

# An Introduction to Decision Modeling with DMN

Building a Decision Requirements Model using the new Decision Model and Notation (DMN) makes for better business analysis and improved system requirements.

The Object Management Group has recently adopted the Decision Model and Notation standard. Here's why you should use it to define your decision requirements.

## Why Model Decisions

Experience shows that there are three main reasons for defining decision requirements as part of an overall requirements process:

1. Current requirements approaches don't tackle the decision-making that is increasingly important in information systems.
2. While important for all software development projects, decision requirements are especially important for projects adopting business rules and advanced analytic technologies.
3. Decisions are a common language across business, IT and analytic organizations improving collaboration, increasing reuse, and easing implementation.

## Gaps in Current Requirements Approaches

Today organizations use a variety of techniques to accurately describe the requirements for an information system.

Most systems involve some workflow and this is increasingly described by business analysts in terms of business process models. Experience shows that when process modeling techniques are applied to describe decision-making, the resulting process models are over complex. Decision-making modeled as business process is messy and hard to maintain. In addition, local exceptions and other decision-making details can quickly overwhelm process models.

By identifying and modeling decisions separately from the process, these decision-making details no longer clutter up the process. This makes business processes simpler and makes it easier to make changes.

Describing decision-making as a task in a process (or as a step in a use case or as a requirement) can result either in long, detailed descriptions that are confusing and

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contradictory or short descriptions that lack the necessary detail. All this has to be sorted out during development, creating delays and additional costs.

By modeling the decisions identified, a clear and concise definition of decision-making requirements can be developed. A separate yet linked model allows for clarity in context.

Decision modeling is a new technique in the International Institute of Business Analysts (IIBA) Business Analyst Body of Knowledge (BABOK® 3.0).

## Business Rules & Advanced Analytics Projects

Successful business rules and analytic projects begin by focusing on the decision-making involved. For business rules projects, clarity about decision requirements scopes and directs business rules analysis. Today, business rules analysis can seem never-ending, with teams trying to capture all the rules in a business area. The result is often a “big bucket o’rules” that are poorly coordinated and hard to manage. Instead, by understanding which decisions will be made, when and to what purpose, it is now easy to tell when business rules analysis is complete.

*“Decision modeling enables us to model our business by dividing it into concrete parts that are understandable to business people without being too detailed. It also helps us not to lose sight of the overall picture of the process while delving deep into the details of business rules.”*

**Timo Laukkanen**, Process Director, Finnish Tax Administration

The decisions-first decision management approach begins with the higher level concept of the decision. This provides:

- ▶ A higher, overarching principle to impose some business oriented structure on this complexity.
- ▶ The separation of a declarative definition of these rules from the sequence-oriented business process – improving both.
- ▶ A structure that can be expanded in a series of iterations, allowing progress to be made in a more agile and less waterfall approach.

Specifying a graphical decision requirements model based on the DMN standard provides a repeatable, scalable approach to scoping and managing decision-making requirements, making it easier to:

- ▶ Draw the automation boundaries.
- ▶ Re-use, evolve, and manage rules beyond the first business rules project.
- ▶ Consolidate business rules across multiple implementations and platforms.
- ▶ Assign ownership, governance and sources appropriately.

Decision Management streamlines and focuses business rules projects for faster, more effective deployment. Learn more in our white paper, [Maximizing the Value of Business Rules](#).

For advanced analytic projects a clear business objective is critical to success. Evidence is growing that specifying this objective in terms of the decision-making to be improved by the analytic is one of the most effective ways to do this. Established analytic approaches such as CRISP-DM stress the importance of understanding the project objectives and requirements from a business perspective, but to date there are no formal approaches to capturing this understanding in a repeatable, understandable format. Now business analysts have the tools and techniques of decision requirements modeling to identify and describe the decisions for which analytics will be required. How the data requirements support these decisions, and where these decisions fit, is clarified and the use of analytics focused more precisely.

The value proposition of analytics is almost always to improve decision-making. Read our white paper, [Framing Analytic Requirements](#), for more information.

In both cases, then, it is essential to first define the decision-making required and only then focus on details like the specific business rules or predictive analytic models involved. Specifying a decision model provides a repeatable, scalable approach to scoping and managing decision-making requirements for both business rules and analytic efforts.

*“This is the critical path to monetizing advanced models.”*

**Head of Analytics, North American Insurance Company**

## **A Shared Framework and Implementation Mechanism**

Decision modeling provides a framework that teams across an organization can use. It works for business analysts, business professionals, IT professionals and analytic teams. Decisions are also easily tied to performance measures and the business goals of a project. This makes it easier to focus project teams where they will have the highest impact and to measure results.

Many business analysts have known all along that decisions, and decision-making, should be a “first class” part of the requirements for a system. Systems that assume the user will do all the decision-making fail to deliver real-time responses (because humans struggle to respond in real-time), fail to deliver self-service or support automated channels (because there is no human available in those scenarios) and fail front-line staff because instead of empowering them with suitable actions to take it

will require them to escalate to supervisors. What business analysts have lacked until now is a standard, established way to define these requirements.

Enterprise Architects meanwhile are chartered with fitting business rules and analytic technologies like data mining and predictive analytics into their enterprise architecture. A service oriented platform and architecture, supported by integration and data management technology does not have obvious “holes” for these technologies. Decisions are both the shared framework and the technical mechanism to easily implement these technologies.

Decision modeling is a powerful technique for business analysis and for enterprise architecture. Using the standard DMN notation to specify Decision Requirements Diagrams and so specify a Decision Requirements Model allows the accurate specification of decision requirements. Decision Modeling is also central to Decision Management, a proven framework that ties business rules and analytics to business objectives.

Most process models today are developed using the Business Process Model and Notation (BPMN) standard published by the Object Management Group. The DMN standard has been designed to work alongside BPMN, providing a mechanism for modeling the decision-making represented in a Task within a process model. DMN need not be used with BPMN but it is highly compatible.

By focusing on the decisions that matter to an organization Decision Management accelerates adoption of a Business Rules Management System or Predictive Analytic Workbench, focuses you where you will have the highest impact, ensures business ownership of the business rules, and delivers agility and continuous improvement of the decisions across the company.

Decision modeling is an iterative approach to defining the requirements for decision-making in your systems.

*“What used to be one week of requirements work was done in a few hours with decision management.”*

**Lead Business Analyst, North American Insurance Company**

## An Overview of Decision Modeling

Decision modeling has four steps that are performed iteratively:

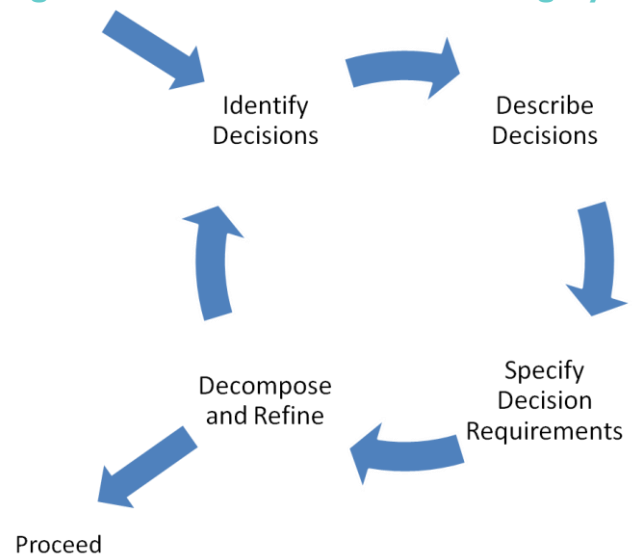
1. Identify Decisions.  
Identify the decisions that are the focus of the project.
2. Describe Decisions.  
Describe the decisions and document how improving these decisions will impact the business objectives and metrics of the business.
3. Specify Decision Requirements.  
Move beyond simple descriptions of decisions to specify detailed decision requirements. Specify the information and knowledge required to make the decisions and combine into a Decision Requirements Diagram.
4. Decompose and Refine.  
Refine the requirements for these decisions using the precise yet easy to understand graphical notation of Decision Requirements Diagrams. Identify additional decisions that need to be described and specified.

This process repeats until the decisions are completely specified and everyone has a clear sense of how the decisions will be made.

At this point you can generate a requirements document, packaging up the decision-making requirements you have identified. This can act as the specification for business rules implementation work or for the development of predictive analytics.

Alternatively you can extend the model with decision logic, such as decision tables, to create an executable specification of your decision-making.

**Figure 1: Iterative Decision Modeling Cycle**



For a detailed discussion of decision modeling with DMN, download our white paper [Decision Modeling with DMN](#).

## Identify Decisions

Decisions are identified as part of the overall requirements gathering process. Decision-making appears in business processes, in use cases or as a specific requirement. Not every decision is equally appropriate for decision modeling as we will see in the *Suitable Decisions for Decision Modeling* section and as you iterate you will also identify additional decisions.

## Describe Decisions

Decisions are the core of the Decision Model and Notation standard. Decisions are shown using a simple rectangle that contains the name of the decision.



Select Marketing Offer

A Decision Requirements Diagram contains one or more Decisions and it is common to create one such diagram for each area of focus on the project. Critical information is captured about each Decision:

- ▶ Question and Allowed Answers.
- ▶ Business context.
- ▶ Organizational context.
- ▶ Application context.

A decision model also puts decisions in context by linking them to the KPIs and objectives they impact, the organizations involved in the decision-making as well as the processes and systems within which the decisions are made.


## Specify Decision Requirements

A decision model describes the requirements for a decision in terms of

- ▶ Input Data requirements.
- ▶ Knowledge about the Decision.
- ▶ Related Decisions.

All of these are displayed on a Decision Requirements Diagram to define the model. Each of these elements can be developed sequentially but you are more likely to iterate through the various elements.

Decisions often require input data, information about customers, parts, orders etc. Input data is generally described at the level of business concepts or business objects—things the business cares about. Input Data is shown in DMN using an oval containing a name. The Input Data required for a Decision is linked to the decision with an Information Requirement shown using a solid line with an arrow head pointing from the Input Data to the Decision.



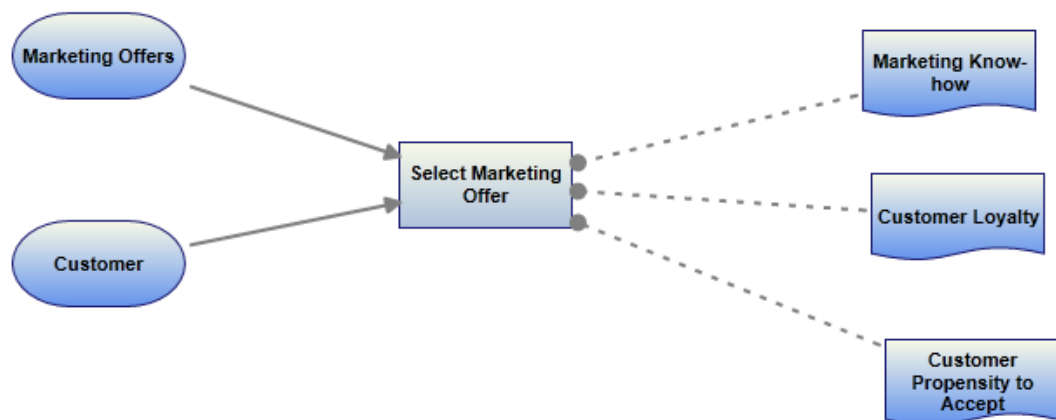
Marketing Offers

Decisions are driven by policies, regulations, best practices, human expertise and analytic insight. DMN calls these Knowledge Sources and they describe how the decision is made and how it uses the Input Data identified. Knowledge Sources are shown in DMN using a document shape containing a name. The knowledge sources that impact a Decision are linked to it using an Authority Requirement– a dashed line with a circle



All of these elements are combined into a Decision Requirements Diagram. Such a diagram contains Decisions, Input Data and Knowledge Sources along with requirements links between these objects. A diagram can be for a single top-level decision or a couple of closely related decisions. In the example below a high level diagram shows a single Decision, Select Marketing Offer, along with two Input Data and three Knowledge Sources.

### A High Level Decision Requirements Diagram



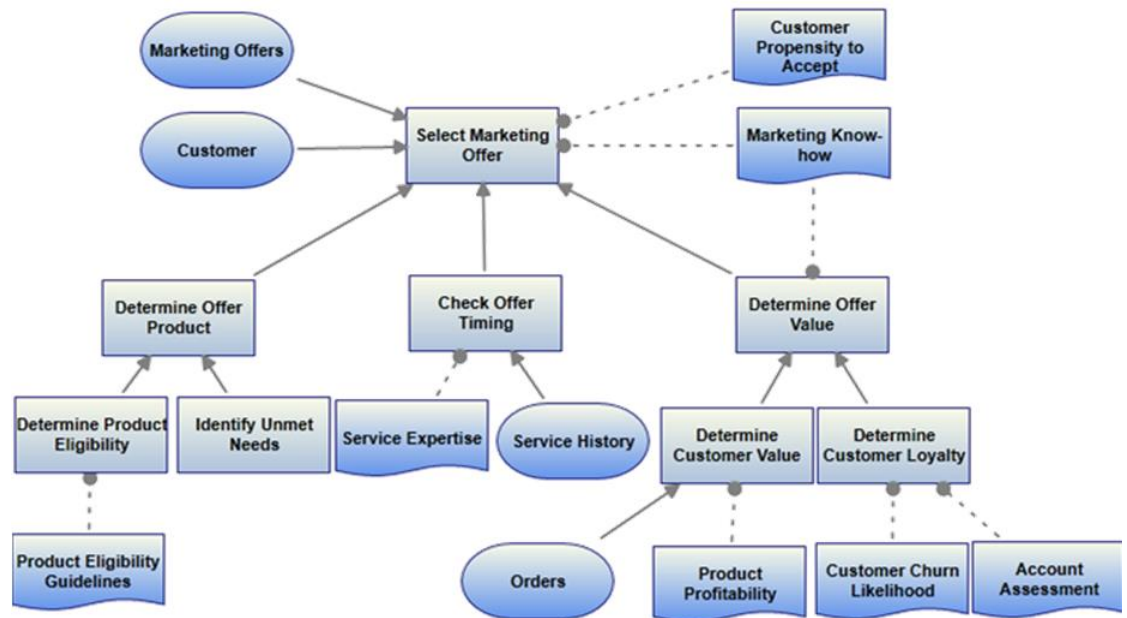
Source: DecisionsFirst Modeler

### Decompose and Refine the Model

The final stage in Decision Requirements modeling is to iteratively refine the model. Decisions often require information that comes from making other decisions. You can think of these decisions as sub-decisions or pre-cursor decisions. These decisions must be made before the top-level decision(s) because the results of these decisions must be available before the top level decision can be made. Each of these decision is linked to the top level decision as Information Requirements because the decision requires the information produced by making these additional decisions.

This analysis is repeated for each decision in the diagram, including any new ones identified. Each new Decision identified may require Input Data (new or existing), new Knowledge Sources and further additional Decisions. As the model is developed it becomes more complete, such as the model shown below.

## A More Complete Decision Requirements Diagram



Source: *DecisionsFirst Modeler*

This iterative refinement can be repeated as often as necessary to flesh out a complete, coherent and useful Decision Requirements Model. If the diagram becomes cluttered, then multiple diagrams can be developed showing overlapping views on the same overall model. It is common for some parts of the model to have more layers of decisions than others because the decision-making is more complex or because there is more value in understanding it in detail. Modeling is complete when the model is fit for purpose so different projects will require different levels of detail and all are useful decision models.

## Business Knowledge Models (BKMs)

There are two key knowledge objects in DMN—Business Knowledge Models (BKMs) and Knowledge Sources. They have quite different purposes despite the similar names.

- Knowledge Sources are for documentation.
- BKMs are about implementation.

Because both objects involve “knowledge”, there is some confusion about how to document source documents. These are Knowledge Sources not BKMs

Some DMN examples show a BKM for every Decision, giving the impression that decision logic can only be specified in a BKM. The DMN specification makes it clear this is not the case.



The value of BKMs in allowing reuse is real when one is trying to store the implementation definition outside the BRMS and then generate code for it. If you are linking directly to a BRMS for implementation, then BKMs are unnecessary.

For more information, download our Best Practices Brief, [Knowledge Objects in DMN](#).

## Suitable Decisions for Decision Modeling

Organizations make decisions of various types as shown in Figure 2.

### Strategic Decisions

Organizations make infrequent but large impact strategic decisions. Much analysis is done before the decision is made and the implications for a business can be dramatic.

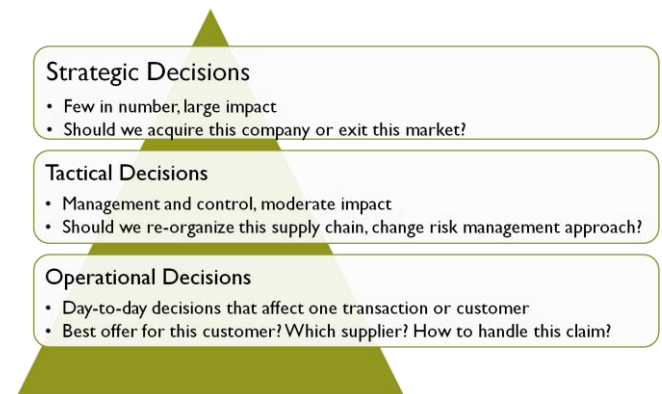
### Tactical Decisions

Regular tactical decisions involving management and control are also made. There is generally still time and energy for significant analysis but there is time pressure too, a need for consistency and the opportunity to learn what works.

### Operational Decision

Finally, every organization makes large numbers of operational decisions about individual transactions or customers. Time pressure is often extreme and these decisions must generally be embedded into operational systems and processes.

Figure 2: Different Types of Decisions



## Characteristics of Suitable Decisions

Decision Requirements Modeling can be used for any decision. Because Decision Requirements Models take some time and energy to build most organizations will only do so when a number of things are true of the decision:

- ▶ There is clear value to defining them because they will be made multiple times (often many, many times) and have enough complexity to warrant modeling. Some combination of being complexity and repetition is what generally makes it worth building a Decision Requirements Model.
- ▶ They are non-trivial because many policies or regulations apply, there is a wide range of options to select from or lots of data to consider for instance. If the way a decision is made must change often, if it is very dynamic, or if there is a mix of drivers combined with a more modest pace of change then that will also make the decision non-trivial. Almost any decision that involves an assessment of fraud, risk, customer opportunity or similar through the analysis of historical data is non-trivial.

- ▶ The value of the decision must be measurable and should be definable in advance. We should be able to identify the KPIs and metrics that will be improved by a better decision or weakened by a poor one.

## Decision Categories

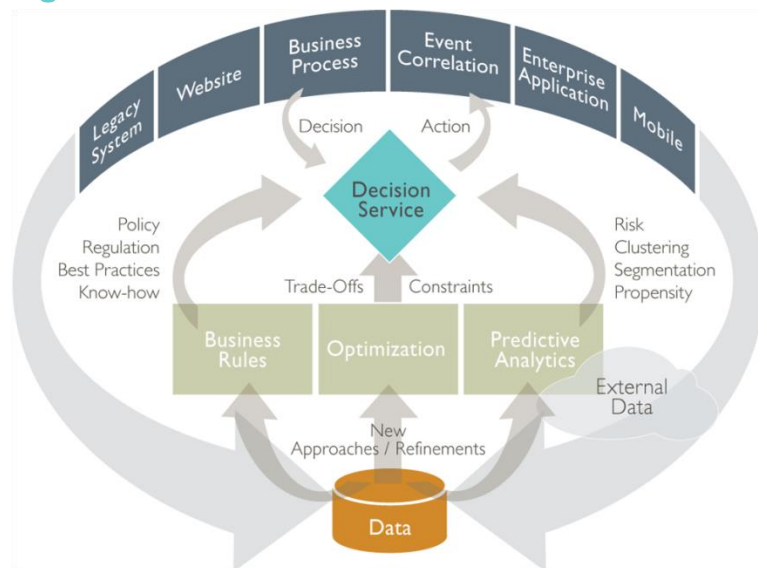
We can categorize operational decisions into various types, though some decisions include characteristics of several types. For instance:

- ▶ **Eligibility or Approval**—Is this customer/prospect/citizen eligible for this product/service?
- ▶ **Validation**—Is this claim on invoice valid for processing?
- ▶ **Calculation**—What is the correct price/rate for this product/service?
- ▶ **Risk**—How risky is this supplier’s promised delivery date and what discount should we insist on?
- ▶ **Fraud**—How likely is this claim to be fraudulent and how should we process it?
- ▶ **Opportunity**—What represents the best opportunity to maximize revenue?
- ▶ **Maximizing**—How can these resources be used for maximum impact?
- ▶ **Assignment**—Who should see this transaction next?
- ▶ **Targeting**—What exactly should we say to this person?

## Decision Services

Having identified high-ROI operational decisions and modeled them so you know what to do to improve them, your next step is to design and build an automated decision making solution. The aim is to create independent Decision Services to replace the decision points currently embedded in business processes and operational systems.

Figure 3: Decision Services At The Center



For a detailed discussion of the decision management architecture, download our [Decision Management Systems Platform Technologies Report](#).

## Getting Started with Decision Modeling

Decision modeling is easy to adopt whether your project is kicking off or underway. Now is the time to optimize and streamline your business, building in agility and gaining operational efficiency.

### Learn More

We offer a comprehensive set of white papers, webinars and other education materials See the *Reference* section for suggested further reading.

### Hands-On

Get started quickly with decision modeling. Go to [www.decisionsfirst.com](http://www.decisionsfirst.com) for information about our decision modeling software **DecisionsFirst Modeler**. Our online [DecisionsFirst Support](#) site includes free tutorials and training videos.

### Training

Register for our IIBA Endorsed live online training courses. Email us at [info@decisionmanagementsolutions.com](mailto:info@decisionmanagementsolutions.com) for information about IIBA member discounts. See our [website for session dates](#).

### Free Consultation

We offer strategic guidance on when, where, and how to adopt Decision Management and Decision Modeling best practices and technologies, coupled with concrete tools for becoming analytically-driven.

We are one of the most experienced decision management and decision modeling consultants and trainers in the world. Many of our clients use our decision modeling software DecisionsFirst Modeler and many do not – our approach and training are vendor neutral. We are also one of the original submitters of the Decision Modeling and Notation (DMN) standard. [Contact us for a free consultation today.](#)

## References

### Additional White Papers and Reports

- ▶ Decision Management Solutions (2013-2015), [\*Decision Management Systems Platform Technology Report\*](#).
- ▶ Decision Management Solutions (2015), [\*Decision Modeling with DMN\*](#).
- ▶ Decision Management Solutions (2015), [\*Framing Analytic Requirements\*](#).
- ▶ Decision Management Solutions (2015), [\*Maximizing the Value of Business Rules\*](#)

### Other Publications

- ▶ Taylor, James (2011). [\*Decision Management Systems – A Practical Guide to Using Business Rules and Predictive Analytics\*](#). IBM Press.
- ▶ DeBevoise, Tom and Taylor, James (2014). [\*The MicroGuide to Process and Decision Modeling with BPMN/DMN\*](#).

### DMN Standard

- ▶ Object Management Group. *Decision Model and Notation (DMN) Specification 1.0*  
Current version at <http://www.omg.org/spec/DMN/Current>  
1.1 is approved but not yet publicly available

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