

: *What is decision automation?*

by Daniel J. Power

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Decision automation (DA) means software rather than people make decisions. The concept of decision automation is deceptively simple and intriguingly complex. On the surface the idea is to write a computer program that uses data, rules and criteria to make decisions. A decision automation system replaces and eliminates the need for a human decision maker in a specific decision situation. Business rules and programmed instructions are triggered by inputs and events and then the program "makes" a choice and initiates action. The greatly expanded and evolving computing infrastructure makes it increasingly cost effective to apply decision automation in situations where that had been prohibitively costly. A decision automation system is **NOT** a decision support system.

Davenport and Harris (2005) claimed "After decades of anticipation, the promise of automated decision-making systems is finally becoming a reality in a variety of industries." They noted that bank credit decisions can be automated. They also noted the increased use of automated decision making for home loan lending decisions by DeepGreen Financial. Sadly as noted in Power (2014) automated decision making may have contributed very directly to the financial subprime mortgage crisis.

Power (2002) argues "routine decision situations should be analyzed and 'programmed' as much as is possible and they should be supported in most situations by technology. The potential rewards from improving routine, recurring decisions are usually very large (p. 39)." Lending decisions are perhaps too risky to be considered routine. Just because a decision is made repeatably and criteria are applied in a standard way doesn't mean the decisions then becomes routine and low risk. When decisions must be made very quickly, the risk of a bad decision is perceived as low, and choices/outcomes are "reversible", then automating the decision using algorithms, Artificial Intelligence, or Machine Learning may make practical and economic sense.

From a narrow perspective a decision is a choice among defined alternative courses of action. Hence decision automation systems make choices among predefined alternatives. From a broader perspective, a decision involves the complete process of gathering and evaluating information about a situation, identifying a need for a decision, identifying or in other ways defining relevant alternative courses of action, choosing the "best", the "most appropriate" or the "optimum" action, and then applying the solution and choice in the situation. Hence decision automation systems can also help automate all or part of a specific decision process. Automation refers to using technologies including computer processing to make decisions and implement programmed decision processes. Typically decision automation is considered most appropriate for well-structured, clearly defined, routine or programmed (cf., Simon, 1960) decision situations.

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An automated decision process occurs without any "human" intervention, people are not in the decision loop. Decision making procedures are programmed and then appropriate programs evaluate stored or "real time" data from sensors. An algorithm based on quantitative, logical, heuristic, statistical, and/or artificial intelligence technologies processes the data. The algorithm specifies one or more actions to apply in the situation. The actions are taken by effectors including human or machine actors. An effector may change the value in a database, send a message or an alert, move an object or play a message.

Human decision makers determine the alternatives, rules, models and methods used for making choices and completing decision tasks in programmed decision situations. Conceivably decision automation programs can "learn" from successes and failures and automatically improve and update the relevant stored procedures, rules or likelihoods.

Overall decision automation is a set of concepts, a related set of technologies, a set of methods and design tools, and an ambitious, general "goal". The range of decision tasks that can be automated has increased as technologies and design tools have improved. This technology evolution has also raised aspiration levels and created more challenging development goals. The overriding goal of a decision automation project is to replace human decision makers in programmable decision situations where it can be demonstrated that the computer program's decision is at least as good as that of all or most human decision makers. The working assumption is that decision automation will be cost effective when compared to an equally skilled human decision maker in a programmed decision situation.

Decision Automation Application Areas

The major improvements in computer processor speed, faster and larger capacity storage technologies, improved sensors, the ubiquity of the Internet and World-Wide Web and increased reliability of information technologies has greatly increased the number and diversity of decision automation applications and that trend is accelerating. Decision automation can assist in an air traffic control environment, in flexible manufacturing systems, in petroleum refining, in high-speed sorting systems, in tax decision automation, in intelligent monitoring and decision making in intensive care situations, in fruit grading, in real-time notification, in credit approval automation, in airborne collision avoidance systems, in building automation and facility management systems, in hardwood log breakdown, in laboratory management and automation systems, and in many other well understood decision situations.

Plant Automation and Decision Support is important in flow and process industries. Rob Spiegel,

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Contributing Editor to AutomationWorld.COM, writes "Web technologies are proliferating through plant automation systems, letting managers review production and control data from anywhere they can access the Internet. So far, the bulk of Web-based plant monitoring is used to obtain production data (June 2004, page 34)." Spiegel (2007) also noted "the business side now realizes it needs data from the plant to monitor and trim direct costs." These needs have not been completely met.

For example, SMARTS Decision Manager (sparklinglogic.com) is a cloud-based or on-premise decision management platform that uses data, analytics and business rules to automate decisions made by your enterprise's core systems. According to the website, "SMARTS lets you: Leverage data insight, build predictive models, and author business rules to define automated decisions using industry-leading and patented approaches; Measure and maximize decision quality using dashboards and decision analytics; Deploy, dynamically evolve and optimize decisions that drive your daily business operations and customer interactions."

So what are the major research and content topics associated with decision automation? The fundamental research topic is developing algorithms for machine processing, the development of the "brain" of a specific decision automation system. Algorithms especially need to exploit parallel processing. Development technologies that are used for automating decision processing include AI systems, Bayesian networks, intelligent software agents, and neural networks. The storage or "memory" of the system is important, but major improvements have temporarily reduced the need for new breakthroughs. The goal for enhancing storage is always higher capacity in smaller devices with faster read/write capabilities. Sensors, the "input" devices of decision automation, are an important research area. We need better visual systems and more automated data collection. Radio frequency identification (RFID), global positioning systems (GPS), and environment monitoring technologies are all contributing to the expansion of sensing technologies. Finally, decision automation requires a means to communicate "the machine's" decision. This task is the realm of "effectors", the "output" devices that can modify a database, control a robot arm, or stop a production line.

Bucklin, Lehmann, and Little (1998) predicted that in the coming decades, a growing proportion of marketing decisions will be automated. In 2001, Henry Morris, IDC Vice President, wrote "Only when decision support moves to decision process automation, can we improve the quality of decisions." Randy Fields in a DSSResources.COM Thought Leader Interview expressed a similar, but more sophisticated view of the need for decision automation. Randy noted "What we have done is to take control away and let machines make the decisions. It is a fundamentally different view of the role of technology. We haven't built thermostatic systems that flash to people, little engineers running around, and tell them in better real time or audibly what the temperature in the room is. We have the sensors, coupled with processors make decisions and implement them. The humans just set the strategy."

Companies are using intelligent decision automation systems to make operational decisions, cf,

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actico.com. These systems combine machine learning technology with business rules management to make rapid, predictive decisions, and transform production processes through automation. Another related concept is automated decision systems. It refers to rule-based systems and machine learning systems that automatically resolve repetitive management problems. Automated decision systems make choices among predefined alternatives based on business rules and learning from results.

Decision automation is increasingly important and it has an expanding role in organizations, but there still remains a major role for human decision makers and hence for decision support systems. Decision support can often improve decision quality in semi-structured situations where decision automation is not feasible or is undesirable.

To support the growth of this knowledge area, Decision Automation Resources (DecisionAutomation.COM) was launched in 2004. This site focused on using quantitative models, heuristics, statistical approaches and Artificial Intelligence technologies to make decisions in highly structured and routine decision situations. The site is **not now** in operation, but the interest in this topic continues to grow.

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Findings Enova Decisions (2018) Research

CHICAGO, Feb. 6, 2018 /PRNewswire/ -- U.S. businesses want to capitalize on emerging technologies like machine learning and artificial intelligence, which have the power to revolutionize how companies operate. But the legacy technology tools businesses rely on may hinder or even prevent them from doing so.

Those are the findings of a recent commissioned study conducted by Forrester Consulting on behalf of Enova Decisions, in which 100 business leaders were asked about their views and plans for these emerging technologies.

The study points to a critical preparedness gap. Between 78 and 90 percent of respondents expect to use AI, machine learning, real-time event processing and constraint-based programming within the next two years. However, 42 percent of business leaders say their current decisioning software is incapable of integrating with today's emerging decision automation technologies. The study concluded that top-cited misgivings with these legacy tools, such as high cost and complexity, are bound to worsen as companies rapidly adopt emerging technologies.

To overcome these challenges, company leaders are evaluating platforms with real-time decision-to-action cycles as a solution. In fact, 81 percent of respondents say such a platform would be valuable to their digital transformation goals.

"Firms need solutions capable of integrating with existing technologies and automating across the customer lifecycle," the study stated. "Decisioning platforms that work in real time to optimize decision-to-action cycles are of high value because they will alleviate integration challenges."

Adoption of emerging tools is already underway and is expected to increase rapidly, with 31 percent of firms currently using AI, 41 percent using machine learning, 47 percent using constraint-based programming and 48 percent using real-time event processing to help make operational decisions. By 2020 those numbers will jump to 78 percent, 81 percent, 86 percent and 90 percent, respectively.

"Legacy technology doesn't have to be a roadblock for U.S. businesses looking to fully reap the

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benefits of automated decisioning, machine learning and AI," said Sean Naismith, head of analytics services at Enova Decisions. "Business leaders can leverage digital decisioning platforms that enable real-time predictive analytics to deliver results now while ensuring seamless integration with technologies of the future."

Other findings from the study include:

Respondents note that the automation of operational decisions is important to executing on digital strategy (77 percent); when asked what business benefits they've experienced as a result of automating operational decision making, 50 percent of business leaders cite a more seamless customer experience, 46 percent say operational cost efficiency and 43 percent confirm improved business performance and key performance indicators.

Only 22 percent of decision makers are very satisfied with the key tools they rely on to automate decisions today.

Business decision makers believe AI is the emerging technology that will see the greatest expansion in two years (47 percent), followed by real time event processing (42 percent), machine learning (40 percent) and constraint-based computing (39 percent).

The share of decisions that are automated will increase markedly in two years.

Today, about one-third of respondents say they have the majority of their operational decisions fully or partially automated. In two years, that group will double.

Businesses currently rely on four key technologies to automate decisions: business process management (81 percent), business rules (75 percent), statistical analysis tools (75 percent) and data warehouses (74 percent).

The top four challenges encountered in automating operational decision making include the inability to integrate with current systems/platforms (42 percent), cost (42 percent), lack of consistency across channels, systems, and processes (42 percent) and technical complexity (36 percent).

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The top objectives for firms' use of software to automate operational decision making are to improve the customer experience; optimize operations for improved speed, efficiency and agility of business execution; improve interactions with customers through mobile apps and other digital channels; and increase business performance and improve key performance indicators.

A report with the full study findings and methodology can be found on the Enova Decisions website at <https://www.enovadecisions.com/research/digital-decisions-tap/>.

About Enova Decisions

Enova Decisions turns data and analytics into action. With more than 14 years of data, advanced analytics and technology experience, Enova Decisions uses real-time predictive analytics and its on-demand digital decisioning platform, Colossus™, to help companies make data-driven operational decisions instantly and at scale. The company provides a hosted service, offering real-time scoring and decisioning through its digital decisioning platform to deliver a better customer experience and improve business performance.

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