



We'll get you there.

Improving Business Operations with Machine Learning and Artificial Intelligence

Troy Hollings, Digital Solutions Consultant

Spencer Lourens, Managing Principal of Data Science, Machine Learning and Artificial Intelligence

Rob Johnson, Director of Digital Growth

CPAs | CONSULTANTS | WEALTH ADVISORS

©2022 CliftonLarsonAllen LLP. Investment advisory services are offered through CliftonLarsonAllen Wealth Advisors, LLC, an SEC-registered investment advisor.



The information herein has been provided by CliftonLarsonAllen LLP for general information purposes only. The presentation and related materials, if any, do not implicate any client, advisory, fiduciary, or professional relationship between you and CliftonLarsonAllen LLP and neither CliftonLarsonAllen LLP nor any other person or entity is, in connection with the presentation and/or materials, engaged in rendering auditing, accounting, tax, legal, medical, investment, advisory, consulting, or any other professional service or advice. Neither the presentation nor the materials, if any, should be considered a substitute for your independent investigation and your sound technical business judgment. You or your entity, if applicable, should consult with a professional advisor familiar with your particular factual situation for advice or service concerning any specific matters.

CliftonLarsonAllen LLP is not licensed to practice law, nor does it practice law. The presentation and materials, if any, are for general guidance purposes and not a substitute for compliance obligations. The presentation and/or materials may not be applicable to, or suitable for, your specific circumstances or needs, and may require consultation with counsel, consultants, or advisors if any action is to be contemplated. You should contact your CliftonLarsonAllen LLP or other professional prior to taking any action based upon the information in the presentation or materials provided. CliftonLarsonAllen LLP assumes no obligation to inform you of any changes in laws or other factors that could affect the information contained herein.

Guest Speaker



- Spencer grew up **on a farm in Central Iowa** between the capitol city of Des Moines and Ames, the home of the Iowa State Cyclones.
- He received his **BS and a PhD in Biostatistics** in 2015 from the University of Iowa.
- He became an **Assistant Professor at Indiana University in the School of Medicine** in Fall of 2015 and began consulting for CLA in October of 2018, transitioning to full time at CLA in August of 2019.
- He has **vast experience** utilizing scripting languages to access, **organize and wrangle**, and model data from disparate and "big" sources.
- He has experience with **modeling with traditional methods including but not limited to linear, logistic, and non-linear regression methods in addition to statistical and machine learning methods such as random forests, boosting, SVMs, and neural networks for classification, translation, computer vision, forecasting, and NLP.**



What We'll Talk About

- Definitions
- Brief history
- Well-known applications
- Business Applications
 - Augmenting process automations(transfer learning)
 - Using historical data to predict the future
- How to build a use-case for utilizing these types of technology



What is it?

Deep Learning

Deep Learning is a subclass of machine learning. It is based on the neural networks that permit a machine or software to train itself to perform a task. It provides high accuracy output comparable to machine learning.

Machine Learning

Machine Learning is a subclass of AI. It has the Algorithms that parse data, learn from it, and then apply what they have learned to make the informed decisions and then get improved based on those experiences. The category includes deep learning.

Artificial Intelligence

Artificial Intelligence(AI) is sometimes called machine learning. It is the intelligence exhibited by machines or softwares – unlike the natural intelligence displayed by humans and animals.



An AI Timeline

1956

- John McCarthy coins the term for AI

1960

- The first machine, The Perceptron, learns by trial and error

1976

- First articulated robot arms for assembly lines doubles the rate of production

1997

- IBM's Deep Blue beats Garry Kasparov at chess

2011

- Introduction of Siri, a voice-assistant powered

2015

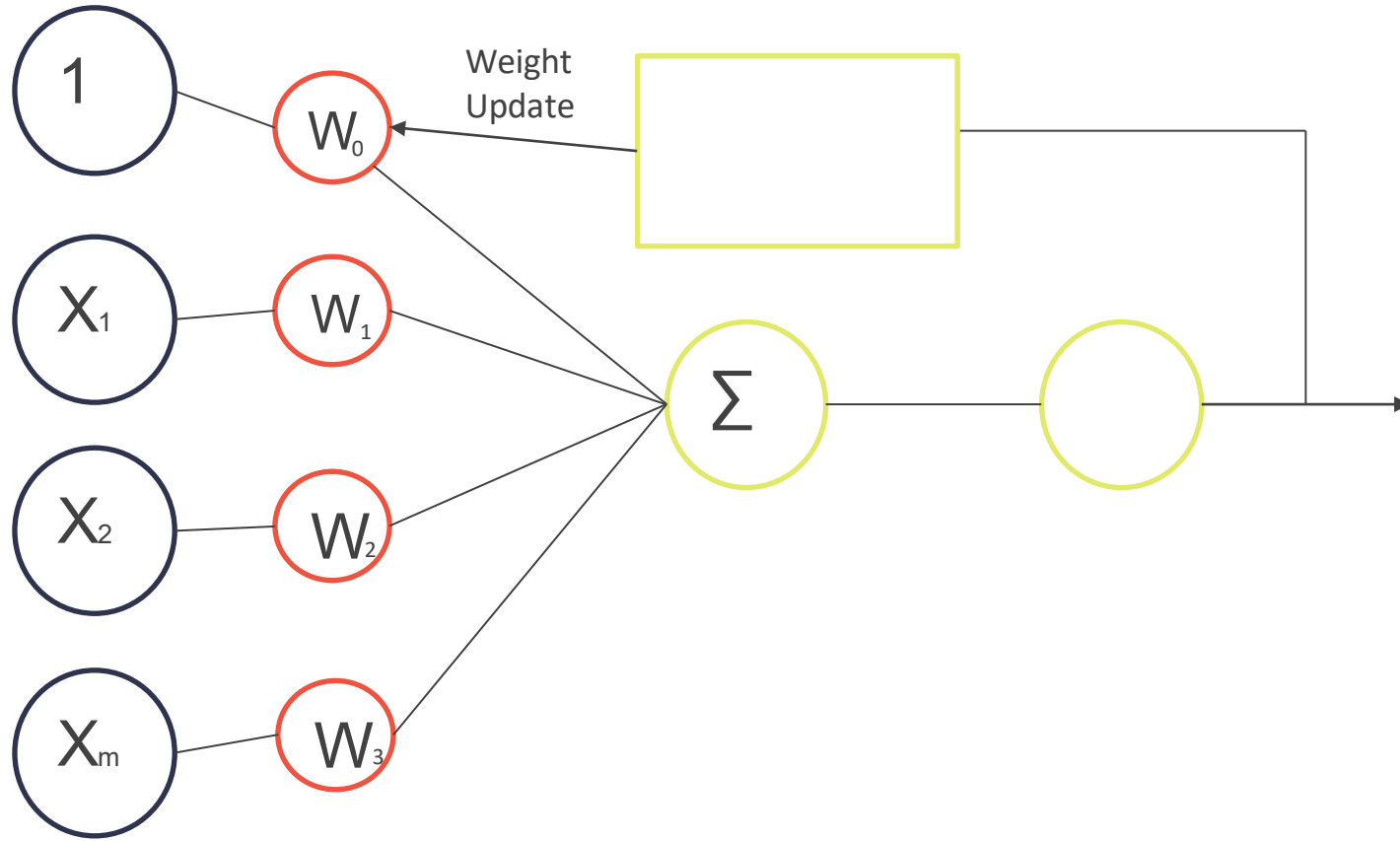
- Amazon launches its virtual assistant, Alexa



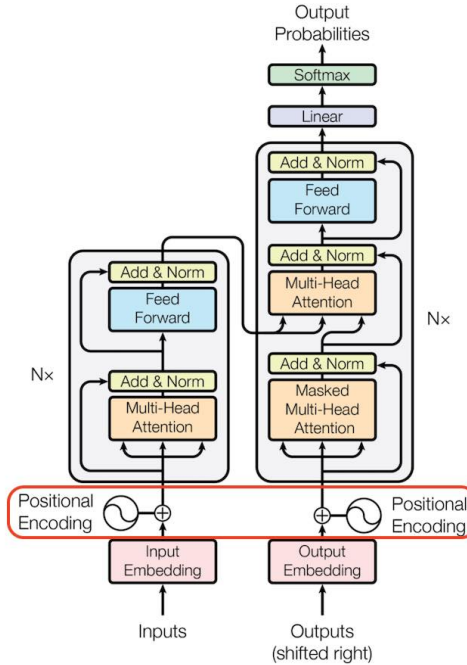
Buzzword Bonanza: Stump the PhD!

- Artificial Intelligence
- Machine Learning
- Deep Learning
- Data Analytics
- Data-driven





Transformers and Attention



From 'Attention Is All You Need', Vaswani et al.



Well-Known Applications(AI)

- Face Recognition
- Text Editing
- Social Media – personalization
- Chatbots
- Media Streaming Recommendations
- Optimized searches



How Businesses Use AI Today

Automation enhanced with AI alleviates repetitive or even dangerous tasks.

Data analytics provides businesses with insights never before possible.

Natural language processing allows for intelligent search engines, helpful chatbots, extraction of meaning from unstructured documents



Common Uses for AI in Business

Transferring and cross-referencing data; updating files, structuring unstructured data

Consumer behavior forecasting and product recommendations

Fraud detection/loss prevention

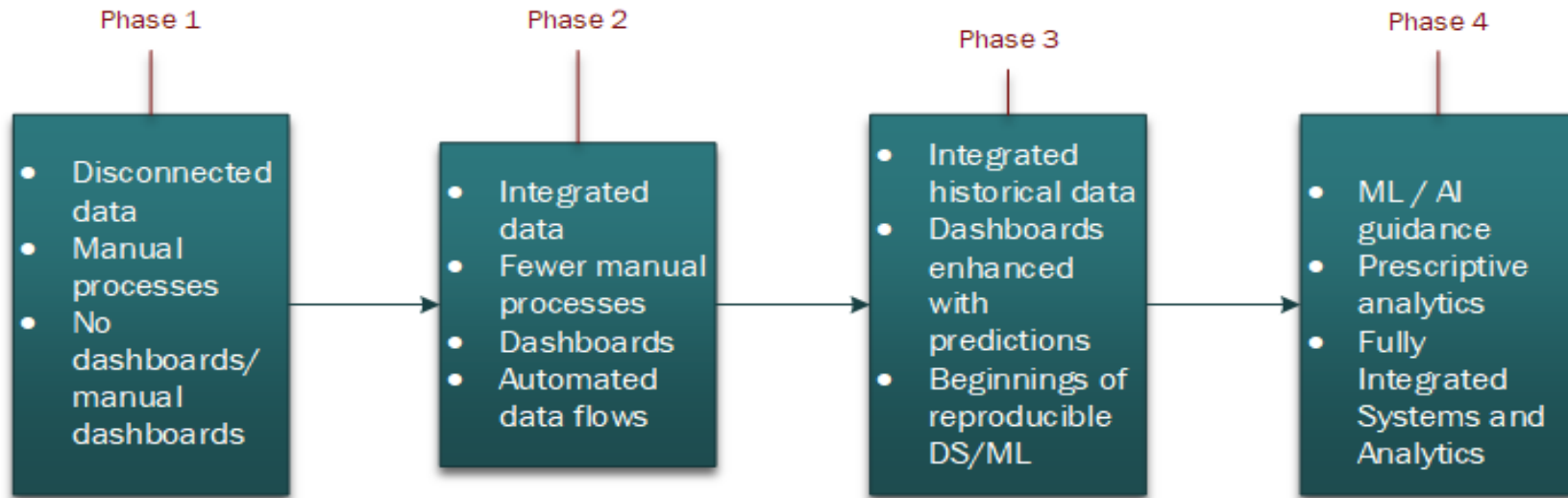
Personalized advertising and marketing messaging

Customer service via telephone or chatbots



Client lifecycle: CLA Digital

We meet you where you are



Buzzword Bonanza: Stump the PhD!

- Non-Fungible token
- Metaverse
- Big Data
- Neural Network
- Cluster analysis



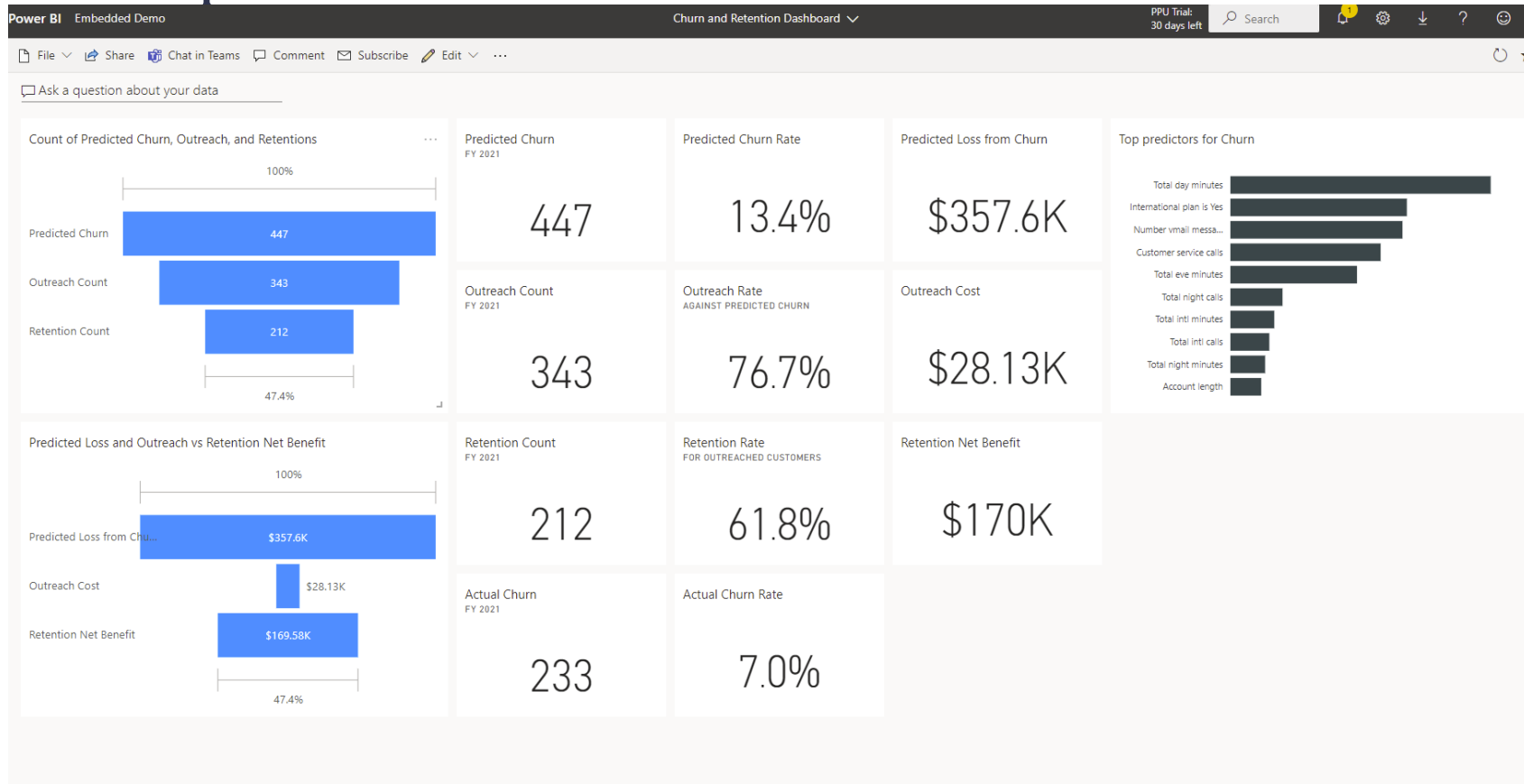


Use Cases

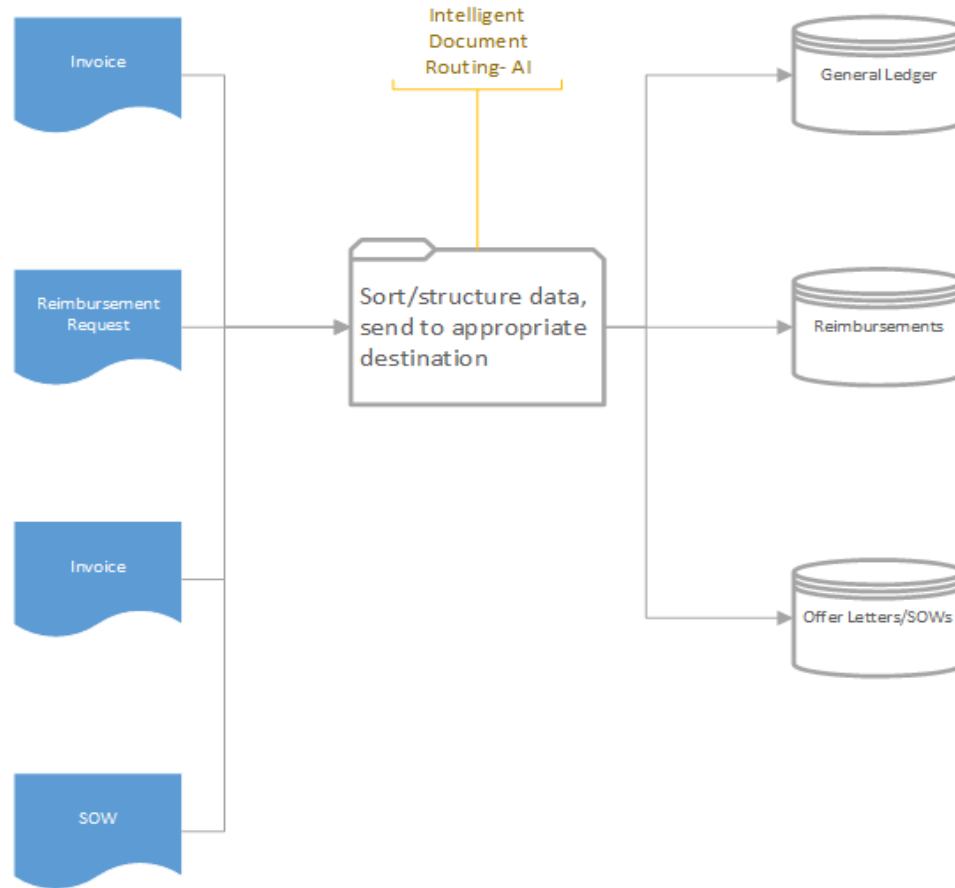
We'll get you there.

CPAs | CONSULTANTS | WEALTH ADVISORS

Example Dashboard



Process Automation: Augmentation with AI



Extract Data - Invoice

- Humans act as reviewers instead of “doers”
- Save time, reduce errors
- Reduce time staff work on low reward activities → reduce turnover

INVOICE

BILUTO

Bench Accounting

545 Robson St

Vancouver BC V6B 2B7 Canada

info@bench.co

Invoice Number

000123

Invoice Date

May 10, 2018

Payment Due

May 30, 2018

Shipping Details

Order Date

May 10, 2018

Est. Delivery Date

May 10, 2018

Method

Ground

Trackable

Yes

Shipping To

545 Robson St Vancouver BC V6B 2B7 Canada

Note

To be delivered to cargo bay #2

Item	Qty	Unit Cost	Amount
10 Chairs	10	\$500.00	\$5,000.00
Comfortable but overpriced chairs			
Subtotal			\$5,000.00
Tax (13.0%)			\$5,650.00
Total			\$5,650.00



Healthcare: Physician Practice

Problem:

- Multiple locations
- Multiple providers
- Multiple systems
- Need financial and operational insights
 - Consolidated
 - By Location
 - By Provider

8 Locations



[This Photo](#) by Unknown Author is licensed under [CC BY-NC](#)

26 Providers



6 Systems



Healthcare: Physician Practice

Action:

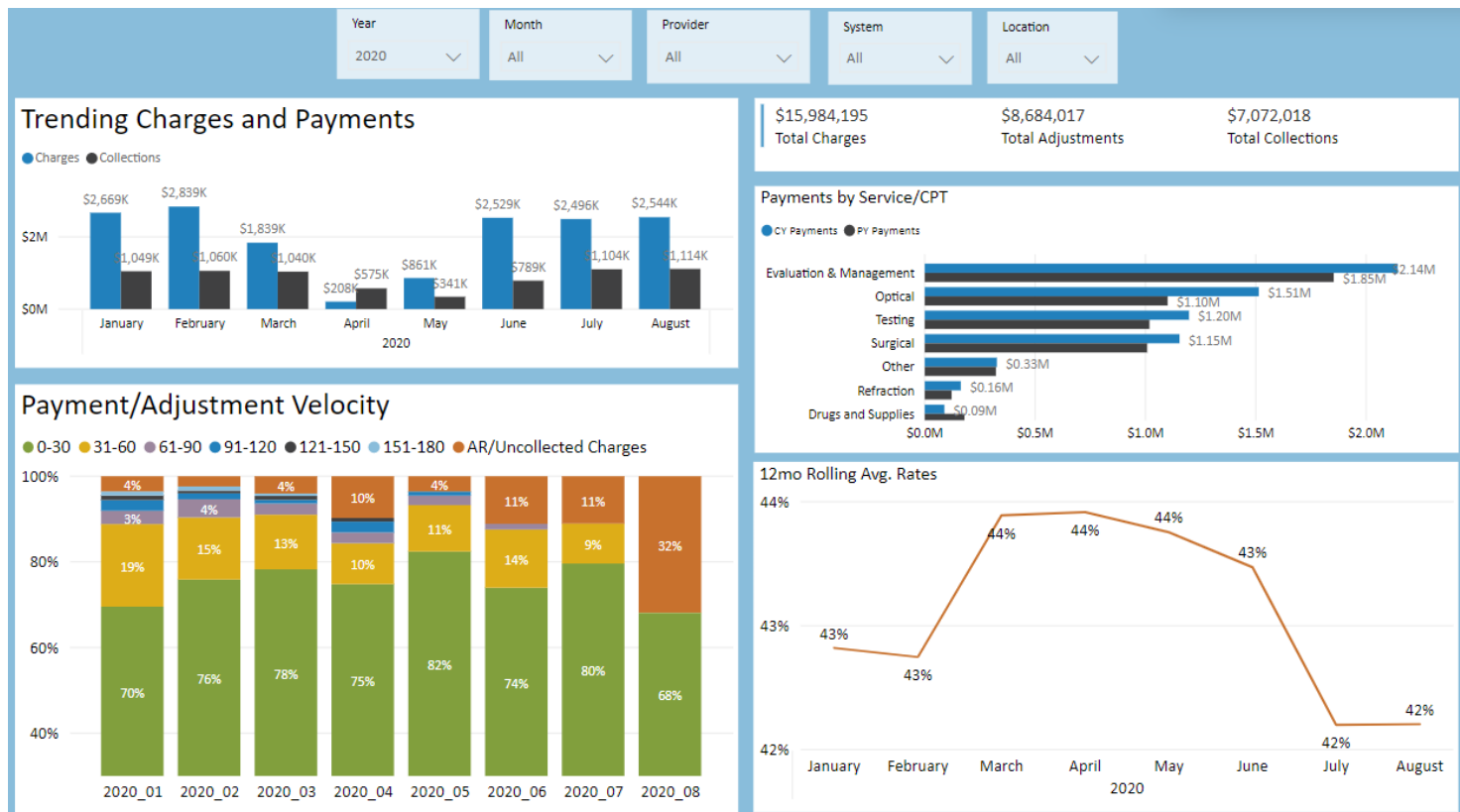
- Develop a Power BI dashboard with monthly updates
- Use data science techniques to clean and process over 200 source files automatically each month

Over 200 Excel files of data monthly: 80% garbage



RStudio

Healthcare: Physician practice



Healthcare: Physician practice

Problem:

- Multiple locations
- Multiple systems
- Need financial and operational insights
 - Consolidated
 - By Location
 - By Provider

Action:

- Develop a Power BI dashboard with monthly updates
- Use data science techniques to clean and process over 200 source files automatically each month

Result:

- A set of reports that are web accessible 24/7 to the client
- Efficiency gain of at least one FTE
- Better informed management decisions



Buzzword Bonanza: Stump the PhD!

- Cloud Computing
- AI Chatbot
- Power BI
- RPA
- Data Mining



- Manual data entry
- Multiple Excel files
- Large data files containing PII duplicated 10s or 100s of times
- Email back and forth with clients

[illegible]

Internal – FI Loan Review

Action:

- Catalyst
- Development of a digital platform solution
 - Client facing App
 - Internal App
 - Automated reporting
 - Stored data

Financial Institution Loan Review Portal

Home | About us | Borrowers Listing | Q | Sign in

Hey, welcome to Power Apps Portals!

[Learn more](#)

SANDBOX

← Show Chart + New Delete Refresh Email a Link Flow Run Report Excel Templates Export to Excel

Active Loan Reviews ▾

Search this view

✓ Name ↑ ▾	Created On ▾
---	5/20/2021 4:50 PM
---	5/27/2021 4:09 PM
Test Loan Review	6/7/2021 8:14 PM
Test Loan Review Completed	6/8/2021 8:06 PM

Internal – FI Loan Review

Problem:

- Manual data entry
- Multiple Excel files
- Large data files containing PII duplicated 10s or 100s of times
- Email back and forth with clients

Action:

- Catalyst
- Development of a digital platform solution
 - Client facing App
 - Internal App
 - Automated reporting
 - Stored data

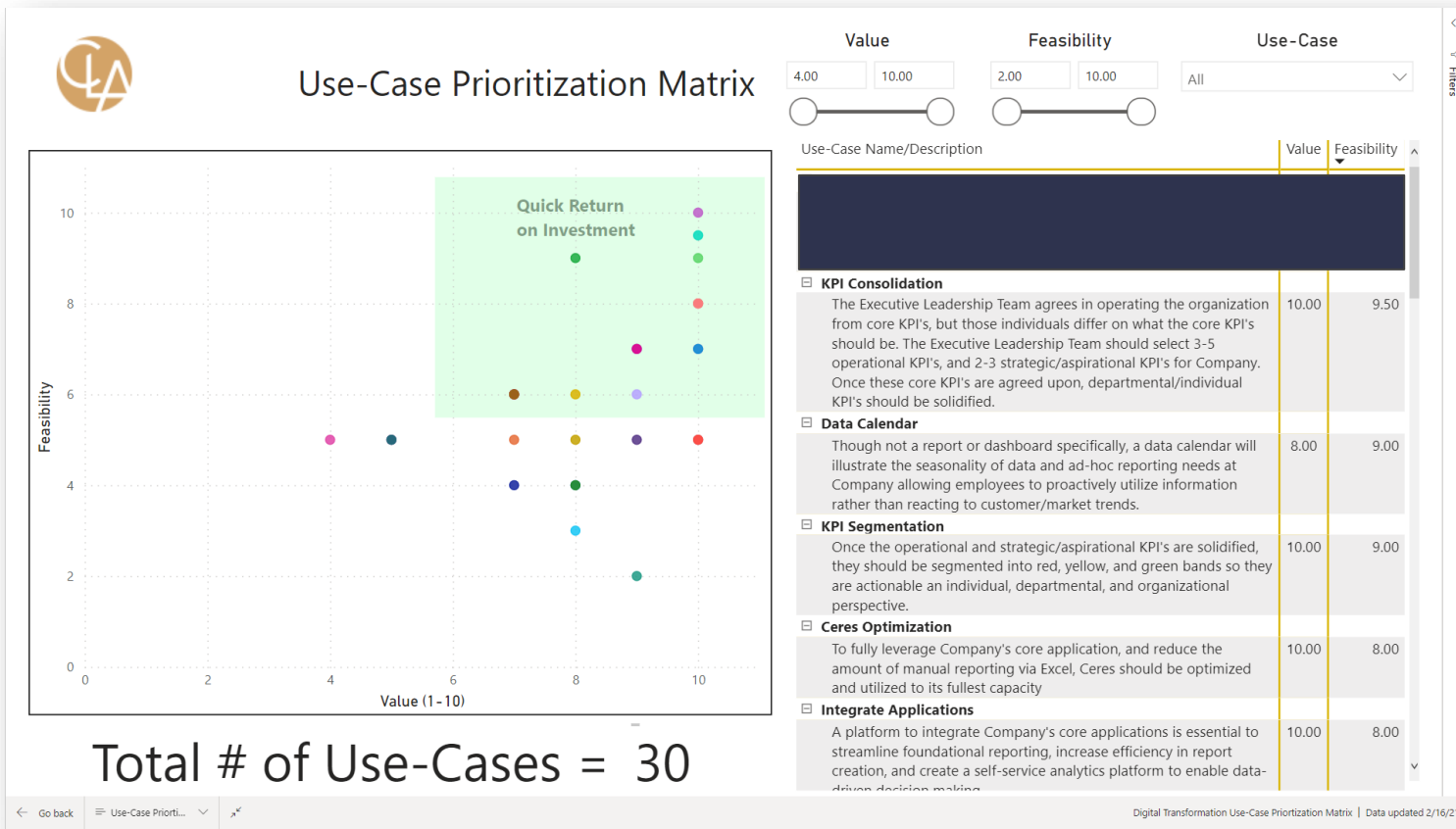
Result:

Development is ongoing

- Improved/seamless client experience
- Efficiency
- Quality
- Insights
- Compliance to operational solution
- Open new market



Food Bank



Food Bank

Problem:

- We need a new ERP
- Managing growth
- Understanding impact
- Identifying potential donors

Action:

- Began as an ERP selection project
- Then the Digital team got involved
- It became an Assessment
- Developed a prioritized digital transformation plan

Result:

A \$500,000 engagement

- Data infrastructure to support the org
- More volunteers
- Increased donations
- More food served
- Project is ongoing



Construction: Job Reporting Dashboard

Problem:

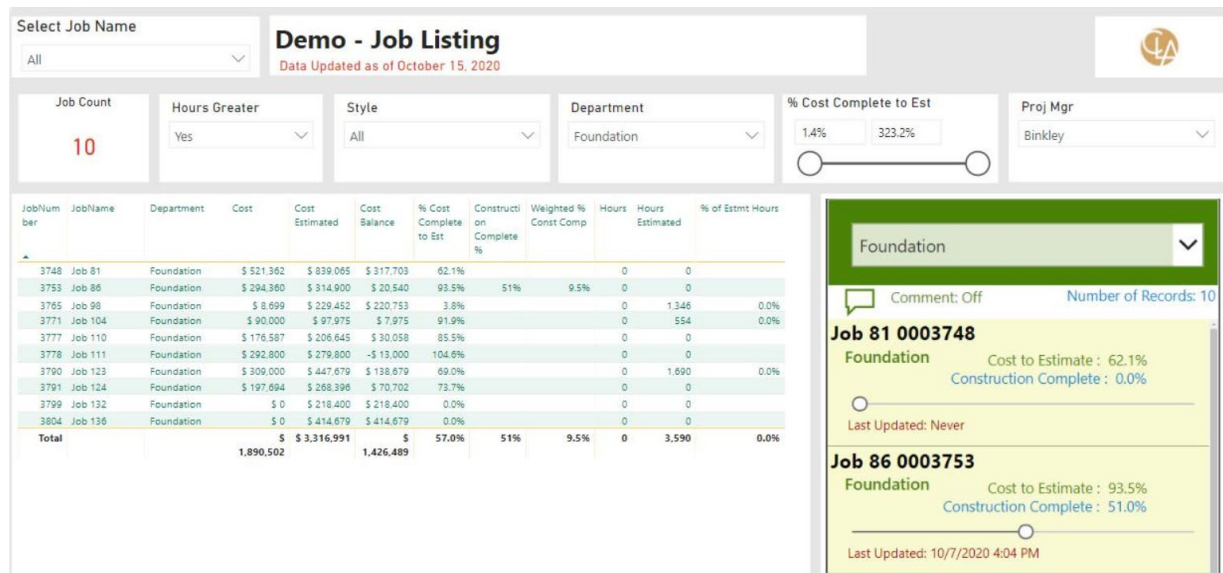
- 90+ Active projects
- Weekly paper reports
- No feedback from field managers
- Need corporate and job-level transparency
- Need to capture actual construction progress



Construction: Job Reporting Dashboard

Action:

- Start with Power BI dashboard
- Embedded Power App to capture actual construction progress
- User-level filtering to focus department leaders and project managers on only their activities



Construction: Job Reporting Dashboard

Problem:

- 90+ Active projects
- Weekly paper reports
- No feedback from field managers
- Need corporate and job-level transparency
- Need to capture actual construction progress

Action:

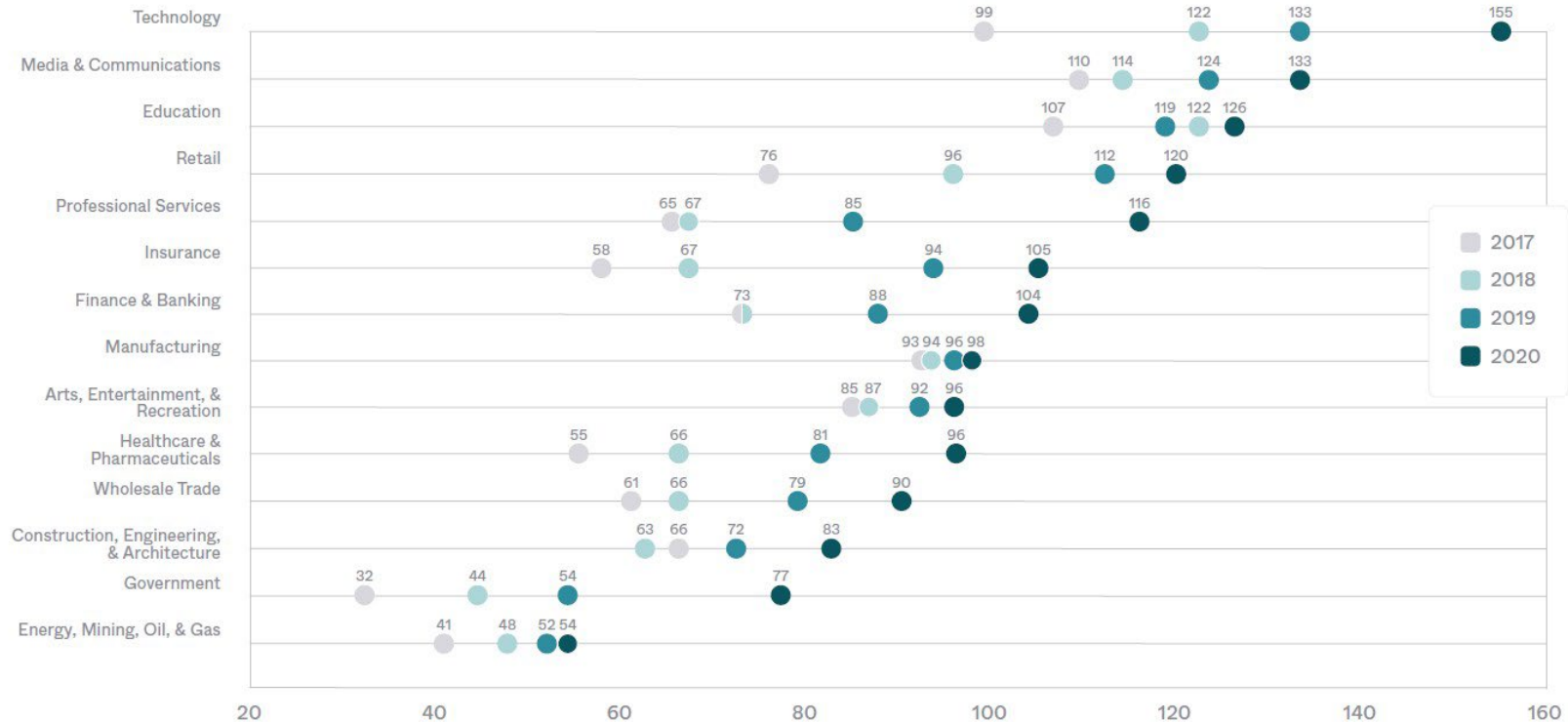
- Start with Power BI dashboard
- Embedded Power App to capture actual construction progress
- User-level filtering to focus department leaders and project managers on only their activities

Result:

- Operational transparency
- Efficiency gain
- New insights to drive change



Why the focus on data?



Estimated growth of applications used by companies (increased 68% over the past 4 years)





Catalyst Services Assessments

Benchmarking
Process Re-Engineering Advisory
Transformation Roadmap
Change Management

- Identify and prioritize areas for digital transformation
- Wide array of diagnostic assessments and benchmarking programs, i.e., Data Readiness Assessment
- Engagements can be comprehensive or targeted



Gain detailed analysis and recommendations



Provides various design and implementation service options



Implementation Roadmap

	Description	January	February	March	April	May	June	July	August	September	October	November	December
Design Optimization	KPI Identification & Consolidation												
	KPI Segmentation												
	BI Team Building / Training / Mentoring / Coaching												
Data Warehousing	Determine infrastructure availability and licensing												
	Gather additional data warehousing requirements												
	Design data warehouse schema												
	Data warehouse build (Custom Tracker, QCube, Additional Applications)												
	Data warehouse testing												
	Data warehouse deployment												
Dashboarding and Reporting	Create Board, Executive, and Department-level wireframes												
	Create prototype dashboards from the wireframes at the Board, Executive, and Department-level												
	Create wireframes and prototypes of non-dashboard reports												
	Begin dashboard build-out												
	Begin report build-out												
	Create ad-hoc reporting structure with Service Level Agreements (SLA's)												
	Test and deploy dashboards												
	Test and deploy reports												
User Enablement	User-acceptance testing												
	Begin end-user training												
	Create and execute bug-fix/feature request process												
	Create and execute maintenance procedures												
	Business and technical documentation												
	Complete end-user training												
Project/Change Management	Create change management plan												
	Execute change management plan												
	Create project management plan												
	On-going project management activities												



Explore CLA Digital

- Schedule a workshop Session
 - 2-3 hour session with one of our team
 - Be sure to click “I want to be contacted”
 - One of our digital growth associates will call you



Buzzword Bonanza: Stump the PhD!

- IBM Watson
- Supercomputer
- Computer Vision
- Autonomous vehicles
- TensorFlow
- Python (not the snake)



Q & A



Thank you!

Troy Hollings
Troy.Hollings@CLAconnect.com

Spencer Lourens
Spencer.Lourens@CLAconnect.com

Rob Johnson
Rob.Johnson@CLAconnect.com



CLAconnect.com



CPAs | CONSULTANTS | WEALTH ADVISORS

©2022 CliftonLarsonAllen LLP. Investment advisory services are offered through CliftonLarsonAllen Wealth Advisors, LLC, an SEC-registered investment advisor.