



Managing Risk
Assuring Compliance
Optimizing Performance

Data as a Critical Asset for Integrity Management

Esri Petroleum GIS Conference 2019 – May 15-16

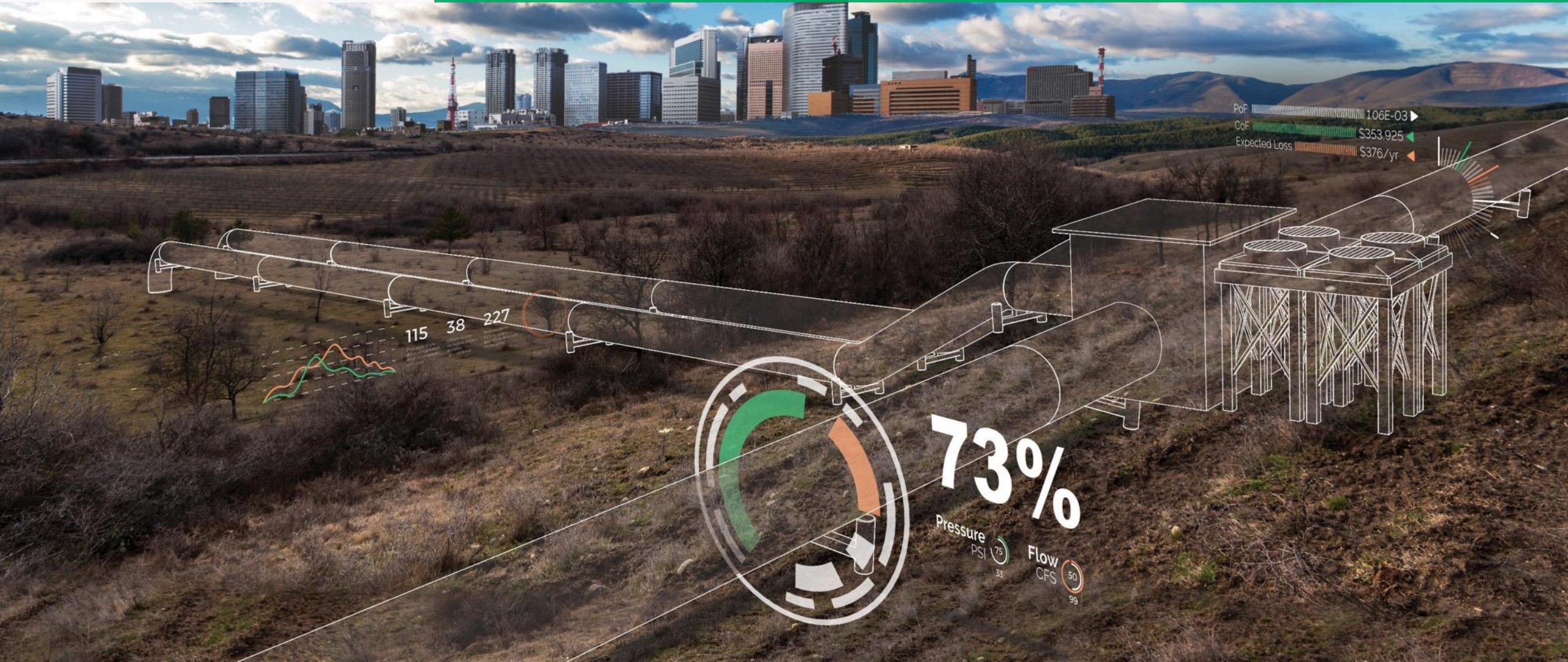


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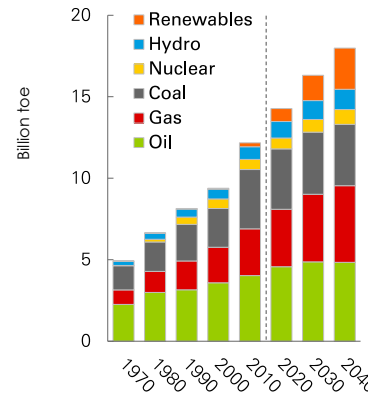
- Pipeline Infrastructure Dynamics & the Role of Data
- The Triad of Systems (WMS, GIS, DMS)
- Data as a Critical Asset
- Recommended Roadmap for Data Management
- Conclusions

Pipeline Infrastructure Dynamics

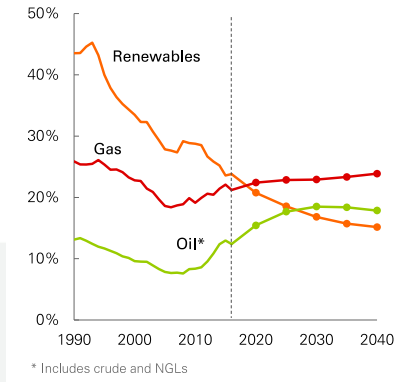


- ✓ Growing global O&G demand
- ✓ NA Gas: Increased volumes: 1.5X by 2035, 2X BCF by 2050
- ✓ Slower construction growth
- ✓ Maintenance of existing assets and life extension is critical
- ✓ O&M optimization & data driven prioritization required

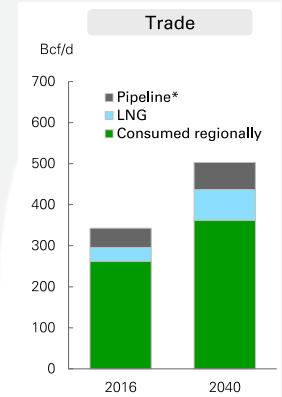
Energy Demand



US Energy Investment Growth



Nat Gas Global



2018 BP Energy Outlook

	Existing Infrastructure	New Pipelines 2015 -2035
Miles of Transmission	300,000	~ 15,000
Miles of Gathering Lines	400,000	~150,000
Gas Processing (BCF / Day)	83	~40
Storage	9,000	~250

Quadrennial Energy Review; Energy Transmission, Storage, and Distribution Infrastructure, April 2015, White House Task Force
 North American Midstream Infrastructure Through 2035: Leaning Into Headwinds, Prepared by ICF International for the INGAA Foundation, April 12, 2016



Data Management and Integration

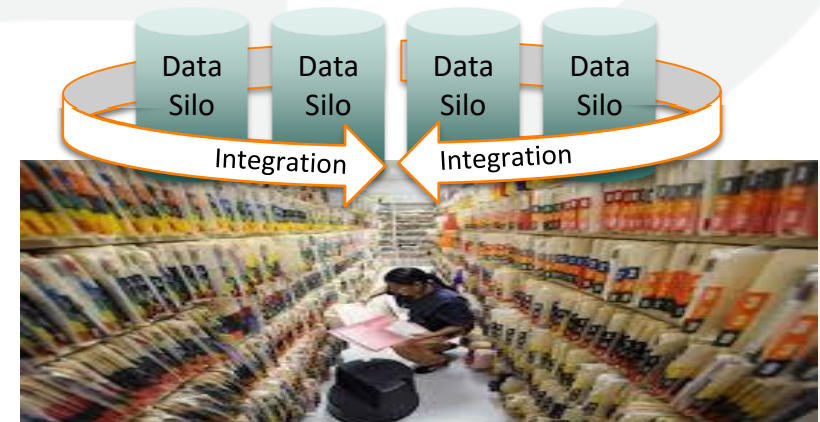


- ✓ API TR 1178: guidelines to empower informed decisions
- ✓ Goal: highest degree of data quality possible
 - Efficient use of resources
 - Easy access/ security
 - Communication across systems (enable analytics)
- ✓ PHMSA: “ The ability to integrate and analyze (...) data from many sources is essential for sustaining performance and a proactive IM program.”
- ✓ Completes framework set by API RP's 1160, 1163, 1173 and 1176



Asset Performance Management

Asset Integrity Management

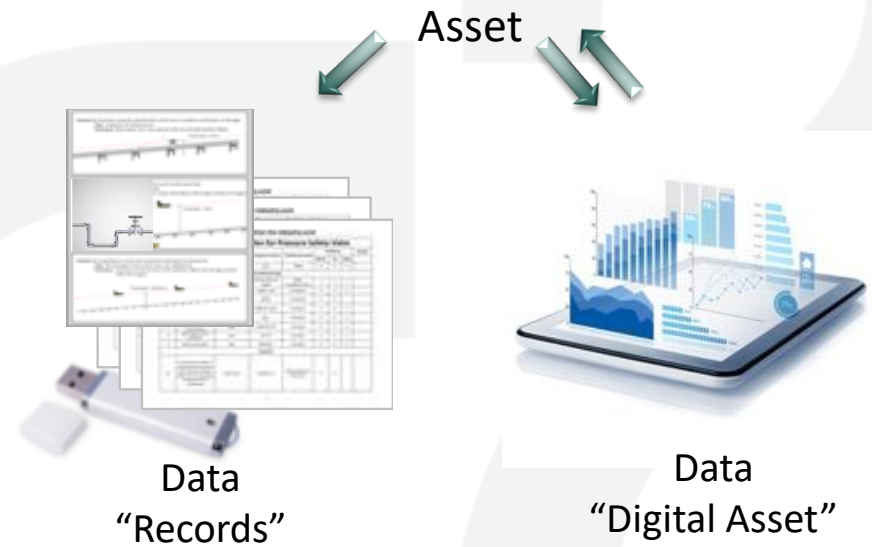


1160 – Managing System Integrity for Liquid Lines / 1163 – In-Line Inspection Systems Qualification / 1173 – Pipeline Safety Management Systems / 1176 – Recommended Practice for Assessment and Management of Cracking in Pipelines

Data Quality & Integrity: What is it?



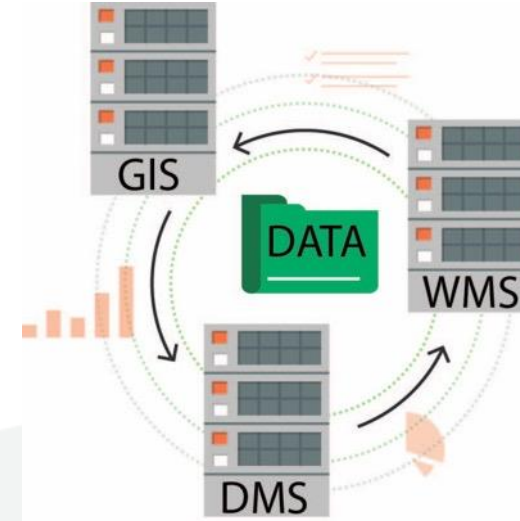
- ✓ **Accuracy:** represents reality
- ✓ **Completeness:** all needed data is available
- ✓ **Consistency:** free of internal conflicts
- ✓ **Precision:** exact as needed
- ✓ **Granularity:** right level of detail
- ✓ **Timeliness:** current and retained until needed
- ✓ **Integrity:** structurally sound (topology)
 - Asset integrity: “is the ability to perform its required function effectively and efficiently over its entire life cycle”



The Triad of Systems



- ✓ Currently, the 3 main systems operate as silos:
 - Work Management (Maximo)
 - GIS (Esri)
- ✓ Data Management (in-house, SCADA)
- ✓ Data grows significantly with more frequency and resolution... “big data” era
- ✓ Digital integration now more affordable
- ✓ Systems providers enable integration capabilities
- ✓ “One version of the truth” becomes a critical skill for any enterprise management system

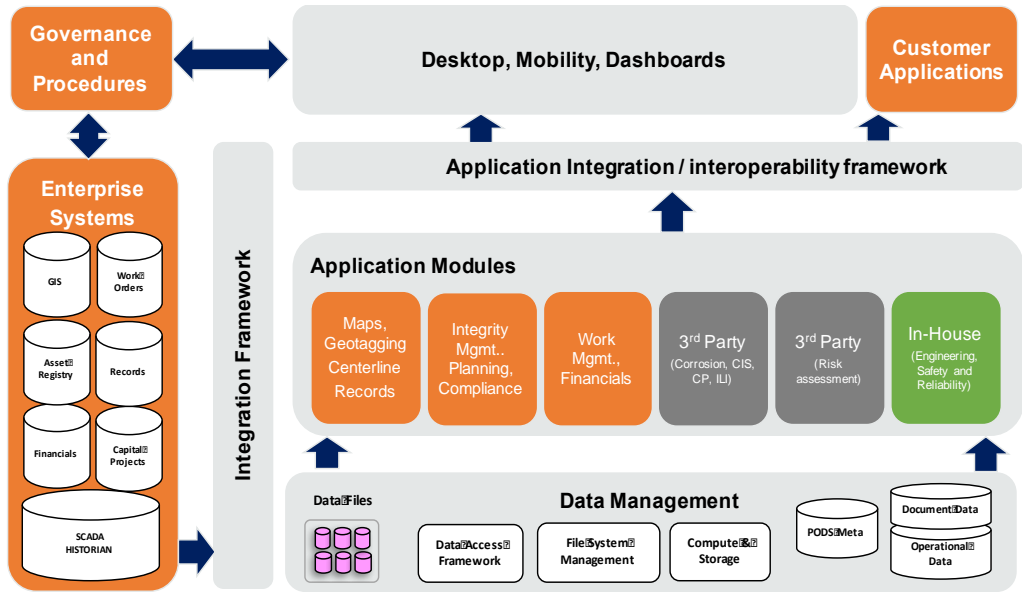


Assets	Number of records	System	Estimated Data size for ~ 10K miles
Compressor stations	100	Historian / SCADA	20 MB
Measurement stations	4,000	Historian / SCADA	1 TB
Regulatory stations	1,200	Historian / SCADA	300
Valves	16,000	GIS	6 TB
Pipe segments	90,000	GIS	45 TB
Main valve segments	12,500	GIS	6 TB
Dynamic segments	69,000	Risk Software	Aggregated with other assets
Inspections (ILI)	3,500	GIS	1 TB
Anomalies from ILI	2,000,000	GIS	1.5 TB
Closed interval survey inspection	1,000	GIS	Aggregated with other assets
Closed interval survey readings	4,500,000	GIS	Aggregated with other assets
Work orders	1,000	WMS	350 MB

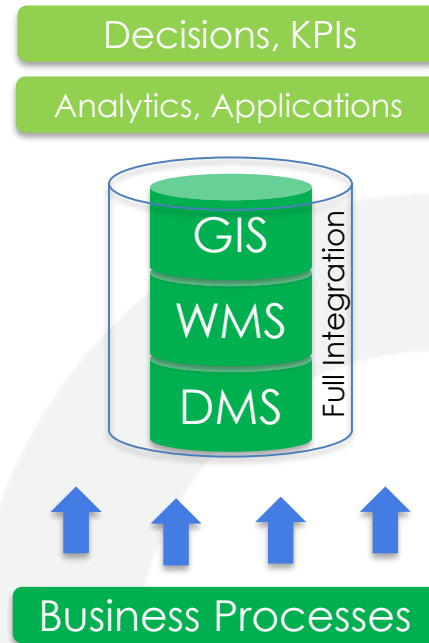
The Triad of Systems



Best Case Today



Goal



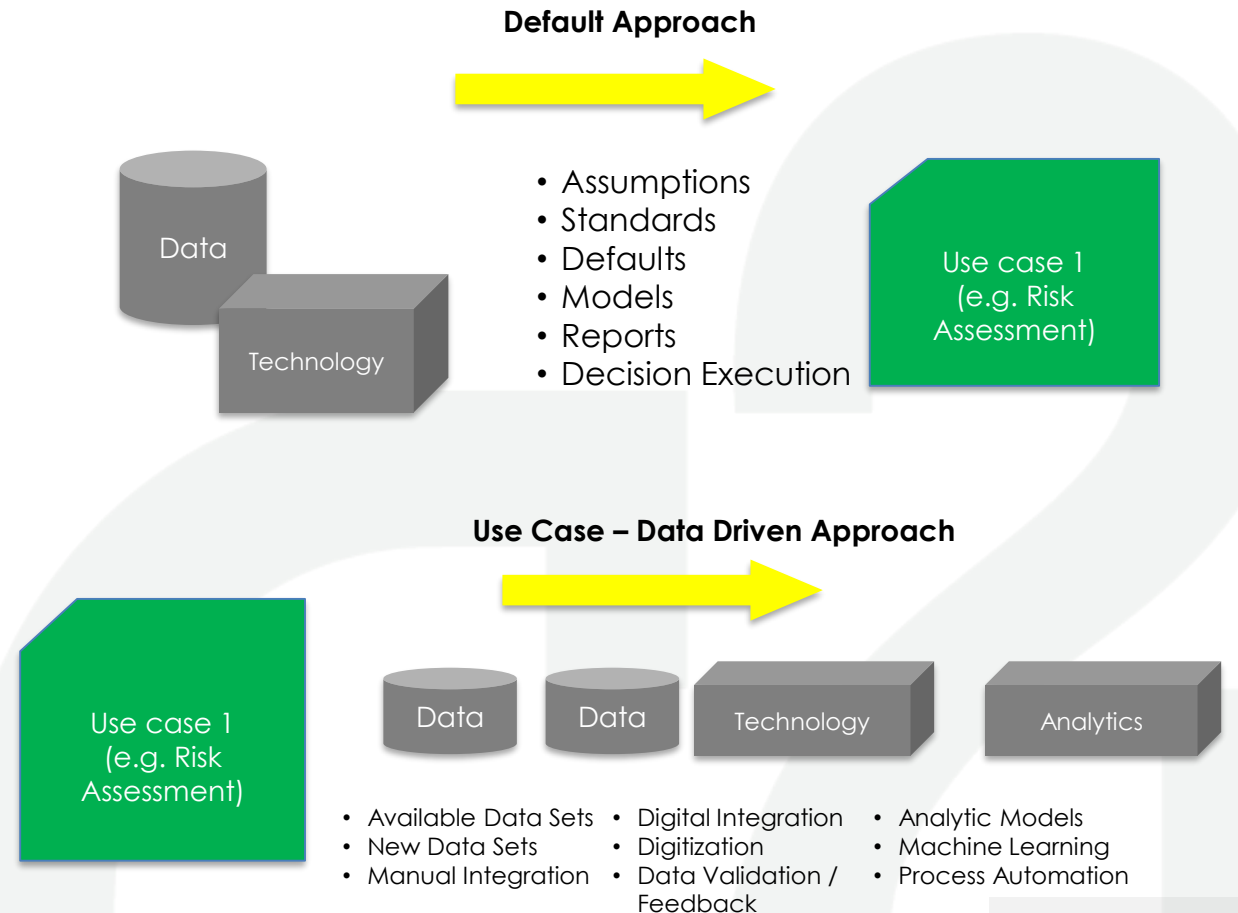
Outcomes



Managing Data as a Critical Asset



- ✓ Data Management needs to be a strategic decision (same as asset management)
- ✓ Prioritization of data efforts must be driven from “Use Cases” not “Data Sources”
- ✓ Data confidence must be a factor in decision-support outputs
- ✓ Governance & roles are critical to success
- ✓ Benefits of treating data as an asset:
 - Auditability / Traceability
 - Easier data corrections, less human error
 - Improved resource utilization
 - Security / Scalability



Roadmap for Effective Data Management



Roadmap for Effective Data Management



Data Attributes



Context

Contextual data (Geo, operations, value chain)

In-Service

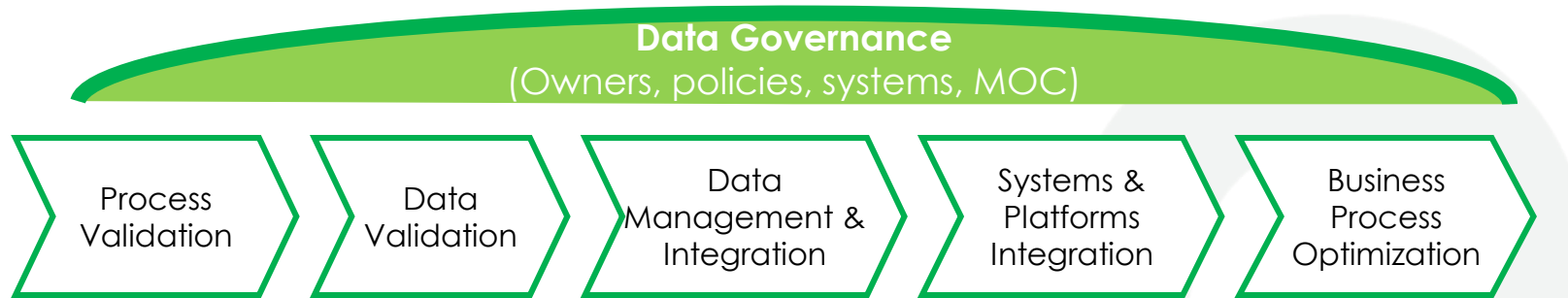
Operational (ILI, field) TVC updates

As-Built

Construction & manufacturing



- Current state
- Gap assessment
- Goal setting



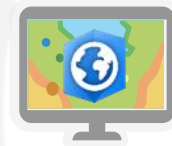
- Process outcome
- Inputs, Stakeholders, data requirements, frequency
- Policies and procedures

- TVC
- Migration
- Conditioning

- Centerline alignment
- Integration of SME knowledge
- Confidence / quality
- Data models & standards (PODS, APDM, UPDM)

- Use-case based integration of systems
- WMS + GIS
- Enhance data models

- Define business outcomes & goals
- Process optimization / automation
- Data analytics
- Machine learning



Roadmap for Effective Data Management



Use case example: Alaska Pipeline Operator, Compliance Management

- Outcome
- Process Optimization
- System Integration
- Data Management & Integration
- Process & Data



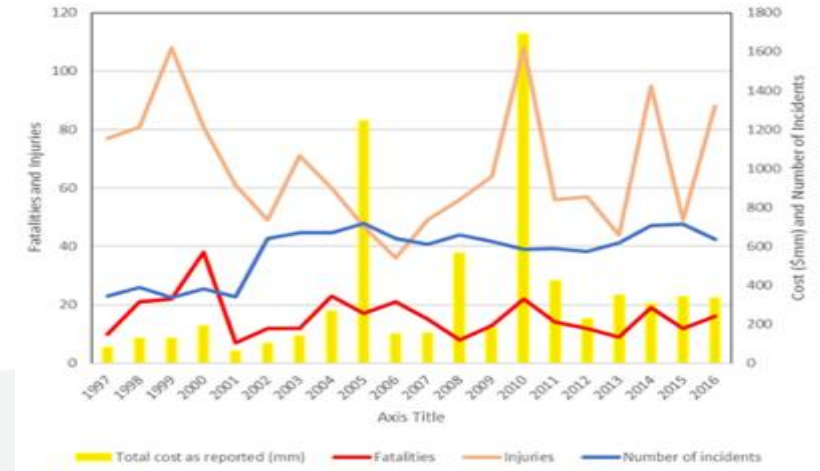
- Minimize non compliance segments
- Optimize field / office work
- Effective support for Reg audits
- Guaranteed, up-to-date, measurable compliance
- Field mobility app integrated to Maximo.
- Esri Insights Dashboard and KPI's
- From XLS to Maximo App
- Manual process, ad hoc updates
- Multi-tab XLS repository

Conclusion

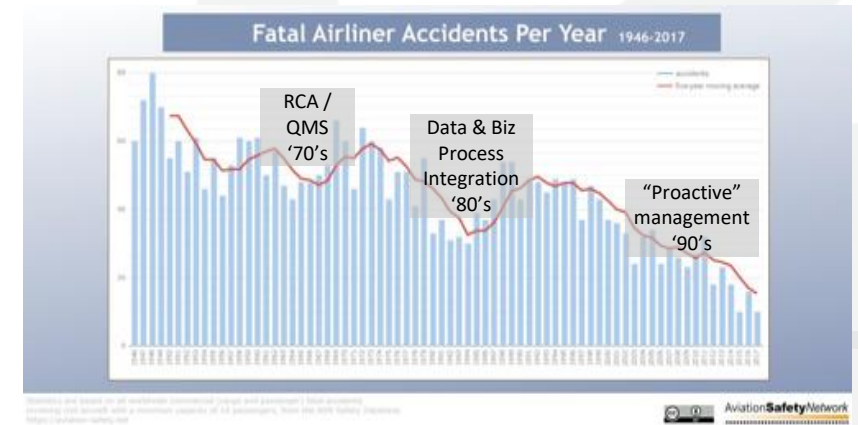


- ✓ Pipeline infrastructure demand growth continues
- ✓ Safe asset lifecycle extension critical
- ✓ Data needs to be treated as an asset: data integrity
- ✓ Data & Business process integration supports safer and more efficient operations:
 - Airline industry shows incident reduction after data and proactive management efforts
 - Pipelines have increased technology and data volumes... safety records still not trending better
- ✓ Data management is a journey, requires governance, roles, goals and continuous improvement mindset

PHMSA Incidents 1997-2016



Fatal Airliner Accidents per Year 1946-2017



Q&A



Managing Risk
Assuring Compliance
Optimizing Performance



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