DECISION ORIENTED
BUSINESS PROCESS MANAGEMENT

Contents

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Business Process Management Meets Decision Management

The unit of work for many information workers and managers is the decision. Call center operatives spend most of their time deciding which products and services to offer a customer, and the deals that might be attractive. Managers move from one decision to another on an ongoing basis. In fact decisions are ubiquitous at all levels of the organization.

Business processes on the other hand are concerned with the flow of information, money and materials as various linked activities are executed. Business process management (BPM) provides a framework for the analysis, design, deployment, execution and monitoring of business processes, and has done much to enhance operational efficiency over the last decade.

Yet – BPM says nothing about the mechanics of decision making, nor does it say anything about its ultimate function as a means of reducing uncertainty in business operations. Fortunately, various methods and technologies have emerged over the last decade which explicitly address the automation of decision making, opening up a significant opportunity for businesses to realize greater efficiency and efficacy. Traditional transaction oriented systems, and business process management systems (BPMS) do not address this domain. Big data, predictive analytics, business rules management, optimization and business intelligence all assist and automate the decision making process. Clearly this facility needs to be integrated into the business process if we are to realize the benefits in a manner that is manageable.

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In reality we have always embedded some level of decision automation into our systems. Decision logic is embedded into program code, and may be eighty per cent or more of the coding effort. There are many problems associated with this approach. The business rules are hidden from the business user, they are difficult (and expensive) to change, prone to errors, and often inefficient. Decision automation and decision management cannot be treated as an 'add-on' to activities within the business process. Indeed not all decisions happen within well-defined processes in any case. And so it is important that the 'decision' is elevated to the same status as the 'transaction' or the 'process'. In this way it can be given appropriate and relevant treatment, instead of using a paradigm that is inappropriate and largely irrelevant. What does this tell us? In practice this means we need decision management methods and tools to deal with decisions in an efficient and effective manner. More importantly, we also need supporting technologies and methods which allow us to embed the decision within business processes – in other words, be able to *execute* the decision – when this is relevant.

Fortunately the technology suppliers and standards bodies seem to agree with this position. While anyone involved with BPM will know of the Business Process Model and Notation (BPMN), they may not be so aware of the Decision Model and Notation (DMN) standard which has been recently ratified. Like BPMN, DMN is an executable modelling notation. With DMN, simple diagrams provide the much needed link between the business process, the decisions made in the process, the data supporting those decisions, and the models created to automate and aid decision making. These "business knowledge models" may be

composed of business rules, or be the result of data mining activities which classify, cluster or predict numerical values. In any case such models are increasingly used for decisions in loan approval, upselling, fraud detection and many other activities relevant to individual businesses and industries. It is important that these models are well managed, that their effects can be measured, that they can be easily modified, and that business users and managers can directly access them instead of having to wait for technical assistance.

The automation of the decision is new territory available to organizations wishing to improve productivity and effectiveness. Unlike the automation of transactional activity, which peaked in the last decade with ERP, CRM, SCM and other systems, decision automation has profound effects on the efficacy of operational activities. Better decisions mean a more effective organization. It is crucial that decision automation is treated with appropriate methods and tools, since the decision automation wave will eventually dwarf the transaction automation wave which preceded it. Businesses embracing decision automation often see returns significantly larger than those associated with more traditional applications. Once again technology is providing the business with an opportunity to transform its operational activities. And with the appropriate methods and tools, decision automation and decision management is already proving itself to be a powerful differentiator.

Adding Intelligence to BPM

Business processes tend to be fairly stable things, specifying how information, money and materials flow throughout the organization. Decisions however tend to be quite volatile, and in industries where policy and regulatory changes are frequent, they can be very volatile. And so it makes sense to separate out processes from decisions, but at the same time provide integration mechanisms.

The traditional format for modeling and specifying decisions has been the decision table. Closely related to this is the decision tree, where decisions are represented in an easily understood tree format. These decision representations provide a good starting point for adding intelligence to business processes. Existing manual decision processes can be captured and embedded into trees and tables, which are in turn loaded into a business rules engine. This will deliver rules to applications as they need them, usually via some widely used protocol such as Service Oriented Architectures (SOA). Using a Business Rules Management System is crucial. It is not uncommon for organizations to find they have thousands of rules, and a rigorous rule management environment is crucial. A central repository of this nature means that business users can directly access rules (given relevant permissions) and that a rule can be defined once and used many times. Changing rules is also very easy, and usually doesn't require programmers or other technical staff, but can be accomplished by someone with responsibility for business rule management.

Creating a business rules management facility has been repeatedly shown to boost productivity, agility and accuracy in decision making. However decision trees and tables are really just the tip of the iceberg. Predictive analytics has recently gained a significant profile and is already widely used for customer focused applications (churn reduction, upselling, targeted marketing etc.). Predictive analytics uses data mining methods and tools to trawl through historical data with the intention of finding patterns which might be useful in the

future. Many types of technique can be used. In some industries it is crucial the way a model works can be understood by humans, and so methods such as clustering and decision trees prevail. Other techniques are available when this isn't a requirement – such as neural networks and support vector machines. The crucial issue is that processes which can take advantage of these predictive models should have easy access to them. This where an integrated decision management platform becomes important, along with methods such as the Decision Model and Notation (DMN), and PMML (Predictive Model Markup Language).

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Other techniques are also available for creating decision models. Optimization methods will create the best plan for resource deployment given a set of constraints and well defined objectives. Statistical methods are also increasingly employed in decision making. Regardless of the techniques used the resulting models need to be available to business processes and other activities (not all business activities can be captured in process) via well-defined interfaces.

The 80-20 rule tends to apply to the creation of decision capability within business processes. Eighty per cent of the benefit will come from twenty per cent of the rules, and unlike traditional business process initiatives, the returns from adding decision models to business processes can be very high – an order of magnitude higher.

The term iBPM (intelligent business process management) has recently been created to capture the added capability that decision models bring to processes. It gives the unfortunate impression that intelligence is some sort of add-on. The decision is a core unit of work almost every person in an organization executes day after day. Decisions need decision management tools and methods if they are to be managed effectively. The alternative is a half-baked solution that will lead to decision model anarchy with associated poor agility, productivity, transparency and performance. We have to be serious about decisions – their automation and management represent the next big jump in business efficiency and efficacy.

Intelligent Business Process Methods

Business decisions permeate operational, tactical and strategic activities. And although business process management (BPM) provides a mechanism for tying some of these activities together with workflows, it says nothing about the decision itself. While BPM has been well served by the methodology encapsulated in BPMN (Business Process Modeling and Notation), the same has not existed for business decisions until very recently. DMN (Decision Model and Notation) provides a bridge between the world of the business process and that of the decision model. These latter involve big data, predictive analytics, optimization, data mining, statistics and business intelligence technologies. It is another universe focused exclusively on improving the efficiency and efficacy of business decisions. BPM serves to tie together decision points and other activities, but offers no framework for understanding them.

DMN provides diagramming conventions and structures which make the decision understandable by a wide range of interested parties – from managers to data scientists. The following excerpt from the DMN specification explains its purpose very well:

"The primary goal of DMN is to provide a common notation that is readily understandable by all business users, from the business analysts needing to create initial decision requirements and then more detailed decision models, to the technical developers responsible for automating the decisions in processes, and finally, to the business people who will manage and monitor those decisions. DMN creates a standardized bridge for the gap between the business decision design and decision implementation. DMN notation is designed to be useable alongside the standard BPMN business process notation."
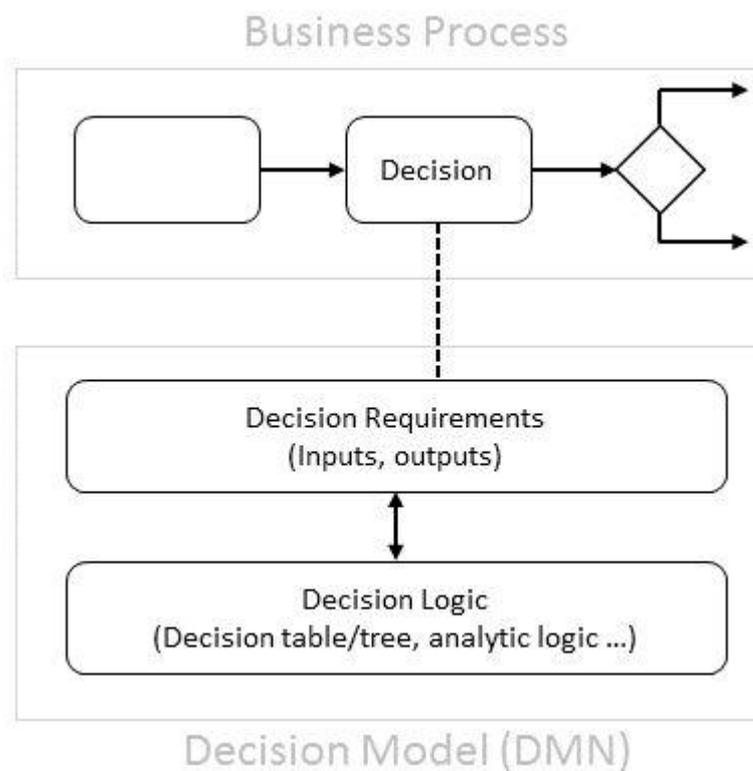
Prior to DMN the business process and the decision model had no real meeting point. Decision models might exist as callable services, or be embedded in applications, but the most a business process model could do was simply acknowledge that a decision needed to be made. DMN splits the decision into two parts – the logic and the model. The former might be represented in PMML (Predictive Model Markup Language), while the model can now be specified using a Decision Requirements Diagram (DRD) - a higher level view of the decision specifying inputs and outputs. This in turn can be linked to the business process.

While DMN will accelerate the automation of decisions, there is need for a broader decision management capability. It is not atypical for larger organizations to employ thousands of decision models. They need to be documented, monitored for performance and integrity, easily modified, and accessible for those who might want to understand them (regulators

for example). As such, an encompassing decision management discipline is needed, and without it businesses will flounder as the number and complexity of decision models proliferates.

It is important to realize that decision automation offers an opportunity for greatly improved agility as decision logic is extracted from process logic, for enhanced effectiveness as decisions become more accurate, and for very significant improvements in efficiency as throughput increases. Standards such as DMN in conjunction with a decision management platform provide the conceptual and operational infrastructure necessary for enterprise wide decision automation, and those with the foresight to put these things in place will benefit accordingly.

Applying Decisions to Business Processes

A great deal of what passes for a 'business process' is actually decision logic, and so large numbers of decisions are already embedded into processes in program code. As such they lack transparency, accessibility, quality control mechanisms and are extremely difficult to orchestrate. By treating decisions as more than an appendage to the process, it becomes possible to implement them more easily, embrace greater complexity and measure efficacy.

Decision tables and decision trees are often the first mechanisms used to explicitly define decisions. These are deterministic in nature, and once a set of conditions has been met the corresponding decision can be made. In loan approval for example, data such as age, salary, number of dependents, other loans - and so on, will be fed into a table or tree, and a 'accept' or 'decline' determined, with little indication of whether the decision is borderline or firm. Of course this can be emulated by finer granularity in the logic. Business rules management systems (BRMS) employ these techniques, and bring many benefits. Where transparency is required (often demanded by regulators) a BRMS provides an ideal environment for implementing decisions.

The recent rise in profile of predictive analytics means a whole new battery of techniques is available to create decision models. Many of these are probabilistic in nature, assigning a probability to a decision. And so a loan approval for example might have a 51% probability of belonging to the 'approved' class – which is clearly borderline. Decision trees can produce probabilistic models as do many other techniques (Bayesian methods for example). Where transparency is not critical other mechanisms are available, neural networks being one of the most popular. It is important that decision models can use innovative new techniques since this is often where an edge might be found.

Finally a whole set of decisions is associated with resource deployment. How many people in a call center for example, should be placed on various campaigns? Or how should manufacturing resources be used to maximize profitability? It is here where optimization techniques (prescriptive analytics) offer powerful solutions that can significantly improve operational efficiency.

Business rules management, predictive analytics, optimization, and ultimately, decision management, are all capable of addressing complex business decisions. They provide

mechanisms for the automation of numerous decisions that form a large part of most business processes. Of course the decision made during one activity within a process often impacts other decisions, and so there is a need for them to be orchestrated. A decision management platform will facilitate such orchestration and allow managers to monitor the effect of automated decisions. It really is very important that organizations put a proper infrastructure in place and use proven methodologies, since the number of decisions which can be fully or partially automated is often be measured in the thousands or tens of thousands in a large business.

Most industries already use some form of decision management technology, but as new technologies broaden the application domain, so there is a need to be more rigorous.

Examples of decision management application are numerous and include:

- Banking - authorizations, self-service web enquiries, account management

- Insurance - underwriting, claims processing, fraud management

- Retail - marketing/campaign management, behavior scoring, order configuration

- Telecom - call center/CRM, problem resolution, personalization

- Government - compliance, collections, self-service web enquiries

- Manufacturing - product/service recommendation, sales commission calculations, process improvements.

This is really just the tip of the iceberg, and many businesses are going well beyond these well know applications. The improved efficiency and efficacy associated with effective decision management is both tangible and substantial, and rests almost entirely on the ability to create, modify, coordinate, monitor and manage business decisions effectively. This is a very rapidly evolving set of capabilities with big data, new analytics techniques and management methods, changing the way businesses use technology.

Decision Management Case Studies

The application of decision automation and management is as diverse as the businesses that benefit from the technologies and methods. The four case studies below are courtesy of FICO, the sponsor of this report, and include an airline operator, a telecoms company and two firms operating in financial services. For all four organizations the benefits were substantial, leading to an expansion of the use of decision management within the organization. These examples go well beyond the use of business rules and demonstrate the arsenal techniques available.

- A large payment processor wanted to increase the speed and accuracy of its underwriting processes. Underwriting has traditionally been treated as something of a bottleneck, with a fixed amount of work allocated to underwriting staff. Decision management has allowed throughput to push well through these fixed ratios, sometimes by an order of magnitude. Its use of FICO technology and decision based processes have had a dramatic effect, with faster on-boarding of new merchants, cost reduction, revenue protection and greatly enhanced flexibility. Cycle times have

been reduced from days to minutes, and manual reviews have been reduced by 60%. There are now plans to productize underwriting and offer it as a service, and extend the approach to other business processes.

- A major US airline used FICO optimization technology to improve margin and the quality of its products. With 3500+ flights per day, 93 destinations, 45,000 employees, 600 aircraft, nearly two billion gallons of fuel consumed each year, and 100 million passengers annually, the optimization problems were non-trivial and for certain parts of the business required near real-time processing. The people optimization tasks included crew pairing, staff planning, crew recovery and various bidline problems. Resource optimization included making sure aircraft were busy and full, and logistics and costs associated with fuel. The desired outcome sounded modest at just a 2-5% increase in margin, by optimizing resources and people. The company has seen a significant improvement in crew paring, and a project called 'Open Time Reoptimization' paid for itself the first time it was run. It is also possible for the airline to run many more flight plans. The project has been sufficiently successful that many more areas of operations will be addressed.

- One of the largest global financial services firms, operating in 60 countries, needed to create decision management solutions for customer centric decisions. This meant complying with a consent order around the life cycle management of analytics, creating efficiencies to reduce operational risk, and allowing traceability of analytics and attributes through a customer centric business (CCB) model. With FICO model management and governance solutions, this organization can now centrally manage all risks within CCB, is served with automated reports to reduce operational risk, and very importantly, monitor the models it is using. The project has been sufficiently successful that thousands of risk models will be created in many other areas of the business.

- A large telecoms operator needed to optimize its credit policy and strategy. Competition is fierce in this industry and there was a need to significantly speed up the formulation of credit policy. The variables involved are large in number, with hundreds of thousands of applications per month, dozens of credit and fraud score bands, many renewal options, numerous third party channels and hundreds of MSAs. Decisions around deposit amounts, the number of lines and monthly spending limit were crucial. A three month project with FICO led to $47 million in additional cash flow. Such was the success of this project that the business has embarked on a 21 month project to embrace additional analytics methods applied to other areas of the business.

There are many, many other examples of businesses which have transformed their process efficiency and efficacy by automating and managing decision processes. An Eastern European Bank significantly improved its early stage collections with a 3 year ROI expected to come out at around 24:1. A leading online shopping provider saw a 3.3% increase in profit per account through decision modelling and optimization. A retail credit card provider saw

a significant increase in the profitability of retail portfolios (between 1 and 2%) in the first month of using decision modelling and optimization technologies and methods.

The case studies are numerous and almost always encouraging. Failure to realize significant benefits must inevitably be associated with skill, political and organizational issues. Decision management focuses on the most important issue facing all businesses – the reduction of uncertainty; and with it comes an increase in effectiveness and efficiency.

Decision Management Strategy

In most organizations, business process management (BPM) is a well-developed set of methods, skills and supporting infrastructure. Decision management is less so. This is understandable, since decisions have often been implicitly buried in transactional systems for as long as businesses have been developing and deploying them. It is only with the emergence of technologies and methods which greatly enhance the accuracy and efficiency of decision making that discriminating between decisions and process has become an imperative.

Decision management supports methods, technologies and processes which together provide a unified facility for designing, developing, deploying, monitoring and managing automated and partially automated business decisions. Relevant technologies include predictive analytics, business rules management, optimization and in some cases business intelligence. Methods include the newly ratified Decision Model and Notation (DMN), and those which incorporate the decision lifecycle, to be found in integrated decision management platforms.

Since it is our belief that decision automation is a separate but complementary wave to process automation, and will eventually eclipse it, so it is necessary to take an integrated view if we are to avoid the islands of automation and information that plagued transactional systems prior to the widespread adoption of ERP (Enterprise Resource Planning) platforms. In fact it is useful to think of a Decision Management platform as the ERP of decision automation.

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The starting point for many organizations will be the capture of existing manual decision processes so they can be incorporated into a business rules management system (BRMS). This in itself is an immensely useful process, since the rules associated with many decisions are a combination of documented procedure and undocumented knowhow. Once rules are embedded into a BRMS they can be used by any system that needs to process them, and they become more transparent, more easily modified, and managed more effectively. The thousands of rules which are typically embedded in program code are likely to stay there for the time being, although efforts can certainly be made to extract critical rules when systems are modified.

Decisions which are generated from analytical models typically come from data mining and maybe statistical analysis. Sometimes these can be reformulated into a deterministic

business rule, which can then be incorporated into a BRMS. However there are dozens of different methods used for generating such models, many of which cannot be expressed in the logic understood by a BRMS. These too need to be managed within the context of a Decision Management platform so that the lifecycle can be managed effectively. This lifecycle incorporates requirements, development, deployment, monitoring, management and modification. Rules available through a BRMS and those deployed as analytic models need an integrated environment, so they can be used collectively to address business decisions. This also applies to models which result from optimization, where the best deployment of resources is established based on various constraints and objectives.

Only when an integrated Decision Management platform is employed can business processes call upon decision models that are well understood and managed. The alternative is decision model chaos, with fragmentation of techniques, technologies and methods, since the number of decision models will number in the thousands, and for some larger organizations in the tens of thousands. These models will lend the same critical advantage to an organization that transactional systems have in the past, and as such need to be managed rigorously.

The urgency for establishing a Decision Management discipline is well demonstrated by the rise in big data analytics. The capture of increasing amounts of data, soon to be accelerated once again by the Internet of Things (IoT), permits ever more diverse analytics initiatives. The dumb business processes which have always needed human intervention for decision making, are becoming increasingly smart and efficient through access to decision models. The plethora of case studies showing how organizations are adding intelligence to their processes simply demonstrates that process efficiency is no longer enough – we have to realize new efficiencies and effectiveness through decision automation - and this is only feasible through an integrated Decision Management platform.

About Butler Analytics

Butler Analytics was founded by Martin Butler, recognized as one of the preeminent technology analysts in Europe. He is best known as founder of Butler Group which, prior to its sale in 2005, was the largest indigenous technology analyst firm in Europe.

The focus for Butler Analytics is decision automation and management technologies, methods, and strategies, since these represent the next major wave in the automation of business activities, with associated improvements in operational efficacy and efficiency. The technologies covered include predictive analytics, big data analytics, optimization, business rules management and business intelligence.