Data Lake

Technology as a Platform for Research Driven Product Development

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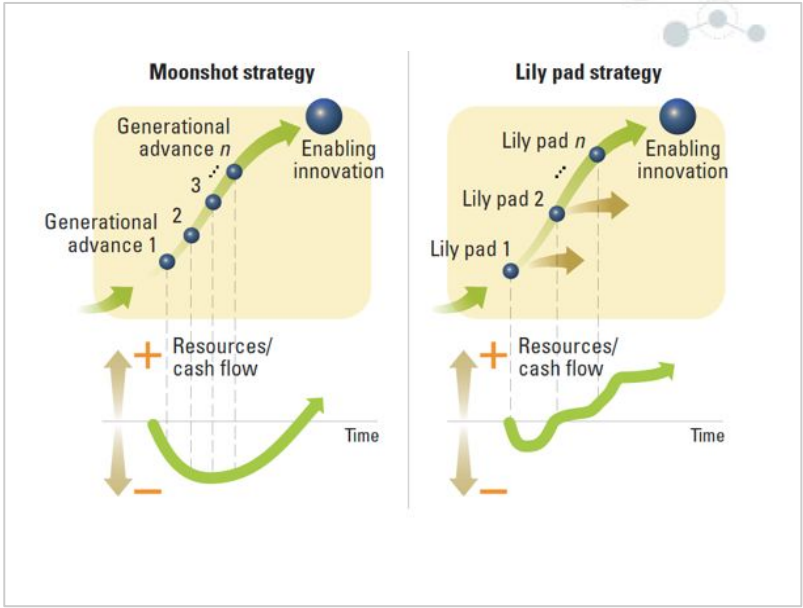
"Wherever there is domain expertise and a willingness to apply big data technologies, there's an opportunity to create the businesses of the future."

-- Alec Ross, The Industries of the Future [1]

How can we use big data?

INCREMENTAL INNOVATION

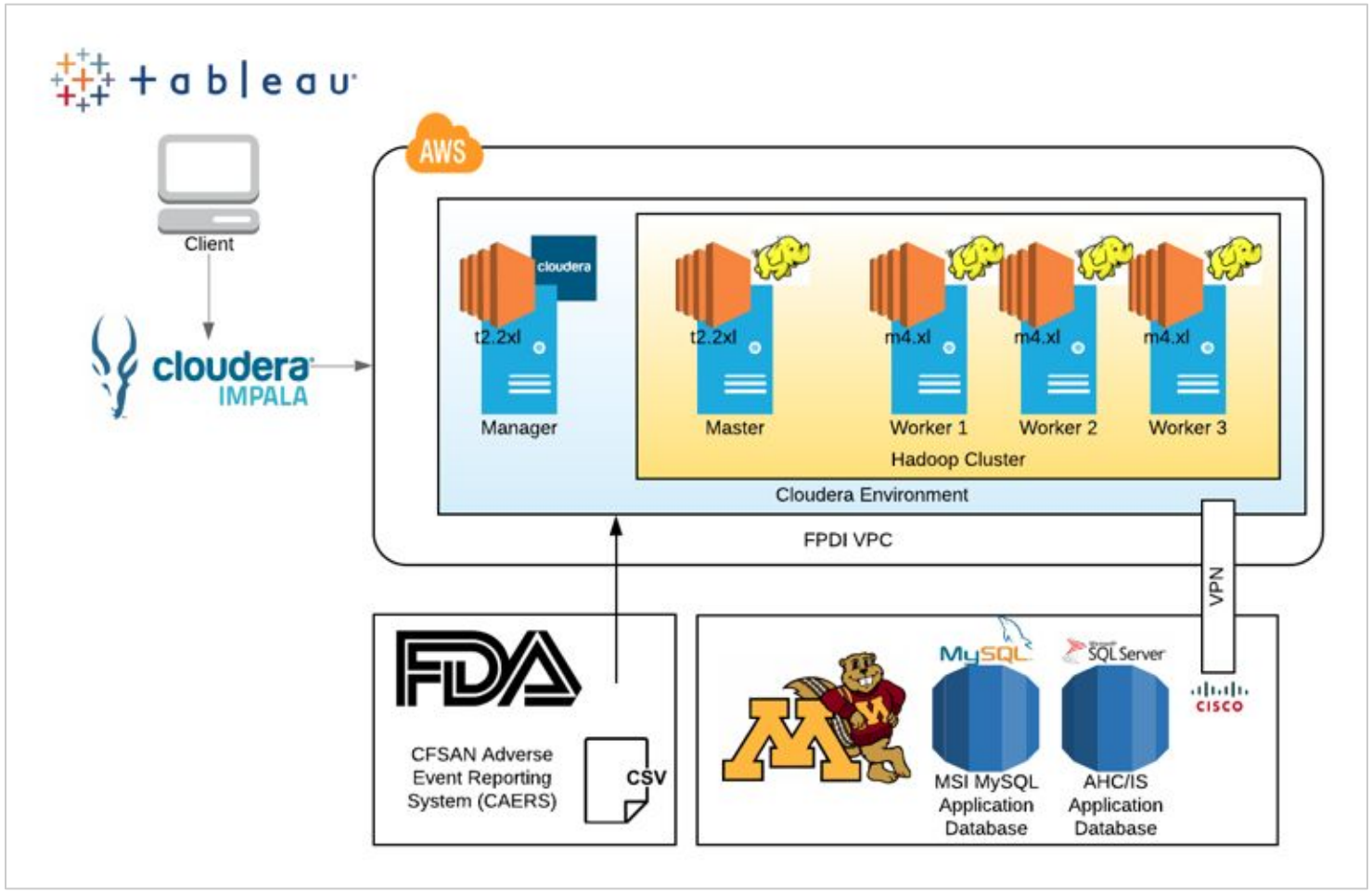
1. Develop a platform that supports efficient collection, curation and exchange of data.
2. Incrementally deploy new products from and for the platform.
3. Efficiently use resources to grow and generate cash flow.



Incremental Innovation [2]

A lily pad strategy for pursuing product development

Aligns well with the Lean Startup approach to commercialization.
Creates opportunity to explore a broad range of funding sources.
Allows developing organizational capabilities and core competencies.
Enables organizational pivots.

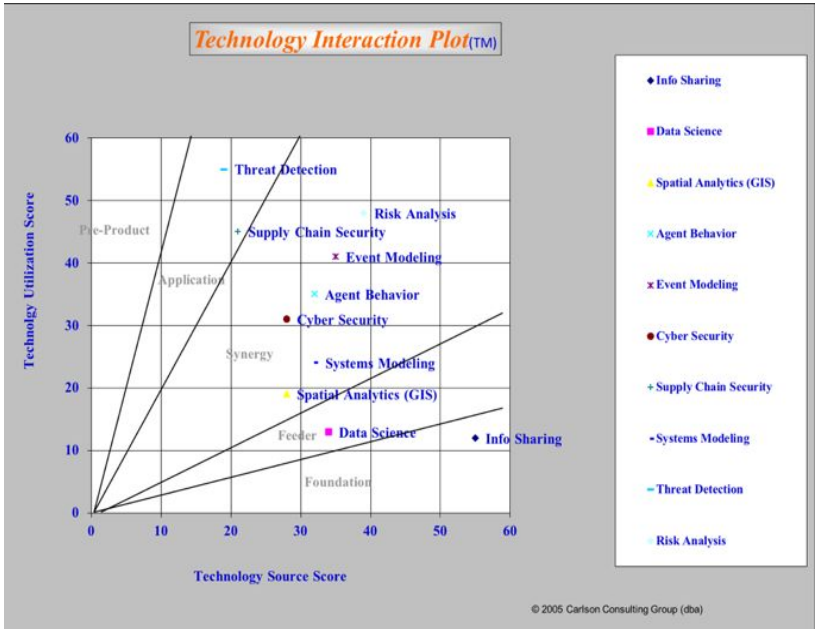


FPDI's Data Lake POC [3]

How did we get here?

THREE DRIVERS OF THIS CAPSTONE

1. DHS grant for Data Lake POC
   - *June 2016*
2. MOT Strategic Technology Analysis
   - *October 2016*
3. OTC Transfer Strategies
   - *October 2017*



Technology Interaction Plot [4]

Technologies that drive, pace and enable each other

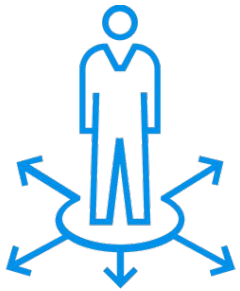
Information Sharing has the highest source score because it enables all others. Threat Detection has the highest utilization score because it requires all other technologies.

Feeder technology is Data Science it has the most potential.

Problem & Opportunity

We have a data lake

What should we do with it?



Advance and Utilize

Capitalize on shifts enabled by technology trends and increase skills, competencies and technology readiness to better utilize machines, platforms and crowds.

Approach & Methodology

	1. Analysis	2. Moves	3. Implementation
INitiate	Literature Review & Interviews	Product Selection (SG)	Normative Forecast
SPeculate	Identify Possible: 1) Technology Advances 2) Organizational Capabilities 3) Applications (use cases)	Identify Possible: 1) Opportunities 2) Costs 3) Revenue	Identify Possible: 1) Product Imp. 2) Partners 3) Paths
Incubate	Assess Opportunities	Calculate Value	Roadmap
REview	Documentation (TRL & Prod Inv)	Return on Investment	Results

Sustained Competitive Advantage + Emertxe (INSPIRE) Project Mgmt

Results & Recommendations

Outcomes, conclusions & next steps

What is taking place?

TRENDS, POLICY & PUBLIC INTEREST

Population: Millennials & Hispanic preferences for fresh & unprocessed, distrust of institutions

Market: Amazon, B2C, Startups, Innovation

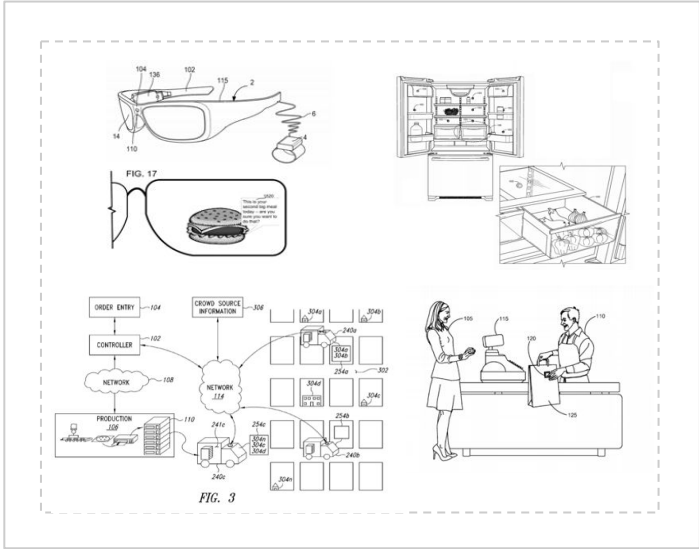
Technology: Cloud, Sensors, IoT, Machine Learning & AI, Big data has gone mainstream, Blockchain

Policy: FSMA, Lobbying, S&T Priorities, Administration changes

Public Interest: Sustainability, traceability, waste and alternative proteins

RESULT

Creating challenges for existing food and beverage businesses and for regulatory agencies. These challenges produce opportunities for FDPI to apply data analysis capabilities and unique domain expertise to addressing potentially unmet needs.



Notable Food Technology Patents [5][6]

What do we have to offer?

	Strategic Fit & Importance	Competitive Rationale	Ease of Execution	Ease of Implementation	Financial Risk vs. Financial Reward	Total
Food Adulteration Incidents Registry (FAIR)	10	10	10	5	10	**45**
World Factbook of Food	10	10	5	5	10	**40**
FRAME	10	10	5	5	10	**40**
Events (After Action eXchange)	10	10	5	5	5	**35**
Research Database	10	5	10	5	5	**35**
FARM/ FS Resource Library	10	10	5	0	0	**25**

Gate 3 (development gate) of the Phase Gate scorecard

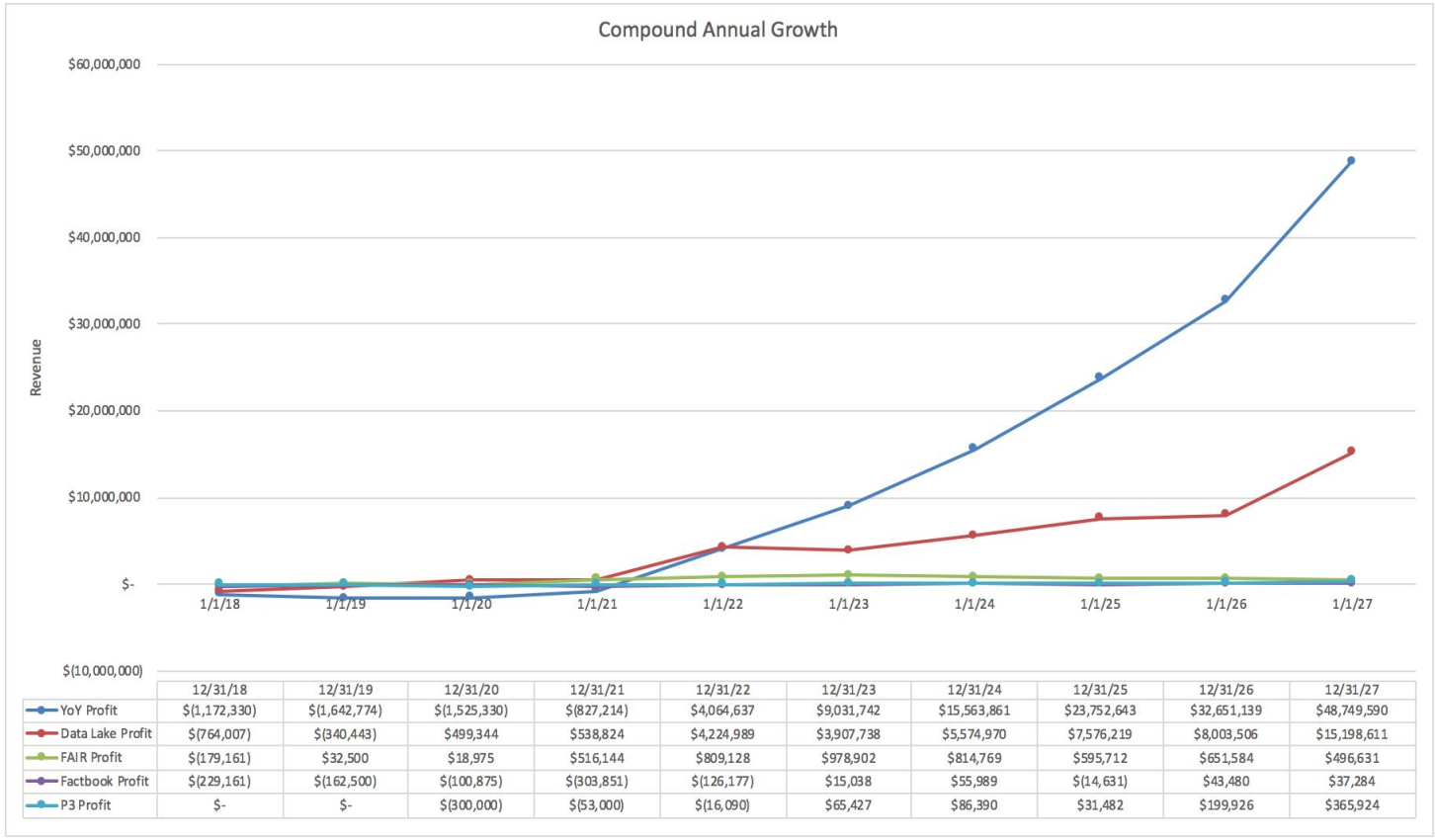
What do we need and what will it cost?

Personnel
IT Manager
Business Analyst
Programmer
Data Scientist*
Systems Engineer
Support
Intern

Data Lake Year 1 New Development & O&M										
	Direct Labor		Direct Material			Indirect Costs		Total		
			Services		Infrastructure	SG&A*				
Data Lake O&M	$	133,176	$	63,000	$ 58,076	$	76,276	$	330,527	
Data Lake New Dev	$	79,080	$	81,000		$	48,024	$	208,104	
FAIR O&M	$	82,218	$	-	$ 1,800	$	25,205	$	109,223	
FAIR New Dev	$	92,260	$	-	$ -	$	27,678	$	119,938	
Factbook O&M	$	82,218	$	-	$ 1,800	$	25,205	$	109,223	
Factbook New Dev	$	92,260	$	-	$ -	$	27,678	$	119,938	
Total								$	**996,954**	

Operational Costs

What is the potential revenue?



	12/31/18	12/31/19	12/31/20	12/31/21	12/31/22	12/31/23	12/31/24	12/31/25	12/31/26	12/31/27
YoY Profit	$(1,172,330)	$(1,642,774)	$(1,525,330)	$(827,214)	$4,064,637	$9,031,742	$15,563,861	$23,752,643	$32,651,139	$48,749,590
Data Lake Profit	$(764,007)	$(340,443)	$499,344	$538,824	$4,224,989	$3,907,738	$5,574,970	$7,576,219	$8,003,506	$15,198,611
FAIR Profit	$(179,161)	$32,500	$18,975	$516,144	$809,128	$978,902	$814,769	$595,712	$651,584	$496,631
Factbook Profit	$(229,161)	$(162,500)	$(100,875)	$(303,851)	$(126,177)	$15,038	$55,989	$(14,631)	$43,480	$37,284
P3 Profit	$-	$-	$(300,000)	$(53,000)	$(16,090)	$65,427	$86,390	$31,482	$199,926	$365,924

Anticipated Revenue

How could it be implemented?

New Product Development

Standardize Food categorization in FAIR and Factbook.

Build case management (reinforcement learning) into FAIR.

Competitive analysis or partnership

Demonstration of Success

Host a hackathon or crowd driven analysis on pre-prod data lake infrastructure.

Find early adopter through value proposition workshop.

Deploy to Production

Meet or exceed infrastructure requirements.

Complete critical technology advances.

Technology Roadmap

How would we like the future to evolve?

Normative Forecast

- Build a data-driven organization
- Explore new ideas and prototype
- Seek opportunities for incremental innovation
- Be ready and capable to respond

Mission of Data Science Teams [7]

How did MOT course material contribute?

No.	Course Title	Learnings and Applications
MOT 8233	Strategic Management of Technology	**External and Internal Analysis** for Sustained Comp. Adv. **(SCA) = [EA + IA] + [BS + … + IS] + [I + R]**
MOT 8221	Project and Knowledge Management	Effectively and efficiently **organize and manage projects**
MOT 8114	Strategic Technology Analysis	Technology Interaction Matrix (**TIM**) and Technology Interaction Plot (**TIP**)
MOT 8214	Technology Foresight and Forecasting	**Trend Analysis**, Scenario Planning, and Roadmapping
MOT 8920	Science and Technology Policy	Changes in **policy** are impacting approaches and availability of funding
MOT 8940	Managing Intellectual Property	Strategic review of the competitive **intellectual property** landscape and analysis of trends in this area.
MOT 8212	New Product Development	Management of **new product innovation** processes, stage gate and lean startup
MOT 8232	Managing Technological Innovation	Consideration for Machines, **Platforms** and the Crowd.
MOT 8122	Financial Management for Tech-Based Organizations	Application of **financial principles** to a technology product or venture.
MOT 8502	Innovation Leadership and Organizational Effectiveness	Development of **new teams** and organizations

Thank you!

Any questions?

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References

[1] A. Ross, The Industries of the Future. Simon & Schuster Audio, 2016.
[2] J. V. Sinfield and F. Solis, “Finding a lower-risk path to high- impact innovations,” MIT Sloan Manag. Rev., 2016.
[3] T. Noll, “Cloudera Hadoop in AWS.” Minneapolis, 2017.
[4] T. Steinmann, “Strategic Analysis of Technology for the Food Protection and Defense Institute,” Minneapolis, 2016.
[5] “Sniffing Fridges & Smart Trash Cans? Amazon & Walmart Look To Connected Appliances To Track Shoppers,” 2018.
[6] “Food Tech Patent Watch,” CBInsights, 2018.
[7] IBM, “Machine Learning Everywhere – the new normal for competitive advantage Five Ways Data Science and Machine Learning Deliver Business Impacts,” Gart. Res., no. 1, pp. 1–8, 2018.

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