



## The 11 Secrets of Business Rules Success

How to balance speed and quality when building a rules-based approach to Decision Management

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When automating decisions, organizations need a platform for defining the policies and regulations that drive those decisions. A modern business rules management system (BRMS), such as the FICO™ Blaze Advisor® system, is ideal. However, it is not enough to pick the right technology. The technology must be applied in the right way.

Based on decades of experience developing decision management applications, FICO has developed 11 steps to help you make the most of business rules. This paper shares these secrets and addresses:

- Picking the right application and development approach
- Writing rules as effectively as possible
- Ensuring the right rules are written and that they have the expected impact
- Operationalizing analytics and improving decisions

*FICO offers the industry-leading FICO™ Blaze Advisor® business rules management system, and our consultants can help you improve the quality of your decisions. Learn more about business rules and download a free trial version of FICO Blaze Advisor at [decisions.fico.com](http://decisions.fico.com).*

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### #1 Select the Right Application

Business rules are an effective technology that can deliver a strong return on investment. However, not every application area is equally suitable for automation using business rules.

Blaze Advisor is designed to automate decisions. Clearly, then, the system or business process being automated must involve a decision or decisions to be a suitable application. And these decisions should be repeatable and occur reasonably often—at a moderate to high volume. Decisions that are always made differently or only made occasionally are not likely to be good candidates.

If you have determined that decisions are important to your implementation, there are a number of characteristics to look for. The decisions might:

- Involve numerous rules, such as medical bill review or warranty claims.
- Have rules that change frequently, such as marketing promotions.
- Require quick changes to meet short time-to-market windows, such as trading or pricing in very competitive markets.
- Have rules that embody business domain knowledge best maintained by business people, such as medical rules or rules about parts compatibility in manufacturing.
- Involve symbolic reasoning, be complex or involve rules that interact in complex ways, such as life insurance underwriting.
- Require multiple levels of reasoning, such as risk analysis, underwriting and identifying allowed configurations.

Good candidates have at least one of these characteristics and the best candidates have several. Sometimes a decision exhibits a particular characteristic so strongly it is clear that the application is a good candidate. Other times the combination of several characteristics makes a BRMS like Blaze Advisor worth considering.

It is often clear that some or all of these characteristics will be true early in the specification of requirements. In addition, you should consider a BRMS if during requirements you hear words like “consequently,” “therefore,” “I can only do this when...,” “Unless this is true I can’t...” and “This is a prerequisite for the next step.”

### Examples of Suitable Decision Areas

- » Underwriting
- » Claims Processing
- » Credit Risk Scoring
- » Regulatory Compliance
- » Product Configuration
- » Product Recommendation
- » Business Process Automation
- » Benefits Analysis
- » Fraud Alerts
- » Marketing Cross-Sell / Upsell
- » Group Enrollment
- » Commission Calculations
- » Phone Usage Analysis
- » Pricing
- » Intelligent Call Routing (CRM)
- » Warranty Claims Management
- » Fault Diagnosis
- » Fee Calculations
- » Eligibility
- » Equipment Failure Detection
- » Spend Management
- » ... and many more

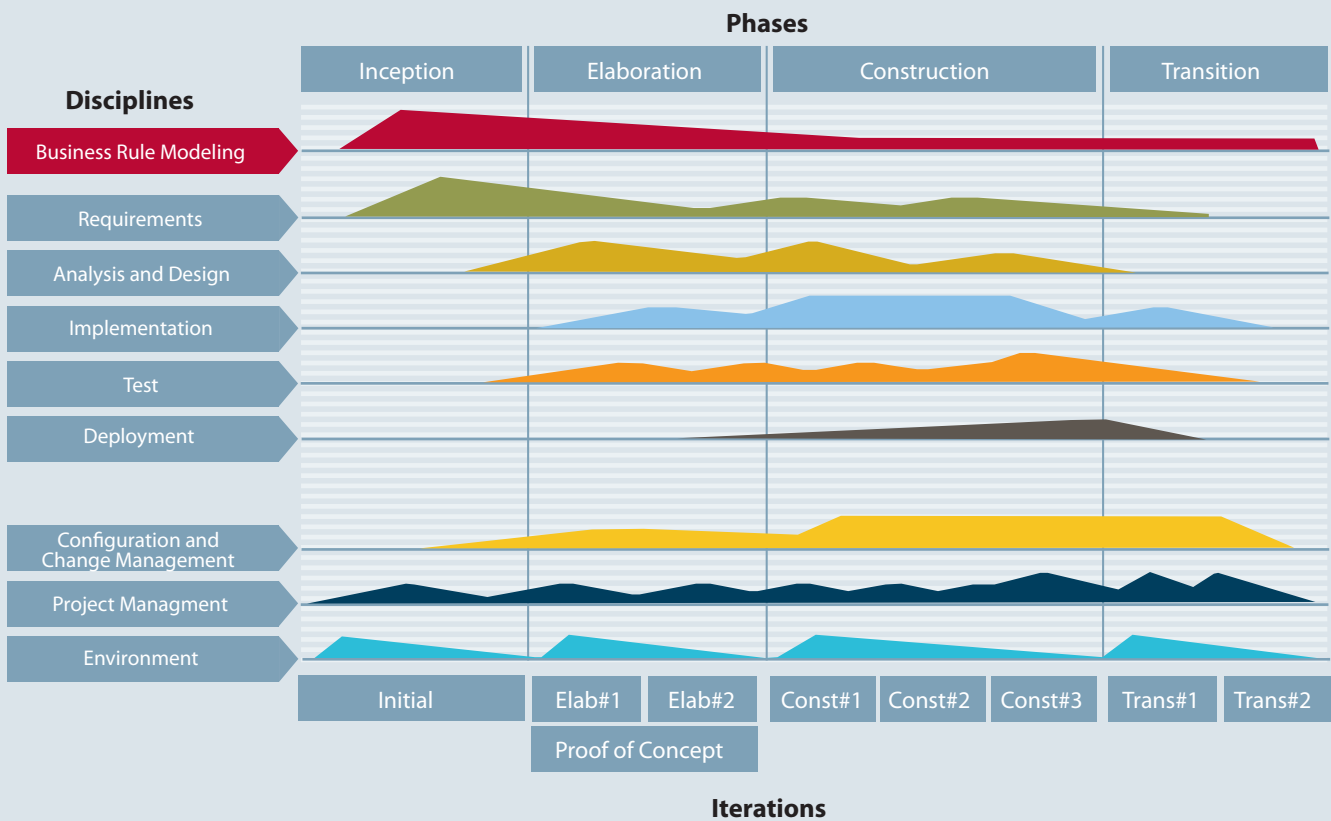
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## #2 Follow a Methodology

Just because you have decided to use business rules and a BRMS like Blaze Advisor does not mean you can forget all your systems development best practices. In particular, it is still important to follow a well thought out methodology. Business rules work well with methodologies from SCRUM and XP to the Rational Unified Process.

FICO's Project Delivery Methodology is based on the Rational Unified Process, which is a widely recognized delivery methodology used by an increasing number of our clients and partners. The methodology includes an iterative approach where risks are identified at the outset. To ensure project success, these risks are addressed early and often within the project lifecycle. Figure 1 below gives an overview of the various phases typically used and the disciplines applied in each, though this is customized for each project.

Figure 1: Typical Project Activities from FICO's Project Delivery Methodology



Integrating the activities required to discover, document, develop and maintain business rules with your preferred systems development methodology maximizes the likelihood that business rules will be a success in your organization. It is equally dangerous to ignore either your existing methodology or the need to make changes to it to support business rules.

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### #3 Document, Document, Document

Just as using a BRMS doesn't eliminate the need for a methodology, it also doesn't eliminate the importance of documenting your requirements. The first step is to document the business processes you're working with, using a business process map, for instance. Then you'll drill down into the details of your use cases. Use cases contain decisions—not business rules—and you need to identify all the decision points within your use cases. You will find decisions that appear in multiple use cases as well as dependencies between decisions. Identifying the decisions explicitly will help you manage this information.

When drilling into the decisions, you need to document the business rules that make those decisions, the terms that are used in those rules and other rule metadata, such as the rule's source. Writing effective, maintainable rules will be much easier if you document what your terms and rules are, where they come from and how you plan to use them. You can document the purpose of a rule within the development environment, or use a third party product like RuleGuide or RuleXpress. You can also use a Word document or Excel spreadsheet.

One approach, the one FICO uses, is to develop a Decision Set Template Structure. This spreadsheet is a useful thinking tool to document and structure the rules you will need. Such a templated approach is more rigorous than just writing natural language rules, but it is still readable by a business person and it helps you organize rules into conceptually related groups. In general, the larger the number of rules associated with a decision, the greater the benefit of this approach.

Figure 2: Rule Specification Template

Conditions					Conclusion		Management Properties				
If	and	and	and	and	then						
Gender	Age	State of Residence	Marital Status	Occupation	Risk	Message	Rule ID	Date	Last	Last	Comments
M	>26	OH	M		med	1	Risk01	8/20/2006	RJB	11/21/2006	
M	<26				high	2	Risk02	8/26/2006	RJB	11/5/2006	
F	>26		M	Type 7	med	3	Risk03	8/20/2006	SAM	11/5/2006	
M	>50		NM		med	4	Risk04	9/4/2006	LO	11/21/2006	
F	>36 & >72				low	2	Risk05	8/20/2006	LO	8/21/2006	
F	>60		NM	Type 3	med	5	Risk06	10/1/2006	CVT	11/21/2006	
M	>62	CA	NM		low	4	Risk07	8/20/2006	RMB	11/21/2006	
F	>48 & <62		M		med	4	Risk07	11/17/2006	JFK	11/17/2006	

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## #4 Manage Traceability

While Blaze Advisor makes it easy to change the rules in your system, traceability to the original source helps ensure you make the right change. This traceability needs to be documented and maintained. Thanks to the Blaze Advisor system's extensible repository, you can record any source information you need—the law it came from, the business unit that defined it, owners and approvers, and more. These Management Properties can be defined for individual rules, rule sets or any artifact in Blaze Advisor. Once stored, these properties are managed and versioned by Blaze Advisor and the powerful query capability provides excellent impact analysis, allowing you to find every artifact used to implement a particular regulation, for instance, or driven by the needs of a particular department.

Business rule updates are driven by changes in the real world. Good management of traceability will help you find the right rules and artifacts to update to meet changing business needs.

## #5 Manage Business Rule Quality

There are many measures of business rule quality<sup>1</sup> but two of the most important are that business rules must be concise and atomic. Ensuring that business rules are both concise and atomic makes it easier to confirm that their behavior is what the business needs and, crucially, makes it possible to modify the rules easily over time.

Concise business rules only mention the concepts that are absolutely necessary to decide what action should be taken or otherwise draw a conclusion. While a business rule should include all the conditions that govern its applicability, it should not specify unnecessary conditions, which would artificially limit the applicability of the rule. Consider, for example, the following rule:

- *If applicant's gender is "Male" and applicant has a Criminal Record and applicant's number of accidents is greater than or equal to 2 and applicant's age is less than 25 then set applicant's risk to HIGH*

Are all four conditions needed for this rule? For instance, would an applicant be high risk if they were a male under 25 years who had two or more accidents, even if they did *not* have a criminal record? If so, the criminal record check is redundant and should be removed from the rule to make it as concise as possible.

Atomic business rules keep the concepts addressed by the rule as simple as possible. This means limiting the conditions and actions of the rule to one concept or activity wherever possible. An atomic business rule should be focused on just one concept or outcome. Consider this business rule that has two outcomes:

- *If the Customer is Platinum then the customer's order qualifies for a 10% discount and the customer's order qualifies for free next-day shipping*

Two completely different business changes would require us to change this rule—any change to the discount policy or to the free shipping policy. If we broke this rule into two atomic business rules we would get:

- *If the Customer is Platinum then the customer's order qualifies for a 10% discount*
- *If the Customer is Platinum then the customer's order qualifies for free next-day shipping*

<sup>1</sup>For a more complete list of business rule quality considerations, see Chapter 10 of "Business Rules Applied," Barbara von Halle, Wiley 2001

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Making this business rule into two separate *atomic* business rules allows these concepts to be managed more effectively because the conditions can be changed independently for the two outcomes. For instance, when written atomically it would be easy to modify them if the criteria for free shipping changed:

- *If the Customer is Platinum  
then the customer's order qualifies for a 10% discount*
- *If the Customer is Platinum and the Customer's order total is greater than 50 dollars  
then the customer's order qualifies for free next-day shipping*

Similarly if a business rule contains multiple sets of conditions where either set can trigger the rule then the rule is not atomic. For instance:

- *If Age is less than 18 or State is not CA  
then reject the Application*

In this case we would have to edit the business rule if we wanted to change our response to either set of conditions. Atomic business rules would separate these conditions out, making the business rules independent and easier to maintain separately:

- *If Age is less than 18  
then reject the Application*
- *If State is not CA  
then reject the Application*

Representing them atomically in this way allows us, for instance, to easily change the policy so that applicants who are under 18 but above 16 are not rejected, but instead charged a 120% surcharge in premiums.

- *If Age is less than 16  
then reject the Application*
- *If Age is greater than or equal to 16 and Age is less than 18  
then Set Premium Surcharge to 120%*
- *If State is not CA  
then reject the Application*

Business rules should be developed to be concise and atomic to ensure they are easy to check and easy to modify in response to changing business conditions.

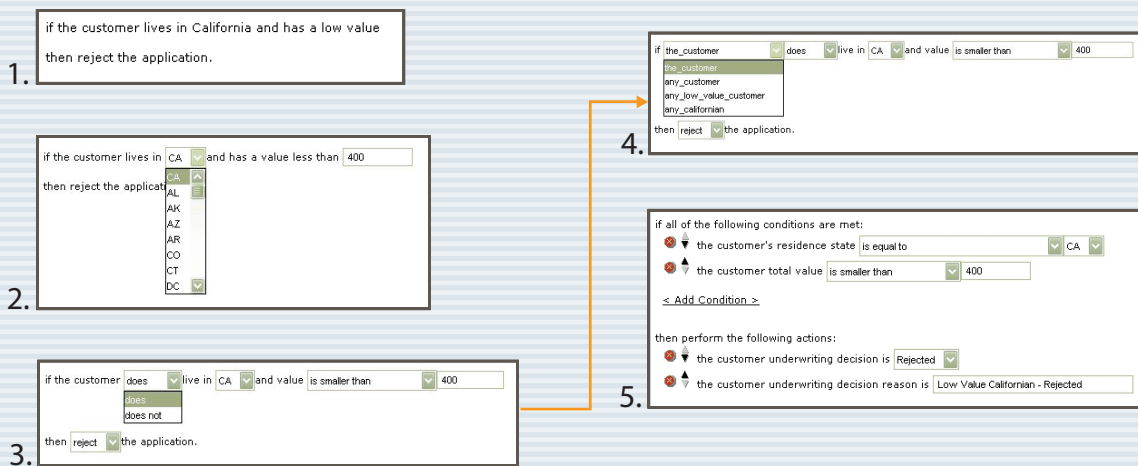
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## #6 Choose the Right Metaphor

When editing business rules, it is critical to consider how the rules are going to be authored. One of the first considerations is to establish how the rule will be edited—what elements can be changed and in what ways.

In Figure 3 below, you might start with a simple text rule (1). To help a business user edit this rule safely and easily, you could establish edit styles—let them select the state and enter a value, for instance (2). Over time you might decide that you also want to be able to specify exception rules, and could add an ability to choose between “does” and “does not” live in the specified state. You might also allow different kinds of comparison (not just less than) and allow rules to specify Accept or Reject, not just Reject (3). Ultimately you might allow the rule to be applied only to one of your defined customer segments (4) or give a user complete flexibility to create and edit rules (5). Support for flexible degrees of authoring should be part of the BRMS so you can develop this flexibility over time.

Figure 3: Various Degrees of Editing Flexibility



While the “if ... then” style is the default or “classic” style for a business rule, it is not the only style. Many situations call for sets of rules to be written. Instead of writing your rules one at a time, you can write them as a set in a decision table, such as the one shown in Figure 4. Decision tables are particularly effective with business rules managed in tables, such as shipping fee tables or actuarial tables. They can dramatically reduce the number of independent rules required. Decision tables also offer easy business rule definition and maintenance and can be used when a table is a familiar representation for business users.

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In a decision table, each cell represents a business rule. In the example, the top left cell represents the rule:

- *If Income is between 7,500 and 9,999 and card type is Student Bronze then set Credit Limit to 1,000*

Figure 4: A Decision Table

Card Type Condition	Student Bronze	Student Gold	Student Platinum
Income Condition	Credit Limit Action	Credit Limit Action	Credit Limit Action
7,500 - 9,999	1,000	1,500	2,000
10,000 - 19,999	1,100	1,600	2,100
20,000 - 29,999	1,200	1,700	2,200
30,000 - 39,999	1,500	2,200	2,700
40,000 - 49,999	2,000	2,500	3,000
50,000 - 59,999	2,500	2,800	3,300
60,000 - 69,999	3,500	3,800	4,000
70,000 - 79,000	4,000	4,500	4,800
80,000 - 89,999	4,500	4,700	5,200
90,000 - 99,999	5,000	5,200	5,700

Decision tables may not be appropriate for all sets of rules, however. If the rule set is very sparse or if the condition action pairs are not symmetrical, then a decision tree as that shown in Figure 5 below is more appropriate. It adds maintainability by making such sparse asymmetric logic evident to the business user.

Decision trees have conditions on their branches and actions on their leaves. In the example, for instance, the top path through the decision tree represents the business rule:

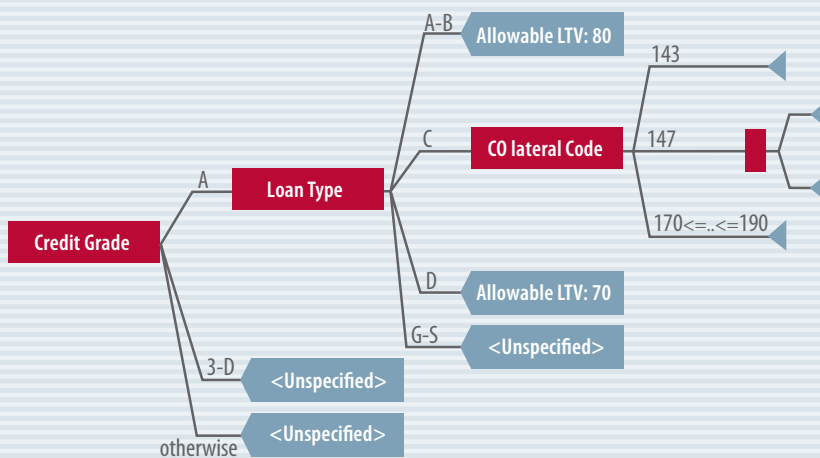
- *If Credit Grade is A and Loan Type is A or B then allowable LTV is 80*

In all cases your BRMS should allow you to use business terminology to define conditions and actions. It should also provide a graphical point-and-click environment for both development and maintenance of these metaphors. Blaze Advisor does both while also providing a wizard-based set-up process and the ability to embed these metaphors in browser-based thin client rule maintenance applications.

Blaze Advisor also provides another metaphor, score models, but these are designed to implement predictive analytic models and will be discussed in that context.

A good BRMS, and a good project methodology, will make it easier to ensure that the right business rules are being written, and written the right way.

Figure 5: A Decision Tree





**» INSIGHTS****#7 Verify the Business Rules**

Having written the business rules, or after making changes, business users want to be sure the rules they've written don't have structural problems. When you have a large number of rules, checking them all by hand is not practical. Blaze Advisor includes a patented tool for verification designed for business users. This tool analyzes all the rules and other artifacts in a project to find potential problems and highlight them.

The tests identify unused variables, properties, parameters and patterns, as well as missing rules and branches (when not every value in a range or enumeration is considered). They identify problems with rules, such as rule conditions that always test true or false, rules with equivalent sets of conditions and rules that have conditions subsumed by a less specific rule. They identify potentially uninitialized variables and properties and self-contradicting test conditions, as well as infinite loops and rule firing cycles. Finally, they highlight extremely complex rule premises and various semantic errors.

It is important to have automated support for verification, but it should not be a "black box." Many errors can be found by automated verification, and the Blaze Advisor system's verification routines are very thorough in this regard. However, in many cases automated verification can only identify *potential* problems. Effective verification must combine automation with manual consideration of potential problems. Blaze Advisor calls them "Warnings." A review of these warnings will determine which are deliberate and necessary in a particular project and which are, in fact, problems. Your BRMS should provide a rich set of verification tools to help your business users ensure they have not made any structural mistakes.

**#8 Validate the Business Rules**

Once you have verified the rules, you need to validate that they work and do what you expect. You also want to be able to continually check that changes made to the rules as part of ongoing rule maintenance have not broken the decision. Just as you want business users to author and maintain the rules, you want the users to be able to validate the rules they are editing.

Typically this validation is divided into unit testing—checking that a change to a specific set of rules behaves correctly—and regression testing to confirm that the system as a whole behaves as expected, and that a set of changes has not broken the system.

Blaze Advisor provides a complete environment for managing tests, which is designed to allow IT and business users to effectively collaborate. The framework, known as brUnit, allows IT staff to create unit tests to detect system problems early. For example, IT staff might develop a test to ensure that deployed decision services will behave gracefully when presented with incomplete or malformed data. Using brUnit these tests can be run automatically to validate business rules before they are promoted to formal QA or production environments. Business users can not only configure and run these tests using brUnit, they can also make modifications and do all of this within their browser-based rule maintenance environment. Designing the test cases template remains a specialist task, but Blaze Advisor allows business users to configure and run them whenever they need to validate that a particular set of changes has not had unintended consequences.

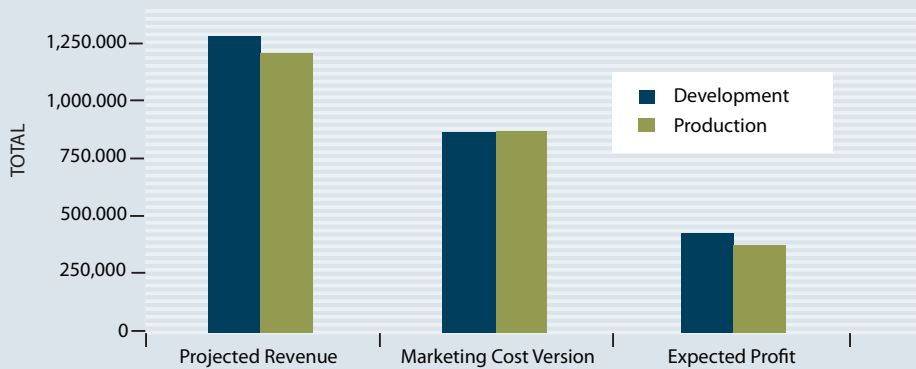
Similarly, a set of regression tests can be defined in brUnit. Using the project's standard test data, these tests are designed to confirm that the test data runs successfully through the system and produces the expected results.

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**#9 Simulate the Business Impact**

Simulating the business impact of a verified and validated set of changes is a critical requirement. After all, everything may work, but the business result may be undesirable and you need to know this before putting the change into production. FICO has a product, Decision Simulator, that does exactly that.

Figure 6: Results of Running a Simulation



Sum	Development	Production
Description		
Projected Revenue	1276714.00	1209886.00
Marketing Cost	848250.00	843950.00
Expected Profit	428464.00	365936.00

A typical output of Decision Simulator is shown in Figure 6. In this case, the development environment contains a set of marketing rules that is being simulated to see how the projected revenue, marketing cost and expected profit will vary between the new rules and the existing production environment. There is a scorecard in production that uses Residential Status (Own or Rent) as a characteristic. The marketing department, advised by its analytic modelers, wants to use a different scorecard that predicts response more accurately. This scorecard drops the Residential Status characteristic and adds Number Of Months Since Credit File Was Established. The simulation is analyzing the impact of this change to ensure that marketing costs will not rise unexpectedly and that the results will be positive. This kind of simulation allows a business user to understand the impact of a set of rule changes before deploying

them, avoiding costly strategy errors that might otherwise be missed.

Business users can use Decision Simulator with actual rule results to estimate outcomes and identify opportunities for improvement. They can even include simulation results within an approval process so everyone knows the impact of the proposed change in business, not technical, terms.

**#10 Structure for Reuse & Governance**

The power of a BRMS like Blaze Advisor can grow the more it is used and as the number of rules it manages increases. But this requires that the rules are stored in a repository that is structured for reuse and governance. The repository design must support the decision service lifecycle you plan to use as well as your organization's governance policies, access controls and more. A well designed repository reduces development time and increases speed to market. It allows your decisions to be managed as a corporate asset.

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FICO has developed best practices in repository design that essentially divide the repository into Technical, Business, Decision Services and Testing Libraries. These are then structured according to your business structure.

- The Technical Library enables reuse of infrastructure components and organizes the object model, decision service definitions, common building blocks and the overall rule architecture.
- The Business Library aligns rule content with business structure, grouping components by task. This enables reuse of shared business rules and the definition of specialized rules in specific areas.
- The Decision Services Library aligns decision services with deployment architectures so you can reuse components and package them into deployable units.
- The Test Library ensures that any rules or artifacts only required to test your work can be kept out of your production deployment, ensuring you deploy only what is truly required.

A repository structured this way also allows you to effectively manage your decision service lifecycle. Decision services and libraries can be packaged for release while private workspaces, supported by Blaze Advisor, can be used as sandboxes during development. The Blaze Advisor system's release management capabilities leverage the repository design to effectively deploy into test and QA environments as well as into production to ensure that the running system stays up to date with each new release. The flexibility of the repository and the lifecycle management capabilities of Blaze Advisor ensure that you can use the software development lifecycle that works for you.

## #11 Operationalize Analytics & Improve Decisions

Business rules underpin your operational decisions, ensuring that decisions are made appropriately, legally and as intended. But you also want to improve your decisions, which is where predictive analytics come in. Business rules define decisions but predictive analytics make them smarter.

Historically it has been hard to integrate predictive analytics into production applications. With most predictive analytic workbenches, modelers were forced to produce a specification that would then be re-coded by hand. All the variables would have to be mapped to production data, all the calculations coded and everything would then need to be retested. This could take months, degrading the accuracy of the model, increasing costs and driving up the organization's time to market.

With Blaze Advisor you can easily integrate predictive analytics into decisions. Predictive analytic models, built using FICO™ Model Builder, can be brought into business rules-based decisions automatically using either a "black box" or a "white box" approach.

The black box approach involves the generation of code that implements the predictive analytic model and the automatic integration of this code in Blaze Advisor. Rules can then use the result of the predictive analytic model exactly as they can use other attributes or data elements. While this is a common approach for integrating models, it is not generally as effective as a white box approach as those writing the rules have no visibility into the model, the characteristics it uses, etc.

The white box approach imports predictive analytic models using a widely supported industry standard—PMML or the Predictive Model Markup Language. These imported models are available to rule developers and authorized business users who can see and even modify them using standard Blaze Advisor features. This brings the full power of the model to bear on the decision making while ensuring that those writing the rules can see and understand the workings of the predictive model.

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Two of the most common kinds of predictive analytic models have specific metaphors to which they can be mapped—decision trees, discussed above, and additive scorecards. The additive scorecard metaphor—a score model—makes it easy to deploy analytic models commonly represented using this approach. As shown in Figure 7 below, the score model displays different predictive attributes and their contribution to the score, which represents the likelihood of the prediction being true. This exposes the predictive analytic model to business users, so they can view and perhaps even maintain predictive analytic models in the Blaze Advisor environment.

Figure 7: An Additive Scorecard

Characteristic	Baseline Score	Description
Gender	0	
Age	0	
Number Of Claims	0	

Bins	Range	Description	Score	Unexpect...	Reason Code	Reason Message
0	0		45	<input type="checkbox"/>	reason10	(+) No accidents in last 3 years
1	1		20	<input type="checkbox"/>	reason5	(-) 1 accident in last 3 years
2+	>= 2		0	<input type="checkbox"/>	reason1	(-) 2+ accidents in last 3 years
All Other			30	<input checked="" type="checkbox"/>	reason26	() Missing accident information

Residence Financing	0	
Years At Job	0	

Each row in the scorecard represents a rule. The first one expanded, for instance, is this rule:

- If the number of claims is 0  
 then add 45 to the score  
 and add "No accidents in the last 3 years" to the reason messages*

Reason messages and reason codes are used to explain how the score was arrived at if it needs to be explained later in the decision-making process. A key difference with this metaphor is that the business user does not specify the rule based on their experience or on regulations—the specifics come from the analytic work performed as part of the model development.

Blaze Advisor makes it easy to bring the power of predictive analytics to bear on decisions, integrating judgmental and regulatory business rules with analytically derived models for more precise, more effective decision making.

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» Conclusions

Using FICO Blaze Advisor to manage business rules gives you control over high volume operational decisions and delivers unprecedented agility. The 11 secrets described above can help you maximize the value of Blaze Advisor and business rules by:

- **Picking the right applications.** Business rules are a powerful tool for building smarter decisions into your applications but are better suited for some applications than others.
- **Following a process.** Like any development technology, business rules work best when you have a structure and follow a suitable methodology.
- **Writing the right rules, the right way, and reusing them.** Ensure your business rules are concise and atomic and use the right metaphor to manage them. Take advantage of your ability to manage them for reuse and to systematically verify, validate and simulate rules to get the result you want.
- **Operationalizing predictive analytics.** Business rules are an ideal platform for putting predictive analytics to work to improve the effectiveness and precision of decisions.

Learn more about business rules and download a free trial version of FICO™ Blaze Advisor® at [decisions.fico.com](http://decisions.fico.com).

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