

# Feasibility Evidence Description (FED)

## Farmworkers Safety Application

### Team 9

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# Version History

Date	Author	Version	Changes made	Rationale
10/11/16	AA	1.0	<ul style="list-style-type: none"><li>• Original version of the FED</li></ul>	<ul style="list-style-type: none"><li>• Preparation for the FCR ARB</li></ul>

# Table of Contents

**Feasibility Evidence Description (FED)..... i**

**Version History ..... iii**

**Table of Contents ..... iv**

**Table of Tables ..... v**

**Table of Figures..... vi**

**1. Introduction.....1**

**1.1 Purpose of the FED Document.....1**

**1.2 Status of the FED Document .....1**

**2. Business Case Analysis .....2**

**2.1 Cost Analysis .....3**

**2.2 Benefit Analysis .....4**

**2.3 ROI Analysis .....4**

**3. Architecture Feasibility .....6**

**3.1 Level of Service Feasibility .....6**

**3.2 Capability Feasibility .....7**

**3.3 Evolutionary Feasibility .....7**

**4. Process Feasibility.....8**

**5. Risk Assessment.....9**

**6. NDI/NCS Interoperability Analysis .....10**

**6.1 Introduction .....10**

**6.2 Evaluation Summary.....15**

# Table of Tables

*Table 1: Personnel Costs* ..... 3

*Table 2: Hardware and Software Costs* ..... 3

*Table 3: Benefits of xxx System*..... 4

*Table 4: ROI Analysis*..... 4

*Table 5: Level of Service Feasibility* ..... 6

*Table 6: Capability Requirements and Their Feasibility Evidence*.....7

*Table 7: Evolutionary Requirements and Their Feasibility Evidence*.....7

*Table 8: Rationales for Selecting Architected Agile Model*.....8

*Table 9: Risk Assessment*..... 9

*Table 10: NDI Products Listing*.....10

*Table 11: NDI Evaluation*.....15

# Table of Figures

*Figure 1: ROI Analysis Graph*.....5

# 1. Introduction

## 1.1 Purpose of the FED Document

<< Discuss the purpose of the FED >>

## 1.2 Status of the FED Document

This document is an initial draft of the FED document that has been prepared for the FCR ARB. It will be improved in the coming days to reflect feedback received during our presentation.

## 2. Business Case Analysis

<p><b>Assumptions:</b></p> <p>Farmers have phones and Internet connectivity; They can use their phones at work.                  They have nearby access to water and shade.                  Farmers want to improve working conditions.                  Contractors and farmers are obligated to provide safety for farmworkers.</p>			
<p><b>Stakeholders (Who?)</b></p> <ul style="list-style-type: none"> <li>- Developer</li> <li>- Maintainer</li> <li>- Farmworker</li> <li>- Contractors</li> <li>- Farmers</li> <li>- Regulators</li> </ul>	<p><b>Initiatives (What?)</b></p> <ul style="list-style-type: none"> <li>- Develop the system</li> <li>- Keep the system up and running</li> <li>- Setup a profile with correct phone number and accurate location</li> <li>- Update locations of farmworkers based on their farm assignments</li> <li>- Manage farmworkers through profiles and provide feedback</li> <li>- Set standards for farmer safety</li> </ul>	<p><b>Value Proposition (Why?)</b></p> <ul style="list-style-type: none"> <li>- Provide temperature based notifications.</li> <li>- Educate farmers and improve their quality of life.</li> <li>- Improve productivity of farmworkers.</li> </ul>	<p><b>Beneficiaries (For Whom?)</b></p> <ul style="list-style-type: none"> <li>- Farmworkers</li> <li>- Consumers of farm products</li> <li>- Farmers and contractors</li> </ul>
<p><b>Cost:</b></p> <ul style="list-style-type: none"> <li>- Development cost</li> <li>- Maintenance cost</li> <li>- COTS products: weather, and SMS API</li> <li>- Backend server and database</li> </ul>		<p><b>Benefit (Metrics):</b></p> <ul style="list-style-type: none"> <li>- Decrease the number of people who suffer from heat illness.</li> <li>- Increase the productivity of the farms.</li> </ul>	



## 2.1 Cost Analysis

### 2.1.1 Personnel Costs

Table 1: Personnel Costs

Activities	Time Spent (in hours)
<b>Valuation and Foundations Phases</b>	
Team Meeting: 4hr/wk * 6 wks * 6 people	144
Client Correspondence: 1hr/wk * 6 wks * 1 person	6
Win-Win Sessions: 2 sessions * 1 hour * 6 people	12
Farmer Meeting: 1hr * 2 people	2
Documentation Reviews: 2hr/wk * 6 wks * 6 people	72
<b>Total</b>	<b>200</b>

### 2.1.2 Hardware and Software Costs

Table 2: Hardware and Software Costs

Type	Cost	Rationale

Ownership Cost	Cost of COTS + Web server	Need to deliver weather and SMS services and store data
Maintenance Cost	\$0	No foreseeable maintenance costs
Hardware	\$0	No foreseeable hardware costs
<b>Total</b>	Cost of COTS + Web Server	

## 2.2 Benefit Analysis

<< Analyze benefits from this project. Benefits could be in the quantitative form such as more revenue, saved effort, and qualitative form such as increase of reliability. Example can be found at ICSM EPG>Task: Analyze Business Case >>

**Table 3: Benefits of xxx System**

Current activities & resources used	% Reduce	Time Saved (Hours/Year)
<b>Total</b>		

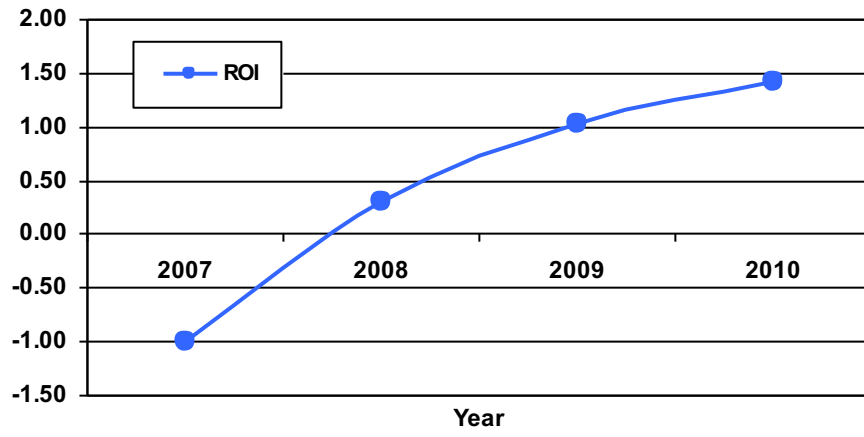
## 2.3 ROI Analysis

<< Calculate Return on Investment by using your cost and benefit analysis results and identify the breakeven point. Note, if you have hardware and software cost, it must be included in ROI calculation. For effort cost, if you use a salary as your calculation base, assume 10% annually increase. Example can be found at ICSM EPG>Task: Analyze Business Case>>

**Table 4: ROI Analysis**

Year	Cost	Benefit (Effort Saved)	Cumulative Cost	Cumulative Benefit	ROI

**Figure 1: ROI Analysis Graph**



### 3. Architecture Feasibility

<< Provide evidence or rationale of why do you think the following LOS, capability, and evolutionary requirements are satisfiable. Example of product and process strategies can be found in ICSM EPG> Task: Provide Feasibility Evidence for Architecture Agile project >>

#### 3.1 Level of Service Feasibility

**Table 5: Level of Service Feasibility**

Level of Service Requirement	Product Satisfaction
LOS-1: The system shall be scalable to up to at least the 400,000 farmworkers in California	Product Strategies: Paid COTS are capable of handling large volumes of concurrent users
	Process Strategies: Monitor number of concurrent users and purchase premium COTS plans as required
	Analysis: Monitoring of users and purchase of COTS will allow us to proactively scale-up our system
LOS-2: The system shall have cross platform and cross system capabilities	Product Strategies: Use SMS and a Web Application for platform-independent support
	Process Strategies: Deploy new features of web application before porting for mobile applications.
	Analysis: Using a web-first strategy and deploying on multiple platforms will enable all types of users to access the service
LOS-3: The system shall not be down for more than 24 hours in a month	Product Strategies: Choose COTS and service providers that offer priority support and that have a proven record of quality
	Process Strategies: Use Sundays for preventative maintenance and deployment of new versions of application. Beta test new versions of application before public releases.
	Analysis: Performing preventative maintenance is a proven method of avoiding downtime, and selecting well-reputed COTS ensures critical components of our system remain online

## 3.2 Capability Feasibility

**Table 6: Capability Requirements and Their Feasibility Evidence**

Capability Requirement	Product Satisfaction
CR-1: Fetch weather	Software/Technology used: Weather API (darksky.net)
	Feasibility Evidence: <a href="#">Prototype Weather API integration</a>
	Referred use case diagram: <a href="#">Use Case Diagram 2.1.5 in the SSAD document</a>
CR-2: Send text based notifications	Software/Technology used: SMS API (Nexmo)
	Feasibility Evidence: Prototype SMS API integration
	Referred use case diagram: Use case diagram 2.1.5 in the SSAD
CR-3: Host Educational Media Content and Store User Profiles	Software/Technology used: Database
	Feasibility Evidence: Evaluate different database providers (Amazon, Google)
	Referred use case diagram:

## 3.2 Evolutionary Feasibility

**Table 7: Evolutionary Requirements and Their Feasibility Evidence**

Evolutionary Requirement	Product Satisfaction
ER-1: << ER name >>	Software/Technology used: <<identify the software/technology that is/are used to develop this capability requirement>>
	Feasibility Evidence: << briefly provide rationale of how this capability could be developed to satisfy the requirements. >>
	Referred use case diagram: << identify related use case diagram >>
	Software/Technology used:
	Feasibility Evidence:
	Referred use case diagram:
	Software/Technology used:
	Feasibility Evidence:
	Referred use case diagram:

## 4. Process Feasibility

<< Based on process decision table provided in ICSM EPG> Concept: Process Decision Selection Guidelines, Identify which process model you are following and provide rationale why that model would fit your development project. Note: Development team discusses with stakeholders on important drivers and project status

**Decision Criteria Rating Scale;** 0:Very Low; 1:Low; 2: Medium; 3:High; 4:Very High

**Importance Rating Scale:** 1:Low; 2: Medium; 3:High

>>

**Table 8: Rationales for Selecting Architected Agile Model**

Criteria	Importance	Project Status	Rationales
30 % of NDI/NCS features			
Single NDI/NCS			
Unique/ inflexible business process			
Need control over upgrade / maintenance			
Rapid deployment			
Critical on compatibility			
Internet connection independence			
Need high level of services / performance			
Need high security			
Asynchronous communication			
Be accessed from anywhere			
Critical on mass schedule constraints			
Lack of personnel capability			
Require little upfront costs			
Require low total cost of ownership			
Not-so-powerful local machines			

## 5. Risk Assessment

<< Identify our project risk, its exposure and its mitigation plan. Please note risk is a threat or probability that something will happen and possibly create loss or injury. So, if your threat or your incident is already happened, then it is a problem, not a risk. More example of risks can be found at ICSM EPG> Task: Assess and Plans to Mitigate Risks>>

**Table 9: Risk Assessment**

Risks	Risk Exposure			Risk Mitigations
	Potential Magnitude	Probability Loss	Risk Exposure	
<b>Design Constraints:</b> The app will cater to users with different language proficiency. Also, a lot of data needs to be conveyed from time to time. Thus UI design needs to be on point.	9	7	63	<ul style="list-style-type: none"> <li>· Test designs before deployment</li> <li>· Visit the farms to understand the best-practices and use conditions.</li> </ul>
<b>System Constraints:</b> The lack of good data service in farms makes it difficult to accurately get the location.	7	5	35	<ul style="list-style-type: none"> <li>· GPS vs Zip Code accuracy analysis.</li> <li>· Analyze frequency of location change</li> <li>· Implement a fail-safe system</li> </ul>
<b>NDI/COTS Conflict:</b> COTS/NDI might have interoperability issues. We also need to consider the cost constraints.	9	5	45	<ul style="list-style-type: none"> <li>· Review the interoperability of different COTS</li> <li>· Consider COTS cost</li> </ul>
<b>Scope Constraint:</b> The multifaceted requirements might evolve and change with the development of the system.	8	4	32	<ul style="list-style-type: none"> <li>· Prioritized win conditions and expect commitment from the clients.</li> <li>· Expect the client to have negotiable outlook.</li> </ul>

## 6. NDI/NCS Interoperability Analysis

### 6.1 Introduction

<< Identify the Non-Developmental Item (NDI) and Net-Centric Services (NCS) including open source software or libraries that you are using/ plan to use in your project and analyze their interoperability. >>

#### 6.1.1 COTS / GOTS / ROTS / Open Source / NCS

<< Identify all candidate commercial off-the-shelf, government-off-the-shelf, research-off-the-shelf, open source software, libraries, and net-centric services component that you are using/ plan to use. Also identify the purpose of each component. >>

**Table 10: NDI Products Listing**

COTS	Type	Links
Laravel, ASP .NET, AngularJS	Application Framework	
C#, C++, Java	Programming Language	
Twilio, Trumpia, Nexmo, SMSGlobal	Programmatic SMS Messaging	<a href="http://Twilio.com">Twilio.com</a> <a href="http://trumpia.com">trumpia.com</a> <a href="http://Nexmo.com">Nexmo.com</a> <a href="http://smsglobal.com">smsglobal.com</a>
OpenWeatherMap, Weather Underground, Yahoo Weather API, DarkSky	Programmatic fetching of working conditions	<a href="http://openweathermap.org">openweathermap.org</a> <a href="http://wunderground.com">wunderground.com</a> <a href="http://developer.yahoo.com/weather">developer.yahoo.com/weather</a> <a href="http://darksky.net">darksky.net</a>

**Table 11: Weather API Evaluation Criteria**

Evaluation Criteria for Weather API	
Criteria	Weight



Update Latency	25
Has Forecast	15
Cost	30
Accepted inputs	5
Output format	10
Comments	15
<b>Total</b>	<b>100</b>

**Table 12: Comparison of Weather APIs**

Programmatic Fetching of Temperature Data						
Service	Update Latency	Has Forecast	Cost	Accepted inputs	Output format	Comments
<b>OpenWeatherMap</b>	<p><u>Free and \$40/mo:</u> &lt; 2 hours (95% LOS)</p> <p><u>\$470/mo:</u> &lt; 10 min (99.5% LOS)</p>	<p>Yes</p> <p>Includes hourly and daily</p>	<p><u>Free:</u> 60 cpm <u>\$40/month:</u> 600 cpm</p> <ul style="list-style-type: none"> <li>• more</li> </ul>	<p>City name, City ID, Lat/Long, Zip Code</p>	<p>JSON, XML, or HTML</p>	<p>Open source. Created to emulate Wikipedia and OpenMaps</p>
<b>Wunderground</b> “Hyperlocal”	<p>15 minutes</p> <p>Includes some real time data sources</p>	<p>Yes</p> <p>Including hourly, daily (3-day and 10-day)</p>	<p><u>Free:</u> 500 cpd, 10 cpm <u>\$20/month:</u> 5,000 cpd, 100 cpm</p> <ul style="list-style-type: none"> <li>• more</li> </ul>	<p>City name, Zip Code, Lati/Long, Airport Code, PWS (personal weather station) id, AutoIP address location, IP address</p>	<p>JSON or XML and GIF, PNG or SWF</p>	<p><b>Supports multiple languages (80+)</b></p>
<b>Yahoo Weather</b>	<p>Unknown</p>	<p>Yes</p>	<p>2,000 cpd</p>	<p>City Name, Zip Code</p>	<p>JSON or XML</p>	<p>Minimal documentation and complicated query structure</p>


<b>DarkSky</b> <b>“Hyperlocal”</b>	< 1 hour  Includes some real time data sources	Yes  Including min-by-min, hourly, daily, weekly, and monthly	1,000 cpd + 0.0001 per forecast after that = <b>40 cents</b> for 5,000 cpd	Lat/Long for hyperlocal weather	JSON  Has wrappers for C#, C++, Java, Javascript, and more	Recently integrated with forecast.io  <b>Supports multiple languages</b>  Tool of choice for many developers
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**Table 13: Scoring of Weather APIs**

Service	Update Latency	Has Forecast	Cost	Accepted inputs	Output format	Comments	Weighted Score
<b>OpenWeatherMap</b>	80	80	92	95	95	85	<b>86.6</b>
<b>Wunderground “Hyperlocal”</b>	95	95	80	100	100	90	<b>90.5</b>
<b>Yahoo Weather</b>	20	80	90	80	95	20	<b>60.5</b>
<b>DarkSky “Hyperlocal”</b>	95	100	100	60	97	100	<b>96.45</b>

**Table 14: Comparison of SMS APIs**

Programmatic SMS Messaging				
Service	Send + Receive	Cost	24/7 Support	Comments

Twilio	Yes	\$1/mo for #, \$0.0075 per SMS (charges for inbound & outbound)  \$1 = 133 texts	Yes with purchasable plans No guaranteed response time for free  Plans from \$500- \$5000	Used by companies like Uber, Cocacola, and Nordstrom
Trumpia	Yes	Setup costs / monthly costs \$0.008 per <b>outgoing</b> SMS if pre-pay for 100k texts \$0.007 per <b>outgoing</b> text if pre-pay for 1m texts  \$1 = 125-143 texts	Yes  Free plan response within 4 <i>business</i> hours  Premium plan response within 2 <i>business</i> hours	Used by various large companies, including Amazon, LinkedIn, Microsoft, eBay, Cocacola, Google, and more
Nexmo	Yes	\$0.75/mo for #, \$0.0063 per <b>outgoing</b> SMS  \$1 = 159 texts 	Yes  2h - 6h guaranteed response time for free  1 support plan for \$5000	Owned by Vonage  Used by Alibaba and predominantly other European and Asian companies
SMSGlobal	No details	\$0.03 - \$0.045 per SMS  \$1 = 22-33 texts	No mention	Used by Microsoft, Budget, Samsung, and IBM  Website has significant issues

## 6.1.2 Connectors

<< Identify the connector, for example

- “In this project, we use PHP/MySQL Connector to enable the PHP web application to retrieve and query data from the database”. >>

### 6.1.3 Legacy System

<< Identify the connector, for example

- “In this project, the development system has to be able to interoperate and works well with “BusinessWorks” version 5.2, which is a software system that the client is currently using.” >>

## 6.2 Evaluation Summary

<< Summarize the final selection of your interoperable NDI/NCS, its usage and its comment. Example can be found in ICSM EPG> Task: Analyze NDI Interoperability for NDI / NCS project. >>

**Table 15: NDI Evaluation**

NDI	Usages	Comments