The Past, Present, and Future of Business Rules

Towards True Business Enablement

White Paper

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Software Technology
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Content

1 Introduction

The business rule is an important metaphor for modeling decisions, events, and process activities. It is used to capture knowledge and develop business systems' requirements. Many organizations use the Business Rules Approach (BRA) to:

- Attain superior performance and greater agility in the strategies and tactics of Sales, Finance, Marketing, Product Development, and Manufacturing.
- Retain knowledge and trace artifacts to the above strategies, tactics, objectives and regulations. Often, business rules are cryptically implemented in code or data structures.
- Manage decisions and compute decision yield. When these are documented and exposed, business rules can improve the consistency and value of automated decisions.
- Develop complex applications. In addition to Decision and Knowledge Management, many businesses make digitized decisions involving thousands of steps or 'gateways'. These areas include medical coverage eligibility or credit risk.

As we will describe in this paper, the BRA, as a method, is a broad field with many entry points and destinations. For instance, business rules methods can be a tool for developing corporate strategy and tactics. Rules can serve as an output, endpoint or enabler of business strategy[1]. In another application, business rules establish the importance of decisions, and document or catalog them. Furthermore, business rules can be a means of improving organizational maturity—the BRA standardizes vocabulary for exchange with others. This is the purpose of the Object Management Group's (OMG) standard Semantic Vocabulary for Business Rules (SVBR)[2]. All of these could be considered a capability of the BRA, yet they might not share the same tasks and deliverables. Similarly, their goals and objectives may be different.

The BRA is also a powerful application development method for business analysts and subject matter experts. Visual Rules (as the name implies) visually documents any business logic and permits it to be tested and executed. Ultimately, the BRA enables the development of a complete business application; it is incorporated into business applications or processes as a complete activity, service or managed event. It does this while preserving the objectives of Knowledge and Decision Management, namely, separating and exposing business logic and enabling traceability.

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[1] OMG Business Motivation Model, www.omg.org

[2] OMG's Semantic Vocabulary for Business Rules (SVBR), www.omg.org

2 Business Rules: The Past

The BRA has principally evolved from three sources: Artificial Intelligence (Expert Systems and others), Data Modeling, and Business Process Reengineering. Its early beginnings have influenced current practices and perceptions, for better or worse. Advances in business modeling created by Artificial Intelligence, Data Modeling, and Process Management have made lasting contributions to the global digital infrastructure. For instance, many organizations report that the adoption of Business Process Management (BPM) has created measurable performance improvements[3]. The modern adoption of BPM is dependent on critical mathematics provided by branches of Artificial Intelligence which created PI-calculus[4].

As we will review, many contemporaneous authors and organizations have connected business rules to business modeling practices. These connections include business processes, metadata management, business intelligence, and business analytics. Business rules is one of the threads that often binds these together.

2.1 Expert Systems: The Birth and Baggage of Business Rules

Circuitously, expert systems became one of the originating technologies for business rules. An expert system is software that tries to answer a question, solve a problem or clarify uncertainties for which normally one or more experts are needed. These solutions are known as goals. Expert systems and knowledge engineering are subfields of Artificial Intelligence. Throughout the 1980's, several companies were formed to develop expert system software. However, as the market became saturated, they started to explore business rules problems. Indeed, many business rules vendors' products began life as expert systems. Another product, Jess, which is a project owned by Sandia Labs[5], is based on an expert system known as CLIPS[6].

Most expert systems share common concepts of operations. As shown in Figure 1, an expert system applies a knowledge base to facts, loaded from various sources, to arrive at a goal.

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[3] Business Process Management, A Rigorous Approach, Martyn A Ould, Meghan Kiffer Press, 2005

[4] The π-calculus, A Theory of Mobile Processes, Davide Sangiorgi, David Walker, Cambridge University Press, 2001

[5] www.jessrules.com

[6] clipsrules.sourceforge.net

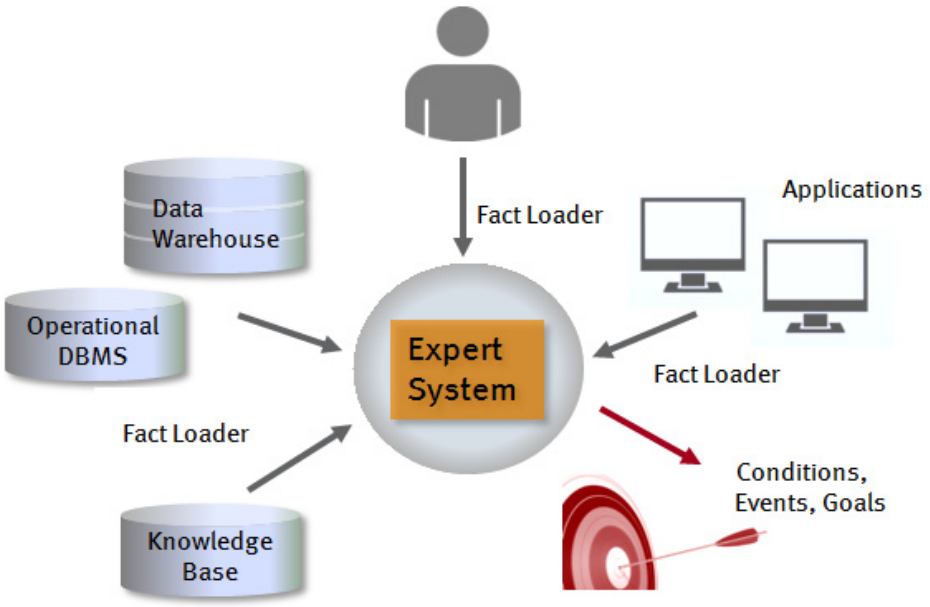

Figure 1: Expert system architectures employ a symbolic fact server

Among other things, expert systems use a concept known as 'inferencing' to derive solutions to the problem. The classic Artificial Intelligence definition of inference is: 'From some facts, others can be inferred'.

To demonstrate inferencing, let's create an oversimplified symbolic grammar involving people and relationships. Suppose, as an example, (person1 Relationship person2) means person1 is a Relationship of person2. This grammar presents a basic example of inferencing family relationships such as:

Fact set:

(Sally Sister Bob) => True, meaning we assert (=>) Sally is a Sister of Bob

(Dave Son Bob) => True, meaning we assert Dave is a Son of Dave

(Sally Aunt Dave)? True, inferring (?) Sally is an Aunt of Dave

Where the rule for this relationship can be stated:

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(Aunt Person1 Person2 True
        IF (Person1 Sister Person 3
                and Exists (Son Person2 Person3))
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Meaning Person1 is an Aunt of Person2 if the inner conditions are true.

This simplified example demonstrates the Expert System Approach to logic evaluation. The first two assertions are 'fact' loaders. The rule for the aunt is the inference-based knowledge. Note that the rule must search for the existence of the son.

Inferencing can be part of a problem solving strategy for well known, complex computer science problems, such as the traveling salesman or Einstein's famous word problem[7]. Things can become exceedingly mathematical and complex in the inferencing world. With inferencing, it is possible to create a deeply nested set of concepts. For instance, a term such as 'late payment' might encase many rules and search many facts to decide if the condition is true. In our example, the son grammar is nested within the aunt grammar. In inferencing, any level of nesting can be used to construct logic. Using inferences to place concepts within rule declarations can be very confusing.

In an expert system, every knowledge statement must stand alone as part of a formal, consistent model of knowledge. In business rules, expert systems use symbolic or language-based representations of ordinary business concepts to solve business logic problems. Language-based models are often called domain-specific languages and our aunt-son example was a crude instance of one. Further, with expert systems it is not enough to define a customer's name as a part of a structure— it must be defined and connected in terms of facts. In some cases the customer's name might be part of a kind of grammar. Although this sort of formalism may sound desirable, it creates a lot of work for the business analysts and the technician, as will be discussed in section 2.4 and 3.1. When business rules are expressed as an abstract knowledge statement, the rules can become inscrutable because the meanings of the symbols or language are deeply nested. The extra effort to translate this must take place far in advance of executable applications.

2.2 Visual Rules: A Different Starting Point

Data Mining is another, albeit indirect, originating technology for business rules. Data Mining, an Artificial Intelligence field, is a method for extracting patterns from data. Although Visual Rules does not use any data mining algorithms, Visual Rules traces the origin of graphical representations of rules to their work in this field. During early Data Mining projects from the 1990's, a division of Innovations Software Technology began exploring graphical representations of the outcome of data mining analysis. Computer scientists found that complex logic could be graphically structured in a way that business analysts could easily understand. This graphical analysis marked a sharp contrast from the inferencing approach.

Figure 2 graphically depicts the decision tree of the parent-aunt example cited previously. As mentioned earlier, the Expert System Approach might solve deeply convoluted problems such as optimizing the distribution of resources to multiple, conflicting demands. Moreover, these optimization

[7] http://www.greylabyrinth.com/puzzle/puzzle084

problems are extremely rare in business requirements. Nonetheless, the two approaches have tradeoffs between simplicity and expressiveness.

A concise symbolic or language-based solution for business problems comes at the price of creating language grammar and symbolic logic. Research suggests that this can be beyond the ability of most business analysts to understand. In a recent blog post, David McCoy presented Gartner research on this topic[8]. The blog post presents a graphic depiction of the various rule representation approaches plotted against two axes:

- Complexity – How complicated and labor-intensive is it to use one of these techniques?

- Linguistic Power – How close does the solution represent the language dynamics used when talking about business rules?

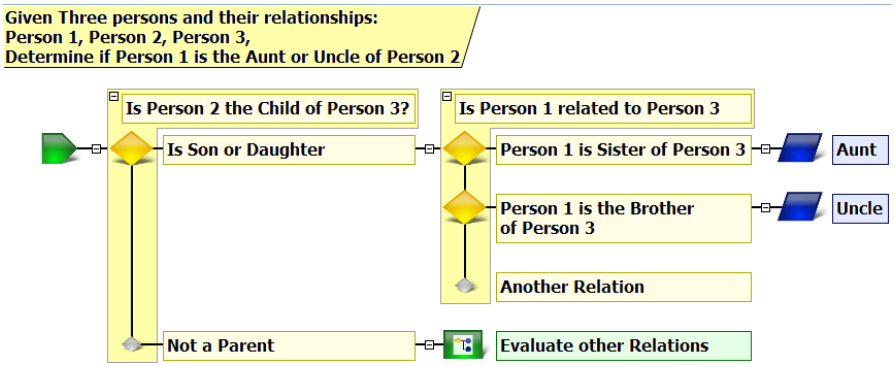

Figure 2: Visual Rules visually depicts knowledge bases

In Innovations' experience, the graphical approach simplifies most practical business rules applications when the business analysts and non-programmers need to understand and manage the solution. For instance, in today's business world, one of the most pressing challenges is the multitude of multi-stepped policies, regulations, and objectives. The sources of these might be government regulations, internal documents and spread sheets, and legacy computer systems. Taken individually, one of these policies or objectives might involve a hundred to a thousand steps, intertwined with several hundred data elements. The steps frequently require statistical or numeric computation. These can be solved and managed with the visual, sequential approach shown in Figure 2.

[8] http://blogs.gartner.com/dave_mccoy/2009/03/10/business-rule-representation-a-tradeoff-of-complexity-and-linguistic-power/#more-1263

2.3 Deterministic Programming Languages

Expert systems use programming languages (so-called declarative or deterministic languages) that are different from familiar procedural languages such as Java, C# or PL/SQL. These languages include Prolog, Lisp or Haskell. For example, the language of Jess is similar to Prolog. These languages are complex and need specialized expertise to be used and interpreted. Also, despite formidable problem solving capabilities, each program must be carefully assembled as a 'domain-specific language'.

A common characteristic of these languages is their capability to carry out 'late binding'. In late binding, a language performs logic operations on data without knowing its type. In a simple example, the program can look at a person's name, regardless of whether it is a customer, seller or supplier. Another characteristic is known as 'lazy evaluation' where a computation is delayed until it is time to execute.

These features provide symbolic or language-based approaches to solving business rules[9].

An unfulfilled dream of expert systems was that the Artificial Intelligence Approach would achieve a higher understanding of the facts it was judging. Similarly, it was also hoped that an expert system could make judgments or determinations about business rules.

The ideas of a governing Artificial Intelligence, running corporate affairs, and a tireless self-operating machine were seductive and intuitively obvious applications of expert systems. Despite seeming unrealistic, the most visible advocates of the movement were seeking to overcome the limitations of data modeling.

2.4 Data Modeling and the Business Rules Group

As SQL databases became prominent in the late 1980's and early 1990's, interest in business rules arose in the data modeling community. The interest came from practices in requirements modeling and design. Many corporate databases included data tables that served as crude decision tables. Many, if not most, business concepts require more components than mere data elements. For instance, most corporations have many time and financial definitions of a 'customer' and the entry in the 'customers' table is an inadequate condition.

The second development in business rules was the foundation of the Business Rules Group[10]. Members of the group included prominent

[9] "The Eleven Secrets of Business Rules Success", FICO, Page 2

[10] OMG Business Motivation Model, www.omg.org

members of the enterprise data modeling community, such as Barbara von Halle, author of the book "Handbook of Relational Design" [11], and David C. Hay, who wrote "Data Model Patterns: Conventions of Thought" [12].

The group's initial focus was on business rules that could be implemented directly in Information Technology. These included rules that would be defined formally in specifications and code of the information system. Later, led by Ron Ross, the group focused on the business aspects of business rules, as opposed to implemented rules. This led to the birth of OMG standards: SVBR and the BMM (Business Motivation Model). These standards are empirically useful, despite their divergence from the mission of making business rules accessible.

2.4.1 Legacy Business Rules Methods

The business rules group practitioners drew on their data modeling expertise to create the early Business Rules Approaches. Data modeling practices involved logical, as opposed to physical, modeling. A logical entity relationship model was created that would be 'de-normalized' into a physical model. An identical approach was applied to business rules.

Accordingly, a number of prominent books on business rules emerged from this group. For the purpose of brevity, we will mention two very influential books:

- Barbara von Halle. "Business Rules Applied: Building Better Systems Using the Business Rule Approach" [13]. This led to the Separate, Test, Externalize, Position (STEP) approach to business rules.
- Ronald G. Ross. "Business Rule Concepts: Getting to the Point of Knowledge" [14].

These represent two contributions. Ross's book created an ontology for business rules and presented a vision for their role in the enterprise. The STEP approach used a vocabulary-based analysis that formalized the terms in the logic that is entered in a business rules system.

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[11] "Handbook of Relational Database Design", Barbara von Halle, Candace C. Fleming, Addison-Wesley Professional (January 1995)

[12] "Data Model Patterns: Convention of Thought", David C. Hay, Dorset House Publishing Company (November 1995)

[13] "Business Rules Applied: Building Better Systems Using the Business Rules Approach", Barbara von Halle, John Wiley & Sons (October 2001)

[14] "Business Rule Concepts: Getting to the Point of Knowledge", Ronald G. Ross, Business Rule Solutions Inc, 2nd Edition (July 2005)

As shown in Figure 3, business rules required a sequence of methodology steps, with different experts involved, to render the rules into executable form. This process, derived from the STEP process described in “Business Rules Applied”, developed a business vocabulary and proceeds through the phases of ‘understood’, ‘analyzed’, and ‘executed’. This is analogous to a logical to physical conversion. Not surprisingly, these steps were essential in the expert-system-based business rules engines because they met their needs.

Figure 3: The legacy BRA created formal forms for the business rules engine

Data modeling involved a verbal parsing of requirements into mathematical constructs. For example, ‘an order has many line items and a line item has one product code’ becomes two boxes and a crow-footed line. Entities were developed from this discussion; for instance, the order and line item entities would emerge from this requirement. Entities were the outcome of the analysis, a metaphor for a data element that is stored in a database. The problem with such parsing requirements is that the originating requirement is often lost, while the boxes remain. This makes it extremely hard for non-technical persons to understand. All of this is done before creating any database tables.

Business rules group practitioners developed analogous approaches to developing business rules, mostly for rules engines based on expert systems (again ahead of creating any rules in the rules engine). Their methods attempted to assess business activity, sometimes in conjunction with a business process, and identify rule-sets and criteria for a set of rules. Again, the outcome would be a semantic parsing of the criteria into business rules metaphors, without entering any logic into the business rules engines. For instance, a formal business rule in expert system form (If …Then … Else) or a decision table can be gathered (not created) based on the collected criteria. As shown in Figure 3, only in the last step, ‘executing’, do we enter rules into the rules engine. Further, just like the data modeling problem, we may find that once the requirement that drove the formal rule is lost, just the (If …Then … Else) logic remains. So there is a cycle of requirements that moves between a manual or offline process and the rules engine.

Mostly what drove the methods shown in Figure 3 was a lack of visual tools in the business rules engines and the highly detailed vocabularies needed to support the expert system logic. This vocabulary is sometimes called a 'domain-specific language'.

2.5 Business Process Management

In 2002, the book "Business Process Management: The Third Wave" was published[15]. While the term 'Business Process Management (BPM)' has been around for a number of years, this book marked a turning point in the recognition of the role of business rules in BPM.

On page 226 Smith states:

"Many corporations manage their business rules in a separate business rule management system …"

This phase started the view that BPM, in concert with business rules, offered an agile approach to workflow and process integration. A business process is often a complex map of flow controls or decision gateways. It may have many sub-processes, decisions, and loops. In a simple example, wherever a decision appears, business rules can evaluate the data provided by the process and control the basis for change in flows.

This viewpoint was a bit narrow. In 2006, Tom Debevoise wrote the book "Business Process Management with a Business Rules Approach"[16]. The book presented the methods of Business Process Management, Business Rules, and Business Intelligence.

Currently, analysts, including the Forrester group, are predicting that business rules, BPM and Business Intelligence are on a converging path[17]. In fact, these, and other research, suggest that a combination has significantly greater business impact when used together than when used separately.

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[15] "Business Process Management: The Third Wave", Howard Smith, Peter Fingar, Meghan Kiffer Pr (October 2002)

[16] "Business Process Management with a Business Rules Approach", Tom Debevoise, Book Surge Press (2006)

[17] "How The Convergence Of Business Rules, BPM, And BI Will Drive Business Optimization", by Boris Evelson, Colin Teubner, John R. Rymer, Forrester Research, (2008)

3 Business Rules: The Present

Today, the BRA is an accepted best practice in many industries, particularly in Insurance, Health Care, Banking, and Finance.

The adoption of business rules has reached maturity. This maturing has led to a number of outcomes. Many organizations, with existing business rules systems, have a huge codebase of impenetrable, resource-intensive logic (imagine many thousands of lines of (Aunt Person1 Person2 True IF ...)). What's more, this logic is not directly connected to the business data. Because the formal requirements that created the logic are often lost, fact loader and data bindings must be maintained. Indeed, creating this separation of business logic and business data creates a maintenance-intensive environment, which defeats the purpose of employing a BRA. The legacy of the expert system has coupled this logic to resource-expensive servers and logic engines.

Still, most organizations maintain their logic as hidden, hard-coded computer applications or within millions of Excel sheets where business experts try to link data and logic. All of this logic falls into a worse pit of important knowledge that cannot be maintained or audited.

3.1 How Abstract, Symbolic Logic Fails to Empower the Business

An expert system evaluates the logic (business rule) by testing the conditions of that logic against each fact in the working memory of the server. The evaluation has two parts: The first part performs tests on working memory elements. The second part evaluates the expressions that are deemed true. For example, with part one it tests for the existence of symbols from within the domain-specific language such as ‘preferred-customer’ and ‘available-product’. Therefore, business rules that are implemented in these systems are logic that is evaluated against facts, supported by a domain-specific language, in the working memory.

It can be difficult for business people to understand the development of symbolic solutions for business scenarios and interpret their outcomes. Also, the structures of a symbolic approach create a very technical step for connecting business data with the rules. Consequently, rules are designed completely abstracted from the business data. This results in a very narrow and limited definition of business rules.

Tools with a symbolic deployment do not provide very strong testing environments and it is difficult to find problems with an execution result[18].

Still, every business rule in an expert system environment must be reduced to an evaluation of logic. Every symbol must be assigned to a working memory element. For example, if a preferred customer is a customer with more than $10,000 in purchases over the last six months, then the database must be queried for this fact and loaded by a fact loader into the memory as a late-bound symbol. As mentioned, business rules analysis in these systems keeps data sources separate from the business rules.

The abstraction of every term in the business rules into a symbol and the separation of business data from the rules is not only a performance restriction; it impedes agility, which forces the business into unnecessary analysis and reduces flexibility. With expert system business rules engines, details of the fact loader (perhaps the SQL query) are not a part of the formal business rule. Changes to critical aspects of the business rules are obscured from the business analyst. These aspects are often the focus of business-agility changes while symbolic representations of the business rule(s) must be continued to be built.

Anecdotally, we offer the following example of comments we frequently hear from a project manager at a large financial institution:

"... [Legacy BRMS] really didn't fit our desired end-state business model. It is very much a technical development tool with extreme power and benefits. However, it really isn't geared to a business user. Yes, you can enable business users with [Web Enabled Rules Managers], but those come with baggage. If our domain content was one of changing values, the [Web Enabled Rules Managers] is a great way to go. But when change occurs, it really is new conditions and actions—which would require [Web Enabled Rules Managers] changes. That just puts more development into the process and slows speed to market. We just found that we could not achieve the business enablement and the speed to market that we desired. There were too many players and too many hand-offs."

What has escaped proponents of a symbolic approach is that they are not building agile business solutions; rather, they are merely assembling logical constructions and vocabulary for the expert system engine to evaluate. With the Visual Rules approach, designers can easily add or remove symbols as needed.

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[18] Comprehensive tracing is difficult and requires understanding the inference chains that can change on a case by case basis and do not reflect the business context but rather a technical, optimized logical evaluation sequence.

3.2 Visual Rules Approach

Visual Rules constructs visual solutions to business rules with a simple top-down, left-to-right approach. It allows business users to define both data models and rules, and connect data to those rules. In expert-system-based products the data model is typically hierarchical and defined by technical people.

Expert systems do not allow, or make it challenging, for business users to manage the data model. Data model changes in those products are problematic; whereas rules are easy to change, the data model is not. More abstract approaches view the data as a logical structure of facts to be connected to the logic. The facts are loaded into the server so the connections between business rules are referenced (remember late binding). Because Visual Rules simultaneously models logic and business data, the Visual Rules method makes data model change considerably easier and faster. The Visual Rules approach has demonstrated that it is not necessary to construct a symbolically complex model of business scenarios. Innovations' Visual Rules product has created many applications with these types of complex business rules requirements.

Figure 4 shows Innovations' alternative to the business rules server approach. The needed rule package is loaded, and only when the context says it is required.

Because there is no central server, Visual Rule's architecture can distribute logic across the entire system environment at the proper point and rules can be executed in any Java Virtual Machine. For instance, rules can be executed in a Java Micro edition (ME) on embedded devices such as SunSpots.

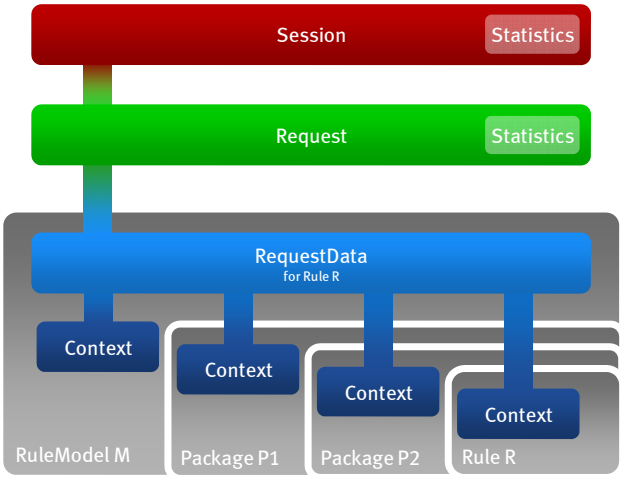

Figure 4: Innovations' approach offers performance and simplicity

Here, Visual Rules supports flexible execution scenarios through a lightweight Java-based architecture. Any computer with a Java virtual machine can execute business rules. There is no need for fact loaders plus

the business analysis is not constrained by a narrow vision of business rules.

With Visual Rules the business analyst can create logic of any desired complexity. Business data is incorporated within the rules and can be a part of the analysis or it can be abstracted in business friendly terms. Importantly, Visual Rules can graphically represent equations, algorithms, and connections to enterprise services and external data sources such as databases, files, or streams.

The improvement is clearest in the business rules sample shown in Figure 5. In this example, computers are assigned from a database to a decision. This shows that data access can be modeled in a way that flexibly retrieves data according to a specific situation. Visual Rules' architecture does not limit the use case to a symbolic representation of the logic, independent of the data.

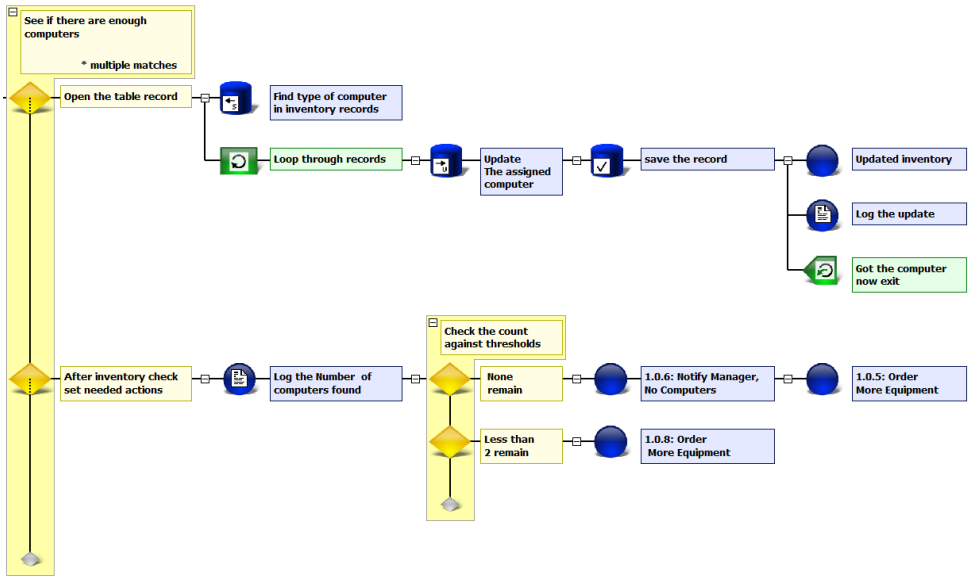

Figure 5: The Visual Rules approach permits analysts to include data

Visual Rules can also support data-neutral approaches through the abstraction of data structures into business-friendly terms. This choice is an organizational issue. With the Visual Rules approach, you are not limited by the architecture of the solution.

3.3 Innovations' Business Rules Methods

Rule capture in the BRA refers to the identification, documentation, and structuring of business rules. As shown in Figure 6, Innovations' approach to rule capture is more direct and is unencumbered by the symbolic processing or grammar construction needs of the expert system engines.

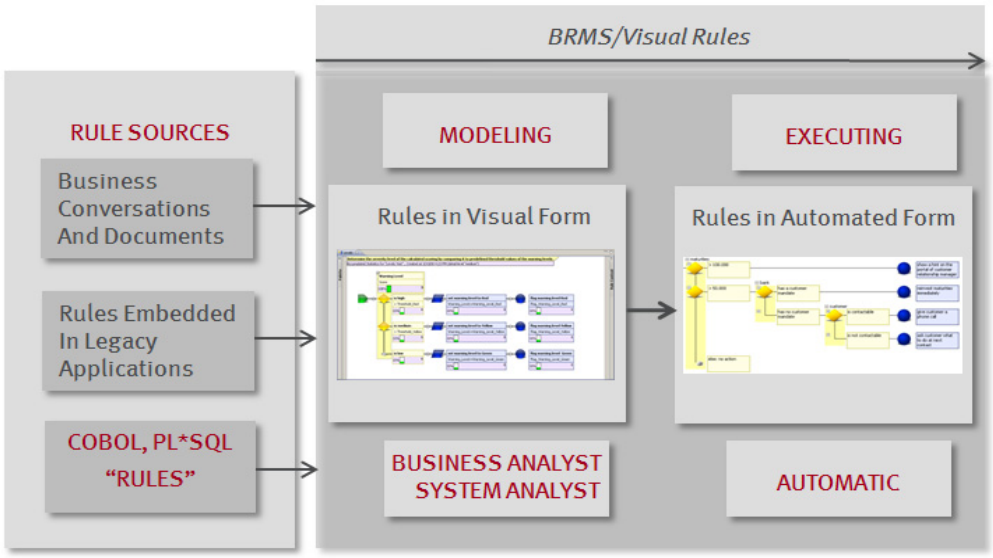

Figure 6: Visual Rules offers a direct approach to the BRA

The artifact or symbol is the visual representation of the logic structure. A verbal or business conversation results in an outline form of the given scenario. The natural language can become the logic structure, without developing many avoidable dictionary terms or jargon. Adding the logic is a simple matter and the logic structure can easily be tested.

As shown in the top of Figure 6, the focus of the rules discovery is the Visual Rules Modeler. Because it uses a visual paradigm for expressing logic, all the steps in Figure 3 are ensconced in a direct approach.

4 Business Rules: The Future

As a method, the BRA has made significant improvements to the development of organizations' digital ecology. From increasing agility to improving governance and overall business results, the contribution is undeniable. Indeed, the business rules metaphor has become an accepted best practice in many industries, especially Finance, Health Care, and Insurance. Recently, the vision of business rules has expanded to include Decision Management. Previously, methodologists grouped rules into rule sets. Subsequently, since they are made with many business rules, the focus shifted to the business decision. The developments on the horizon are less obvious.

For over 20 years, application development methods have undergone cyclic shifts every four to eight years. Moreover, a recent shift has been precipitated by the disruptions of the economy, which has spawned many new needs. This shift happened because of the difficulties of the incumbent, or favored, method versus the advantages and innovations in the new approaches. This paper has described some of the limitations of Business Rules Management Systems based on expert systems and the symbolic processing approach to business requirements. As such, we expect developments in the field of business rules to drop unnecessary technology and practices while preserving the benefits of the status quo. For example, the future will incorporate significant new metaphors and paradigms, such as event-based architectures, the 'Internet of Things' and Social Media. Yet, we anticipate that these advances will probably be subsumed into parts of other more appropriate technologies.

In a current example, Innovations uses Visual Rules to rapidly construct solutions for Credit Risk Management. The Visual Rules approach is business-driven and provides rapid results for making risk models transparent and easy to maintain. Previously, many of these risk models were in inappropriate technologies such as spread sheets.

The future of the BRA will include the integration of more metaphors in a streamlined and visual approach with all the enterprise's application development needs.

4.1 The Changing Role of the Rule Metaphor

Business rules and decisions are critical aspects of enterprise architecture. Yet, they are aspects of a larger approach. For instance, BPM, with its central focus on the process, has been extremely popular with business analysts. Yet, process modeling is limited in the specifications of complex logic and algorithms. Moreover, process modeling does not specify data structures. The aim of business process modeling is to assist business analysts and managers to adapt, reengineer, and optimize organizational processes. Modeling happens with analysis, visualization, and simulation in Business Process Modeling Notation (BPMN).

With BPMN, process modelers were trained to capture as much of the process as possible. The outcomes were, just like data models, many important logical details were buried within or baked into process

diagrams. BPMN was intended to be a human-readable layer that hides the complexity of designing transactional business processes. The reality is that the practice of process modeling creates diagrams that are unreadable by business analysts and managers.

Unreadable process models arise from modeling what changes most often: the underlying policies and not the process itself. You can simplify processes by extracting the complexity of rules from the diagram and handling them in the business rules system.

Now and in the future, Innovations is tackling the limitations of process modeling. Within the business process, the Visual Rules approach to business rules provides clarity in the relationship between process activities and the logic, data, and computations. In addition, Visual Rules has deepened its role in workflow with a new discipline: Event Modeling. The focus of the new discipline is the event.

> "A business event is an event that is meaningful for conducting commercial, industrial, governmental or trade activities." [19]
>
> *Chandy and Schulte*

We call a concrete instance of an event an 'event instance'. An event instance is uniquely identified throughout an application or system and acts as a canonical key. In most cases, events are independent or separable from the activities they start or enable. Different events start the same activity. Activities affect the state of the applications and can cause more events or monitoring activities. An example of Visual Rules' state flow is shown in Figure 7.

[19] "Event Processing, Designing IT Systems for Agile Companies", K. Mani Chandy, W. Roy Schulte, McGraw Hill, 2010

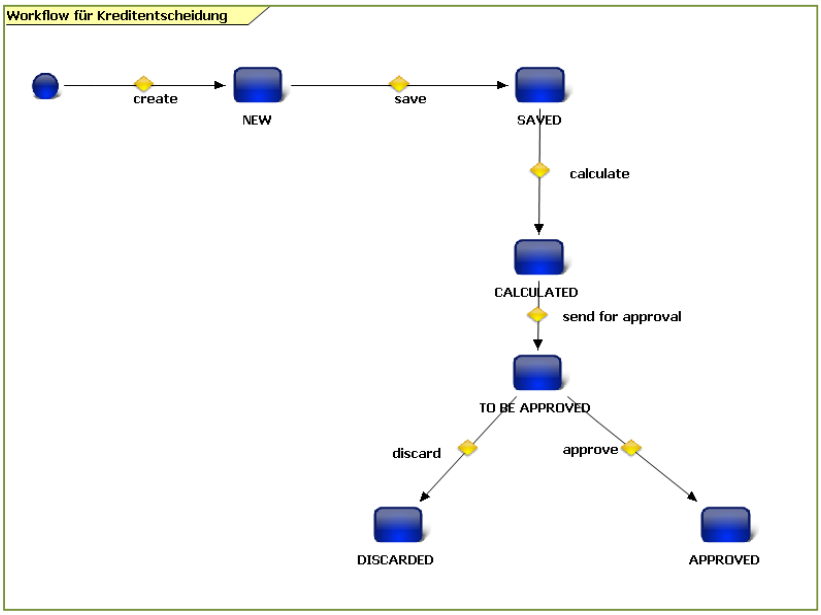

Figure 7: Visual Rules supports events with a state flow modeling tool called mediator rules

Innovations' state flows integrate multiple events in a unique and natural way that leverages all the business rules capabilities of Visual Rules. As a process proceeds, events move it from state to state. These events can be driven by participant's activities or by internal or external triggers. By determining a process's next state, a rule-supported decision can mediate the outcome of an external event. Also, there can be more than one outcome to a Mediator Rule which distinguishes this approach from BPMN.

4.1.1 Visual Rules a Critical Part of an Integral Approach

Business rules will play an increasing role in application development methodologies in enterprise architecture. As we mentioned earlier, some thought leaders have believed that the business rule is only an element of a decision that affects the gateways of the process. Researchers at Georgia University have identified five categories of business rules that have a behavioral influence on the business process in terms of mitigating operational risk or achieving compliance to regulation[20].

Briefly, these five categories are defined as:

[20] "The alignment of risk management and compliance by integrating them into the company's mainstream business processes by means of existing or newly developed method(s) or technique(s), with the purpose of improving the overall performance", Martijn Zoet, Master's Thesis, University of Georgia (2009)

- Structural Sequencing Rules: These rules influence the structural, executional position of activities, events, and decisions within the processes. A rule in this category influences the sequencing of activities (this encompasses the traditional thinking).
- Actor Inclusion Rules: These rules state (or constrain) the activities an actor (person/role) can or cannot perform. That is why business rules might act behind the scene to select the role.
- Transactional Sequencing Rules: The values associated with the individual transactions affect the process execution path taken by the transaction instance. This is also known as transactional assurance.
- Data Condition Rules: These rules influence which data needs to be stored, how it is stored, how long it is stored, and the authorizations concerning the access and modification of the data.
- Outcome Control Rules: These rules influence how results from events (undesirable or desirable) occurring in business processes are identified.

Because a decision is made by many business rules, a decision can influence a process behavior in any combination of these ways. Moreover, event-based architectures can use business rules. Some of these ways touch the process shape, some act in different points in the architecture. Understanding the relationship between the business rules' behavior and its influence on enterprise architecture is important.

True corporate processes are notoriously complex and involve thousands of activities, events, and participants. This complexity has amassed over decades of practice. Detecting what is necessary and important is difficult. Therefore, business conversations might take weeks and even months. With a visual paradigm, Visual Rules easily moves from high-level details to the smallest behavior needed for high performance execution while maintaining the most agility and management control.

With the Visual Rules approach, the team creates progressive models for a solution that either carries out or updates an activity within a business process.

4.1.2 True Business Empowerment

Experience has shown that a graphical approach is ideally suited for business analysts and subject matter experts to implement and maintain decision services and process activities. It is simpler for business users to visualize logic as opposed to constructing symbolic, domain-specific models. In addition, business users need the ability to handle the most complex calculation logic. They also need to control, model, and analyze enterprise data. Clearly, Visual Rules has overcome the limitations of the outdated expert system approach to Decision Management and business rules.

This intuitive approach dramatically lowers TCO and improves efficiency as the company is able to quickly master the entire lifecycle management of their requirements.

5 Conclusion

As mentioned at the start of this paper, the legacy of expert systems based on business rules systems has fostered a very cumbersome implementation methodology. The reasons for these extreme symbolic derivations have eluded the practitioners. A consideration of the over twenty year history of the business rules movement reveals this.

No one can deny the contribution of business rules to the digital ecosystems of today. Business rules vendors have solved many problems and saved their customers vast sums. Yet, solving business scenarios with symbolic logic and abstract domain-specific languages is not necessary when you have a visual representation of the same logic.

For over a decade, customers have used the Visual Rules approach to enhance performance and increase agility. Because the approach is visual, logic is expressed in the notations. A single sequence of shapes on a flow rule or a decision table is equivalent to many lines of code or symbols. These visual notations reduce the steps required to express, create, and update business rules. In addition, the Visual Rules Modeler works directly with the business data in the same runtime environment as the production systems. By accelerating testing and moving modelers closer to the data, agility is enhanced even further.

Visual Rules supports an expanded vision of business rules that encompasses and moves beyond supporting a process decision. This is applicable to the enterprise. In addition, new metaphors, especially events, are on the horizon. As with every method, the complexity of the development will greatly expand. Visual approaches should reduce complexity and increase transparency with today's model-driven approaches. Visual paradigms are on the verge of becoming the only sensible way to manage growth in this unprecedented complexity. Clearly, given its experience in this area, Innovations will continue to lead.

About the Author

Tom Debevoise is the Senior Vice President of Innovations Software Technology Corporation. He is an executive technologist with 20+ years of experience as a BPM/Business Rules Practitioner, leader, trainer Member Object Management Group (OMG) BPM Practice Group. He has specific business rules experience in the fields of Supply Chain Management, Petroleum, Pharmaceutical Clinical Trials, and Health Care.

Tom is the author of three books, “The Data Warehouse Method,” “Business Process Management with a Business Rules Approach” (2006), and “A Microguide to Process Modeling in BPMN” (2008). He is a contributor to numerous technical and trade journal articles.

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