Where are organizations automating decisions?

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Decisions are at the core of every organization, be it a Fortune 100 company, a start-up, or a governmental agency. In this article, we present the different tools that companies use to support or automate their decisions. To explore these tools, let us start by asking where decisions are made. We will see that organizations make decisions all the time. Some are high stakes and therefore visible not only by the organization but also outside, by the customers, partners, and competitors. Others are so routine that they become too familiar and go unnoticed by the very people who pick them up, daily.

Where decisions are made

In every organization, there are three overlapping activities. Operations to run the business projects to prepare the future, and decisions to optimize both operations and projects. In other words, decisions are made at all levels of the organization, from the CEO who manages the entire organization to the technician who operates a machine. To make exploration easy, we will divide an organization's decisions into strategic, tactical, and operational decisions.

Strategic decisions

By strategic decisions, we mean the set of action plans or policies aimed at achieving major or global goals. Strategic decisions are transformational in nature. Examples include a merger or an acquisition, an initial public offering, or an investment in a completely new product, such as a vaccine.

So far and in the foreseeable future, strategic decisions cannot be fully automated. Every situation is unique and requires creative thinking that still goes beyond AI. But this does not mean that the tools are absent from strategic decisions.

For decades, industries and businesses have relied on Excel spreadsheets and business intelligence (BI) tools. And with the advent of big data and machine learning, strategic decisions are now increasingly integrating data on the national economy, customers, competitors, and distributors into sales forecasts and business planning.

Indeed, there are cases where organizations use advanced methods to support strategic decisions. In the energy, oil, gas, and construction sectors, the big majors have been using real options for decades to decide whether to invest in a new oil or gas field or in the construction of a bridge, in the same way, that big investment banks do when deciding to buy options on complex financial products on the stock exchange.

Tactical decisions

In this paper, tactical decisions mean the set of actions planned and taken to achieve a specific end. They are like strategic decisions but have a reduced scope and horizon.

Until recently, the norm in organizations was to use the same technologies as for strategic decisions, that is, analytical, optimization, and statistical tools. But with the era of cloud computing and big data, organizations are using machine learning increasingly. Examples from the sector of consumer good products include the optimization of the advertising budget of a brand across TV, outdoor, radio, print, and digital; the forecasting of the sales of a new product in each region where the product will be marketed for the first time; or the personalization of discount coupons to help customers to save money, the brand raise sales, and the merchants receive foot traffic.

Most problems organizations solve with machine learning are in fact decisioning problems. The need to predict is to decide, guide an action, or perfect a system. Said briefly, prediction is a means, not the end.

Expert decisions

As the name suggests, expert decisions are made by those professionals who use their background knowledge, developed expertise, and tailored heuristics to arrive at a decision.

Automating expert decisions was the rage in the '80s and '90s. Knowledge-based and expert systems were what machine learning is today — the subject of many conferences, journals, and books. Developers, then known as knowledge engineers, interviewed subject-matter experts to extract the way they made decisions.

In a knowledge-based or expert system, decisions are encoded in the form of condition-decision rules. An inference engine checks all the conditions and fires the corresponding decisions. The inference engine also relies on heuristics that the subject-matter expert has honed during years if not decades.

Contrary to a common belief, knowledge-based and expert systems solved too many problems where knowledge could be easily modeled such as when correlating alarms in a telecommunication network, configuring an electronic product, or troubleshooting faulty equipment.

These days you do not hear much about knowledge-based and expert systems but about business rules, a modern approach to decision-making that does not require expert interviews but gives experts the tools to manage their own decisions, without prior knowledge of a rule programming language.

Operational decisions

Operational decisions are those that companies make in the thousands and sometimes millions in a single day. Financial services and insurance firms are typical examples of organizations where operational decisions are the core of the business. In every product they offer, there are cascading sets of terms and conditions, legal constraints, eligibility criteria, and levels of risks to check before deciding.

Operational decisions seem like expert decisions, but they are different. Operational decisions are often prescriptive decisions in that they implement industry regulations, internal policies, or business strategies regardless of the beliefs, expertise, or preferences of those who implement the decisions. Think of a loan officer in a bank deciding to lend or not to a borrower based on his or her repayment history, or an insurer agent calculating the premium an applicant should pay based on the latter's health condition and medical treatments.

In contrast, expert decisions are often descriptive in that they implement how managers or experts make choices among alternatives based on available information and expertise. Think of a doctor in a hospital deciding a treatment following a diagnosis, or a trader using market data and a predictive model to buy a highly volatile asset.

To automate operational decisions, organizations quickly turned to decision management systems. Behind the terminology of decision management systems lies a multitude of technologies. The simplest are decision tables, trees, and graphs. The most sophisticated combine rules and predictive models.

Humans always in the loop

Interestingly, whatever the method, it requires a certain amount of human work. Whatever the level of sophistication of the tool and the level of automation it allows, at one or more times, a human must intervene. Either define the problem, fine-tune the parameters, or confirm the solution.

In mathematical optimization, practitioners have to frame and structure the problem at hand into parameters, constants, and constraints; select and run an algorithm on these data; often, the algorithm may never converge in which case, they have to relax some of the constraints and repeat the optimization process again and again until they find an acceptable solution to the initial problem.

In machine learning, they must split data into training, validation, and testing data; select a model and fine-tune hyper-parameters; run the model, and repeat until they are satisfied with the results. And once the model is in production, they must monitor its performance as the new data may deviate from historical data on which the model was built.

In knowledge-based systems, they must extract domain-knowledge from experts to encode it into rules; as the world is never easy to capture in one step, often they must change rules or add new ones. Once the number and heterogeneity of the rules cross a certain level of complexity, there is no choice but to organize the rules into manageable knowledge sources.

In decision management systems, they must check the impact of individual decisions on global business performance. A small error in a unique decision may end up with large consequences in terms of brand image, revenues losses, and even legal pursuits. Modern tools come with dashboards with real-time decision analytics to aid users in monitoring and changing decisions if the new situation requires it.

Summary

Since the early days of the computer, organizations used decision support and decision automation systems to better manage their strategic, tactical, expert, and operational decisions. Currently, big data and machine learning are covered too much in the press, media, and social networks, but they are not the only decision-making elements within organizations. Instead of a single method, organizations use a coordinated collection of data, systems, tools, and techniques.

So far there is no unified decision method that can fit the puzzle of decision-making in organizations. For strategic and tactical decisions, practitioners continue relying on optimization and statistics but with the explosion of data, they are integrating more machine learning techniques. For expert decisions and operational decisions, they use decision trees, decision graphs, rules, and machine learning.

Going back to the title question, organizations use decision support tools for strategic and tactical decisions and decision automation tools primarily for expert decisions and operational decisions. Whatever the category of decision support or decision automation tool, humans are always in the loop to configure, monitor, and fine-tune the tool. Seeing a do-it-all algorithm is not ready to become reality very soon.

About the author

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