Advanced Analytics Architecture at General Motors

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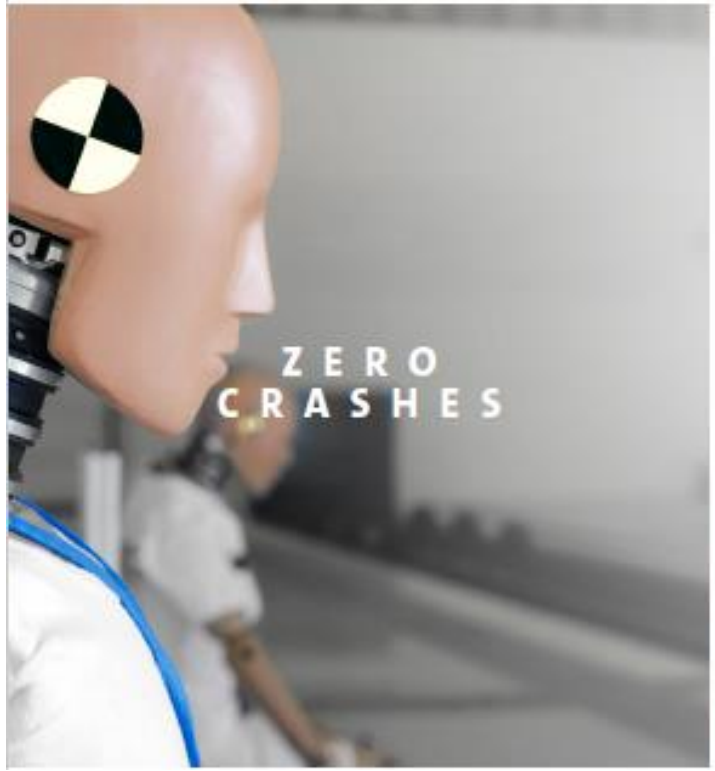
Advanced Analytics

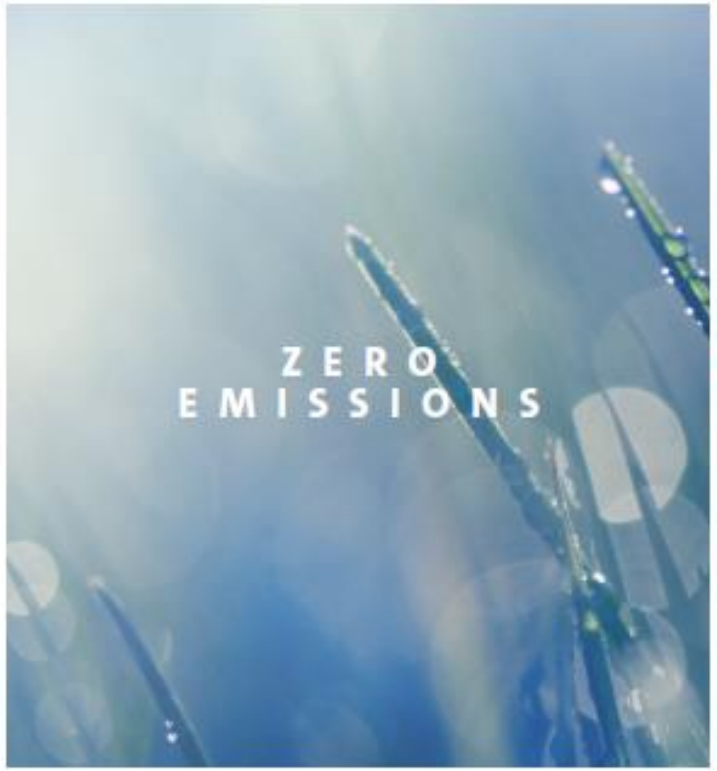
GENERAL MOTORS

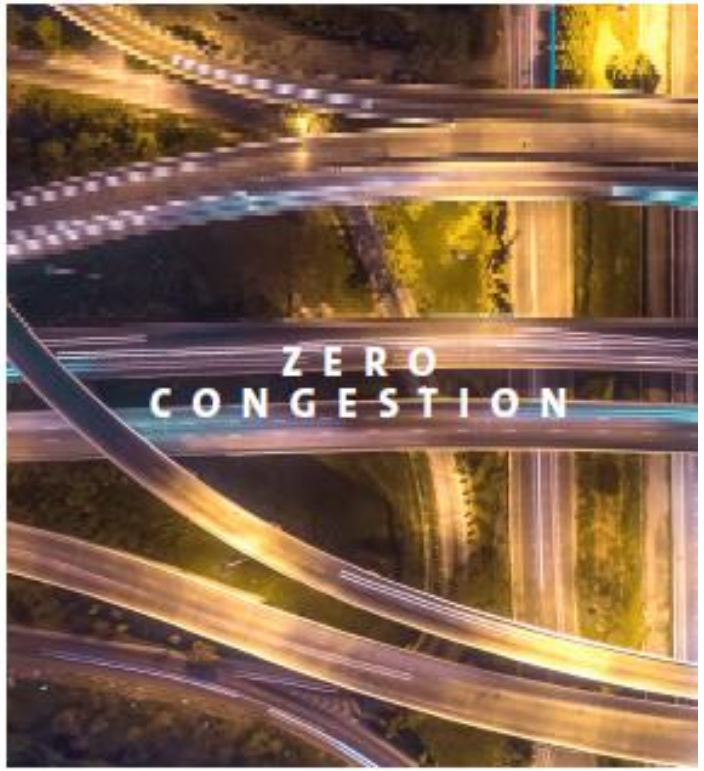
Outline

1. GM & the Automotive Industry
2. GM Advanced Analytics
3. Example Analytics Use Case
4. Designing the Analytics Architecture

GM aspires to







These Forces are Driving Dramatic Change in the Automotive Industry

CONNECTIVITY

Zero Congestion

SHARING

Zero Congestion

AUTONOMOUS

Zero Crashes

ALTERNATIVE PROPULSION

Zero Emissions

General Motors

Mary Bara, Chairman and CEO

Global HQ: Detroit, MI

- 8 Brands
- 180,000 Employees
- 5 continents
- 23 time zones
- 70 languages

2017 Financials

- 145.6 Billion revenue
- 9.6 Million retail vehicle sales

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2. **GM Advanced Analytics**
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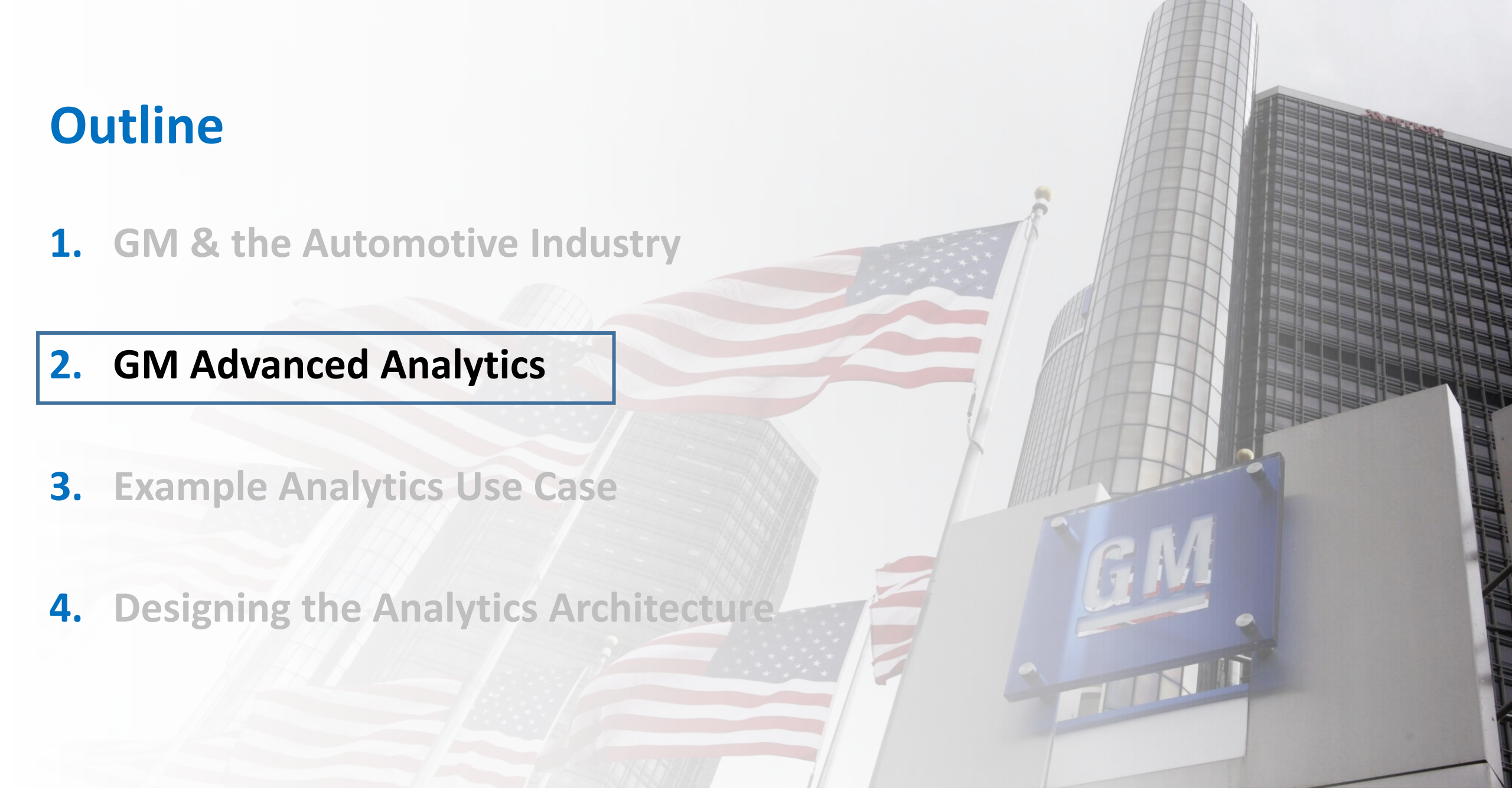

Advanced Analytics

Created in 2014 at the direction of the CEO to enable “better business outcomes”

- **Disciplines:**
  Data Science, Visualization, Data Acquisition, Software Development
- **Backgrounds:**
  Statistics, Mathematics, Economics, Machine Learning, Data Engineering, Computer Science
- **Locations:**
  Warren MI, Austin TX, Atlanta GA

Example Analytic Topics

- In what technologies, products, and markets should we invest?
- How do we identify potential vehicle quality and safety issues?
- What features do we put on 2021 vehicles?
- How do we reduce down time in assembly plants?
- How do we get the best return on our marketing dollars?

Advance Analytics deliverables

Insights & Recommendations

Predictive & Prescriptive Models

Decision Support Systems

Reusable Assets

(data, models, tools)

Example: Applying analytics to Product Development

Insights & Recommendations

Predictive & Prescriptive Models

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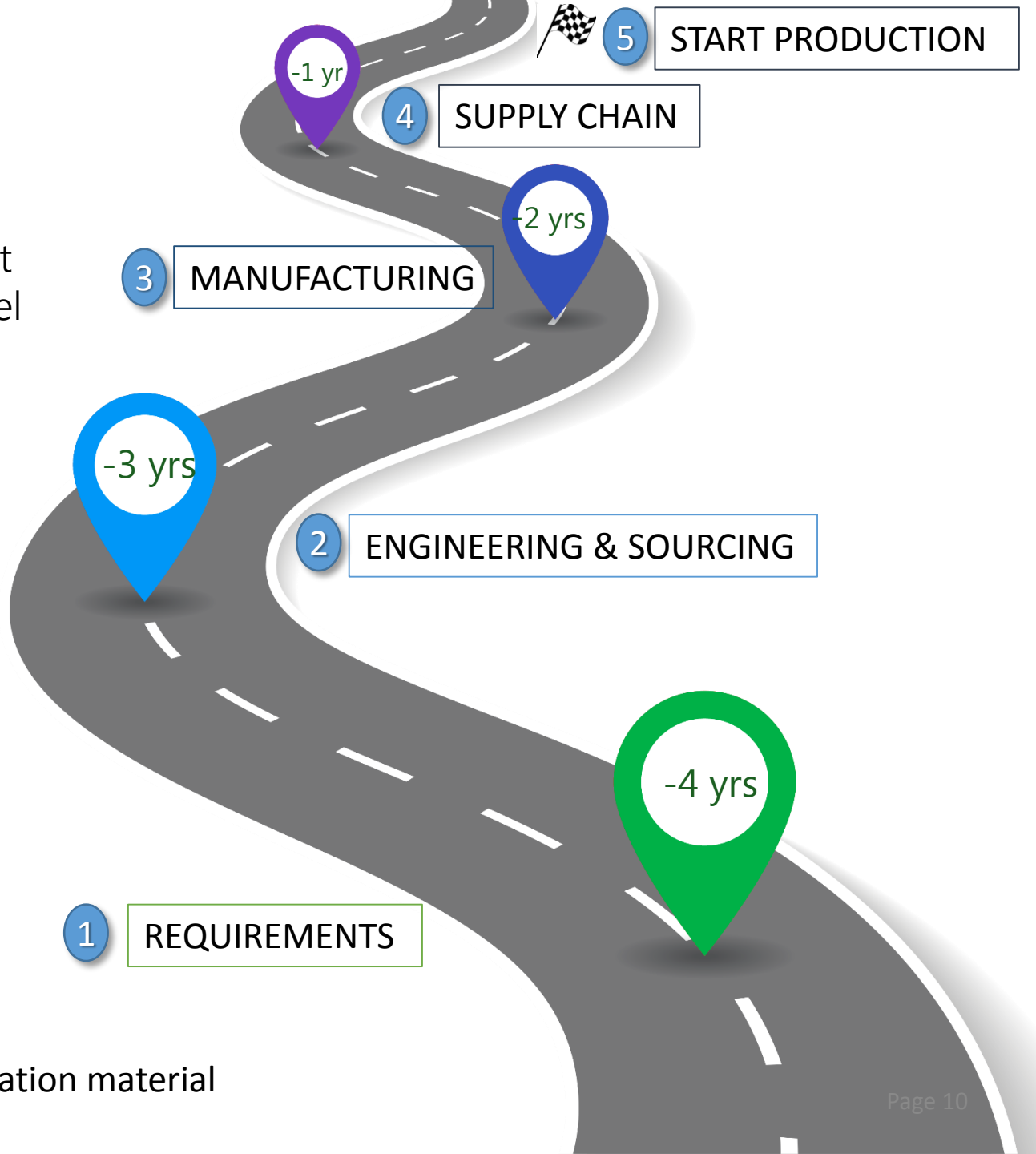
How to develop a car?

- Highly complex products that must meet global market requirements for safety, emissions, recyclability, and fuel economy
- 30K parts and over 150 possible features in a vehicle
- Highly cross functional
  Engineering, Program Marketing, Marketing, Research, Purchasing, Styling, Quality, Finance, Sales, Planning Powertrain, Manufacturing, Supply Chain
- GM not only designs the vehicle, but designs the processes, machines, and facilities to manufacture the vehicle.
- 4 years from "art to part" (Virtual to Physical)



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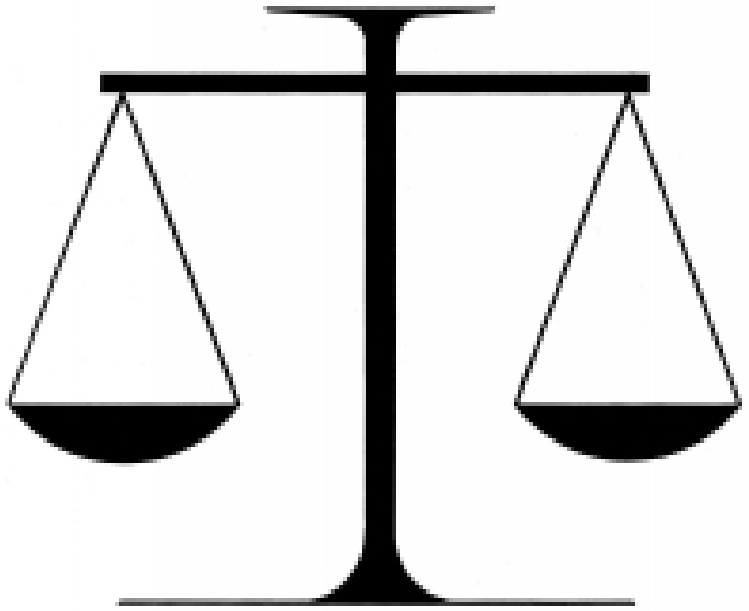
Analytics challenge…
What features should go into a Chevy Malibu?

- Engine(s) – Hybrid, Turbo?
- Fuel economy (MPG)?
- Wheel sizes?
- Leather seats?
- Number of trim levels?

- Remote start?
- Sunroof?
- Heated seats?
- Sound system – Infotainment?
- Remote locks?
- Push button start?

This business decision requires complex trade-offs 4-5 years ahead of production



Attractiveness
Competitors
Price

Cost

What are primary considerations?

- Customer preferences and willingness to pay
- Competitor offerings
- Price positioning in the market and in the GM portfolio
- Brand strength
- Revenue, share, and profitability objectives
- Projected market segment volumes

What is our approach?

- Conjoint analysis
- Optimization/What if

2018 Malibu – showing three trim levels

Features (example only)	**LS**	**LT**	**Hybrid**
	$24,000	$26,000	$29,000
4-Wheel Antilock disc brakes	Standard		
17' Aluminum Wheels	NA	Standard	
1.5L Turbo DOHC 4 Cyl	Standard		NA
1.8L Hybrid DOHC 4 Cyl	NA		Standard
Bose 9 Speaker		Available	
6 Speed Automatic transmissions	Standard		
Adaptive Cruse Control		Available	Standard
Heated Driver and Passenger seats		Available	Standard

What reusable functional building blocks can be leveraged from this solution as part of an Analytics Architecture?

Insights & Recommendations

Predictive & Prescriptive Models

Decision Support Systems

Reusable Assets

(data, models, tools)

Defining an Analytics Architecture

- Analytic tools that get used as a standard part of a business process, must be produced in a technologically **scalable, easy-to-use, supportable, and secure manner**
- It quickly becomes apparent that these tools require common components
  - **User interface, scenario management, data management, security**
- Also, many analytic problems make use of common datasets
  - **Historical sales, market demographics, competitor pricing, vehicle sensor measurements**

The Analytics Architecture is comprised of

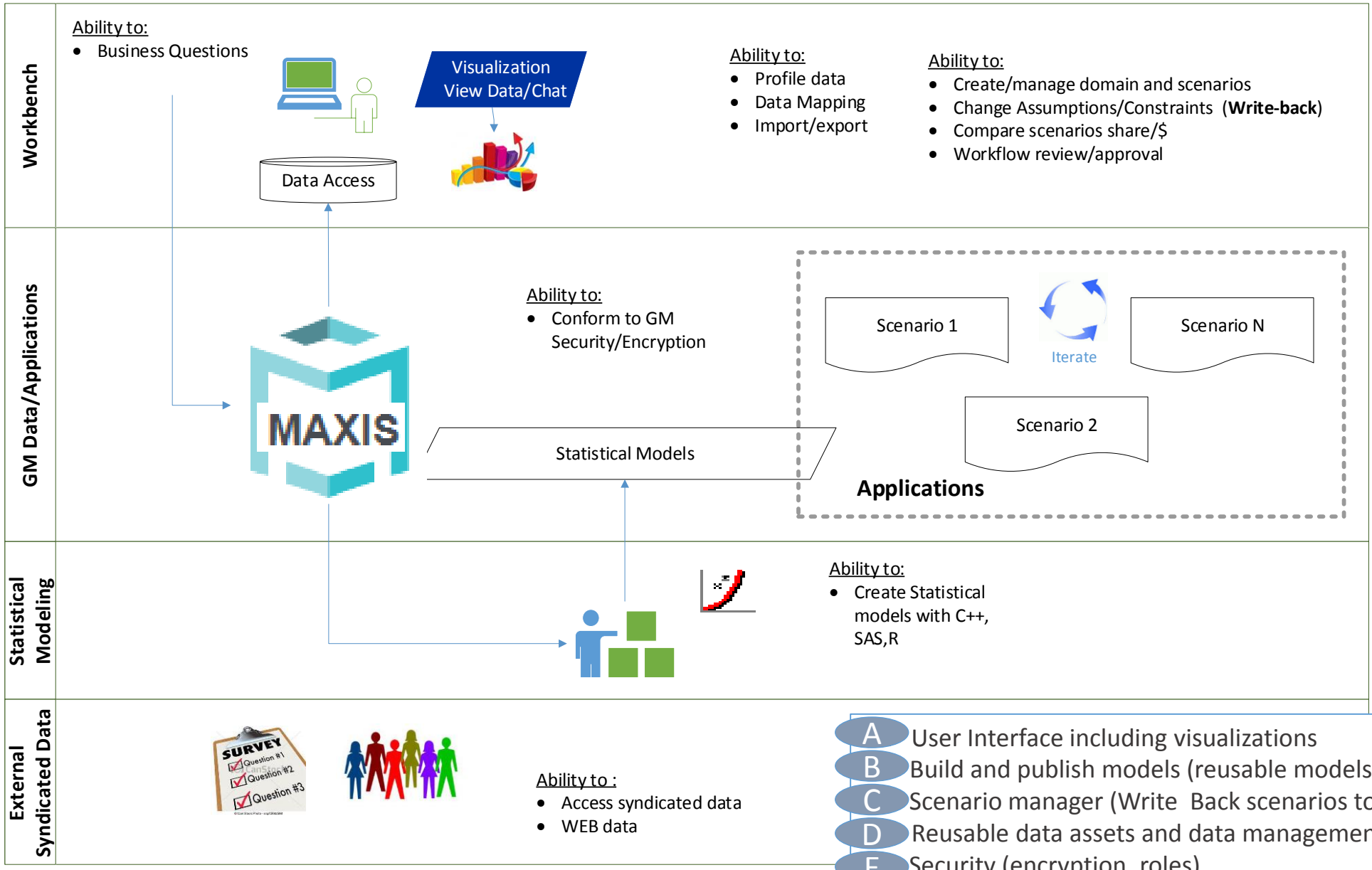
…reusable functional building blocks built on preferred technologies & standardized interfaces, and

…build and publish model

…reusable analytic models & datasets

This makes future projects go faster, and ensures that the tools will stand the test of time!

Five reusable functional building blocks



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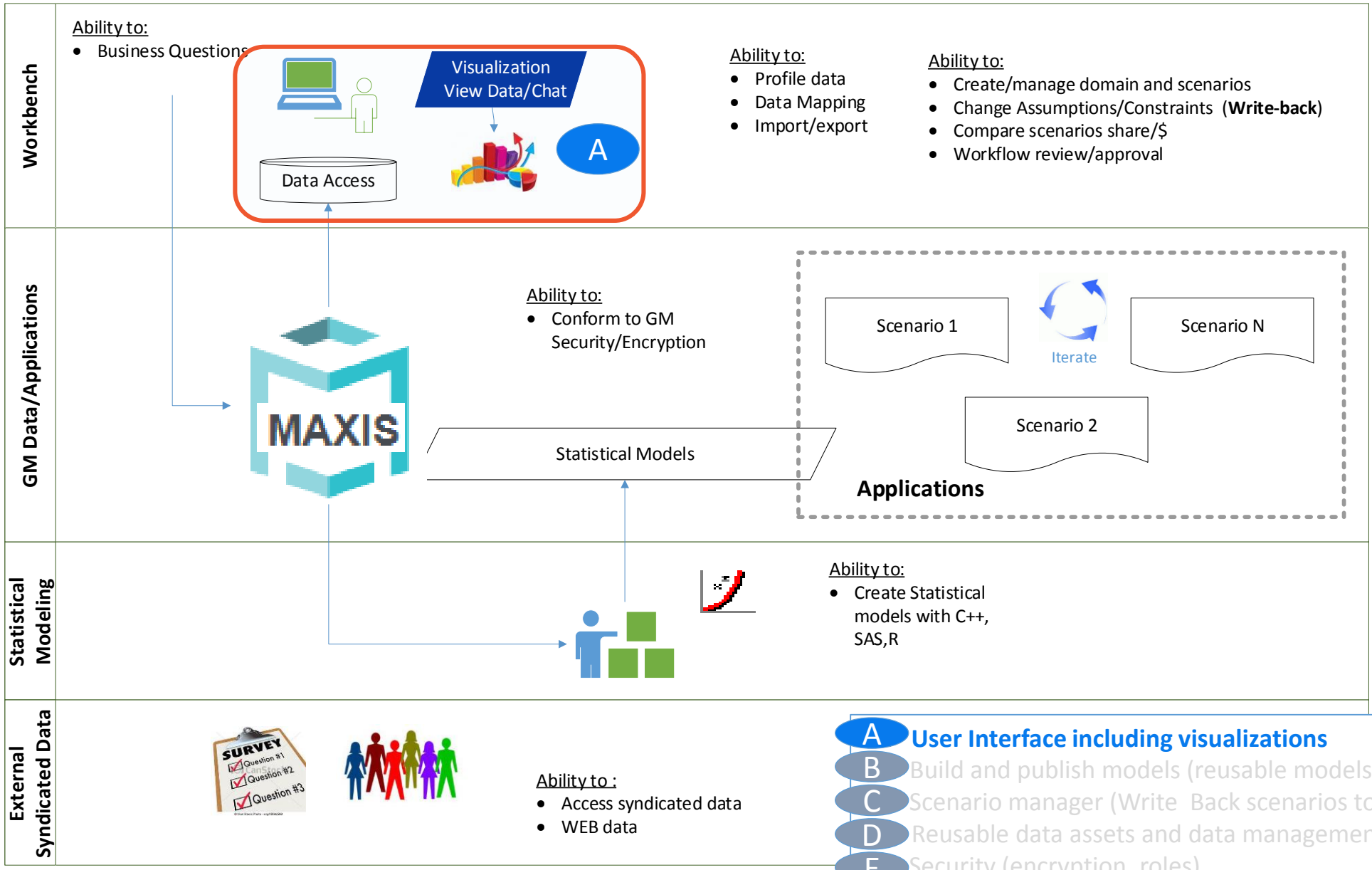

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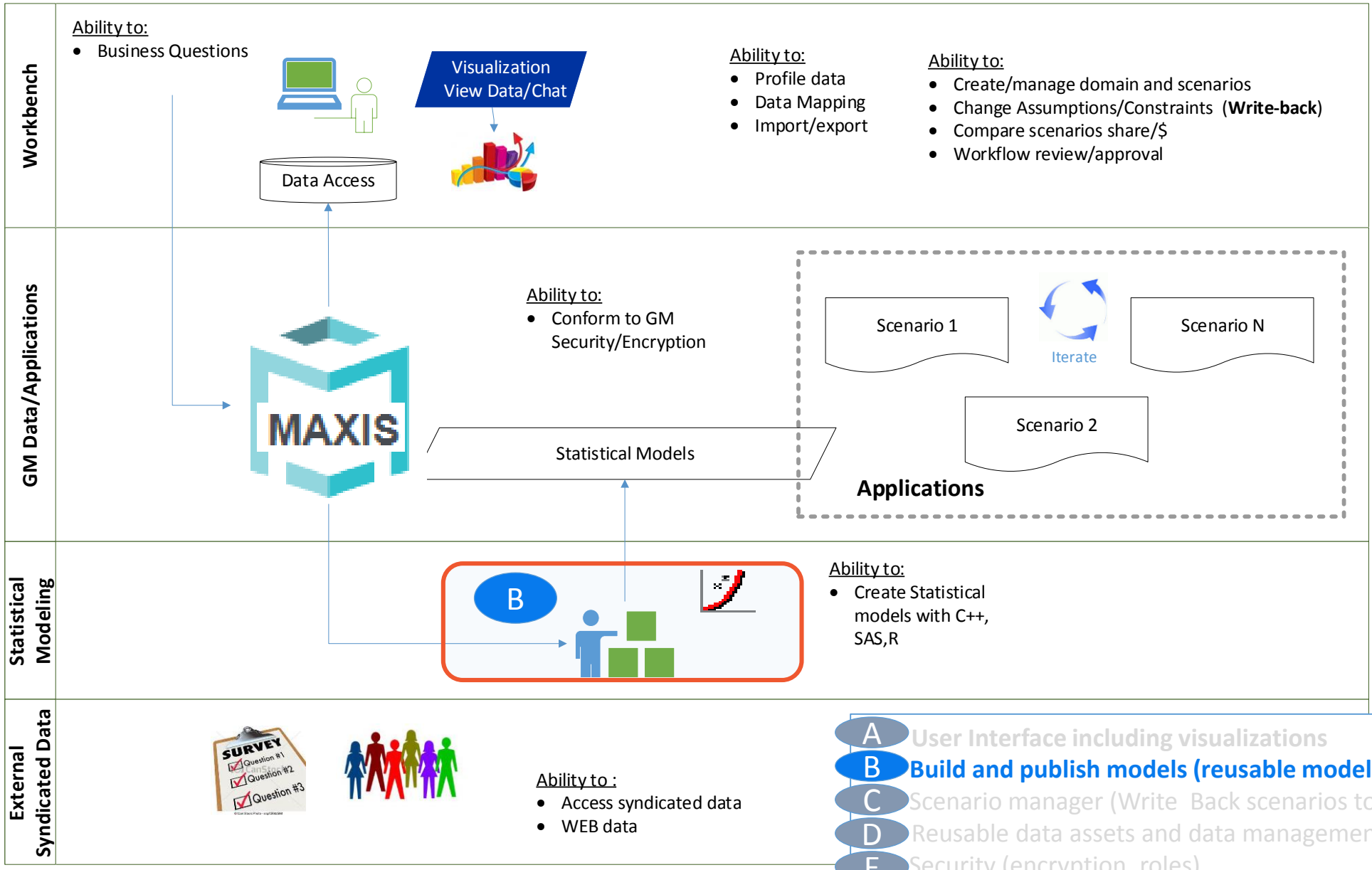

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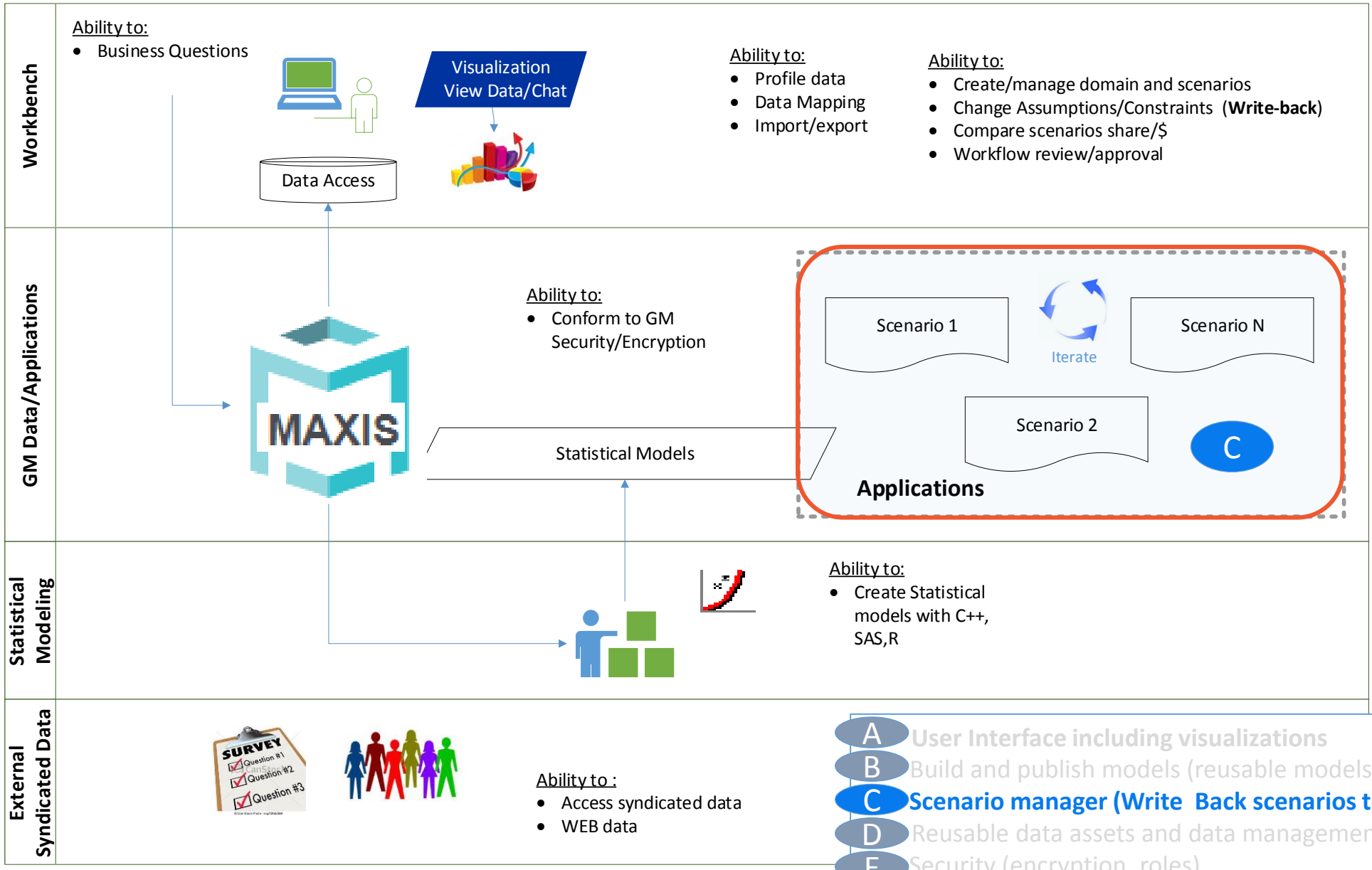

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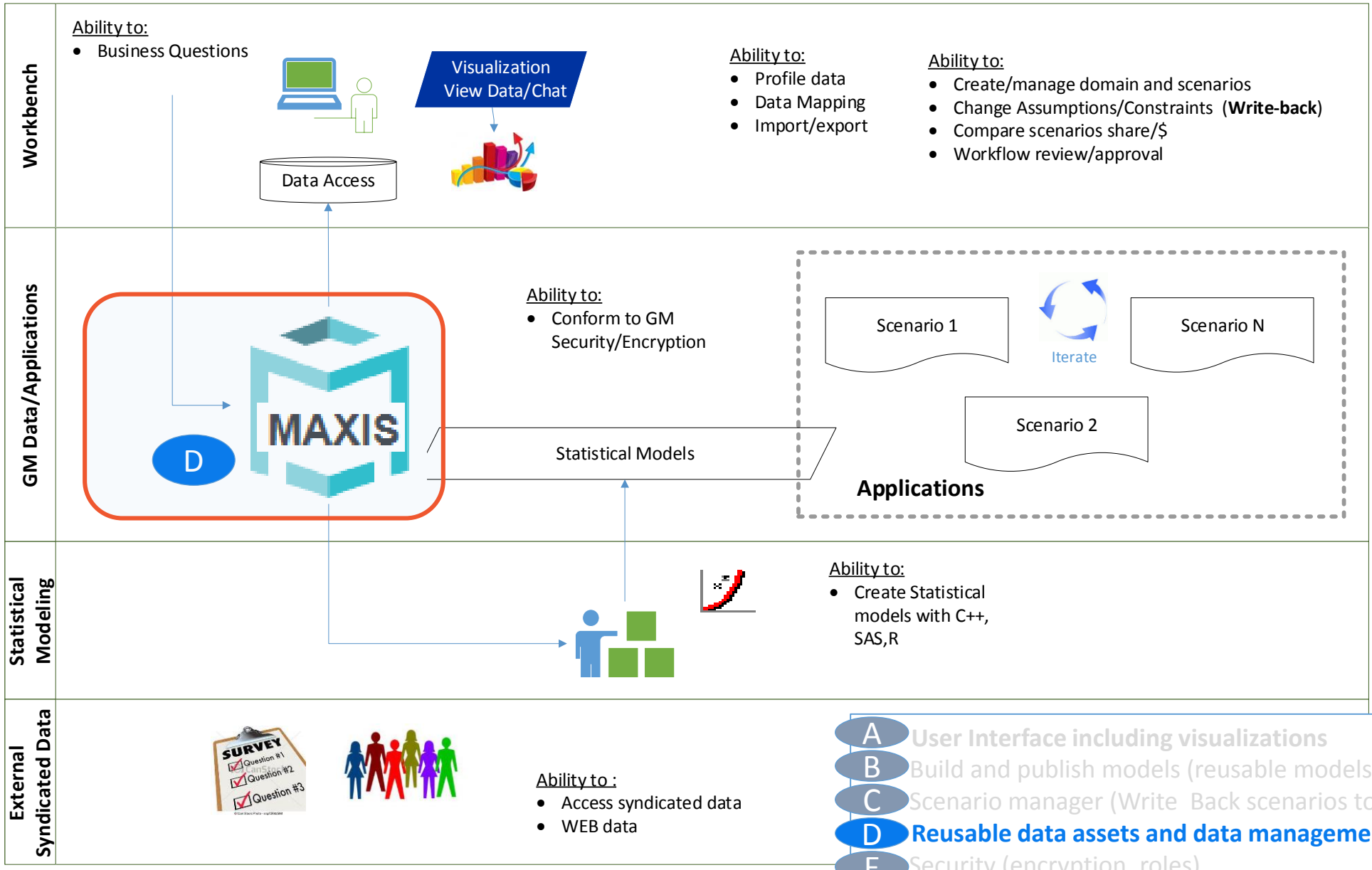

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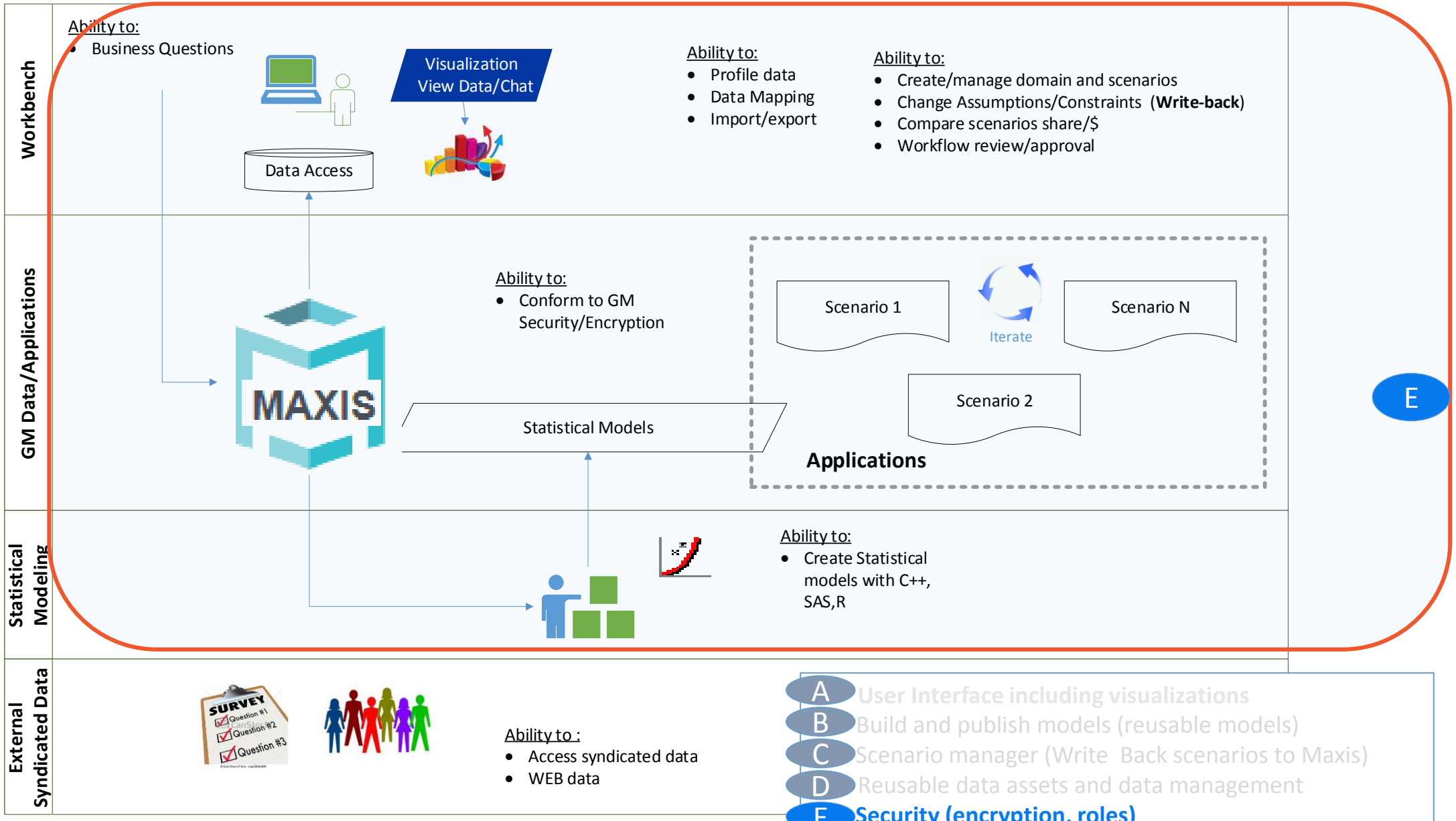

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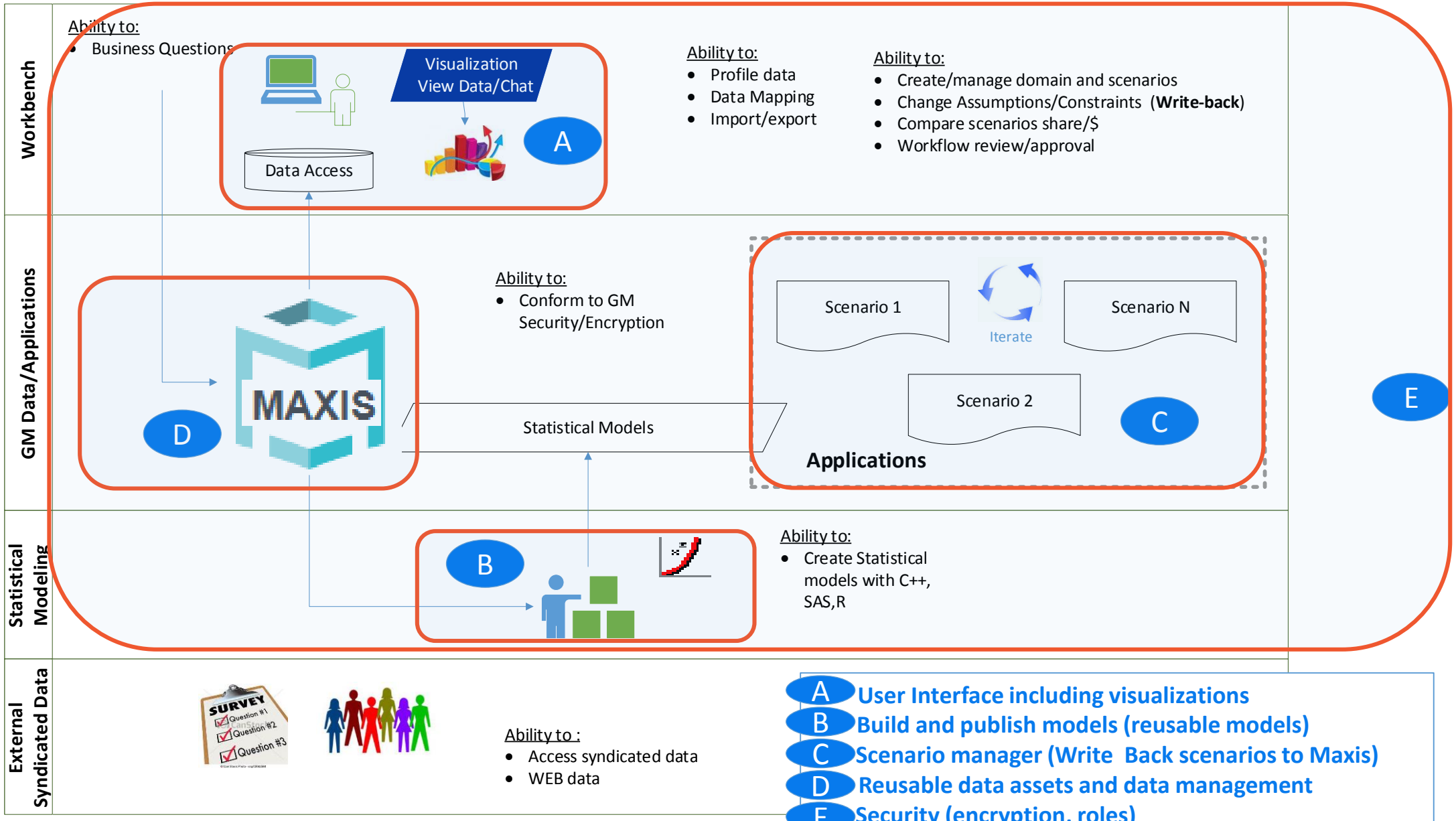


INFORMATION TECHNOLOGY

We Are General Motors

WE ARE COMMITTED TO SAFETY IN EVERYTHING WE DO

WE EARN CUSTOMERS FOR LIFE

WE BUILD BRANDS THAT INSPIRE PASSION AND LOYALTY

WE TRANSLATE BREAKTHROUGH TECHNOLOGIES INTO VEHICLES AND EXPERIENCES THAT PEOPLE LOVE

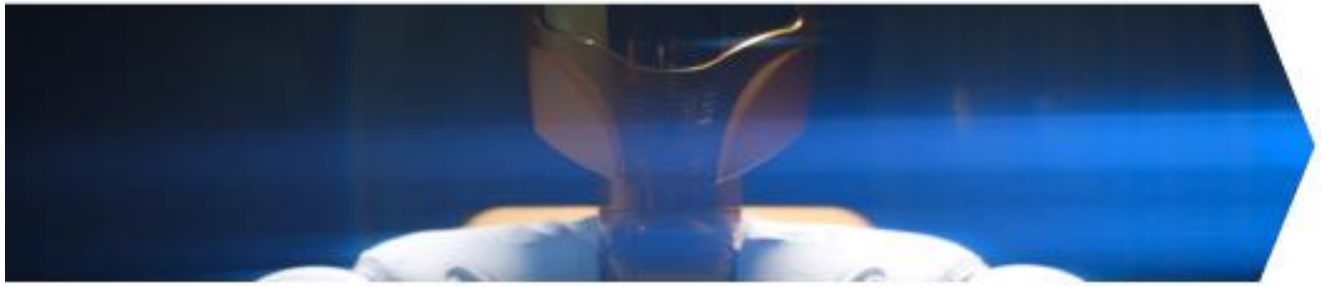
WE CREATE SUSTAINABLE SOLUTIONS THAT IMPROVE THE COMMUNITIES IN WHICH WE LIVE AND WORK

WHAT WE DO

Deliver safer, better and sustainable solutions.

HOW WE DO THIS

By putting the customer at the center of everything we do.



WHY WE EXIST

To move humanity forward.

WHAT WE VALUE

CUSTOMERS

We put the customer at the center of everything we do. We listen intently to our customers' needs. Each interaction matters. Safety and quality are foundational commitments, never compromised.

EXCELLENCE

We act with integrity. We are driven by ingenuity and innovation. We have the courage to do and say what's difficult. Each of us takes accountability for results, drives for continued efficiencies and has the tenacity to win.

RELATIONSHIPS

Our success depends on our relationships inside and outside the company. We encourage diverse thinking and collaboration from the world to create great customer experiences.

Reference

- Ahmed M. D. , Sundaram D. , 2004 “Scenario Driven Flexible Decision Support Systems Generator”. 8th Pacific Asia Conference on Information Systems · PACIS 2004