



DECISION
MANAGEMENT
SOLUTIONS

Using DMN on Machine Learning Projects

James Taylor

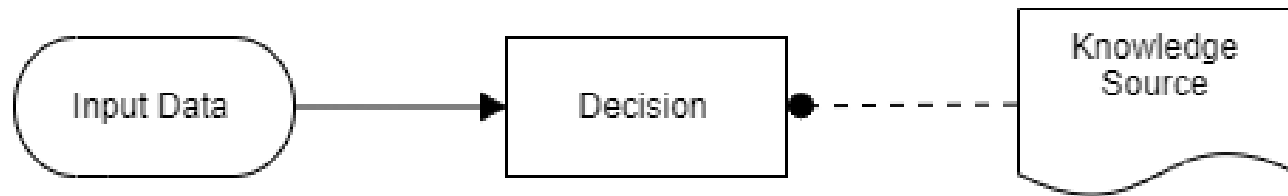
DEDICATED TO
DECISIONS FIRST

Agenda

- ▶ DMN
- ▶ Why do ML Projects Need DMN?
- ▶ DMN for framing (ML) requirements
- ▶ DMN for documenting ML development
- ▶ DMN for ML deployment
- ▶ DMN for ML next steps
- ▶ Call to Action

DMN

- ▶ A shared notation
- ▶ Readily understandable by all
- ▶ Standardized bridge

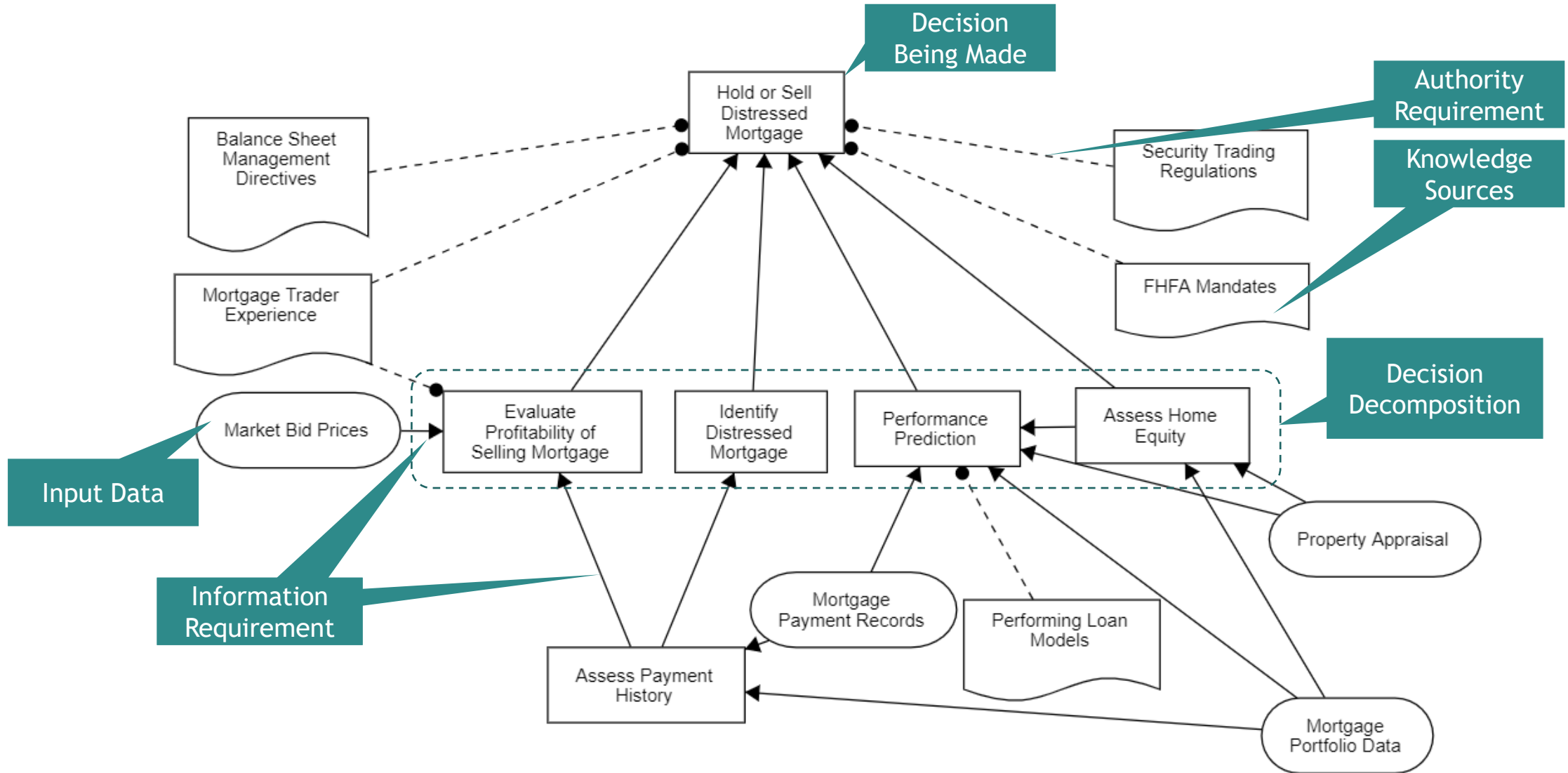


3 shapes and 2 lines!

- ▶ A great tool for analysis
 - ▶ Decomposition and normalization
 - ▶ Visualization and discussion
 - ▶ Requirements not sequence
 - ▶ Reusable decisions not rules
 - ▶ ...



Example Decision Model



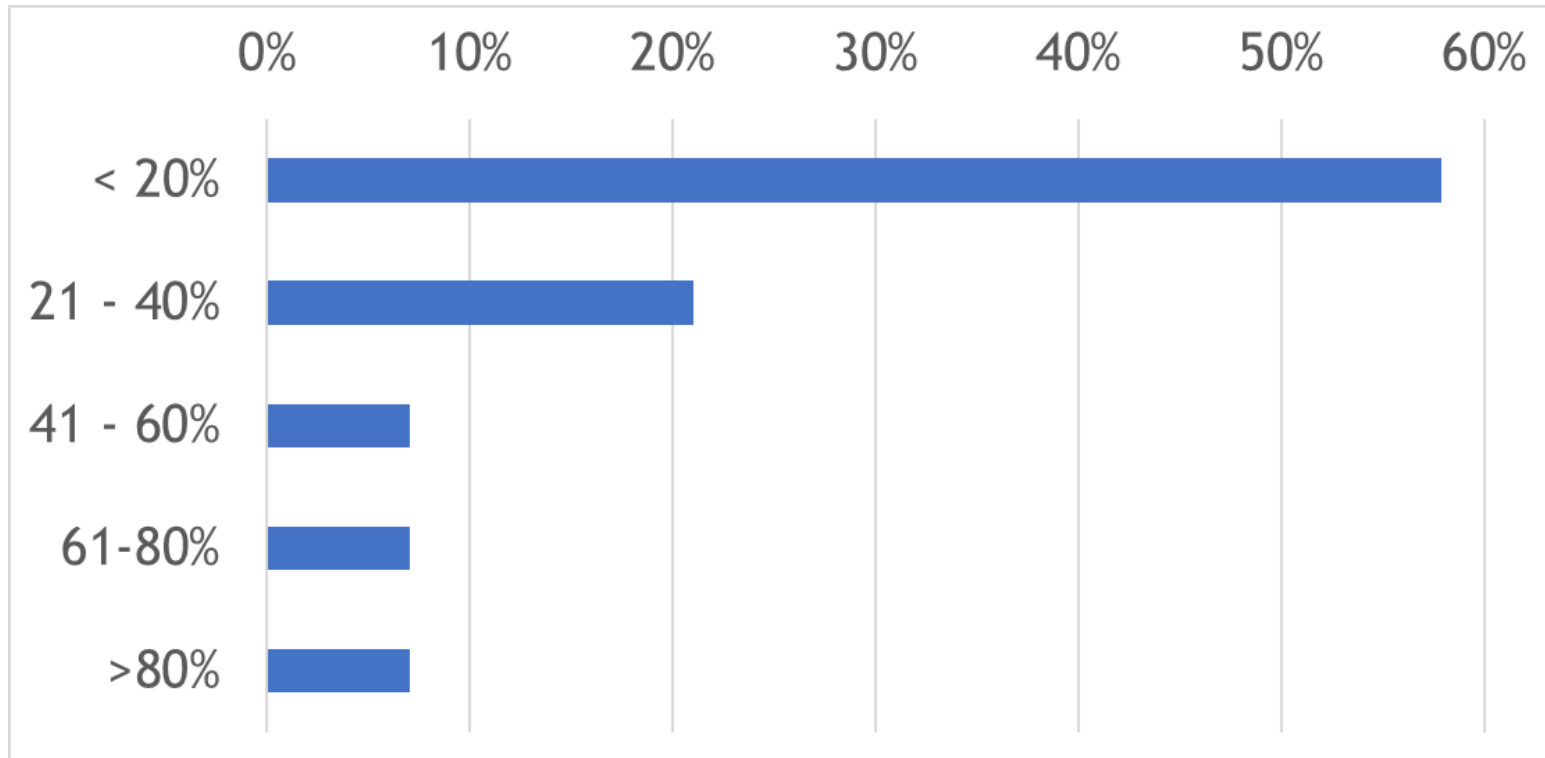


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Why Do ML Projects Need DMN?

ML Models Are (Still) Not Being Deployed

- ▶ 2022 KDnuggets Survey
 - ▶ Most models **intended** to be deployed are **not** deployed
 - ▶ In most companies, **80%** fail to make it!

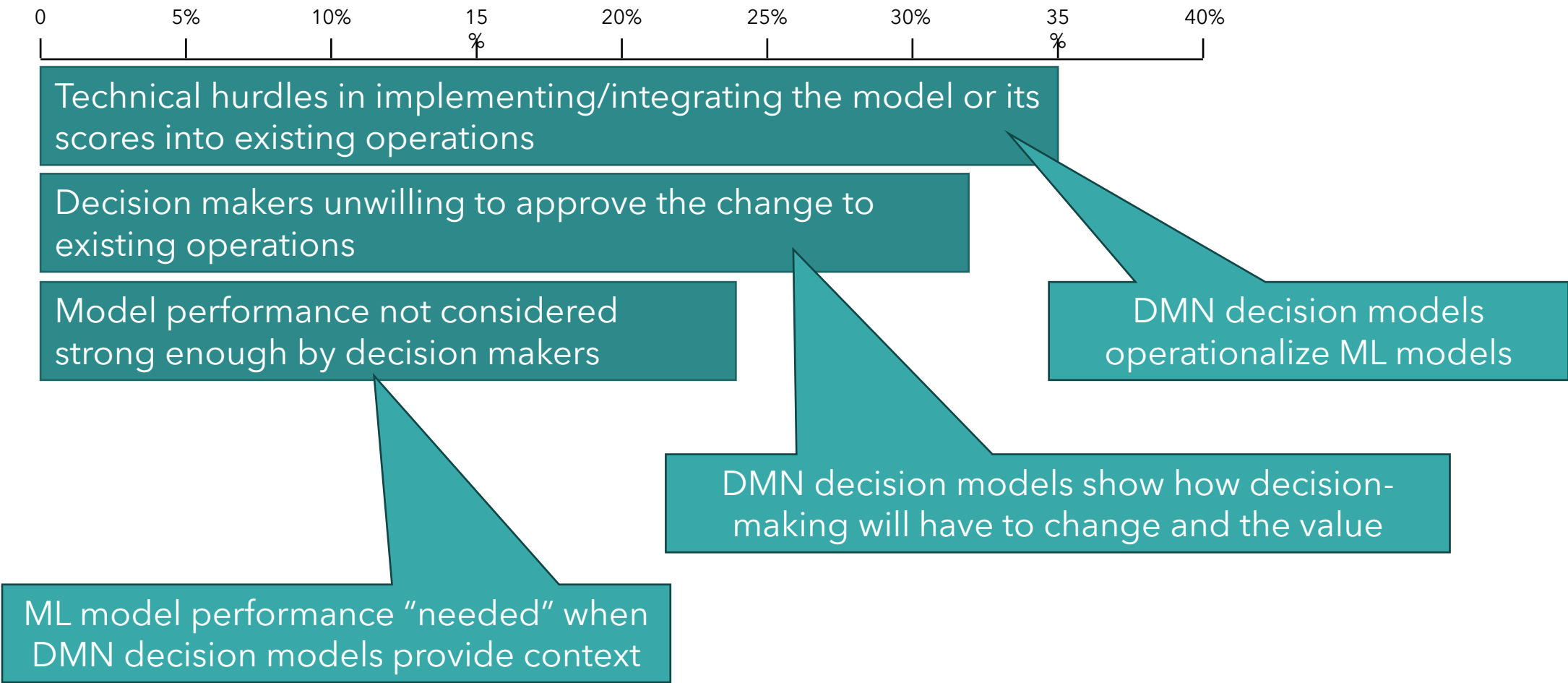


Percentage of respondents reporting various deployment rates for models developed with an intent to deploy



[Models Are Rarely Deployed: An Industry-wide Failure in Machine Learning Leadership](#) Eric Siegel
KDnuggets January 17, 2022

Why Are So Many Models **Business** Failures? And How Does DMN Help?



These are the three main reasons given in the survey for a failure to deploy a model built for deployment. These are the reasons that so many successful technical models are **business** failures because they have not been deployed.

What Does It Mean To Succeed with ML/AI?

Not just analytic insight

Changed **Operational Behavior**

Not just analytic precision

Business Value Created

Not just in limited deployment

Throughout an organization

Not just once or twice

But **often**

The ML Industry is Working on Solutions

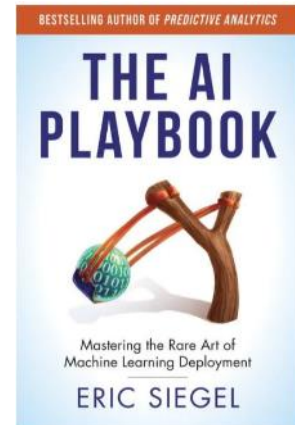
- ▶ More being written about challenges
 - ▶ How to focus ML teams on the right problem
 - ▶ How to engage business and ML teams together
 - ▶ How to ensure operationalization
- ▶ But there are no standards
- ▶ If not us, who?

McKinsey
&Company

“To achieve analytics at scale, companies should ... start by identifying the decision-making ... they could improve to generate additional value”

“Decision-driven data analytics starts from a **proper definition of the decision** that needs to be made and the data that is needed to make that decision.”

Bart de Langhe and
Stefano Puntoni



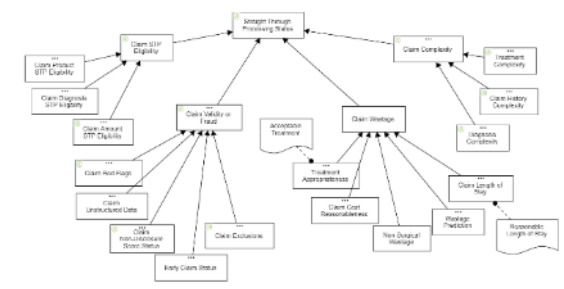
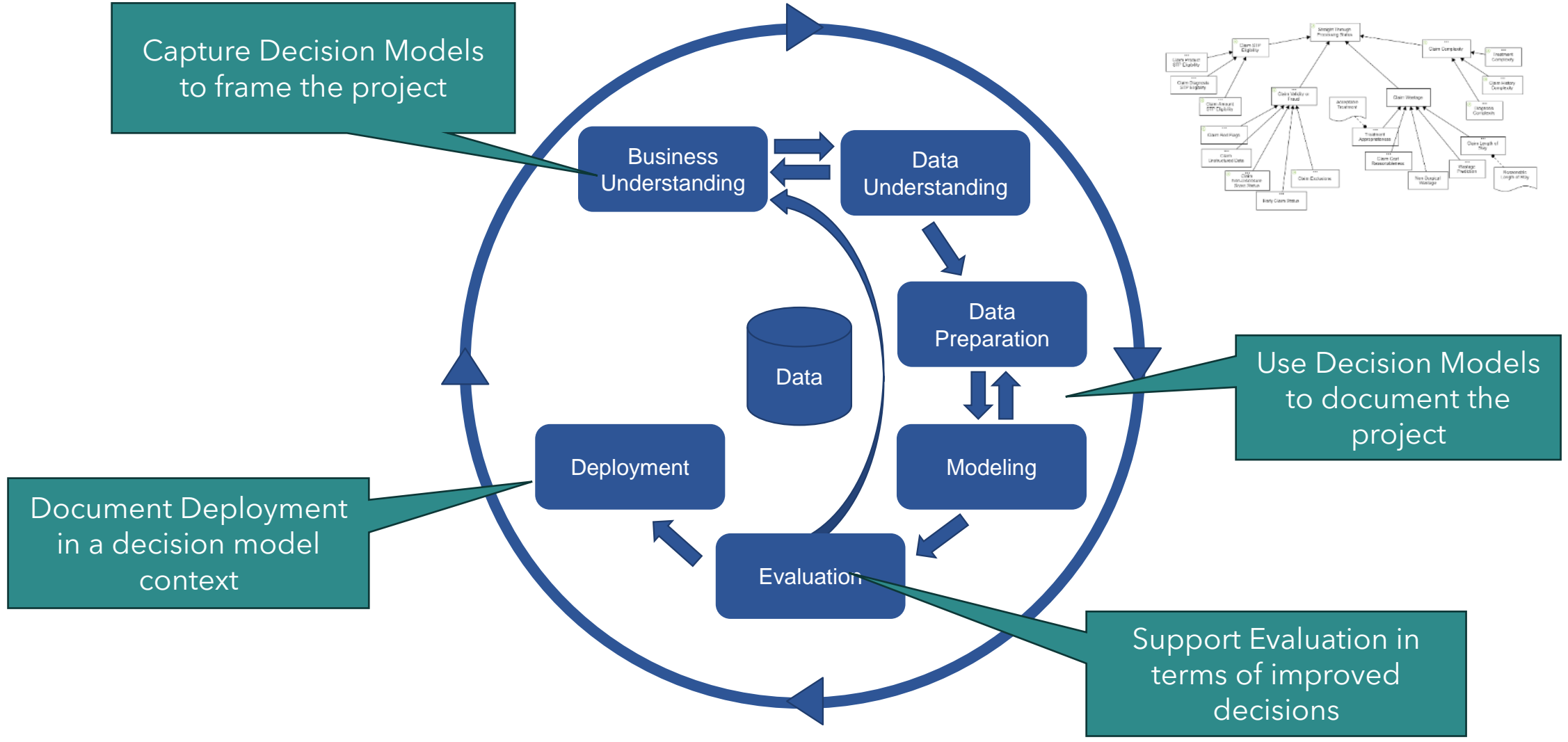
Bart de Langhe and Stefano Puntoni in the MIT Sloan Management Review
“[Leading With Decision-Driven Data Analytics](#). Breaking away: The secrets to scaling analytics,
May 2019 By Peter Bisson, Bryce Hall, Brian McCarthy, and Khaled Rifai



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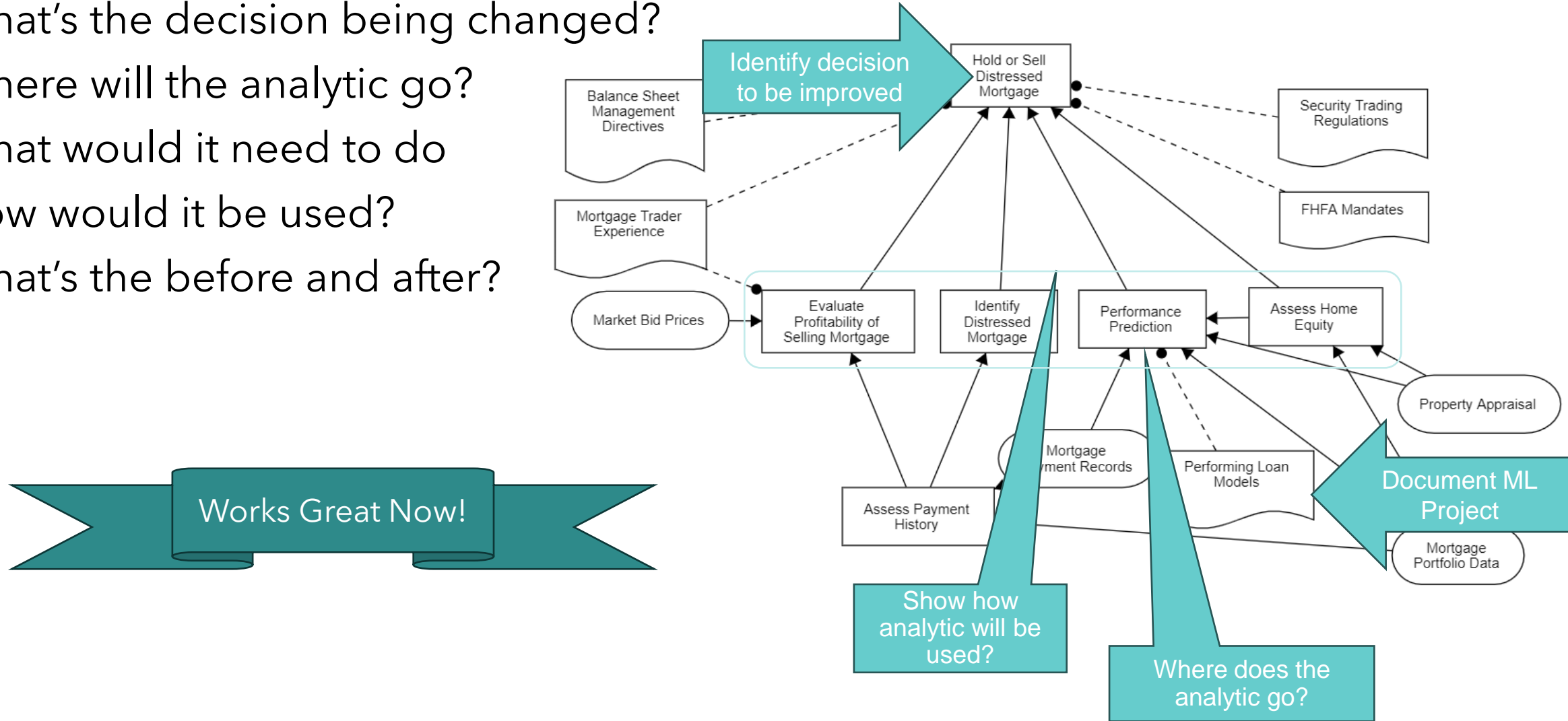
DMN for ML Today

DMN Adds Value Today



Decision Modeling For Precise Framing

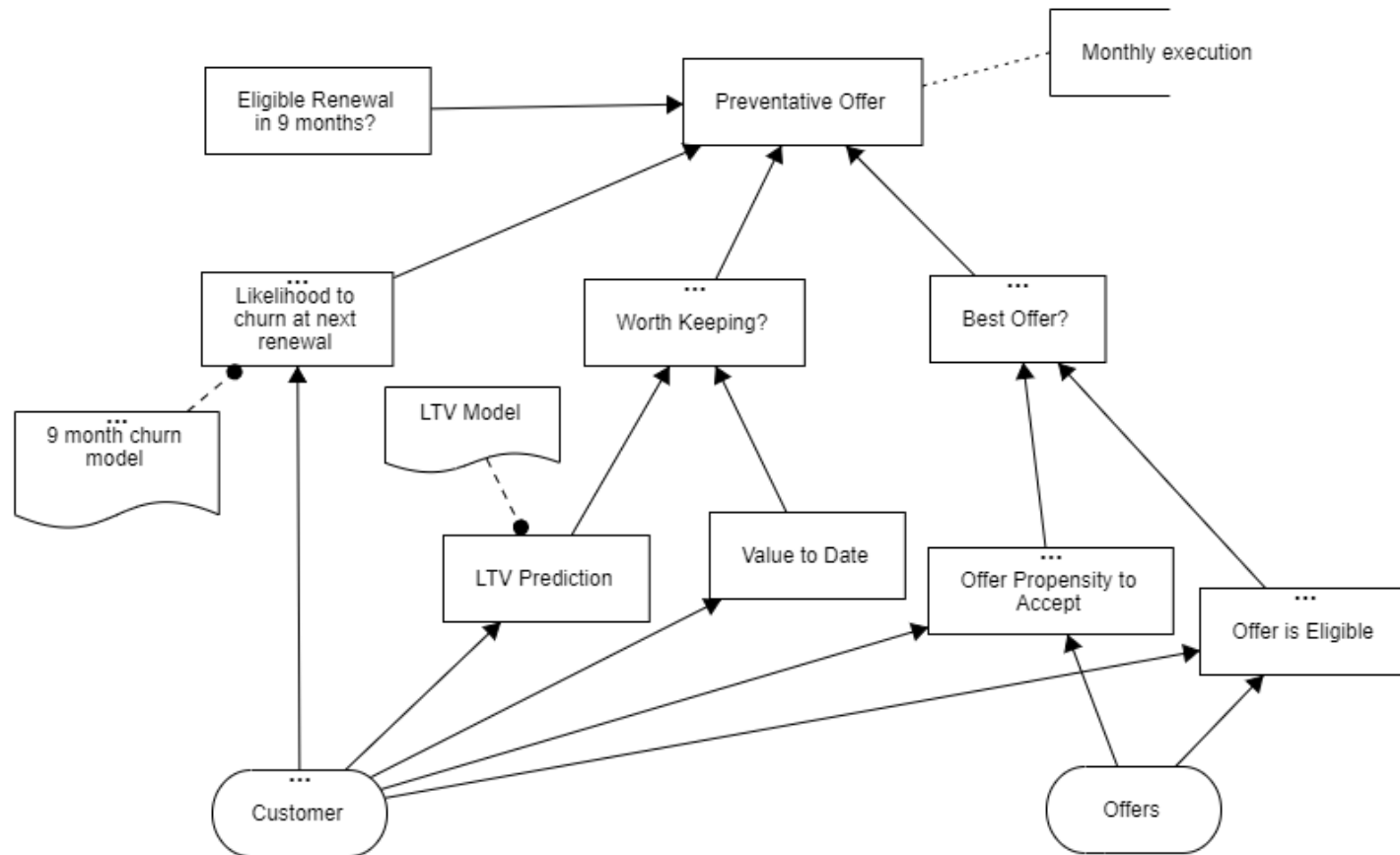
- ▶ What's the decision being changed?
- ▶ Where will the analytic go?
- ▶ What would it need to do
- ▶ How would it be used?
- ▶ What's the before and after?



Example: Approach 1 of 2 to Customer Retention

► Preventative

- Identify at risk customers well in advance and make them an offer so they don't quit



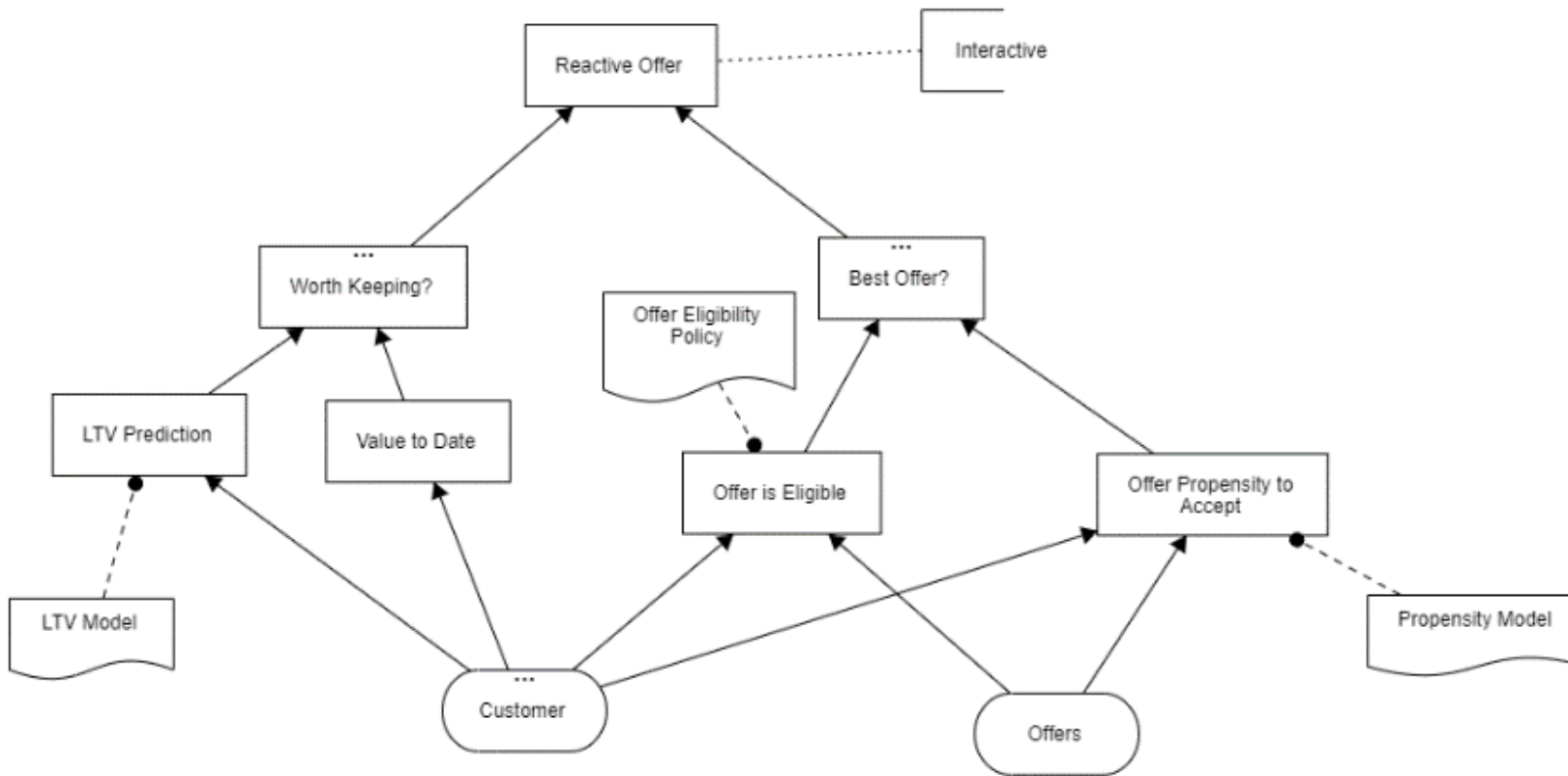
Notes

- Need a churn model
- Batch implementation

Example: Approach 2 of 2 to Customer Retention

► Reactive

- When someone calls to cancel, try and persuade them not to



Notes

- Interactive at cancellation
- Don't need to know churn risk
- Different offers eligible
- Different Propensity to Accept

DMN for Managing and Documenting ML development

- ▶ Many ML projects are poorly documented
- ▶ Most business users don't understand the documentation
- ▶ A visual DMN model adds real value
- ▶ Four Areas:
 - ▶ Show the data involved
 - ▶ Document the approach used
 - ▶ Visualize the features created
 - ▶ Capture the ML model feedback loop

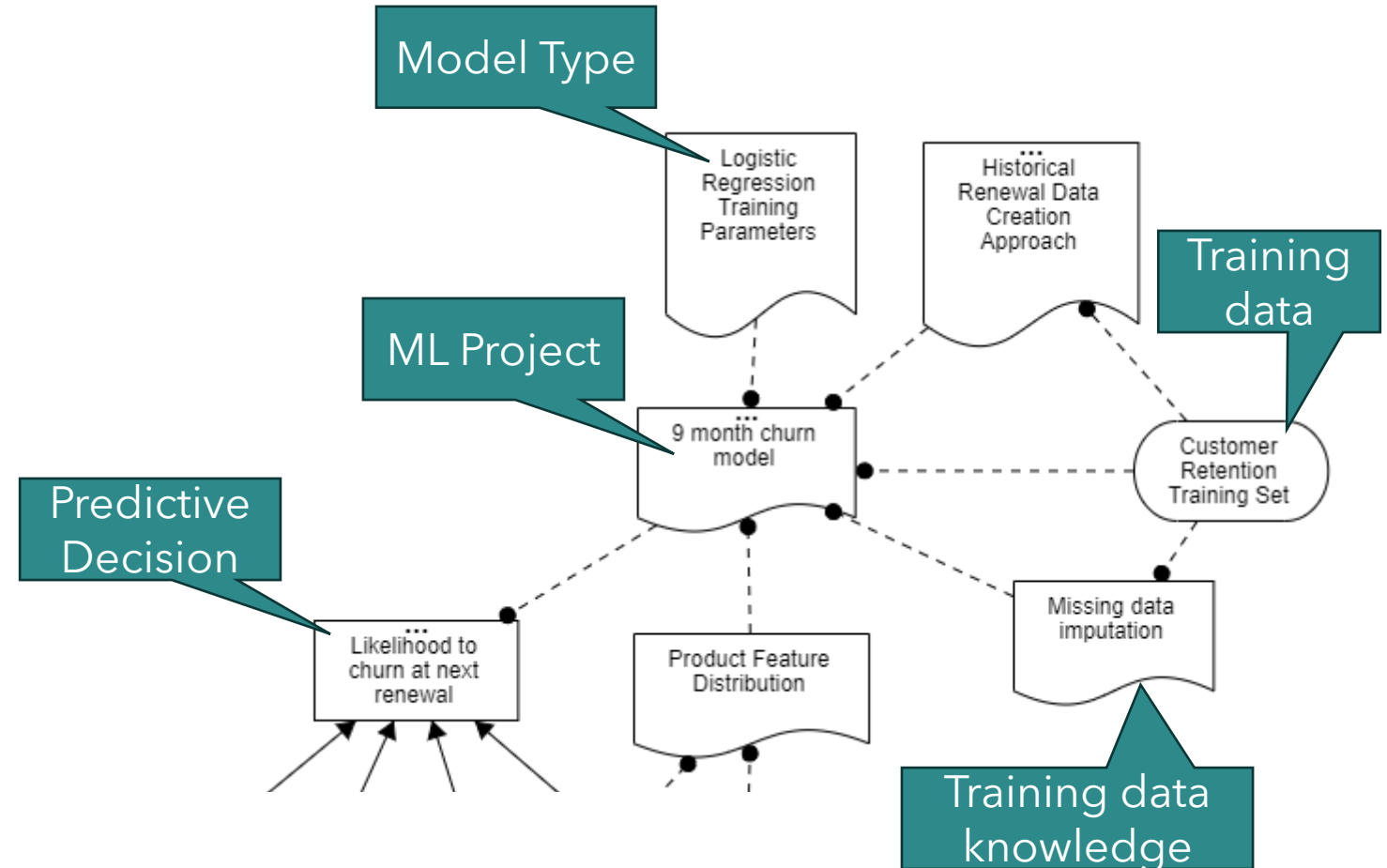
DMN for Managing and documenting ML development

► Data

- Input Data for data structures
- Knowledge Sources
 - ▷ Data descriptions
 - ▷ Data distribution
 - ▷ Training data descriptions

► Approach

- Knowledge Sources
 - ▷ The project
 - ▷ ML Model Type
 - ▷ Approaches and testing
 - ▷ Hierarchy of Knowledge Sources



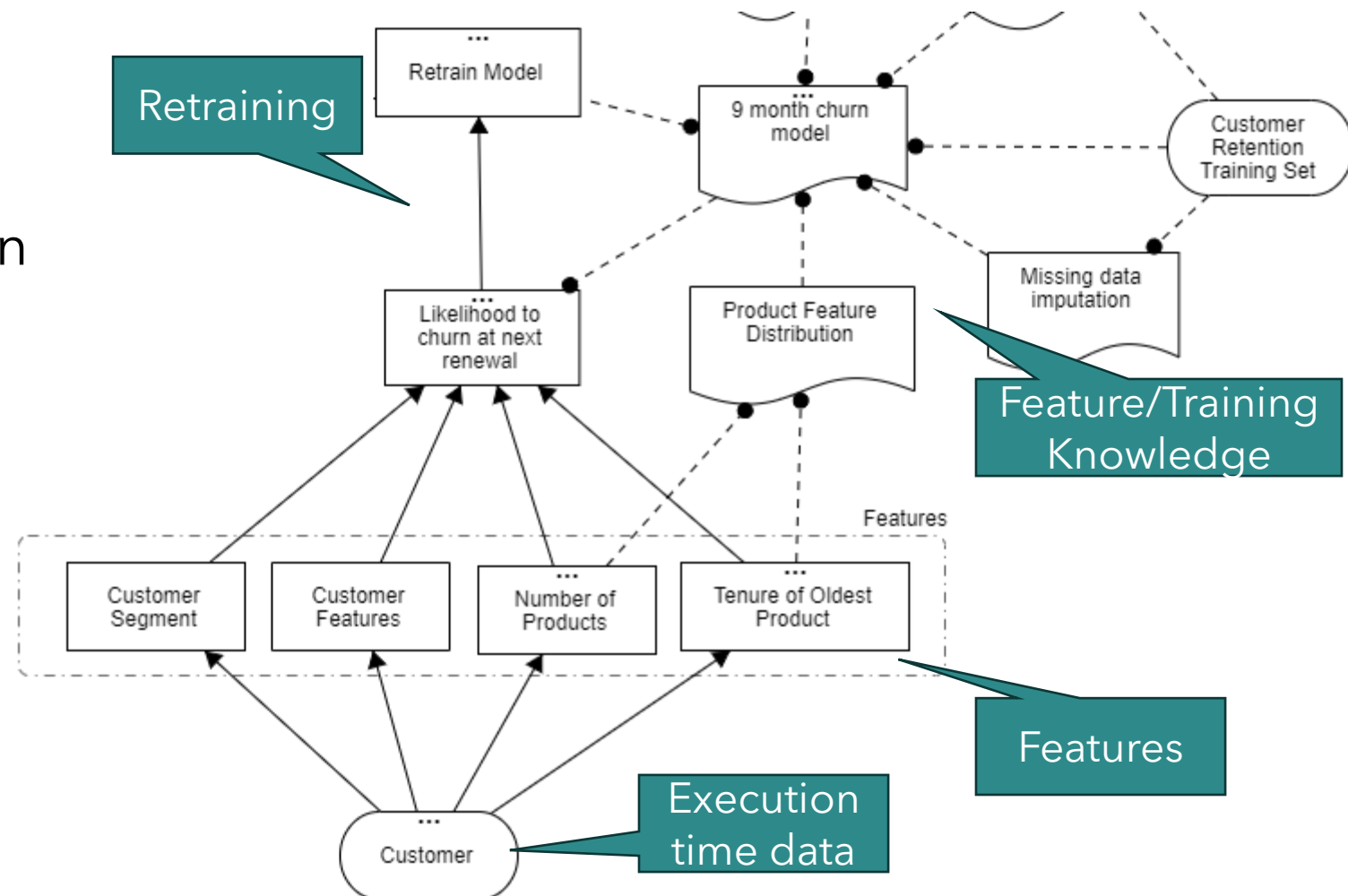
DMN for Managing and documenting ML development

► Features

- Decisions for each feature
- Most features have >1 value
- Passthrough features common
- Knowledge Sources
 - ▷ Missing Values and Imputation
 - ▷ Feature distribution

► Retraining

- Decide when to change the Knowledge Source
- Use the results of decisions
- Assess performance, drift



DMN for MLOps Deployment

- ▶ Deployment limited
 - ▶ Functions are FEEL, Java or PMML
 - ▶ FEEL lacks many of the capabilities used in ML features and models
 - ▶ Data scientists very rarely use Java functions
 - ▶ PMML is limited and has never really “made it”
- ▶ Invokables (BKMs, Decision Services) don’t add much as a result
- ▶ Could
 - ▶ Call a deployed REST end point inside a Java function
 - ▶ Call Java libraries that mimic python functions
 - ▶ ...
- ▶ But meh



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DMN for ML Tomorrow

DMN for ML Next Steps 1 of 3

End Point Deployment

- ▶ REST API for functions
 - ▶ So can deploy ML models as end points and use from DMN artifacts
 - ▶ Increasingly the most common way to deploy ML Models
 - ▶ Generally useful for other functions
 - ▶ Risk to the stateless, side-effect free DMN model
- ▶ Gray box decision service
 - ▶ Allow a Decision Service to be partially defined if it has a function defined
 - ▶ Can use the function for invocation but see some of the decision-making
 - ▶ Allows
 - ▷ Model-level reuse of elements in deployed services
 - ▷ Use of DMN to document a deployed service written in something else
- ▶ Draw a Decision Service, map to a deployed python service and use DMN to document it

DMN for ML Next Steps 2 of 3

Manage the Data More

- ▶ Knowledge Source Templates
 - ▶ Different kinds of knowledge have different properties
 - ▷ Data distribution information
 - ▷ ML model parameters and project documentation
 - ▷ Missing value imputation
 - ▷ Training data descriptions
 - ▷ Policies
 - ▷ Regulations
 - ▷ ...
- ▶ Decision Types
 - ▶ Broad classifications shown on diagram
 - ▶ Explicit Logic, ML/AI model, human decision-maker, feature set
- ▶ More on KPIs
 - ▶ Show on diagrams to increase visibility
 - ▶ Add more structure so can be used for things like ML model accuracy, retraining metrics
 - ▶ Think about monitoring and tracking

DMN for ML Next Steps 3 of 3

Python and ML Support

- ▶ Matrix Type
- ▶ Feature functions in FEEL
 - ▶ e.g., scaling, discretization, embedding, prompt manipulation
- ▶ Support for Python
 - ▶ Map to Python types
 - ▶ Allow Python functions
- ▶ Make it easy to add libraries of new (Python) functions
- ▶ Dataframe to Context mapping
- ▶ Support for Image, Video and Audio data types

Call to Action

- ▶ Use DMN for framing and planning ML projects NOW
- ▶ Use DMN to show where ML is being used in decisioning NOW
- ▶ Get your ML colleagues to see the potential in a graphical notation

- ▶ Help define the approach!
- ▶ Join the DecisionAutomation.Org ML discussion
 - ▶ Jan Purchase purchase@luxmagi.com
 - ▶ James Taylor james@decisionmanagementsolutions.com



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Decision Management Solutions

Decision Management Solutions

- ▶ Global footprint: Offices in USA, South Africa and India
- ▶ 40+ Years of executive experience in Decision Management
- ▶ 1,500+ People trained in Decision Management and decision modeling
- ▶ 5,000+ Decisions improved to date
- ▶ 16 Fortune 100 clients
- ▶ 21 Global 500 clients

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James Taylor

Founder and Partner

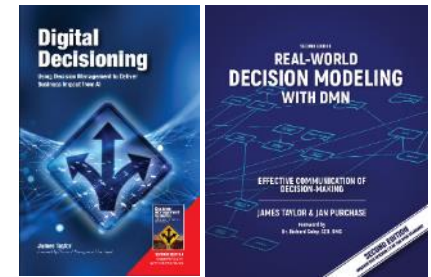
- ▶ More than 20 years championing Decision Management
- ▶ Extensive business rules & analytics experience
- ▶ Frequently cited expert, speaker, author

- ▶ Blogs

- ▶ jtonedm.com/
- ▶ decisionmanagementsolutions.com/blog/

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Decision Management Solutions specializes in helping organizations transform the operational decision-making that impacts businesses every day. We do this through Digital Decisioning, a unique approach that maximizes the value delivered by investments in AI and machine learning.