High performance. Delivered.

Precision Agriculture Service Overview

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Strategy | Digital | Technology | Operations

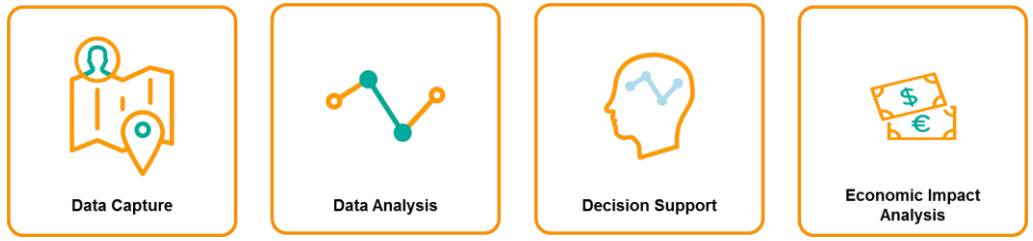
Executive Summary

Many farmers are already investigating the need to change the way in which they farm using Precision Agriculture technologies, however struggle with the immaturity of the fragmented marketplace that has yet failed to bring together an holistic solution that can improve their operational decisions …

There is a window of opportunity to become a dominate player in this fast moving marketplace by combining the GTM relationships of a strategic partner along with the investments that Accenture is making to develop the Precision Agriculture Service (PAS) ….

Farmer Challenges / Uses Cases

GTM Opportunity



PAS Scope

PAS will analyze numerous, diverse data sources in order to create a set of operational decisions that a farmer can take in order to improve the economic output of their farms ...

Opportunity Overview

Market Demand : *The majority of farmers that we talked to were already considering some type of precision agriculture technology driven by :-*

- Rising costs of energy, seeds, chemicals, and equipment
- Variability in weather and climate change leading to increased unpredictability in yields
- Environmental pressures on use of chemical and water
- The recognition that many operational decisions are made based on “gut feel” and with limited empirical data

Solution Description : *Precision Agriculture solutions can bring significant benefit to farmers through a combination of :-*

- UAV multispectral images and sensors in the field
- A sophisticated image recognition engine and decision support tool
- Being able to easily view historical data on precise locations within a field
- Integration with other data sources / farming equipment automation solutions from GTM partner

Benefits to Farmer : *Based on our analysis we believe an integrated PAS could help a farmer :-*

- Reduce their operating expenses by 20%-30%
- Increase their yield by 10%-20%
- Significantly reduce the chances of crop failure
- Reduction in environmental impact / ability to comply with legislation

Barriers to Adoption : *There are ~50K crop farms[1] (in the US) who struggle to adopt Precision Agriculture technologies as a result of :-*

- No clear dominate market player yet despite the market announcements from key players
- No simple end to end solution that provides day to day operational decision support
- Lack of technical knowledge to integrate existing technologies

Monsanto Bets Nearly $1 Billion on Big Data Analytics … paying US$930 million to acquire the Climate Corporation – Oct ‘13

BASF announced plans to expand its services and initiatives for growers and agricultural professionals worldwide. This double-digit million euro investment will drive the development of unique, integrated IT tools that will support growers – Dec ‘14

DuPont Pioneer and John Deere are collaborating to deliver near real-time field level data to growers, taking Decision Services to the next level; linking Pioneer Field360 with John Deere Wireless Data Transfer architecture, JDLink and MyJohnDeere. – Nov ‘13

Monsanto signed a memorandum of understanding with Land O'Lakes Inc.'s WinField, one of its largest distribution partners, to explore connections between Monsanto's integrated farming systems and its recent Climate Corp. acquisition with WinField's R7 Tool. – Jan ‘14

1 - ttp://www.epa.gov/oecaagct/ag101/demographics.html & Tom Dorr Associates research

Our vision…

is to help clients leverage digital technologies to change the way the world farms …

Scope


Produce Wholesale Market
Produce Supply Chain
USDA “Soil Type” Database
Doppler Weather Forecast
UAV with Sensor Payload
Precision Irrigation
Temp Farm Workers
Selective Scouting
Weather Station in Field
Plant Sensors (e.g. sap flow)
Precision Crop Dusting
Key
Inputs
Impacts

Current Challenges

The agricultural industry is on the cusp of a disruptive digital revolution that will address a number of the key challenges faced by many farmers and the wider eco system …

Typical Challenges Faced by Farmers

- **Numerous manual processes** that take time and still yield imperfect results / data
- Operational **data inputs typically available piecemeal** with little correlation or decision making insight
- Operational **data only available at a very course level** of detail, leading to high operational costs / inefficiency
- Operational **decisions made based on "hereditary tribal"** knowledge and limited empirical historical data
- **Limited tracking of historical trends / results**
- **Inability to capture market opportunities** due to lack of accuracy / faith in yield forecasts
- **Limited integration with 3rd party** labor market and downstream supply chain partners to forecast demand
- Increased vertical integration in the food supply chain causing **increased pressure on farmers to differentiate their "commodity" crop**

The Precision Agriculture Service (PAS) capitalizes on the dramatic decrease in the cost of high tech sensors, ability to capture granular geo-specific data and ubiquitous connectivity, to bring insight that drives better business decisions …

Conceptual Design

The PAS will include the following four components to bring together an end to end service that drives significant business benefit for the farming ecosystem …

Data Capture

Data Analysis

Decision Support

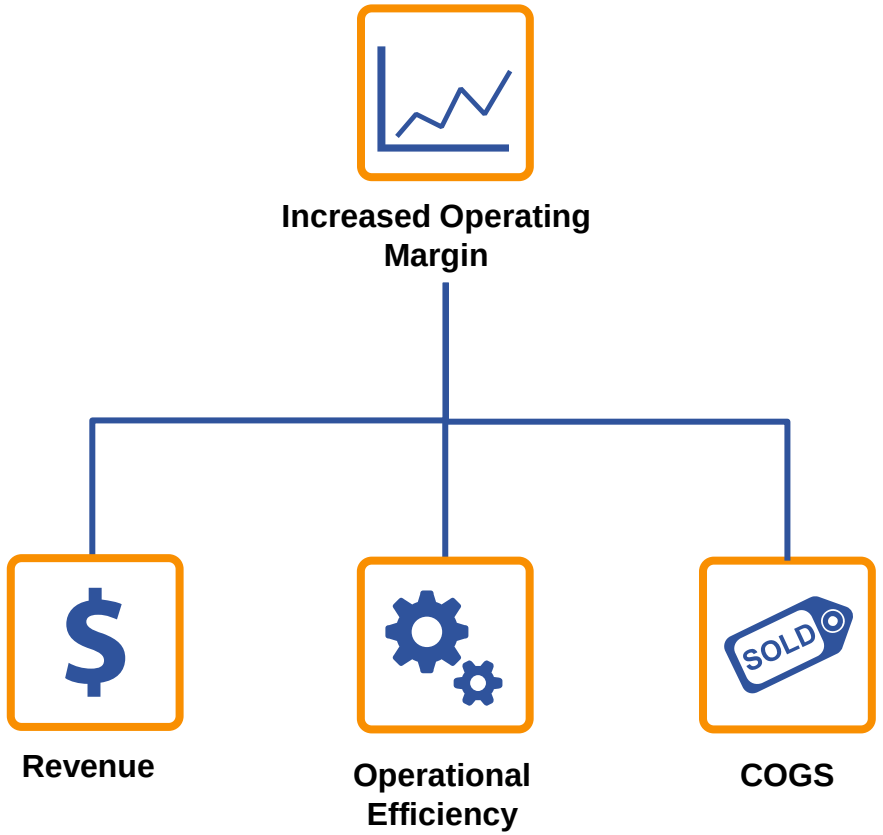
Economic Impact Analysis

High Level Business Benefits

These use cases are supported by a detailed set of value levers which help drive the business case that increases the operating margin of the average farm …

Use Cases

Business Case

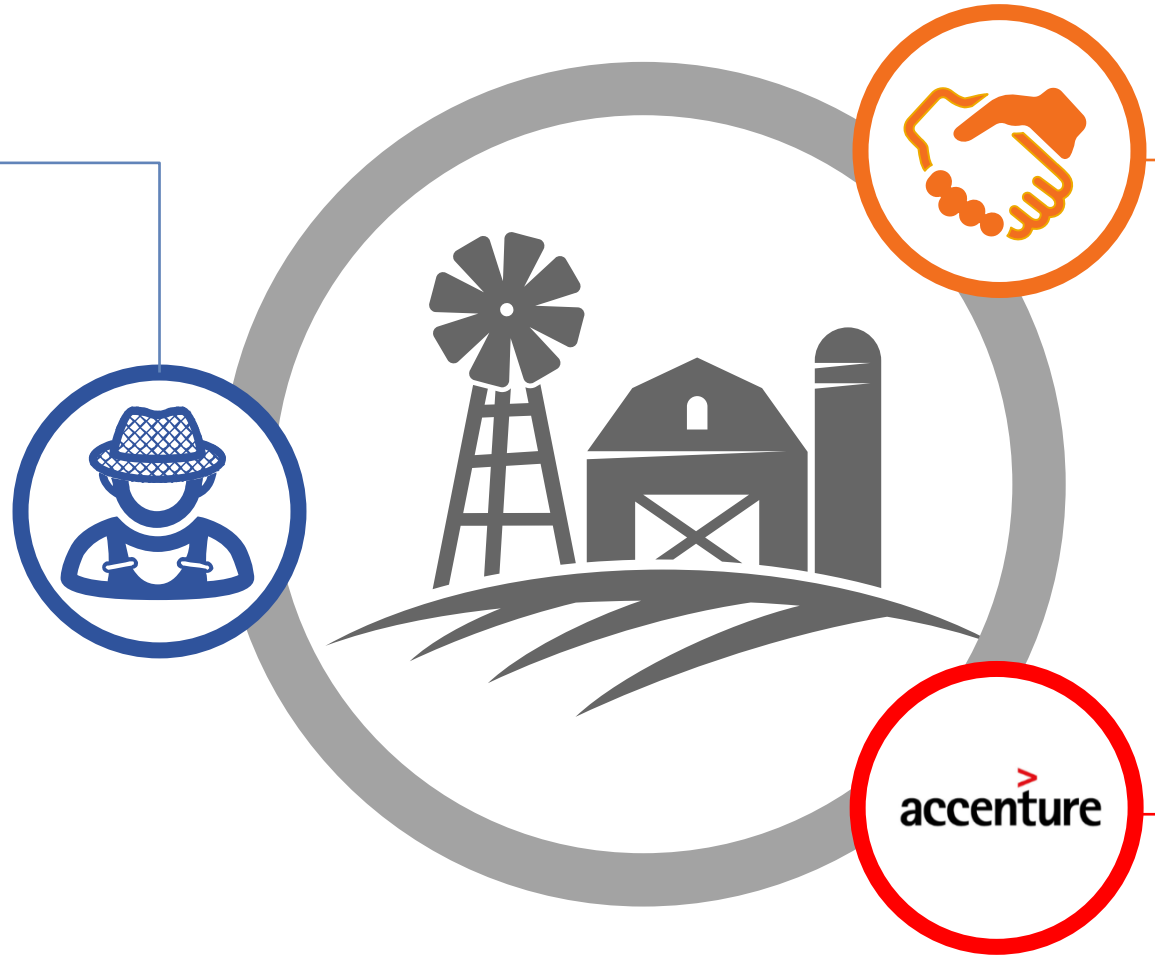


Benefits for Respective Parties

The proposed PAS operating model creates significant complimentary benefits for all parties …

Farmer

- Reduced operational costs
- Increased yields
- Increased profitability
- Reduced risk of crop damage
- Increased food safety
- Reduced environmental impact



Strategic Partner

- New revenue stream
- Market differentiation leading to premium pricing of core products
- Integration with existing precision ag investments
- Ability to increase sales of core products
- Increased ability to hedge revenues through greater information on aggregate predicted yields

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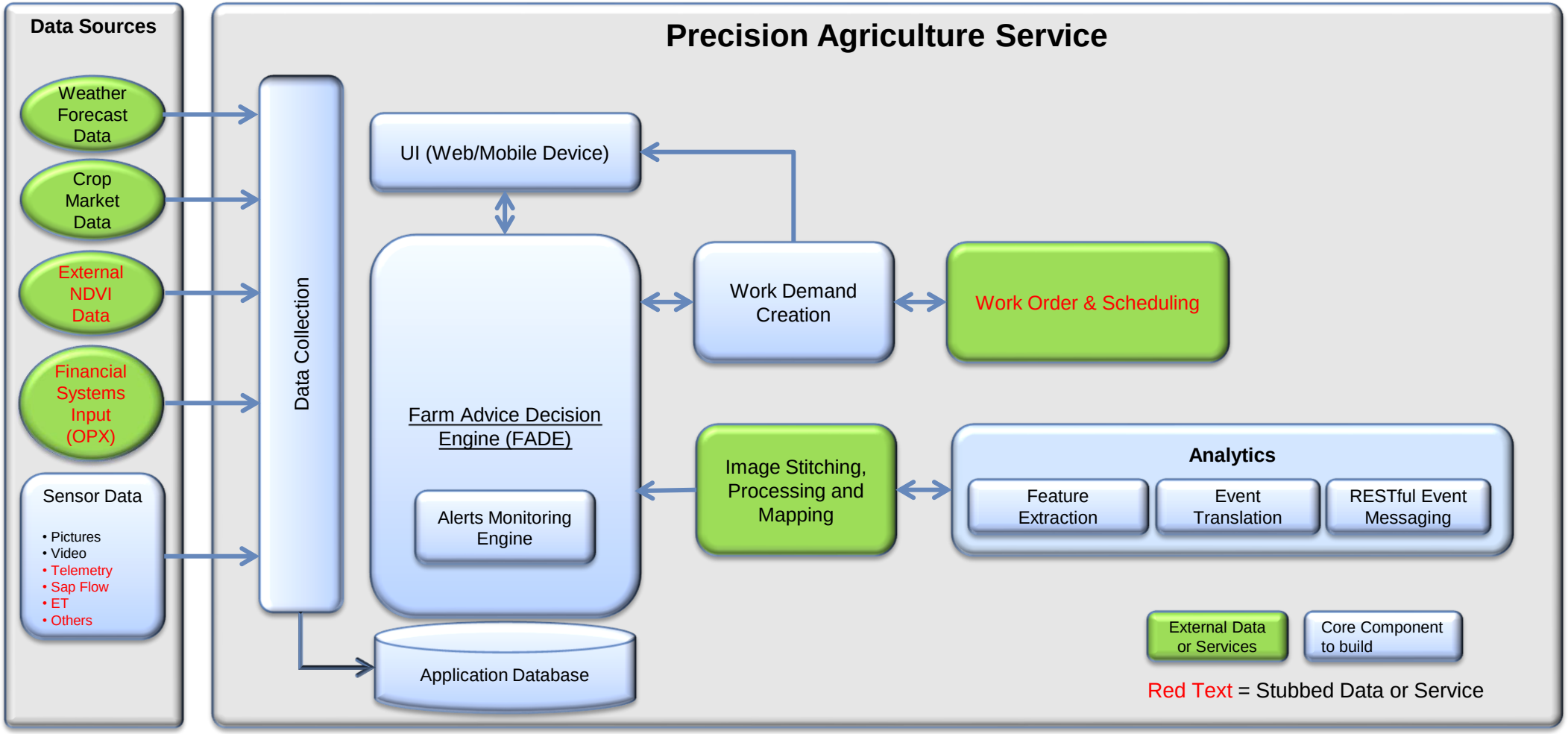
- Ability to create a new business service with repeatable revenue stream
- Grow and differentiate relationship with GTM partner through “sell with” model
- Market differentiation through innovation

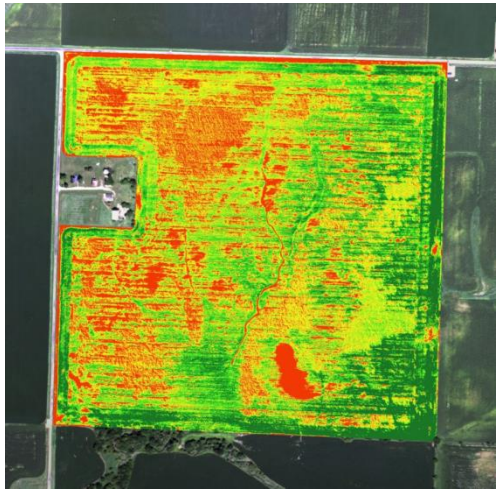
The PAS Technology Blueprint

The "working" prototype architecture will leverage existing components and help prove out the technology integration risk well in advance of a production system …

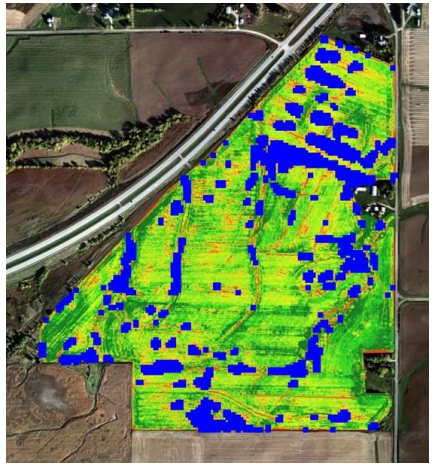


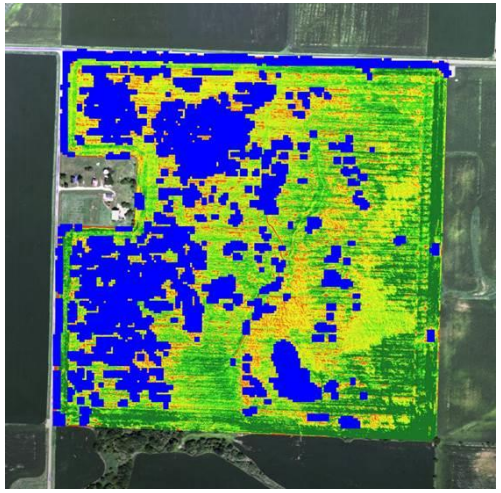
Some early results from image analysis …

NDVI Images from UAV



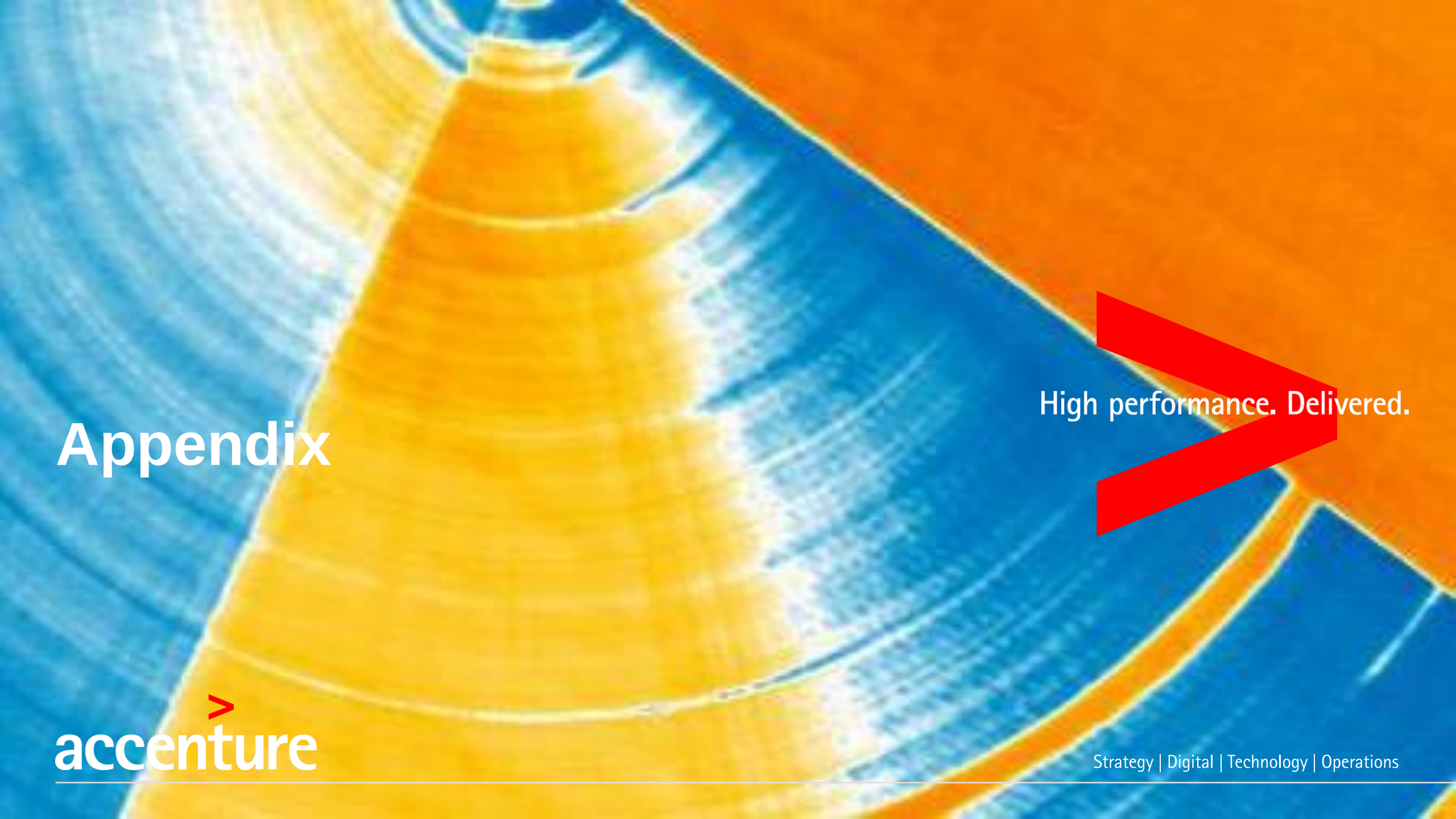
Initial Analysis of Problem Areas





Suggested Actions to be taken given other environmental inputs

See demo



Appendix

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The Agribusiness Landscape is Evolving

There is a fundamental need to change the way in which the farming industry operates that is being driven by a number of the following factors …

Farming Technology is Evolving, Challenging

- Delivering increasingly higher yields for growers
- Protection of intellectual property
- The need to both provide and consume agronomic data
- Increasing demand for customer service

Environmental, Health, and Safety Pressures

- Variability in weather and climate change
- Environmental pressures on use of chemical inputs
- Pressure to use less natural resources (land, water)
- Safer and more educated farm labour

Demand for Agronomic and Precision Ag Technology

- Lack of agronomic data to sources for all users
- Growing demand for prescriptive farming
- Data privacy concerns

Supply Chain Challenges

- Rising costs of energy, seeds, chemicals, and equipment
- Poor access to markets, financing, loans & insurance,
- Demand for product traceability

The PAS Prototype: Use Cases

For the PAS prototype, we've selected four key use cases from our complete list which are most representative of situations, equipment, and applications on a broad number of farms in common crop lifecycle stages today.

Overall PAS Use Cases

PAS Prototype Use Cases*

#	Prototype Name	Prototype Description
1	**Equipment Malfunction**	Problem detection, there's a circle in your pivot field, or evenly spaced lines. we detected what is likely a clogged spigot or a malfunctioning sprinkler head – irrigation not working correctly
2	**Disease or Insects**	Detected a pattern in a crop that is spreading over time – possible disease or infestation
3	**Irrigation**	Low rainfall detected by in field weather stations, review current forecast and decide on irrigation plan, assign irrigation activities
4	**Financial Alert**	Detected thresholds in commodity pricing on corn or soy beans, project yield and profit based on harvest now or harvest in 4 weeks, suggest plan of action

Crop Cycle → **Seed** → **Care** → **Harvest**

* Current plans which have some flexibility based on input from a GTM partner

The PAS Core Application: Components and Definitions

Component Name	Description
UI (User Interface)	Web pages that allow users to see information and interact with the application and data
FADE (Farm Advice Decision Engine)	Takes data from sensors, database, analytics and external feeds to provide recommendations and a dashboard of current state of farm agriculture operations
Work Demand Creation	Allows user to specify automated or manual action to be taken. Provides mechanism to create tickets or kick off an automated machine process.
Image Stitching Processing & Mapping	Takes data from cameras and camera sensors and creates maps based on pictures of fields and GPS meta data in images. Maps include NDVI, SAVI, and other agriculture indexes evaluating the colors sampled from the images
Data Collection	Component that collects, transforms, and aggregates various data sources into the application DB and provides data to the application components as they require it for processing.
Sensor Data	Data from various cameras and agriculture sensors used on farms
Application Database	Collection of the different data types, history and logging of activity
Weather Forecast Data	Data feed from sources such as Weather.com or agriculture specific weather reporting services
Crop Market Data	Commodity pricing data from various crop market reporting sources or services
External NDVI Data	USDA, university, and or other sources of NDVI data by crop type and location, also historical data not current in system for NDVI evaluations done locally in the past.
Analytics	Custom analytics services developed by the Accenture labs for evaluating video and images
Work Order Scheduling	Scheduling, distribution, and monitoring of actions specified by the Work Demand Creation application component.
Feature Extraction	Preprocessing step in image/video analytics that selects a set of features (feature vector) that could be taken by a recognizer/ classifier function to recognize a pattern.
Event Translation	Translating raw data from recognizer/classifier in to a standard set of events that could be consumed by other architectural components.
RESTful Event Messaging	Interfacing the communication between analytics component and all clients that pull analysis output.