



DECISION  
MANAGEMENT  
SOLUTIONS

# Decision Management Systems Platform Technologies Report

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# Best Practices in Decision Management Systems

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*Decision Management Systems operate with four key principles, and within those, there are specific best practices to be considered. In this section of the Report, we'll delve into these best practices in detail, helping you to improve business performance and get the most ROI from your investments.*

There are four key principles of Decision Management Systems:

- ▶ Begin with the decision in mind.
- ▶ Be transparent and agile.
- ▶ Be predictive not reactive.
- ▶ Test, learn and continually improve.

Within each of these principles, we have identified three to four specific best practices in analysis and design, development, deployment, and operations.

This Report section outlines these Best Practices based on our extensive experience helping clients build successful Decision Management Systems.

## Navigating the Report

The [\*Decision Management Systems Platform Technologies Report\*](#) is a set of documents describing the best practices and technologies for building Decision Management Systems.

1. *Introducing Decision Management Systems*
2. *Use Cases for Decision Management Systems*
3. *Best Practices in Decision Management Systems.*
4. Five Key Capabilities
  - 4.1. *Managing Decision Logic with Business Rules*
  - 4.2. *Embedding Advanced Analytics*
  - 4.3. *Optimizing and Simulating Decisions*
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  - 4.5. *Modeling Decisions*
5. *Selecting Products for Building Decision Management Systems*

All readers should begin with *Introducing Decision Management Systems* as it gives an overview of the category, technologies and rationale.

Business and technical readers can continue with *Use Cases for Decision Management Systems* and *Best Practices in Decision Management Systems*.

Business and Technical Track	Technical Track
Introducing Decision Management Systems	Managing Decision Logic with Business Rules
Use Cases for Decision Management Systems	Embedding Predictive Analytics
Best Practices in Decision Management Systems	Optimizing and Simulating Decisions
	Monitoring Decisions
	Modeling Decisions
	Selecting Products for Building Decision Management Systems

Technical readers are recommended to read the five Key Capabilities documents (*Managing Decision Logic with Business Rules*, *Embedding Advanced Analytics*, *Optimizing and Simulating Decisions*, *Monitoring Decisions* and *Modeling Decisions*) to better understand the component technologies of Decision Management Systems. *Selecting Products for Building Decision Management Systems* will be useful as part of assessing technology needs.

## Begin with the Decision in Mind

Decision Management Systems are built around a central and ongoing focus on automating decisions, particularly operational and “micro” decisions. Developing Decision Management Systems with a focus only on business processes, only on events, or only on data is not effective. Understanding the business process or event context for a decision is helpful but the development of Decision Management Systems requires a focus on decisions as a central component of enterprise architecture. Focusing on operational or transactional decisions—those that affect a single customer or single transaction—is a significant shift for most organizations and requires a conscious effort. In particular, where the operational decision in question is what is known as a “micro decision,” one that focuses on a how to treat a single customer uniquely rather than as part of a large group, organizations must learn to focus on decision-making at a more granular level than previously.

It is also worth noting that this focus on decisions must come first, before a focus on business rules or predictive analytic models. When it comes to developing Decision Management Systems, the right business rules and most effective predictive analytic models can only be developed if there is a clear decision focus. While the most basic best practice is encapsulated in this principle—begin with the decision in mind—there are some more specific best practices that should be followed.

### Decisions as Peers for Process

One of the most important aspects of building Decision Management Systems is to ensure that decisions start being treated as peers to business processes. Many organizations that are being successful with SOA and that are successfully adopting new and more advanced development technologies and approaches have done so using a business process focus. A focus on the end-to-end business process, not on organizational or system silos, and the tying of these business processes to real business outcomes represents a significant improvement in how information technology is applied to running an organization.

To move forward with Decision Management Systems, however, it is necessary to do more than regard decisions as just part of a business process. Our work with clients, as well as the evaluation of results from multiple companies, shows that organizations that can manage decisions as peers to business processes do better. While it is true that decisions must be made to complete most business processes, simply encapsulating the decisions within the business process is not enough.

Decisions are true peers for processes. Decisions are often re-used between processes, and how a decision is made has a material difference on how the process executes. Failing to identify decisions explicitly can result in decision-making logic being left in business processes making them more complex and harder to change. Identifying high level decisions at the same time as you identify high level processes

allows your understanding of both to evolve in parallel, keeping each focused and simpler.

## Link Decisions to Business Outcomes and Results

Your business can be thought of as a sequence of decisions over time. Organizations make strategic decisions, tactical decisions and operational decisions but each decision, each choice, affects the trajectory of the business. In fact, given that each choice you make about products, suppliers, customers, facilities, employees and more is a decision it is clear that decisions are the primary way in which you have an impact on the success or failure of your business. If there is no decision to make, then there is no way for the organization to affect its destiny.

One of the first steps, then, in understanding your decisions so that they can drive the development of effective Decision Management Systems, is linking them to business outcomes and results. For each decision you identify it is important to understand what key performance indicators, objectives, or business performance targets are impacted by the decision. Understanding that a particular decision has an impact on a particular measure and understanding the set of decisions that impact a measure has two important consequences. First, it enables you to tell the difference between good decisions and bad decisions. A good decision will tend to move the indicators to which it is linked in a positive direction, a bad one will not. Second, it enables you to see how you can correct when a measure gets outside acceptable bounds or moves in a poor direction. Understanding which decisions could be made differently gives you an immediate context for solving performance problems.

Building links between decisions you identify and your performance management framework is important as you identify and design your decisions. It is also important to use this information to present options and alternatives to those who are tracking the objectives in a performance management context.

## Understand Decision Structure Before Beginning

Identifying decisions early, considering them as peers to processes and mapping them to your business performance management environment are all great ways to begin with the decision in mind. Before you start developing a Decision Management System, however, you should understand the structure of your decisions.

The most effective way we have found to do this while working with clients is to decompose decisions to show their dependencies. Decisions are generally dependent on information, on know-how or analytic insight, and on other (typically more fine grained) decisions. Having identified the immediate dependencies of a decision you can evaluate each of the decisions you identified and determine their dependencies in an iterative fashion.

The dependency hierarchy you develop will actually become a network as decisions are reused when multiple decisions have a dependency on a common sub-decision. This network reveals opportunity for reuse, shows what information is used where and identifies all the potential sources of know-how for your decision making whether regulations, policies, analytic insight or best practices.

For more on this approach, please see the author's book [Real-World Decision Modeling with DMN](#), written with Jan Purchase (Meghan Kiffer, 2016).

## Use a Standards-Based Decision Modeling Technique

Building a Decision Requirements Model using the Decision Model and Notation (DMN) standard captures decision requirements and improves business analysis and the overall requirements gathering and validating process.

For a detailed discussion of decision modeling with the new Decision Model Notation (DMN) standard, download our white paper "[Decision Modeling with DMN.](#)"

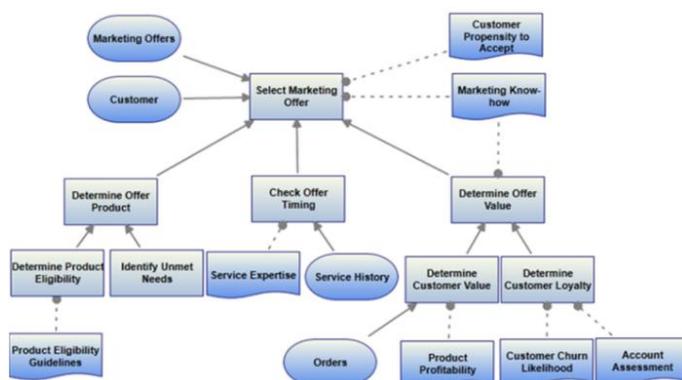
Experience shows that there are three main reasons for defining decision requirements as part of an overall requirements process:

- ▶ Current requirements approaches don't tackle the decision-making that is increasingly important in information systems.
- ▶ Decision requirements are especially important for projects adopting business rules and advanced analytic technologies.
- ▶ Decisions are a common language across business, IT, and analytic organizations.

However, gaps exist in current requirements approaches. Most systems involve some workflow, often described as process models and therefore overly complex.

This is difficult to maintain, and local exceptions and other decision-making details can quickly overwhelm process models.

Figure 1. Example Decision Requirements Model



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. A separate yet linked model allows for clarity in context.

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. For advanced analytic projects, a

clear business objective is critical to success. In both cases, 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. **Decision Modeling: Decisions as a Shared Framework and Implementation Mechanism**

Decision modeling is a powerful technique for business analysis. Using the standard DMN notation to specify Decision Requirements Diagrams and so specify a Decision Requirements Model allows the accurate specification of decision requirements.

A Decision Requirements Model provides the needed structure for the implementation of a Business Rules Management Systems (BRMS), supporting iteration and agile development. Framing data mining and predictive analytics projects with a Decision Requirements Model links analytics to business results and helps ensure successful deployment. Understanding the decisions relevant to a dashboard or decision support environment structures knowledge and puts a premium on taking action.

Decision Requirements Models are a common language across business, IT, and analytic organizations improving collaboration, increasing reuse, and easing implementation.

There is an emerging consensus that a Decision Requirements Model is the best way to specify decision-making. Decision Requirements Models can and should be developed in an industry standard way using the Object Management Group's Decision Model and Notation (DMN) standard. Adopting this industry standard gives users access to a broad community and a vehicle for sharing expertise more widely.

## Be Transparent and Agile

The way Decision Management Systems make each decision is both explicable to non-technical professionals and easy to change. Decision-making in most organizations is opaque—either embedded in legacy applications as code or existing only in the heads of employees. Decisions cannot be managed unless this decision-making approach is made transparent and easy to change or agile. As noted in **Managing Decision Logic with Business Rules** this need for both design and execution transparency is the primary driver for the use of a Business Rules Management System to manage decision-making logic.

Three main best practices are relevant in this area—design transparency, execution transparency, business ownership and explicable analytics.

### Design Transparency for Business and IT

The first best practice in transparency is that of ensuring design transparency for both business and IT practitioners. Most code that is written is completely opaque as far as non-technical business users are concerned. Much of it is even opaque as far as programmers other than the one that wrote it are concerned. This lack of transparency is unacceptable in Decision Management Systems.

Design transparency means writing decision logic such that business practitioners, business analysts and IT professionals that were not involved in the original development can all read and understand it. This allows the design of the decision-making to be transparent as everyone involved can see how the next decision is going to be made. This supports both compliance, by allowing those verifying compliance to see how decisions will be made, and improves accuracy by ensuring that everyone who knows how the decision should be made can understand how the system plans to make it.

From a practical perspective this means writing all business rules so they can be read by business people (even those that will be edited by IT going forward) by avoiding technical constructs such as ++ and terse programmer centric variable names for instance. It means ensuring that a business friendly vocabulary underpins the rules—the use of IT-centric names for objects and properties is one of the biggest reasons business people cannot understand business rules. It also means using graphical decision logic representations such as decision tables and decision trees whenever possible and following rule writing best practices like avoiding ORs and writing large numbers of simple rules instead of a small number of large complicated ones.

Design transparency is the fundamental building block for all other kinds of transparency and for agility.

## Execution Transparency and Decision Logic Logging

It is essential to understand how the next decision will be made. Once decisions have been made, however, it will also be necessary to understand how they were made. The approach to the next decision will change constantly as business situations change or new regulations are enforced. The way the next decision will be made therefore diverges steadily from the way a decision was made in the past.

Execution transparency means being able to go back and look at any specific decision to determine exactly how it was made. The decision logic and predictive analytic models used to make the decision must be recorded, logged, so that the decision-making sequence is clear. Ideally this should be “left on” all the time so that every decision is recorded rather than being something that is only used for testing and debugging. When every decision can be analyzed, ongoing improvement becomes much easier. In an environment where any decision can be challenged, by regulators for example, then such ongoing logging may be required.

Most products support logging to a fairly technical format designed for high performance and minimal storage requirements. This will need to be expanded to be readable by non-technical users and integrated with other kinds of data (such as customer information or overall performance metrics) to deliver true execution transparency.

## Explicable Analytics

While the use of well-formed business rules to specific decision logic makes the biggest single contribution to transparency, explicable analytics have a role also. When decisions are made based on specific predictive analytic scores it will be important to be able to understand how that score was calculated and what the primary drivers of the score were. Just like decision logic, the way a score is calculated is likely to evolve over time so it is important that the way a score was calculated at a particular point in time can be recreated.

Some advanced analytic models are more explicable than others. The use of predictive analytic scorecards based on regression models, for instance, allows the contributions to a predictive score to be made very explicit and supports the definition of explanations, reason codes, that can be returned with the score. Thus, a customer may have a retention score of 0.62 with two reason codes “Never renewed” and “Single product” that explain where that low score comes from. Decision trees, association rules and several other model types are also easily explicable. In contrast, models such as neural networks and other machine learning algorithms as well as compound or ensemble methods involving multiple techniques are often much less explicable.

The value of explicable analytic techniques varies with the kind of decision involved with regulated consumer decisions putting a premium on explicability while fraud detection, for instance, does not.

## Business Ownership of Change

The final best practice is to focus ownership of change in the business. This means empowering the business to make the changes they need to the system when they need those changes made or when they see an opportunity in making a change.

Business ownership of change is not essential for a successful Decision Management System. Many, most, of such systems still use IT resources to make changes when necessary. Often these are less technical resources, business analysts rather than programmers, but it is still IT that makes and tests and changes.

Over time, most organizations will find that business ownership will improve the results they get from their Decision Management Systems. By empowering business owners to make their own changes (using capabilities like business user rule management and impact analysis) organizations will increase their agility and responsiveness, eliminating the impedance of the business/IT interface. Empowering the business to own their changes is not a trivial exercise, however, and cannot be simply asserted (“here you go, here’s your new business rules interface now please stop calling us”). An investment in suitable user interfaces and tools will be required along with time and energy invested in change management.

## Be Predictive, Not Reactive

Decision Management Systems use the data an organization has collected or can access to improve the way decisions are being made by predicting the likely outcome of a decision and of doing nothing. Decisions are always about the future because they can only impact the future. All the data an organization has it about the past. When information is presented to human decision-makers it is often satisfactory to summarize and visualize it and to rely on a human's ability to extract meaning and spot patterns. Humans essentially make subconscious or conscious predictions from the historical data they are shown and then make their decisions in that context.

When building Decision Management Systems, however, this approach will not work. Computer systems and Business Rules Management Systems are literal, doing exactly what they are told. They lack the kind of intuitive pattern recognition that humans have. To give a Decision Management System a view of the future to act as a context for its decision-making we must create an explicit prediction, a probability about the future.

Three best practices relate to this focus on turning data into insight. The use of data mining and other analytic techniques to improve rules and analytic/IT cooperation are best practices in development approaches. A focus on real-time scoring will make for more powerful Decision Management Systems.

### Using Data Mining with Business Rules

Many organizations building Decision Management Systems keep their rules-based development of decision logic and their use of analytics completely separate. At best, they only bring the two disciplines together when they reference a predictive score in a business rule. This is a pity and a clear best practice is to do more to drive collaboration in this area, specifically by engaging data miners and data mining approaches in the development of business rules.

To get started with this best practice the first step is to use analytical techniques to confirm and check business rules. Many business rules are based on judgment, best practices, rules of thumb, and past experience. The experts involved in defining these rules can often say what the intent behind them is—that a rule is to help determine the best customers or to flag potentially delayed shipments for example. Historical data can be used to see how likely these rules are to do what is intended. For instance, the number of customers who meet the conditions in a “best customer” rule or the correlation between the elements tested in the delayed shipment rule and actual delays in shipments. Using data in this way both improves the quality of business rules and helps establish the power of data to improve decision-making. While reporting and simple analysis tools can help in this area, the use of data mining is particularly powerful for these kinds of checks.

More sophisticated organizations can also use data mining to actually find candidate business rules. Many data mining techniques produce outputs that can easily be represented as business rules such as decision trees and association rules. Using these techniques to analyze data and come up with candidate rules for review by those managing the decision-logic can be very effective. Because the output is a set of business rules it is visible and easy to review, breaking down the kind of reluctance that more opaque forms of analytics can provoke.

At the end of the day, the best practice is simple to define—organizations should regard their historical data as a source of business rules just like their policies, best practices, expertise, and regulations.

## Analytic and IT Cooperation

The power of predictive analytics is sometimes described as the power to turn vertical stacks of data (data over time) into horizontal information (additional properties or facts). Analytics professionals almost always look at data this way, seeking patterns in historical data that can be turned into probabilities or other characteristics, using analytics to simplify large amounts of data while amplifying its meaning.

The challenge is that IT people do not think of data in the same way. IT departments tend to think of historical data as something to be summarized for reporting and as something to move off to backup storage to reduce costs or improve performance. They are very familiar with the design of a horizontal slice of the data—its structure—but not with how it ebbs and flows historically. They will often change data structures to improve operations without considering how it might affect historical comparisons, clean data to remove outliers and to include defaults, or overwrite values as time passes and data changes. Many of these kinds of standard IT tasks are very damaging from the perspective of an analytics team.

A clear best practice then is to improve analytic and IT cooperation around data governance, data storage and management, data structure design and more. In this context, the analytic team cannot just be the Business Intelligence, dashboard and reporting team but must include those doing data mining and predictive analytics. While the former are often part of the IT department and well-integrated with the rest of the IT function, the latter are often spread out in business units or focused in a risk or marketing function. Building cooperation over time between analytic specialists and IT will reduce costs, improve the value and availability of data for more advanced analytics and make integrating analytics into Decision Management Systems easier.

## Real-Time Scoring Not Batch

A clear majority of organizations applying predictive analytic models today do so in batch. Having developed a predictive analytic model, they run daily or weekly updates of their database, adding a score calculated from a model to a customer or other record in the database. When a Decision Management System needs access to

the prediction, it simply retrieves the column that is used to store the score. Integration is easy because the Decision Management System accesses the score like it does any other data item.

The problem with this is that batch scores can get out of date when data is changing more rapidly than the batch is being run. For instance, a customer propensity to churn score that does not include the problem the customer had this morning or the inquiry they made about cancellation penalties is not going to be accurate. In addition, this arms-length integration may be technically simple but it also keeps the IT and analytic teams from needing to work together and is therefore potentially damaging in the long term.

For long term success with Decision Management Systems, and in particular to develop the kinds of Decision Management Systems that will allow you effective response to events and new more mobile channels, organizations need to develop systems that use real-time scoring. A real-time score is calculated exactly when it is needed using all the available data at that moment. This might include recent emails, SoMoLo (Social Mobile Local) data, the opinion of a call center representation on the mood of the customer and much more. Ultimately, being able to decide in real time using up-to-the-second scores, or even score data as it streams into a system so that predictions are available continuously, will be a source of competitive advantage.

## Test, Learn, and Continually Improve

The decision-making in Decision Management Systems is dynamic and change is to be expected. The way a decision is made must be continually challenged and re-assessed so that it can learn what works and adapt to work better. Supporting this kind of ongoing decision analysis requires both design choices in the construction of Decision Management Systems and integration with an organization's performance management environment. Both Business Rules Management Systems and analytic workbenches have functionality to make this easier while optimization suites can be used to develop models to manage the potentially complex trade-offs that improving decision-making will require.

This kind of continuous improvement relies on many of the features noted earlier such as being able to link decisions to business outcomes and results, having execution transparency and decision logic logging and support for real-time scoring not batch. In addition, the development of integrated environments for ongoing decision improvement, broad use of experimentation and moving to automating tuning, adaptive analytics and optimization are all best practices worth considering.

## Integrated Decision Improvement Environment

To provide an integrated decision improvement environment, organizations should bring together the logs they have on how decisions have been made in the past,

information about the business results they achieved using these decisions and the decision logic/analytic management environment itself. Each piece of this environment typically involves a different piece of technology to develop with everything from a business rules management system to an analytic model management tool to traditional dashboard and business intelligence capabilities being used. Providing an integrated, coherent environment where all this is brought together around a particular decision offers real benefits to an organization. When business results can be compared to the decision making that caused them and when the business owner can navigate directly from this analysis to editors allowing them to change future decision-making behavior, organizations will see more rapid and more accurate responses to changing conditions.

## Broad Use of Experimentation

Relatively few organizations are comfortable with experimentation. For most, experiments are confined to the marketing department or to low volume experiments where customers and prospects are quizzed on preferences or likely responses. Some organizations use experimentation to determine price sensitivity and a growing number of web teams use experimentation for website design.

Yet without experimentation, it is very hard to see if what you are doing is the best possible approach or to truly see if a new approach would work better. Unless the behavior of real customers or prospects (or suppliers or partners) is evaluated for multiple options, those options cannot really be compared. Asking people what they would do if they got a different option rarely results in data that matches what they actually do when they get that different option.

Organizations that wish to succeed in the long term with analytics and with Decision Management Systems will invest in the organizational fortitude and expertise required to conduct continuous and numerous experiments.

## Moving to Machine Learning and Adaptive Analytics

The logical extension of a focus on real-time is to focus on machine learning and adaptive analytics. Today most Decision Management Systems and the analytics within them are adapted manually, with experts considering the effectiveness of the decision and the making changes to improve it. As systems become more real-time, however, this becomes increasingly impractical and suboptimal. Especially in very high volume, quick response situations such as ad serving, the system is continually gathering data that shows what works and what does not. Waiting until a person considers this data before changing the behavior of the system means allowing the system to make poor responses long after the data exists to realize this is going on.

The best practice is to consider the use of machine learning and adaptive analytic engines in these circumstances. Building trust in the organization that analytics work will increasingly allow analytic systems to be left to make more of the decision themselves. Allowing analytic engines to collect performance data and

respond to it, perhaps within defined limits, will improve the performance of real-time decision making while reducing the length of time it takes to respond to a change.

Not all decisions are suitable for these kinds of engines. For instance, those decisions that have a strong regulatory framework or where the time to get a response to a decision is long will not work well. Where a decision is suitable, however, a clear best practice is to integrate these kinds of more adaptive engines into Decision Management Systems.

## Optimization

One final best practice in this area is to increase the use of optimization over time. A powerful approach, optimization is often siloed into specific parts of the business and regarded as a little bit of a side bar to “core” analytic efforts. In part, this is because the mathematics can be very complex and because the solutions can take a long time to develop. A lack of business user-friendly interfaces for reviewing results and a need to integrate optimization with simulation tools also limit the use of optimization in many organizations.

This is beginning to change, however, as more business friendly interfaces are developed and as optimization tools become more integrated into the overall stack for developing Decision Management Systems. Faster and more stable optimization routines, standard templates and integration with both predictive analytics and business rules are also helping. Organizations should regard the use of optimization as part of their decision design and improvement processes as a best practice and should seek therefore to bring it out of its silos and into the mainstream.

## Next Section: Key Capabilities

The next section of the report considers Five Key Capabilities that organizations need to develop Decision Management Systems. Each is presented in its own section:

- ▶ Managing Decision Logic with Business Rules
- ▶ Embedding Advanced Analytics
- ▶ Optimizing and Simulating Decisions
- ▶ Monitoring and Improving Decisions
- ▶ Modeling Decisions

The first section to consider is that on managing decision logic with business rules. Building Decision Management Systems requires a complete set of software components for the creation, testing, management, deployment, and ongoing maintenance of the logic of a decision—the business rules—in a production operational environment. The most common product category name for this capability is a Business Rules Management System (BRMS).

Continuing reading [The Decision Management Systems Platform Technologies Report](#)

## Learn More

We have extensive experience helping organizations like yours define, configure and implement Decision Management Systems that deliver on the value propositions described in this Report. Our clients are leading companies in insurance, banking, manufacturing, telecommunications, travel and leisure, health management, and retail.

- ▶ [Client Case Studies](#)
- ▶ [Our Services](#)

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## About The Decision Management Systems Platform Technologies Report

This report is focused on platform technologies used to build custom Decision Management Systems and our goal is to be comprehensive within this scope. Many vendors have developed powerful pre-configured Decision Management Systems focused on solving specific decision problems such as loan underwriting, claims handling or cross-channel marketing. For many organizations these solutions are ideal but they are not the focus of this report. Similarly, there are vendors that build custom Decision Management Systems for their customers and that have developed powerful platforms for doing so. If such a platform is not for sale to those building their own solutions, then it is out of scope for this report.

In both these scenarios the report's discussions of what kinds of functionality is useful, best practices and characteristics for suitable products may well be useful in the selection of vendors but some interpretation will be necessary.

Vendors and products in scope for the report are added continually. First Looks are also posted to [www.JTonEDM.com](http://www.JTonEDM.com) as they are completed. Each new version of the report will be made available at [decisionmanagementsolutions.com/decision-management-platform-technology/](http://decisionmanagementsolutions.com/decision-management-platform-technology/).

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Decision Management Solutions specializes in helping organizations build decision-centric, action-oriented systems and processes using decision management, business rules and advanced analytic technologies.

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