flawed, cumbersome
  - Researchers interested in implementing EMA more efficiently

Client

Dr. Natalia Dmitrieva
Department of Psychological Sciences

Solution Motivation

Current EMA Solutions

- Expensive
- Time consuming
- Intrusive for participants
- Limited number of participants

Our Solution: Requirements

- Free
- Flexible
- More personalized data gathering procedure
- Cultural adaptation
- Highly configurable
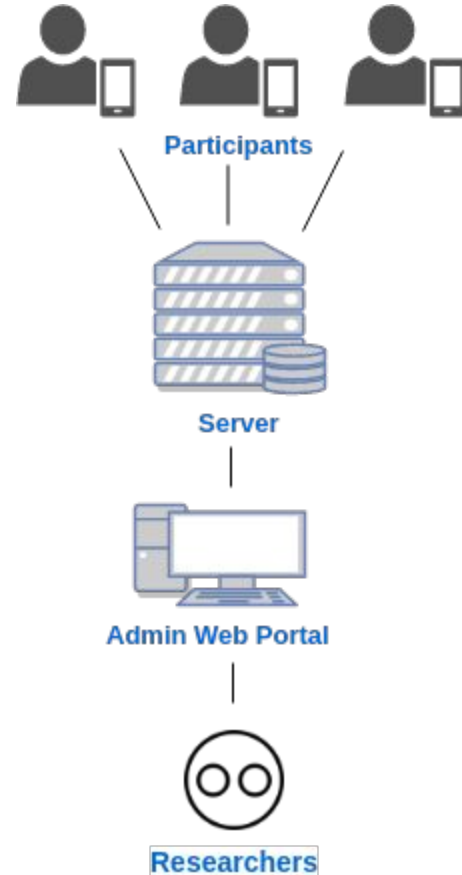- Unlimited number of participants
- Real-time data capture

Solution Vision

Mobile Application Features
- Participant access
- Easy/convenient way of providing data
- Momentary questionnaires (modules)

Web Portal Features
- Administration access
- Creation of studies
- Configuration of study protocols

Solution's Key Features

How Were They Acquired?
- **Sponsor Provisions -** meetings, documents and past research studies
- **Market Analysis**

Functional Features:
- Application Individualized to the user
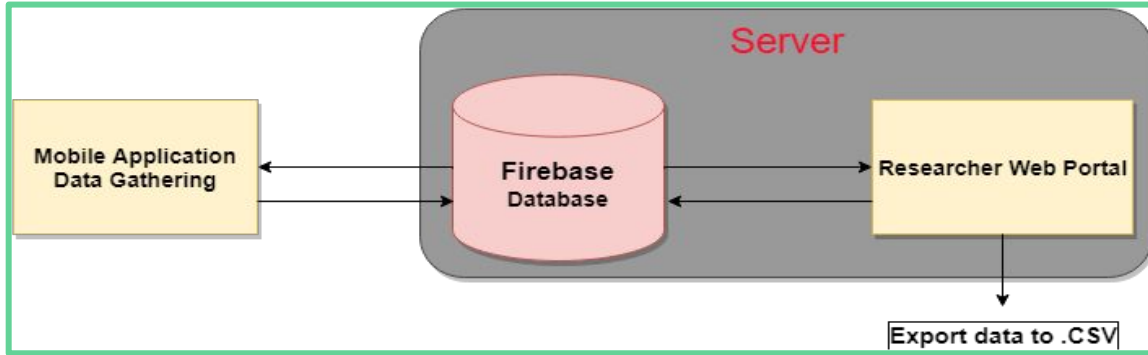- Administrator data viewing

Performance Features:
- Mitigate intrusive interruptions (notifications)
- Minimal need for application usage training

Environmental Features:
- Fitbit integration
- Run on Android or IOS mobile devices

	App	Best for:	Free for:	Plans from:
	Device Magic	pre-filled data in forms	Basic features on 1 device	$17/mo. per device
	GoFormz	digitizing paper forms	1 form on 1 device	$10/mo. per device
	Nexticy	paper-style forms on iPad	3 forms & 50 responses	$9.99/mo. per device
	QuickTapSurvey	questions and surveys	1 form & 50 entries	$19/mo. per device
	Fulcrum	geolocation with custom maps	—	$18/mo. per user
	Formitize	accepting payments in mobile forms	—	$29.99/mo. per device
	iFormBuilder	adding data to your database from anywhere	10 forms & 100 records	$83/mo.
	PushForms	turning paper forms into mobile apps	—	$99/mo.

Architecture and Implementation

Server

Mobile Application Data Gathering ← → Firebase Database → Researcher Web Portal

Export data to .CSV

Web Portal

Mobile Application

Description

Front End -

- Study creation
- Ionic Framework
- Question, timing protocol, and
  - Utilizes cordova plugins for
participant initialization
    easy add-ons
- Participants link to study and pull

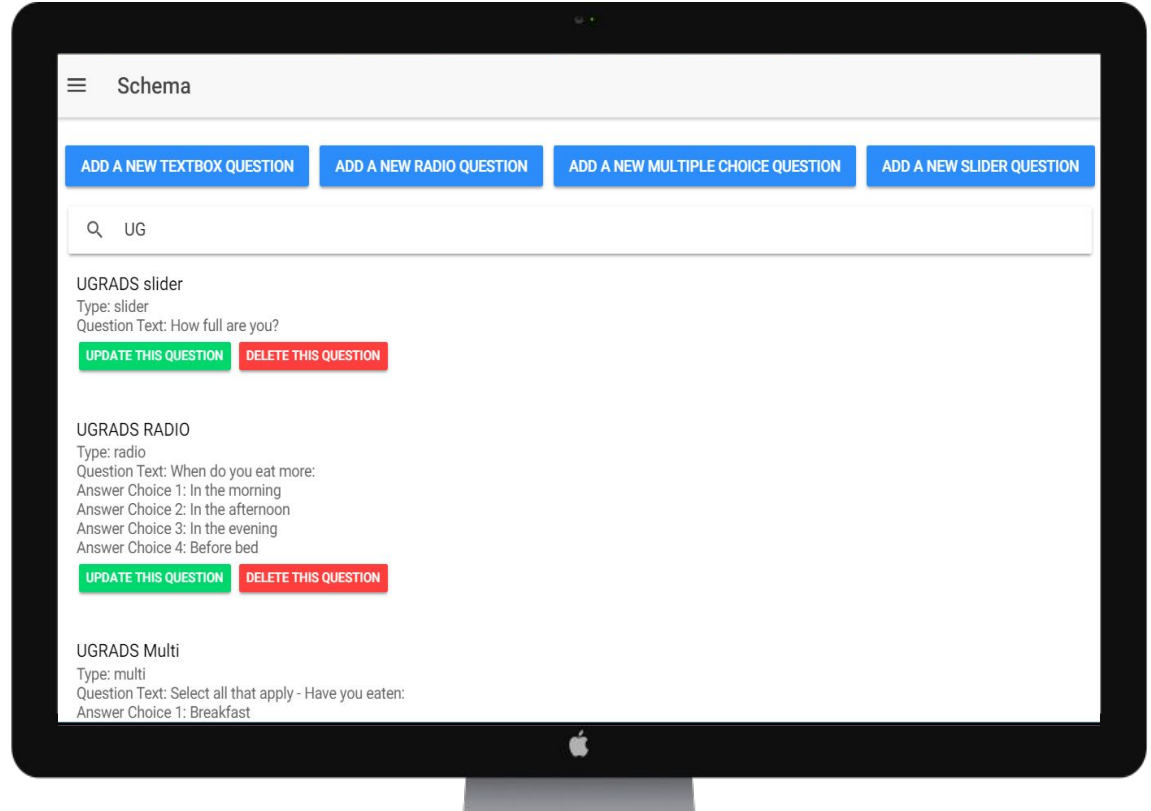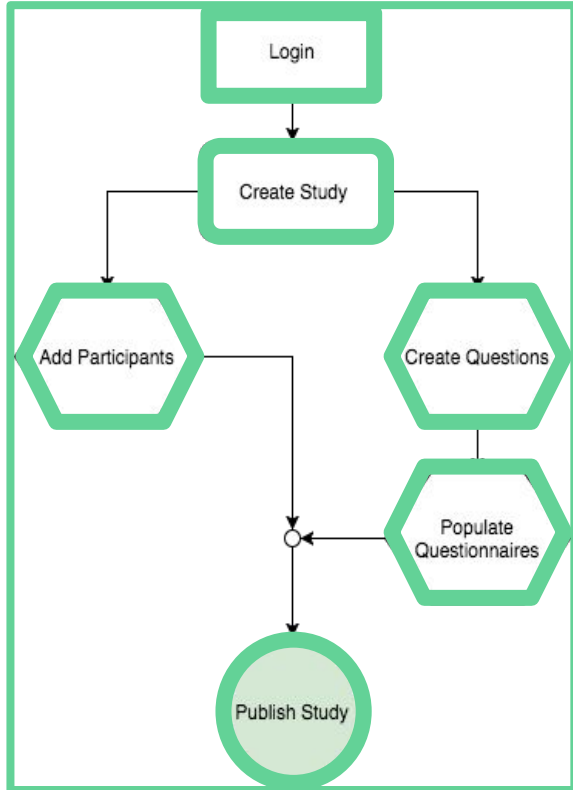**Back End -** information from firestore

- Participants provide answers to
- Firebase questionnaires that are relayed back
  - Provides hosting solutions
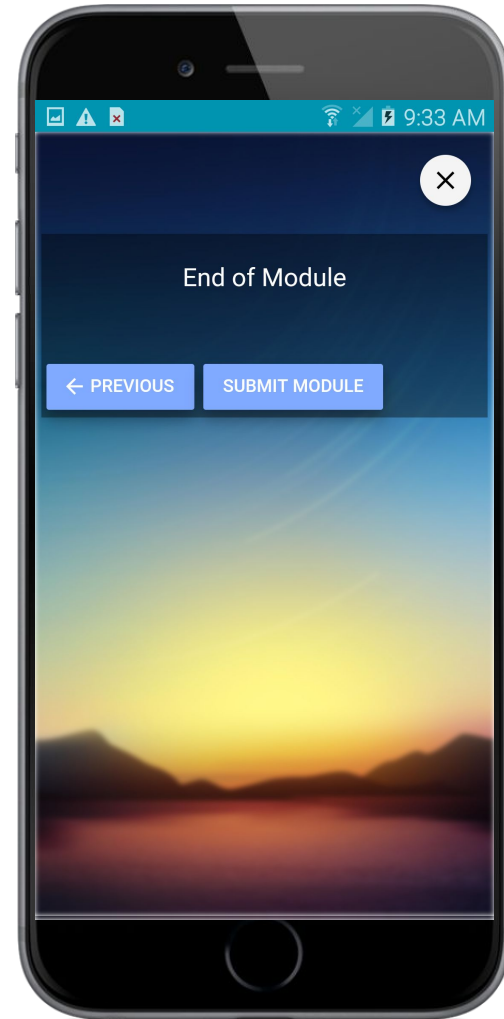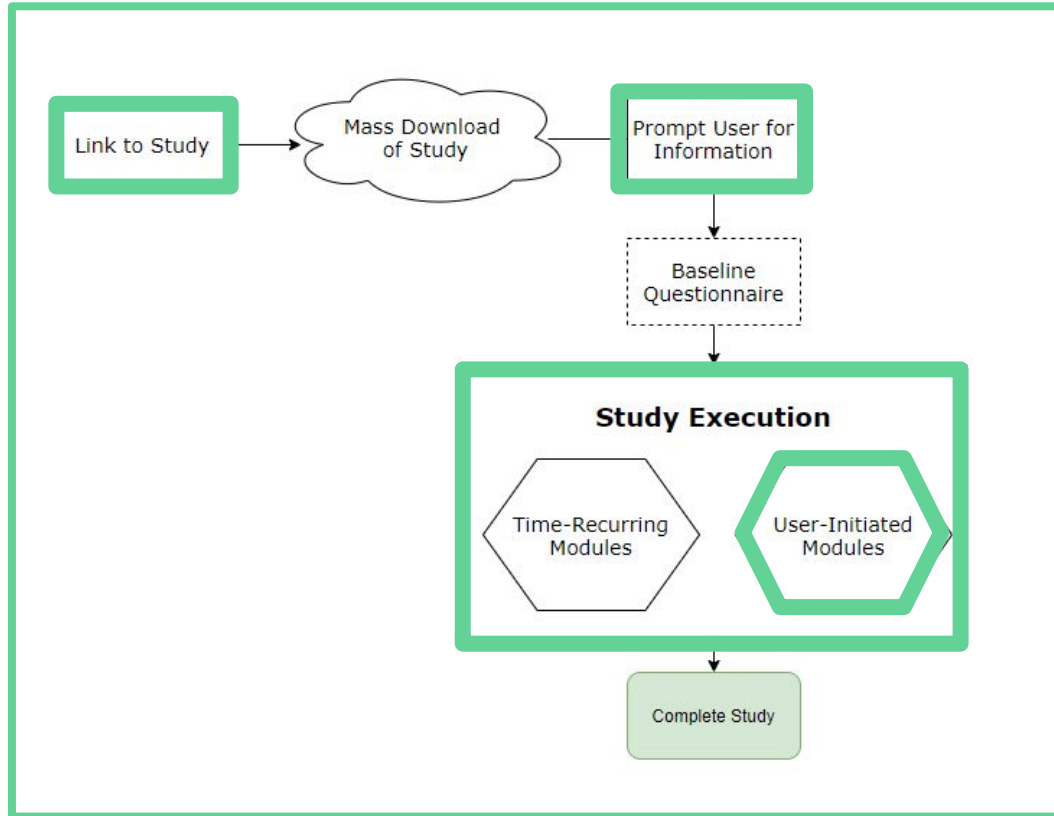to researchers
- Javascript / Typescript

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Use Case Walkthrough

- Phase 1: A researcher at NAU wants to create an EMA study to gather information on participants' diet and exercise

- Phase 2: A participant enrolls in this study and answers a questionnaire

Use Case: Researcher Creating Study
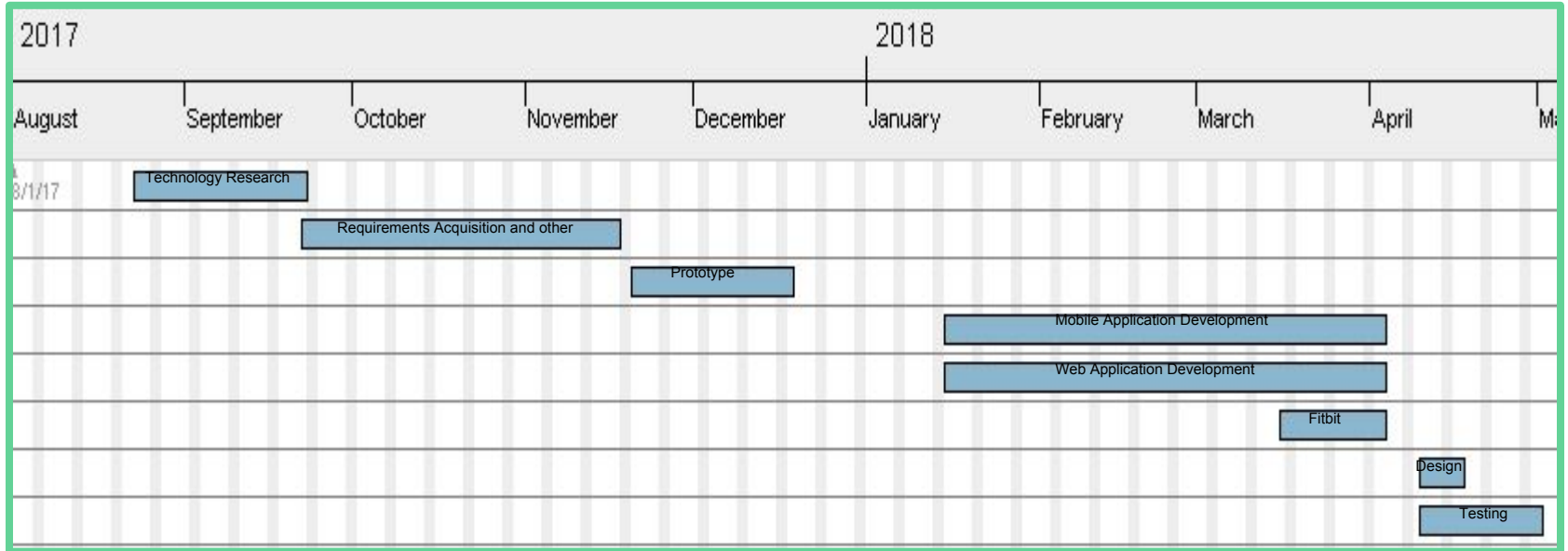
Use Case: Execution of Study

Challenges and Resolutions

Challenges	Why was this a challenge?	Resolutions
Offline Functionality	App needed to administer study and record results even while offline	Locally save study / Upload answers on next connection
Notifications	Alert participants when new questionnaires are available & Dismiss questionnaires into backlog	Utilize Firebase functionality and Cordova plugins
Hosting Services	The project needed to be free or as cost effective as possible	Firebase Hosting service
Fitbit Integration	WearWare, a third party academic portal, is unable to connect to Fitbit's proprietary repositories at this time	Utilized previously gathered Fitbit data to assure our product will work once WearWare is functioning again

Schedule

Testing Plan

- Unit Tests
  - Utilized Chai and Mocha to quickly write and check correct functionality
  - 25 unit test over 10 modules
- Integration Tests
  - Ensuring web, mobile, and database components communicate correctly
  - 10 fully encompassing integration tests
- Usability Tests
  - Main Focus
  - Rapid iterative development meetings with client
  - Moderated and unmoderated user tests
  - 30+ changes or refactors

Example changes since user testing:
- Search bars implemented in the web portal
- A more robust .csv output file
- Added an end of study message
- Slider questions start at the halfway point
- Application splash screen differs from the application logo

Future Work

Sugar Coded has satisfied our client's needs for version 1.0 of SCHEMA

Technical Insights
- Use native plugins instead of wrapping them in the framework
- Code file converters and parsers from scratch

Product Evolution
- Dr.Dmitrieva will be implementing social functions into the application
- At Dr.Dmitrieva's discretion SCHEMA may make its way into other researchers' hands for further insight on useful additions or modifications.

Sugar Coded Wrap Up

- **SCHEMA's Importance -** At risk individuals are falling off the SDPI-DP and conducting research in this field has been difficult
- **Solution -** Web and mobile applications for collecting momentary data
- **Project Impact -** Improved cost, time, manpower, and scalability

	Low Quality Study	Standard Study	SCHEMA
Length	4 days	24 weeks	∞
# of Participants	8	50	∞
Question Amount	~ 6 (5 time based)	~10 time based @ 5 times a day + 4 event based	∞
Cost	$600	$6000	Data storage @ $0.18/GB

Thank You!

- UGRADS Poster Session: 2pm - 4pm, Display 29B
- Sugar Coded's website:

  https://www.cefns.nau.edu/capstone/projects/CS/2018/SugarCoded

Questions?