Precision Consulting Transformation Road Map

Operation Management

Precision Consulting
Team at Northwestern

Danish Moti

George Purtell

Kimberly Van

Introduction

Precision Consulting considered 10 different use cases and found the top three cases that this company can implement to deliver more for the consumer while lowering the cost of operations. Our roadmap for digital transformation focuses in improving operation management. Operation management can include anything from price optimization to delivery efficiency to warranty claims. Our recommendations require support from all executive level stakeholders, so that they may signal to the entire company that this digital transformation is necessary for the company's success. This road map can also put the company in a position to compete with distinctive capabilities that other competitors cannot match.

Top three use cases for OpsTech

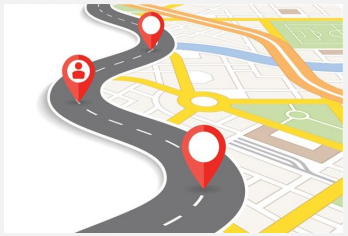
1. Product Development
2. Quality Control
3. Fault prediction
4. Predictive maintenance
5. Demand forecasting
6. Price optimization
7. Transportation Route Optimization
8. Warranty analysis
9. Robotization
10. Computer vision applications

Why three use cases?

The Operations Team has chosen to address the process of digital transformation through two points-of-view: the consumers and your company. We aim to increase customer satisfaction yet keep the operation costs low for your company. By being customer-obsessed, our three use cases are able to better streamline the operation workflow from start to end in order to meet the consumers' demands.

Demand Forecasting

- Accurately predicting demand for various products to optimize manufacturing schedule and scale
- Minimize excess inventory and sunk costs
- Focused product marketing in certain regions



Transportation Route Optimization

- Increase speed and number of deliveries
- Reduce time per route
- Reduce costs (e.g. fuel) with optimized routes

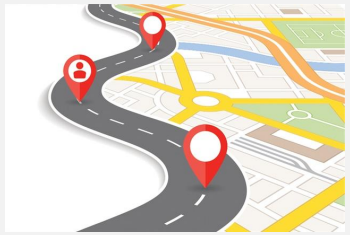
Warranty Analysis

- Provide coverage that is deemed to be an asset by the consumer
- Reduce cases of warranty claims
- Reduce cost of completing a warranty claim

Problems to address

Demand Forecasting

- Uncertainty of product demand by consumer region and type
- Irregular manufacturing schedule
- Unsold inventory results in sunk costs



Transportation Route Optimization

- Inefficient routes result in high costs
- Lower number of deliveries completed
- Higher risk of missed/delayed deliveries

Warranty Analysis

- Company warranty costs are high
- Consumers highlight the warranty as deterrent to purchase

Solutions and benefits

Demand Forecasting

- Sensitivity test for demand in different regions and customer groups to allow company to have proper understanding of consumer demand across entire portfolio of products
- Once firm forecast is created, begin to model future demand while considering various industry and market transformations
- Capture forecast trends and takeaways, and translate this information into actionable price point optimization for each offered product

Transportation Route Optimization

- Optimal routes reduce costs in fuel and corresponding vehicle maintenances.
- Decrease number of vehicles and drivers need to complete deliveries
- Increase the speed and number of deliveries, resulting in shorter wait times for customers
- Reduce the risks of missed/delayed deliveries, resulting in higher customer satisfaction
- Dynamic capabilities to manage last-minute scheduling

Warranty Analysis

- Track warranties by product and consumer. Monitor which products are most likely to come back as a warranty claim. Monitor which consumers are most likely to make a warranty claim.
- Implement changes in product development to ensure that the product is less likely to return in warranty claim
- Rewrite policies for products. Increase warranties for products that are the least likely to cause a claim. Either improve the product or reduce the warranty for products that cost the most to repair.

Visualization, Algorithms, and AI for Analytics

Demand Forecasting

- A predictive model that can utilize historical demand data, as well as current market-wide information, to pinpoint future demand for an array of products across various regions and consumer types, while storing data in Hadoop tables
- A ML program (MS Azure) that can learn from the accuracy of original demand forecast model, and in turn predict future demand while accounting for success of previous forecasts
- Visualize forecasts and learnings using Tableau linked to Hadoop data source, and utilize predictive analytics to benchmark against forecast models

Transportation Route Optimization

- Graph theory parameters and algorithms are used to analyze road networks and optimize transportation routes.
- Additional data required:
  - real-time: traffic data and weather data
  - historical: recurring events (e.g. holidays) and stored data (road closure/constructions)
- Data visualization tools such as Tableau can be used to analyze cost-savings and delivery performances for further insights.

Warranty Analysis

- A model that can track costs as new data streams come in. Visual trends should reveal products that impact our warranty policies the least and the most. A ML model that can predict what product will be a warranty claim before the actual claim is made.
- Using Tableau for predictive analytics to capture where our warranties are the most cost effective. Can we implement intervention while product is in market so there are fewer warranty claims.

Quantifying Return on Investment and Project Value

Demand Forecasting

- Need to quantify value of use case, while accounting for the licensing costs of Hadoop, Microsoft Azure, and Tableau, plus consulting fees
- Project value can be measured by a decrease in operating costs, and thus an increase in profits for the company, given successful demand forecasting and following actions to capitalize on this information
- Additionally, pricing can be made more accurate given better understanding of market demand, which will ideally increase revenue and consumer trust

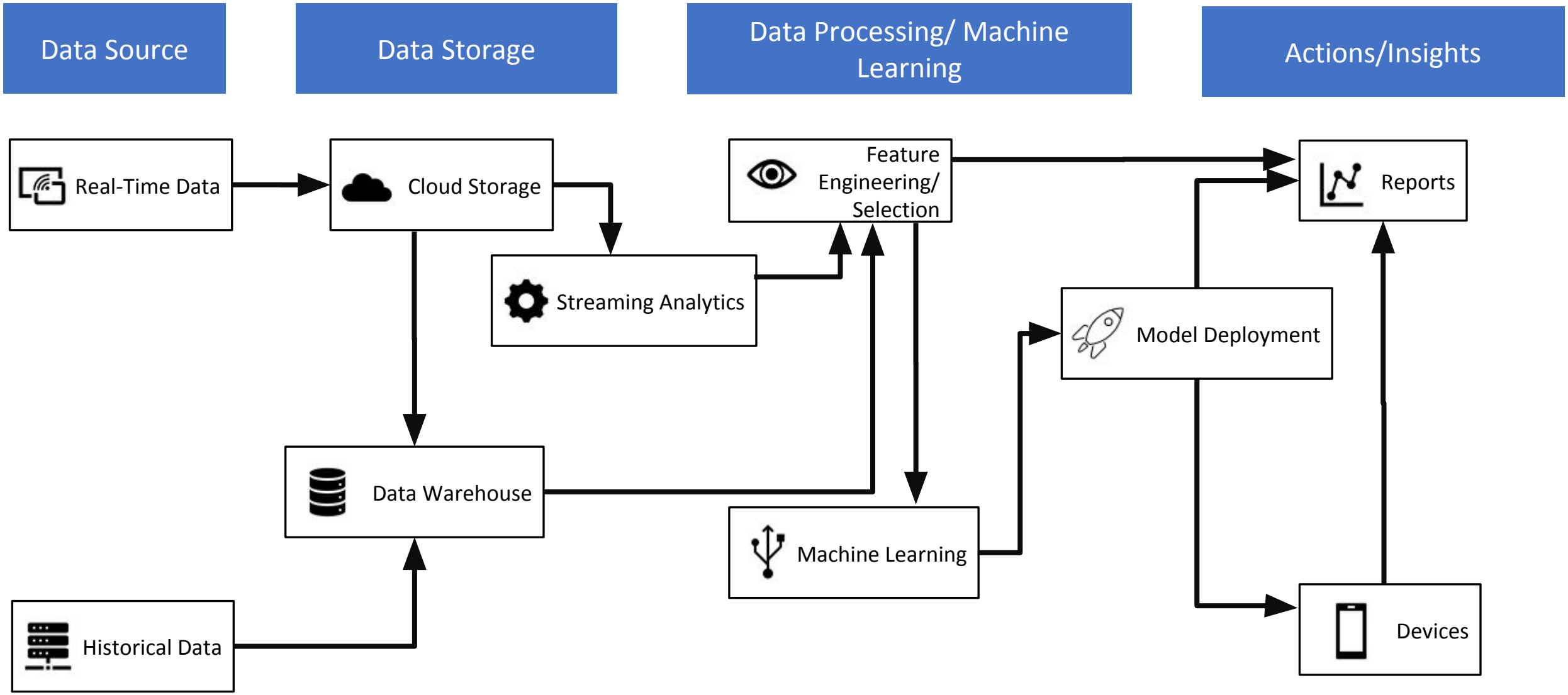
Transportation Route Optimization

- Can use Tableau to analyze cost-savings and performance of use case
- Project value can be measured by decreasing operation costs and increasing number of deliveries. Every small change in delivery routes can make a big difference in cost-savings in miles, vehicles, and drivers
    - For UPS, the implementation of route optimization that can reduce 1 mile per driver per day can save the company up to $50 million[1]
- Optimized routes also contribute to reducing CO2 emission

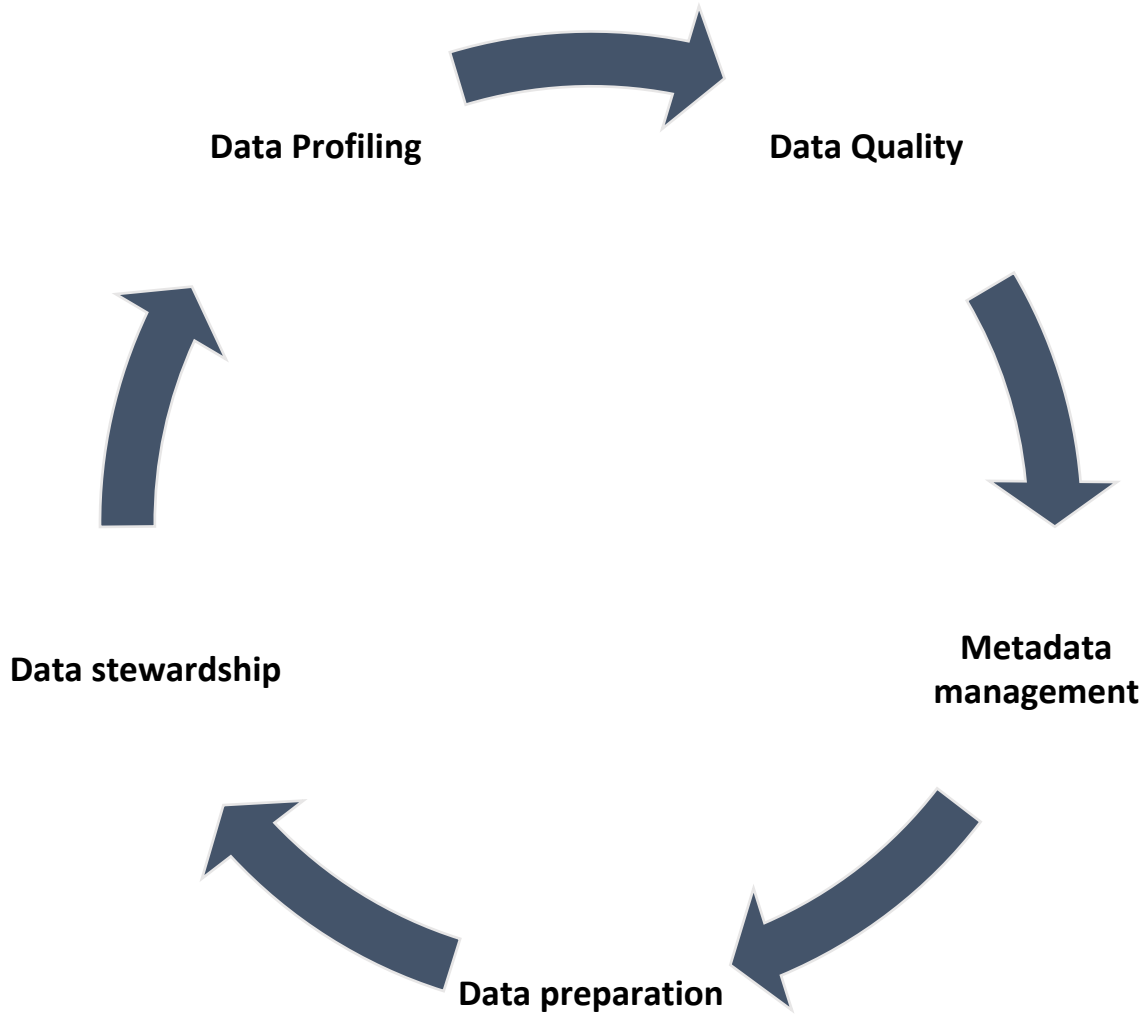
Warranty Analysis

- Digitize the process of seeking and fulfilling claims. Automate as much of the warranty claims process to limit the cost of hiring operators.
- Track product product development and remove the products that are most likely to trigger a warranty.
- Track and monitor warranty claims. The high demand user is most likely utilize warranty claims the most. Warranty abuses can cost the company billions, limiting how often a warranty is triggered can limit monetary impact for the company.

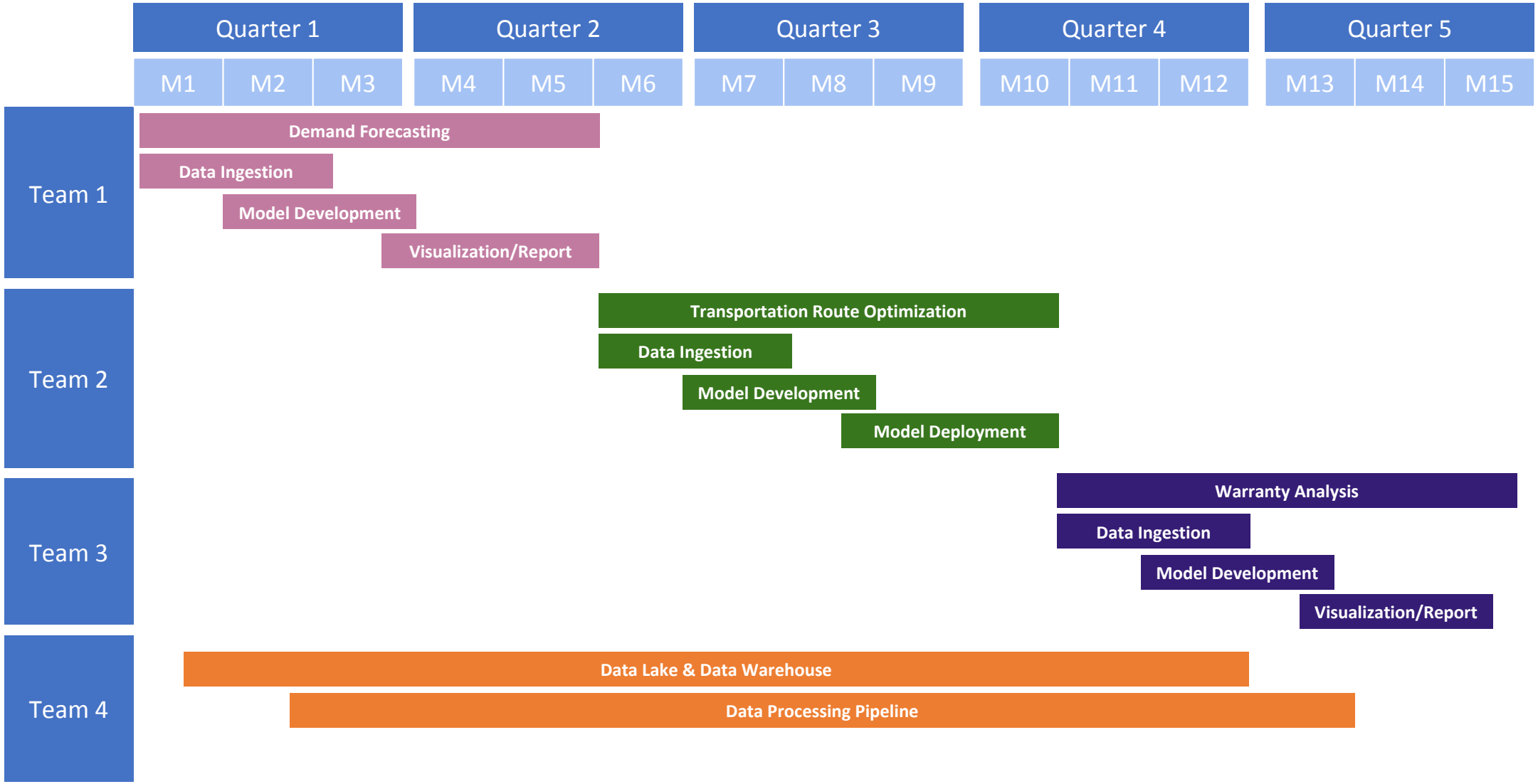
DATA ARCHITECTURE



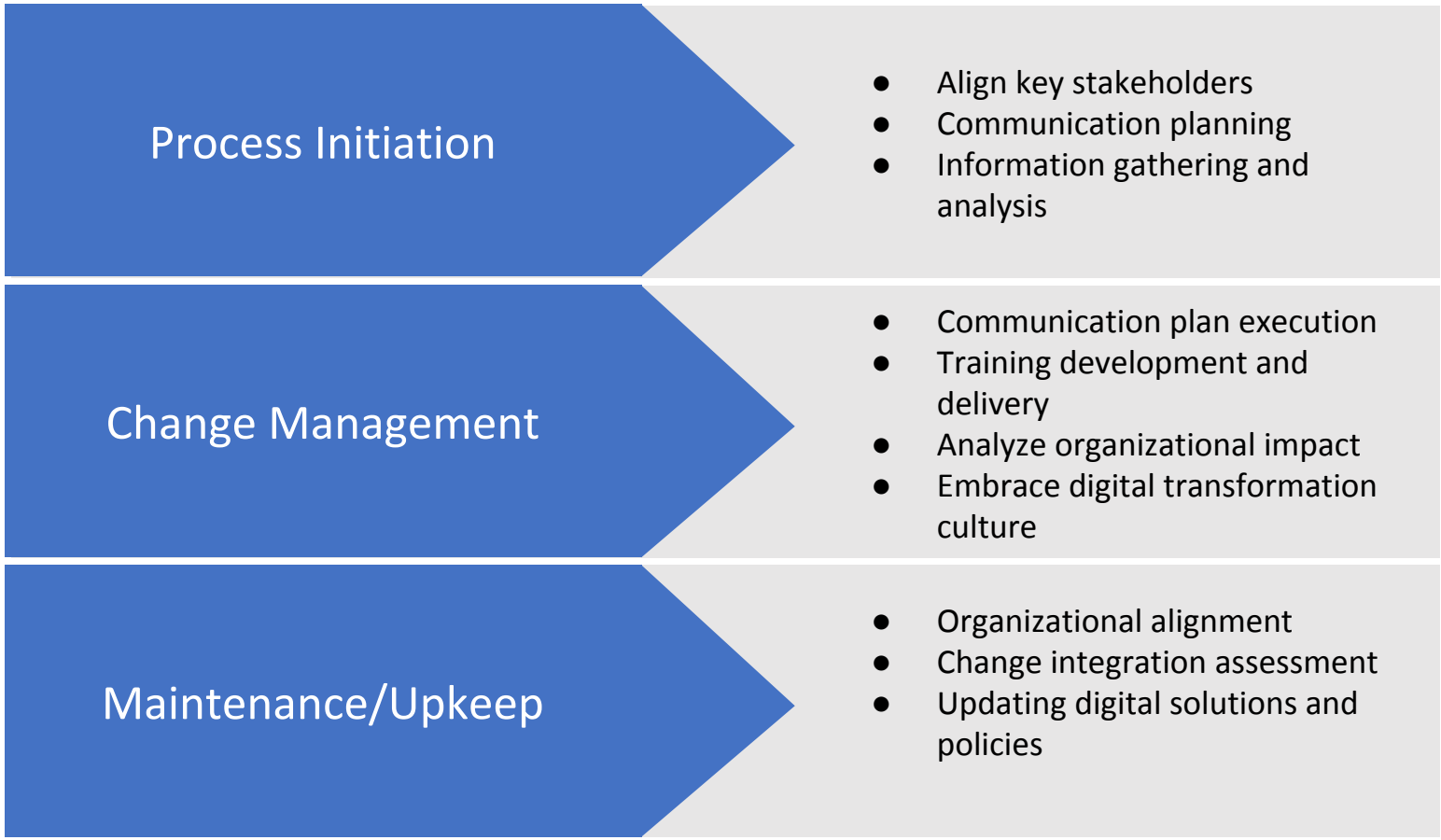
Data Governance



Implementation Timeline



Change Management



Thank you
Questions and comments?

Appendix

Use Case	Groups Benefited	Cost reduction impact	Satisfaction-related impact	Profits Impacted	Aligned Strategic Mission and Support	Impact on Customer Outcomes	Volume of Individuals Impacted	Impact to Society	Total Score (Sum of Scores/8)
Quality Control	Consumer, manufacturer, retailer - 4	reduces risk of putting harmful products into the environment - 4	Companies and manufacturers benefit when their product is known to provide quality -3	Increases production time, but limits the need for recalls and bad press, (Tesla skipped last quality control check to move the Model 3 out, but the reviews for poor quality are well known issues. - 3	Hi level support. Execs want to be known for creating quality products, not the bad PR that comes with putting bad products into the market -3	Consumers demand quality goods, and consumers reward brands known for providing good quality	All manufacturers, consumers, retailers.	High impact. Quality control is a standard part of the manufacturing process. Increased life span of durable goods.	3.5
Fault prediction	Both the company and its customers / users - 4	Companies can spend wisely given understanding of potential manufacturing / use risks - 3	Accurate fault prediction should improve the finished product offered to consumers - 4	Proper prediction should decrease need for corrective spending - 4	Yes, acts on promise to provide quality goods and services - 3	Consumers can trust the integrity of the product - 3	Impacts every relevant consumer - 4	Increases the reputation of the companies in a given market - 4	3.625
Predictive maintenance	Any large companies, esp. in software, distribution, travel/deliver, and manufacturing - 4	Reduces potential loss in sales from unexpected downtime - 4	Companies with historical maintenance data since predictive maintenance saves company costs and prevents missed deliveries - 4	Reduces potential loss from downtime - 3	Receives executive supports since operations are first to receive digital transformation (in Amazon's case) -5	Reduces inconvenience of experiencing downtime for consumers - 3	Impacts teams in company at risk of dealing with unexpected maintenance and consumer's experiencing downtime - 4	Minimal impact to society since it only reduces unexpected downtime experiences - 3	3.75
Demand forecasting	Companies, who will be able to optimize cost by producing based on projected demand, as well as customers, who will not have to face shortages of desired goods - 5	Can greatly reduce manufacturing / fulfillment costs with more accurate forecast of sales - 5	Supply is adequate to meet consumer demand - 4	Companies can reduce manufacturing cost and in turn margins with accurate prediction of demand - 5	Yes, demand forecasting contributes to extending company's lifespan, however correlation data is sparse - 2	Consumers can rely on timely availability of goods and services - 3	Impacts every relevant consumer - 4	Increases overall market efficiency - 3	3.875
Price optimization	Companies that use value-based pricing, as opposed to competitive pricing - 5	Little to no impact on cost - 1	Consumers end up paying fair, market competitive prices - 3	Positive impact on margins - 5	Yes, effective pricing that reflects the value of goods sold and is market competitive should align with most companies' strategic missions - 4	Customers face fair and accurate prices - 5	Impacts every relevant consumer - 4	Results in better representation of a good's value in the market - 4	4
ransportation Route Optimization	Large companies in travel, delivery, distributing/retailing - 3	Reduces waste in time, distance and gas - 3	Companies benefit by satisfying customers with prompt deliveries - 4	Increase in delivery efficiencies and order fulfillments - 4	Receives executive supports since operations are first to receive digital transformation (in Amazon's case) - 5	Reduces wait time of order fulfillments - 5	Impacts both consumers and drivers - 4	reduces wait time and increase in fulfillment efficiency - 4	4
Warranty analysis	Large companies that offer any tangible good, consumers	mixed results - must cover product malfunctions but also requires durable products with durability tests	companies with good track records attract consumers because of their warranty. Costco, Hyundai	limits fraud, helps track defects in design and manufacturing.	Yes, brand survival is based on trust in the product		All manufacturers, consumers, retailers.	high, Consumers expect warranties, and expect them to be honored	4.5
Robotization	Consumers and Large distributing/retailing companies (e.g. Amazon, Wal-Mart) and manufacturing companies (J&J, Pfizer, Apple) - 3	Reduces labor cost and increases efficiency in productions and order fulfillments - 5	Companies benefit when customers are satisfied with quick order fulfillments - 4	Increase in order fulfillments - 5	Receives executive supports since operations are first to receive digital transformation (in Amazon's case) - 5	Customers receive quicker deliveries and increase capabilities in mass productions may result in competitive pricing for consumers - 5	Impacts a large volume of consumers and improves labor performances - 4	Positive impact for consumers with quicker turnaround times on fulfillments. Negative impact on the work force for reduction in laborers - 5	4.5
Computer vision applications	Large companies in distributing/retailing, manufacturing, and healthcare/research - 3	Increase efficiency in fulfillment or production and reduces number of labors (e.g. manufacture laborers, cashiers) - 5	Companies and manufacturers are positively impacted with more accurate and efficient performances - 4	Increase in order fulfillments, production, and services - 5	Receives executive supports since operations are first to receive digital transformation (in Amazon's case) - 5	Reduces wait-time on fulfillments or services - 5	Reduces workforce (e.g. warehouse laborers, cashiers) and reduces customer-facing experiences for consumers - 5	Major impact to workforce by reducing demand for laborers. Increases efficiency in mass production or turnaround time for consumers. Reduces customer-facing experiences. - 5	4.625

Use Case	Types of Input Data Needed	Success Measurement Possible with this data?	Volume of Data Needed	Data Availability	Frequency of Data Needed?	Structured vs. Unstructured	Data Quality	Match Keys and Knowledge Available around Data	Overall Data Accessibility and Viability Score
Product Development	R&D costs, manufacturer costs, marketing - 10	4 - Profits, costs in R&D and manufacturing	Large - 2	2 - Mixed	Infrequent, but need data from so many parts of a company it makes it tough	Structured	3 - Mixed – requires data cleaning and preprocessing	5 - Yes - PD is key to the growth and sustainability of a company. Cannot think about digital disruptions if there are no products to disrupt	3
Quality Control	Time and costs it takes to measure quality. Time it takes to redesign a product or retool machinery - 8	4 - Yes, check for defective products that come out of production and into the consumers hands	Medium - 2	4- yes, from the manufacturer and the consumers.	Real time would be great, but not a necessary demand. Yearly and quarterly data would be acceptable	Structured, unstructured public comments	3 - Mixed – requires data cleaning and preprocessing	3- Mixed - Quality control is hugely important, but there have been times when companies have chosen speed over quality. For example, tesla cars and samsung phones.	3.5
Fault prediction	Software code dependency / contigency data, fault prediction success rate, tangible	It will be difficult to capture what high-level effect results from the implementation of a fault	Properly analyzing the impact of fault prediciton data would require a large volume of data - 2	The necessary data is not easily accessible or understandable - 2	Given a long enough history of available data post implementation of FP system, the data set	Although the available data is trouted, it is complex enough that it would require some	The quality of available data is sufficient for further analysis - 4	Knowledge available around data is relatively low compared to other use cases - 2	2.6
Predictive maintenance	Machine operation data, product usage data, product quality data, design data, staff behavior data, cost and logistic information, environmental conditions, customer information - 7	Yes, data from product quality/usage and operating machines - 5	Large – data from sensors and measurements - 2	Generally, yes because these data are collected per regulations - 5	Ranges from minutes to weekly or real-time - 2	Data can be structured or unstructured - 3	Mixed – requires data cleaning and preprocessing - 3	Yes, business knowledge is available around data -1	3.5
Demand forecasting	Prior and post forecast implementation sales / profits - 8	Success can relatively be measured by comparing previous sales to current sales - 5	To see trends in sales before and after implementation of the forecast model would not require an excessive amount of data, as long as the results are statistically significant - 4	The necessary data is readily provided in the paper - 4	While the data itself may not need to be refreshed often, the demand forecasting system may need to be updated from time to time to keep up with market trends - 3	The available data is well structured, with a clear distinction between prior and post data - 4	The available data does not require cleaning and is ready for analysis - 4	Given knowledge for the available data is quite high compared to other use cases - 4	4
Price optimization	Prior and post forecast implementation sales / profits, as well as prior and post price points for certain products - 8	Success can relatively be measured by comparing previous sales to current sales - 5	To see trends in sales before and after implementation of the forecast model would not require an excessive amount of data, as long as the results are statistically significant - 4	The necessary data is readily provided in the paper - 4	While the data itself may not need to be refreshed often, the price optimization model may need to be updated from time to time to keep up with market trends - 3	The available data is well structured, with a clear distinction between prior and post data - 4	The available data does not require cleaning and is ready for analysis - 4	Given knowledge for the available data is quite high compared to other use cases - 4	4
Transportation Route Optimization	Vehicle data GPS data, traffic data, spatial data stamp, weather data, and process log - 5	Mixed - 3	Medium to large - 3	Yes - 5	Daily or real-time - 2	Mixed - Data can be structured (vehicle data, process log) and unstructured (GPS data, traffic data, weather data, etc.). Although most data will be unstructured - 2	Medium to high -3	Yes, business knowledge is available around data -1	3
Warranty analysis	company reports on returned products and impact of warranties on sales. - 8	3 - Check product returns and warranty claims made during the life of product coverage.	Medium - need information from the manufacturer and the customers who use the product. - 5	3 - available through sites like BBB and McKinsey research	Real time would be great, but not a necessary demand. Yearly and quarterly data would be acceptable	Structured, unstructured public comments	3 - Mixed – requires data cleaning and preprocessing	Mixed - most business plans are not driven by warranty policy analysis	4
Robotization	Design data, product data, logistic information, task designs, machine operating data, sensor data, recurring data outputted by robots- 5	Yes, data from product quality/usage and operating machines are collected per regulations - 4	Medium to large volume of data needed - 3	Generally, yes because these data are collected per regulations but some data may be missing but can be collected through development- 4	Ranges from seconds to minutes or real-time - 1	Data can be structured (sensor data, etc) or unstructured (images) - 3	Mixed – requires data cleaning and preprocessing- 3	Yes, business knowledge is available around data -1	3
Computer vision applications	Images and video files - 3	Mixed – large companies may have been collecting data or used available data on the web depending on the application of computer vision. If this is not the case, company may have to generate own images -1	Large volume of data is needed - 1	Mixed – some large companies may have image data but most would not have the volume of data needed - 2	No data frequency required - 5	Data is unstructured and require image preprocessing - 1	High - 5	Mixed, probably will have an some knowledge available around data -4	2.75

Use Case	Static Data Platform	Streaming Data	Amount of Data to be Stored	Volume and Velocity of Data	Complexity of Data Manipulation	Overall Ease of Enterprise Architecture Implementation Score (5 easiest and 1 hardest)
Product Development	3- Static info can help ballpark what similar products have cost in the past.	Need data from all parts of R&D	1- Very large	2 - need fast data to structure development and makes changes before moving on to the next step		1
Computer vision applications	Can use static data like images -3	Can use real-time data from surveillance videos - 2	Very large volume of data stored - 1	Large volume of data and velocity of data - 1	Require manipulation of unstructured data from image and video files - 1	1.6
Robotization	Can use static data like images and historical measurement data/sensor data- 3	Can use streaming data from real-time videos or sensors for identification of target or obstructions - 2	Very large amount of data stored - 1	Large volume and velocity of data - 1	Require manipulation of unstructured data from image and video files and reformatting of sensor data - 2	1.8
Transportation Route Optimization	Some insights can be used from historical, static data such as distance from any two locations - 4	Real-time data from traffic flow/GPS and environmental conditions - 3	Very large volume of data stored - 1	Large volume and velocity of data - 1	Require data preprocessing of unstructured data such as traffic/GPS data and reformatting of static data - 2	2.2
Fault prediction	Historical data measureing program success rate will be diffilcult to collect and maintain - 1.5	Data analysis associated with this use case should not necessitate daily data loads, thus streamed data is not required - 4	Depending on the number of prior years to be included in historical data, can vary - 3	Because certain programs are run many times daily, volume of success measurement data will be massive in scope - 1	As uccess data could potentially be measured in a binary field or with a weighted comparison value, complexity of data manipulation can vary - 3	2.5
Predictive maintenance	Can be static data from different sensors/machines - 4	Can be real-time streams of data from different sensors/machines for anomaly detection models - 3	Large amount of data stored - 2	Generally, as close to real-time data from large sensor networks are collected for most accurate models - 2	Some data preprocessing required as sensory data come in different formats but are generally structured data- 4	3
Demand forecasting	High level historical data for product demand exists - 3	Demand model must be refreshed daily to provide updated forecasts - 3	Depending on the number of prior years to be included in historical data, can vary - 3	Since data will be populating daily, volume and velocity will be high - 2.5	While the algorithm used in the models may be dificult to understand, the outputted data is not too complex in nature - 4	3.1
Price optimization	High level historical data for product price points exists - 3	Price optimization model must be refreshed daily to provide optimal price for daily offerings - 3	Depending on the number of prior years to be included in historical data, can vary - 3	Since data will be populating daily, volume and velocity will be high - 2.5	While the algorithm used in the models may be dificult to understand, the outputted data is not too complex in nature - 4	3.1
Quality Control	4 - historical processes are still useful in current quality control	2 – searchable reports available	3 – medium	Low volume and low velocity		3-
Warranty analysis	3 – pull data from past and streaming data	2- data from fault analysis and public reports	2 – medium	2 – for the sake of market analysis, we could take the slower data. If we were to design corporate policy for a product that		4 -

Use Case	Data Governance and Digital Trust Matrix Evaluate your list of 10 use cases from an ease of management related to Data Governance and Data Compliance Considerations (1 – 5, 1 being easiest and 5 being most complex)	Score
Predictive maintenance	The data used in predictive maintenance are not sensitive data such as SSN. Data are collected mainly through internal sources like sensory data. Maintaining data integrity and protecting data is easy - 1	1
Robotization	In terms of operations and supply chains, robotization does not contain sensitive data since these robots are involved in automation. Data collected are mainly from internal sources. Maintaining data integrity and protecting data is easy - 1	1
Computer vision applications	In terms of operations and supply chains, computer vision applications do not contain sensitive data since these are primarily used in automation and manufacturing. Data collected are mainly from internal sources. Maintaining data integrity and protecting data is easy - 1	1
Product Development	Company infomation is generally safeguiarded well. In its collection of consumer information where product development might face ethical and legal challenges.	2
Transportation Route Optimization	Some level of checking for data integrity is required since these are not generated internally but reliant on weather reports, live traffic data, etc. Also, the data can contain some sensitive data like customer's addresses if providing direct delivery services. - 2	2
Warranty analysis	In warranty analysis there is a small challenge that comes up because companies sometimes share information on people who make warranty claims to track potential warranty-abusers. Outside of this sharing of data, the data governance in warranty claims is fairly reliable and trustworthy. The compliance score is 4.	2
Quality Control	Quality control is another arena that largely manages more company data than consumer data. However, similar to product development, the measure and monitor face is where quality controls need to make sure they do violate customer trust in the way they gather consumer data and how the consumer uses their product.	3.5
Demand forecasting	Demand forecasting use cases require a strong enforcement of data security, meaning strict internal access delegation, as well as a strong emphasis on protecting certain data (cost, pricing strategy, etc.) from external parties - 3.5	3.5
Price optimization	Price optimization use cases require a strong enforcement of data security, meaning strict internal access delegation, as well as a strong emphasis on protecting certain data (cost, pricing strategy, etc.) from external parties - 3.5	3.5
Fault prediction	Fault prediction use cases contain software success / failure metrics that require less internal governance, yet are almost never released to public consumers to protect product integrity - 4	4

Use Case Quantification Sheet
Evaluate your list of 10 use cases from an ease of management related to Overall Ease of Measurement of Project Outcomes
(1 – 5, 1 being easiest and 5 being most complex

Use Case	What does success look like for a solution addressing this problem?	How can this success be measured (both to determine a baseline and then ongoing progress against that) from the data? What KPIs will be tracked?	Overall Ease of Measurement
Computer vision applications	· Increase in percent of productions · Increase in yield of products aka quality (lower number of defects)	· We will compare the number of products produced before and after implementation of robotization. · We will also compare the number of rejected products before and after robotization. · Production number and product yield will be tracked.	1
Product Development	- Getting products to market on schedule or quicker - Limit the cost of development - Eventual profitability of the product	- Compare costs of PD for each product, success would be to reduce the cost - Compare time to market, success is reducing the cost it takes to get product to market - Profits from product	1
Robotization	· Increase in percent of productions · Increase in yield of products aka quality (lower number of defects)	· We will compare the number of products produced before and after implementation of robotization. · We will also compare the number of rejected products before and after robotization. · Production number and product yield will be tracked.	1
Transportation Route Optimization	· Faster route times · Increase in number of deliveries	· We will compare the numbers of deliveries before and after transportation route optimization. · We will also compare the time of deliveries before and after route optimization.	1
Demand Forecasting	Successful demand forecasting solutions will result in a higher level of confidence and understanding of a company's market and its various demand curves, allowing the organization to plan inventory properly - 2	Similarly to price optimization, the success of demand forecasting use cases can be measured by comparing pre and post implementation figures such as revenue, margins, and quantity sold, as well as average excess inventory - 3	2
Predictive maintenance	· Lower number of unexpected downtime · Increase in machine/parts longevity	· We will measure the number of downtime before and after implementing predictive maintenance. · We will compare sensory data and machine/parts lifetime before and after predictive maintenance. · Number of downtimes and sensory data indicating machine/parts lifetime will be tracked.	2
Price Optimization	A successful price optimization solution will use various models to calculated optimal pricing for a company's offerings, resulting in pricing legitimacy and increased consumer trust - 3	The success of a price optimization use case can be measured by comparing pre and post implementation figures such as revenue, margins, and quantity sold - 2	2
Quality Control	Limit defective products in the market Higher customer satisfaction Change internal processes to measure quality	Count the number of defective products that get to market Measure costs of repair Track third-party ratings from Consumer Reports and other leading trackers	3
Fault Prediction	The success attained in fault prediction use cases can be seen in the increased awareness and understanding of products' various life cycles, which the company can use to better structure not only product design, but warranty structures - 4	The success of a fault prediction use case can be measured not only by comparing the before and after performance metrics of a product, but by also enhancing product warranty design to increase margins - 4	4
Warranty Analysis	Fewer warranty claims Higher customer satisfaction Lower costs to service products Create new warranty policies	Count number of claims Track costs of warranty claims Measure consumer sentiment	5

Use Case	What business question are you trying to answer with data visualization and modeling?	What kind of data visualization would provide useful insights?	What kind of machine learning, forecasting or analytics is suggested?	What algorithmic approach to you expect to lead with to solve this?	Overall Ease of Data Analysis and Modeling Score
Predictive maintenance	Whether the number of downtimes decreased	Number of downtimes over time before and after implementation of use case	· Machine learning for forecasting (regression model) · Can use Tableau or Power BI for analytics and visualization by other departments	1. Analyze data prior to use case as baseline. 2. Collect data (environmental, sensory, and # products produced) after use case 3. Analyze data 4. Building predictive model 5. Train, validate, and test model 6. Deploy model	1
Warranty analysis	How do consumers use our warranty and what is the cost to the company. Is there a way we can reduce the cost of implementing the warranty, whether through changing policy and coverage days, or can we make our product differently so it impacts our warranty less.	Number of warranty claims by time and product. The average cost to complete a warranty claim. Customer satisfaction with warranty policy.	A model that can track costs as new data streams in. Visual trends should reveal products that impact our warranty policies the least and the most. A ML model that can predict what product will be a warranty claim before the actual claim is made	Using Tableau for predictive analytics to capture where our warranties are the most cost effective. Can we implement intervention while product is in market so there are fewer warranty claims.	2
Price optimization	For price optimization use cases, the most important question to answer is how the newly generated optimal prices are performing. Are they leading to an increase in revenue and margins? Are they performing better in certain regions compared to others? These are questions with very tangible answers - 2	When assessing the impact of price optimization, double bar charts can be a very good starting point to compare defined metrics, before and after the implementation of optimal prices. This comparison would paint a stark picture of the measurable impact - 1	Any sort of predictive AI, that can learn from given training data, and in turn predict how the optimal prices will continue to perform in an evolving market, would be a really valuable tool for analyzing the effects of the solution provided in this use case - 3	Building off the suggested predictive AI tool, a proper set of training data can be leveraged to teach the model what kind of margins and revenue can be expected for various price points. This approach tests numerous price points to continue improving optimal pricing - 3	2.25
Demand forecasting	For demand forecasting use cases, the most important question to answer is how the accurate the predictive demand model is. Once this is known, the next question for the business to ask is how to act on this new information. These are questions with fairly tangible answers - 3	When assessing the impact of demand forecasting, double bar charts can be a very good starting point to compare defined metrics, such as predicted vs. actual demand. This comparison would paint a stark picture of the measurable impact - 1	Any sort of predictive AI, that can learn from given training data, and in turn predict how market demand will continue to change in an evolving world, would be a really valuable tool for analyzing the effects of the solution provided in this use case - 3	Building off the suggested predictive AI tool, a proper set of training data can be leveraged to teach the model what kind of fluctuations in demand can be expected over time for certain regions. This approach tests numerous demand curves to continue improving on its prediction of demand - 3	2.5
Robotization	Whether productivity and quality yield increased	Bar graphs for productivity and quality yielded for comparison	· Neural network for model · Tableau or Power BI to analyze productivity and quality yield	1. Analyze data prior to use case as baseline. 2. Collect data (sensory, feedback, and/or image data) after use case 3. Analyze data 4. Building model 5. Train, validate, and test model 6. Deploy model	3
Computer vision applications	Whether productivity and quality yield increased	Bar graphs for productivity and quality yielded for comparison	· Neural network for model · Tableau or Power BI to analyze productivity and quality yield	1. Analyze data prior to use case as baseline. 2. Collect data (image/video data) after use case 3. Analyze data 4. Building predictive model 5. Train, validate, and test model 6. Deploy model	3

Use Case	What business question are you trying to answer with data visualization and modeling?	What kind of data visualization would provide useful insights?	What kind of machine learning, forecasting or analytics is suggested?	What algorithmic approach to you expect to lead with to solve this?	Overall Ease of Data Analysis and Modeling Score
Transportation Route Optimization	Whether the time it takes to complete a route decreased and numbers of deliveries increased	Line plot for duration of completed routes and bar plot for number of deliveries made	· Neural network for model · Tableau or Power BI to analyze speed of route completion and numbers of deliveries	1. Analyze data prior to use case as baseline. 2. Collect data (traffic, distance, weather, speed limit data) after use case 3. Analyze data 4. Building predictive model 5. Train, validate, and test model 6. Deploy model	3
Quality Control	What is the cost associated with implementing quality controls. How do our QC measures help reduce costs in the long run. Is there opportunity improve our QC measures. What is the tradeoff between the highest level of quality, cost of product, how much the consumer is willing to pay for the product, and how soon the customer is likely comeback for a product upgrade	Track cost of QC measures and the time it takes to implement these measures. Then check the defect rate for the products in market. Data needs to show what QC measures pay off and where we are lagging.	A model that can track costs as new data streams in. Visual trends should reveal products that impact our QC policies the least and the most.	Create a tool to predict how much QC impacts the end product. Test to measure how the end user will test the product. Create unique QC measures for each product.	3
Fault prediction	Fault prediction use cases must first answer the question of when and how often a system will fail. With a better understanding of a product's potential defects and lifetime, the business can begin asking even more important questions, such as how to prevent these failures from occurring, and how to improve the lifetime of the product - 4	In order to gather meaningful insights from a fault prediction use case, a scatterplot that compares optimal performance to various outliers (failures) can be a useful method of visualizing not only how often these failures are occurring, but when they occur in a product's supposed lifespan - 3	Machine learning solutions can be particularly valuable for fault prediction use cases. A machine learning program that learns how often a product fails under different conditions, can in turn predict failure rates for future (and unidentified) scenarios - 4	Given a machine learning model that can learn to predict failure rates in future foreign scenarios, a justifiable approach would be to lean on these predictions (understanding their inherent confidence intervals), and translate these into business decisions - 4	3.75
Product Development	What is the cost and time associated with PD. Can cost and time be reduced? Cost of technology is in constant flux. While manufacturing costs might go down overtime, new technologies still cost a premium. What balance of cutting edge and profitability does the company want to follow.	Track cost and time. Most basic charts would help here. Box, bar, or line to show the change in key metrics. A measure of consumer wants and needs. Also, leading firms can show the consumer what they want before that know they want it. Data can show where the company naturally excels and offer that product first in market.	A forecasting model like Tableau to help track costs from the ideation phase to market. Link all parts of development to optimize product delivery to market and meet or exceed consumer demands.	Track consumer demand Track cost of development Create and test prototypes Update designs Bring to market while the technology is till in demand.	4