DECISION
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Maximizing the effectiveness of government with analytics

Making the most of constrained resources with analytic decision making

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Government agencies need to maximize the value of the resources they are budgeted. Using analytics to improve decision making is an effective tool to focus people on the most problematic cases, deliver better services without increased cost, or reduce overhead and administration.

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"The use of analytics has proven to increase the efficiency of government agencies and the effectiveness of the programs they run."

IBM Executive

"By focusing our efforts on those individuals who are the most criminally active and have a violent history, the Atlanta Police Department will have a longer-lasting impact on reducing crime in the city."

Major Jim Sellers Atlanta Police Department

Most government agencies come under constant pressure to improve the efficiency and effectiveness of their operations. When economic growth is slow or non-existent, the way governments use money and the way they raise it come under particular scrutiny. Budget and headcount restrictions are common responses, though agencies rarely see a matching reduction in scope. Even when the value of additional resources is clear, or when the scope of an agency must increase, additional budget is rarely easy to come by. With these restrictions come demands for greater accountability and rigorous compliance to ensure taxes are being wisely spent. Add in the growing demands of citizens for increased safety and worldwide concerns around borders, climate and food safety and the operations of a typical agency become even more challenging.

In this environment government agencies focus on maximizing the resources they have. One area of focus during recent years has been e-government, and many agencies are focusing on a second generation of e-government systems to improve operational effectiveness. The traditional view of how cases are handled is being reassessed to see if there are more efficient ways to handle an agency's workload. The most progressive agencies have realized that waiting for citizens to request services, waiting to respond to crises, is far less effective than being proactive. Agencies looking for new ways to maximize operational effectiveness are finding that analytics are critical.

Opportunities and challenges

The *opportunities* for government agencies are fourfold. If they can deliver a second generation e-government experience, move beyond first-in/first-out, adopt holistic case management and become proactive, then they can dramatically improve their efficiency and effectiveness.

eGovernment

e-government needs to mean more than just electronic forms on websites. Today's e-government initiatives need to use the web to streamline operations and connect more fully to citizens, bringing them into processes and operations.

Beyond FIFO

With limited resources, government agencies need a way to move beyond first-in/first-out or FIFO processing. Instead, they need ways to apply resources where they will make the most difference, whether that means reducing crime, increasing tax revenue or providing services where they are most needed. Citizens have a right to a response, but agencies must maximize the value of their services by applying them where and when they will have greatest impact.

Proactive outreach

Most of what government handles are problems—fraud, crime, floods, food safety. Yet engaging in pay-and-chase or after-the-fact clean up is notoriously inefficient. If government agencies could predict more, act in advance of problems to prevent them, reach out to those likely to need services, then the same level of investment could achieve much greater results.

Holistic case management

Increasingly citizens are looking to agencies to provide a single point of contact and integrated, holistic case management. By presenting a unified face to the citizen and sharing information effectively, agencies can resolve problems faster and improve services while reducing costs and eliminating missteps caused by inter-agency miscommunication.

This vision of government agencies as interconnected, Internet-enabled organizations that preempt problems and predict needs to better focus the resources citizens are paying for is compelling, but there are challenges—especially challenges of budget, accountability, revenue and safety.

Budget constraints

All government agencies are constrained by budgets and headcount limits. Often these budgets do not take into account potential revenue growth or cost savings that could be gained by applying additional resources. Agencies must manage to these budgets; apply them as effectively as possible; focus resources where they will make the most difference. Asking for more money simply does not work.

Accountability and compliance

Government agencies are typically audited and required to demonstrate compliance with multiple layers of regulations. They must also show accountability to their citizens and stakeholders. Clarity of decision making, clear reporting and thorough justification of actions are required to meet these requirements.

Revenue

Few governments have all the revenue they need and most governments face a tax and fee gap—10-15% that is owed but not collected. Add in more sophisticated schemes for fraud, increased avoidance and under-reporting, and the challenge of collecting revenue is clear. Lower revenue impacts already constrained

budgets. Yet agencies want voluntary compliance and transparency, not just enforcement, and this further complicates the situation.

Safety

Government agencies of all kinds, not just traditional police and security agencies, must consider the safety of citizens as part of their mission. But it is hard to know what threats are real and what really works to reduce crime or recidivism. Who should have access to data? Who should be held at the border and who allowed through? Which tip is real? Without this clarity, time and money will be wasted that is desperately needed elsewhere.

Government agencies can reinvent themselves to be more effective and more efficient. They can grasp these opportunities and meet these challenges if they set out on a journey to adopt analytics.

Transformation

Analytic effectiveness

"It is nearly impossible to expect a person to learn, recall and adapt to the ever-changing federal and state regulations for child health-care programs. Business rules can remove this knowledge barrier, ease the screening process and streamline application procedures."

A leading provider of services to the health and human services industry

"With new smarter insights, we can be proactive instead of reactive in delivering secure services people need, when they need it the most, while saving valuable taxpayer dollars."

Don Edwards, assistant agency director, Alameda Social Services Agency

"Over the past five years, the tax audit and compliance system has saved the state more than US$889 million, while allowing us to process refunds faster."

Tim Gardinier, Manager, Data Warehousing Unit, New York State Department of Taxation and Finance

For government agencies to meet these challenges and deliver on these opportunities, they must embark on a journey. The challenges can best be addressed holistically and each step in the journey improves an agency's efficiency and effectiveness. Each step moves them closer to maximizing the value of the resources available. Agencies around the world are already on this journey and seeing real benefits from their increased use of analytics.

No agency will achieve this in one step; however, each step will show a return in terms of reduced costs, better utilization, or improved results. Using the increasingly rich set of information agencies have enables them to focus their resources where they will make the most difference. New tools and new techniques will allow them to use their data in innovative and more effective ways.

Each step—integrating disparate data sources, automating activities, analyzing program effectiveness, analytically focusing resources and becoming proactive—improves outcomes and increases the utilization of agency resources.

Each agency will take a different journey but no matter what their current state, they can and must take a first step towards analytic transformation.

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Analytic effectiveness

Deliver information

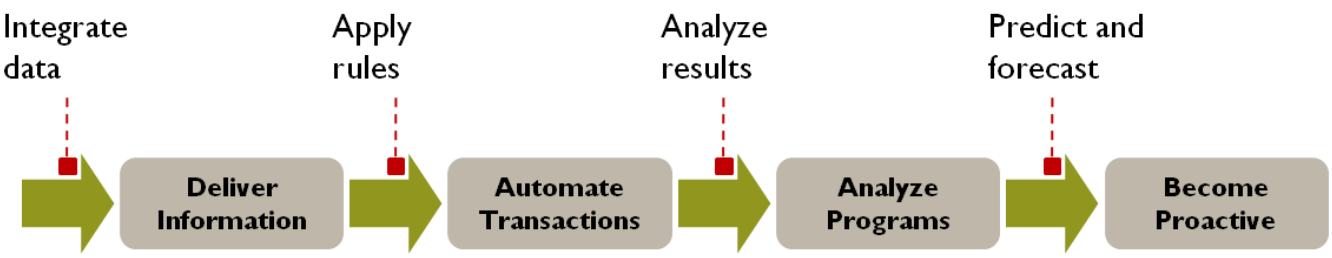
Countries, states, provinces and even cities handle vast numbers of transactions and must support millions of citizens every day. As a result, government agencies have more data, and do more with it, than any other industry. Many agencies have so much data, and their data are so complex, that they stretch the limits of software and technology. Yet the world of managing by the numbers has changed. The hardware and software tools for manipulating data have vastly improved and our understanding of analytic techniques has moved forward in leaps and bounds. It is time for agencies to revisit how they turn their data into information and take action on it.

Analytic efficiency requires agencies to integrate data sources and to turn data into information that can be used to make improvements. Most agencies have multiple data sources developed independently and stored in different, disconnected technology implementations. Many data sources are "owned" by a specific group in one agency yet critical to other agencies and other groups within the same agency. Data is created and updated solely in support of a particular operational system or process. Governance of this data, as well as critical definitions and completeness criteria, is managed at a very low level if at all. Yet most agencies need to report on this data to demonstrate accountability and compliance. This means that manual reporting and consolidation processes are widespread, creating unnecessary costs and delays.

The first step for most agencies, then, is to integrate multiple data sources to eliminate the costs and inefficiencies of wading through data from multiple data sources. Integrating data across the agency will position it for future analytic work while at the same time reducing costs and improving the efficiency with which reports can be produced. Accountability and compliance costs can thus be reduced, often significantly. Most agencies will also find that there are specific operational tasks that require data from multiple sources and that are incurring additional costs as a result. Finding the decisions where many manual steps are required to process data and where costs are high is critical.

THE CITY OF ALBUQUERQUE, for instance, has 750,000 residents, 7,000 employees in 20 city departments, and an annual budget of more than $1B. Like many cities, it had lots of different systems on different platforms each with its own database. Integrating these disparate sources and making it easy to develop and use reports across the data silos freed up staff time and allowed resources to be scheduled and applied more effectively. For instance, one city employee had spent 6 hours a day extrapolating and collating data on large garbage pickup requests that could be entered in three different systems. Integrating and making this data available saved thousands of hours a year and allowed the city to move to same day pick up requests. Analyzing patterns in the data, such as how the time to respond to graffiti varied with time of day, showed how work hours could be refocused, reducing response time from 2-4 days to just 1 day, despite an increase in reports.

The transformation journey



Sometimes the costs of integration are more than just wasted time. In police departments, time spent by investigators chasing down data is time wasted. And time is the enemy—the time it takes to act on information is time that perpetrators spend at large, free to commit other crimes, and during which crimes go unsolved.

Police departments like THE NYPD collect lots of data about a crime after it occurs. Like many police departments, this data was compartmentalized by agency and not readily accessible. To address this, the NYPD developed a crime information warehouse around a common data model. Integrating crime data and enriching it with geographic data freed up investigators to actually investigate by making it easier for them to find and evaluate information that had already been collected.

Besides eliminating the time to find information, agencies can also increase the usability of the information and ease its use in real situations. Simply integrating the data could result in far more information that someone can use. Summarizing and presenting the integrated data so it can be used more effectively by program and agency staff is critical.

THE ATLANTA POLICE DEPARTMENT was not able to use criminal records to spot repeat offenders or identify likely violent offenders— there was just too much information. The Georgia state criminal history records contained data on everyone arrested in the state in the previous decade— many millions of records of various types. Analytics were used to rank and sort the most violent and highest risk offenders in Atlanta and an actionable, one page summary that highlighted pertinent information for each offender was created to help officers. Officers were forewarned about problem offenders on their beat and were able to obtain actionable information.

Automate transactions

When data is integrated and summarized in this way many agencies find new opportunities for automation. Activities that require manual intervention often do so because a person must collect all the available data manually before they can act. Once the data is integrated the opportunities for automation increase. Notifications are one of the first ways this data can be put to work.

For instance, the ALAMEDA COUNTY SOCIAL SERVICES AGENCY has clients who receive services from up to six different programs. A consolidated picture of all the services being delivered to a particular individual enables instant automated notifications of status changes, such as benefits approval, helping keep case workers and clients fully informed. The agency also provides accurate participation and other program information necessary for state and federal programs using this infrastructure.

Agencies with the data for a case or a transaction integrated into a common model can apply business rules management systems to automate more than notifications, however. They can act automatically on some or all of their transactions using this information. Business rules can easily express the regulations and policies that need to be applied, allowing 80% or more, sometimes up to 95%, of transactions to be automated.

A LEADING PROVIDER OF SERVICES to government agencies took advantage of this to improve the efficiency with which it managed state Children's Health Insurance Programs. Not all low-income families qualify for Medicaid, so many states have programs that offer similar benefits to those who don't qualify. However, determining eligibility is difficult and the available data must be compared to large numbers of rules from multiple policy areas, income, Medicaid and more. Using a business rules management system to process the data collected, staff could process 4-5 applications an hour, more than double the manual process, and do so

with less training. Using business rules to act on the data reduced administrative costs and ensured faster eligibility determinations for citizens.

When aiming for automation, some agencies have only to replicate regulations and policies as rules. There is no choice about the rules to be implemented as they are completely constrained. But when the decision is a more judgmental one, determining the right rules can be challenging. An integrated data source can play a critical role with these kinds of rules. Good data allows rules designed by an expert to be verified so that the agency can be sure they do what is expected.

THE NEW YORK STATE DEPARTMENT OF TAXATION AND FINANCE collects and tracks all types of state taxes. Every year, the agency processes 24 million personal and business tax returns. The total tax collection exceeds $90 billion annually in state and local taxes. As part of a multi-year effort to identify questionable refund requests and thus maximize the amount of tax revenue collected, the department created a department-wide data warehouse to integrate and manage information about returns and audit cases. Focused on improving audit case selection, this data warehouse allowed staff members and systems to access the complete history of each case and each return. This is used to validate and improve the business rules that drive the audit process. Created and managed by business experts, these rules identify the cases that should be considered for audit. The data warehouse allows the department to be certain of exactly what impact each will have. This helps to ensure the right rules are in place to catch questionable returns without inconveniencing those filing legitimate refund requests.

One part of analytically focusing resources is to automate broadly so program resources can be focused on exceptions, those cases that really cannot be automated. The combination of business rules-based automation of day-to-day transactions and analytics to understand the exceptions to those rules allows resources to be applied effectively.

THE REGIONAL GOVERNMENT OF CASTILLA Y LEÓN, one of Spain's 17 autonomous regions, took this approach in administering the agency's social assistance programs for the disabled and child protection. These services support over 50,000 people and when new and complex regulations on autonomy and care were introduced, with precisely defined eligibility, the agency needed a new approach. Using a business rules management system to automate eligibility determinations, a much greater number of cases could be handled by the same staff—the staff's focus moved to exceptions and applicants experienced a much faster processing time. Because the rules were separately managed, they could also be changed as the regulations changed, eliminating the need for expensive system updates.

Analyze programs

Integrated, easy-to-consume information is a great asset when it comes to both accountability and program efficiency. Building on that information, agencies can begin to improve effectiveness as well. Most agencies have measures and performance indicators that are local and focused on a single department, a single initiative. With an integrated information base, agencies can go further and develop new, cross-silo/cross-functional measures that truly represent overall agency effectiveness. By considering these measures and analyzing their data, agencies can ask and answer questions about the true effectiveness of their programs.

THE CITY OF COQUITLAM, located on the West Coast of British Columbia, developed an integrated data warehouse as a basis for this kind of analysis. Coquitlam is a dynamic city with a commitment to community-based living and 115,000 residents, but with data in multiple silos it was hard to determine the true costs and benefits of services and programs. Using the new data warehouse, the leisure and parks department was able to calculate the total cost of each facility

(combining payroll, maintenance and more) and compare that with revenue from those facilities. With an accurate assessment of its cost recovery rate, the city could make more effective resource allocations. With labor the major part of its budget, this makes a real difference to the effectiveness of the city government.

THE ALAMEDA COUNTY SSA also uses an integrated data infrastructure to assess effectiveness. Gaps in service, as well as the effectiveness of programs, can be readily identified so funding and resources can be directed to where they are most needed. For example, caseworkers analyze the effectiveness and status of child services interventions and adjust to meet a child's specific needs.

While a true understanding of program costs and funding can improve the effectiveness of a program, agencies can also use analytics and integrated information to compare programs. By analyzing the effectiveness of each program, they can find programs that work and ones that do not. This enables them to focus resources where they have the most benefit and get the best results.

FIRST COMMUNITY HOUSING provides affordable housing and services to lower-income individuals in San Jose, California. Analyzing integrated data on programs and usage, FCH was able to identify no- or low-participation programs, freeing up funds that were then redirected to more popular programs. For instance, a software purchase program was not popular and the funds were redirected to expand financial counseling and recreation programs that now boast user rates of more than 70 percent.

Lastly, this kind of analysis of integrated data can help agencies plan more effectively. Analyzing program usage and trends can help an agency analytically plan for the future, forecasting program workloads at a useful level of granularity.

SOCIAL SECURITY ADMINISTRATION, the US' largest agency, will provide more than US$40 billion in assistance to over seven million disabled citizens with limited income and assets. SSA is legally required to conduct full medical reviews to determine whether individuals currently on disability are still eligible to receive benefits. Yet their budget is limited and the number of cases rises every year. SSA used analysis to develop workload projection models that allowed it to estimate workload requirements by state, date, and various other categories. Thanks to an integrated data infrastructure, SSA can change assumptions and quickly assess the impact of these changes on workloads, improving overall agency effectiveness.

As agencies become more analytically sophisticated they can put their data to work ever more effectively. Once overall planning and program effectiveness are being measured and managed analytically, the next step is to use analytic techniques to focus resources within a program so that that program can be as effective as possible.

When actual usage information is captured at a transactional level it can be analyzed to help optimize the services offered. Analyzing patterns of behavior and usage can help design new services, identify services that should be changed or eliminated and lead to a continuous improvement loop.

THE SINGAPORE LAND TRANSPORT AUTHORITY manages one of the most modern, affordable and heavily used public transport networks in the world, with nearly three million people riding the bus and 1,600,000 people riding the train on any given day. The LTA developed a new fare processing system to allow any smart card compliant with Singapore's standard to be used in public transport. This system increased convenience for commuters and lowered costs while eliminating 80 percent of revenue leakage from "lost" transactions. Perhaps more importantly, though, the system allows LTA to look into the overall commuter base and create profiles based on routes taken, connections made

between transportation modes and how these patterns change over time, from time-of-day to seasonal differences. By analyzing patterns within this data, the LTA's planners gain insights into travel patterns and can use the data to develop optimal routes, schedules and fares that are more convenient and more attractive, so increasing long-term ridership.

The kind of automation discussed earlier makes it easier to apply resources to exceptions. But analytics can also help agencies find exceptions that require a special focus, those that will show a return in terms of improved results or services. Analytics can also help identify non-intuitive items that would repay additional investment—those cases or situations that might otherwise not be the focus of scarce resources.

Two police departments illustrate this use of analytics. Shrinking resources, few leads and aging cases complicate crime fighting and limit the number of cases that can be handled. High volume cases like house burglary or car theft without clear evidence are often filed pending compelling new evidence. But many of these crimes are committed by the same people. The WEST MIDLANDS POLICE in the UK used advanced analytic techniques to cluster crimes that showed criminals with a similar modus operandi and physical descriptions. This helped them find potential suspects from among known perpetrators and analyze clusters of crimes to see if the same individual was involved. Focusing on individuals committing multiple crimes let them get the biggest reduction in crime possible given their resources. The RICHMOND POLICE DEPARTMENT in the US found it could not sift through all the information available to it. Using analytics, the department was able to process thousands of incident reports, tips, calls for service and much more to find patterns in criminal activities. These patterns allowed tactical units to be placed where they are most likely to be needed, improving response times and better utilizing the limited tactical units available. The department also identified the kinds of minor crimes most likely to escalate to violence and then to prioritize these cases. Both departments used analytics to focus constrained resources to get the best possible return, in this case safer cities, on those resources.

These agencies were using analytics to pick between apparently similar situations and focus resources on the ones that would show the greatest return. In a similar vein, agencies can use analytics to make predictions that allow them to focus resources on just some of their portfolio. By analytically deriving where risk truly exists, agencies can focus resources on just those aspects of their role that will make a real difference.

THE MINISTRY OF AGRICULTURE FISHERIES AND FOOD is one of the United Kingdom's leading food safety agencies and must analyze the risk from thousands of food additives. Merging two large publicly available databases and applying advanced analytics, MAFF was able to predict the harmfulness of thousands of these additives. The models produced were 70% accurate in predicting chemical toxicity. Knowing this, MAFF could focus its resources on those additives predicted to be more toxic, making more effective use of taxpayers' money, minimizing the need for animal testing and improving health and safety.

Become proactive

The final stage in analytically improving the effectiveness of an agency is to use analytics to predict problems before they occur. Instead of being reactive, agencies can become proactive. Instead of waiting for something to go wrong and then spending money and resources to fix it, agencies can identify much cheaper preventative steps so they can apply resources to the prevention of problems not their cure. Predictions can be of fraud, of natural disasters or other problems, of equipment failure and much more. A rich, integrated history of what has happened in the past can provide the data needed to produce these kinds of models. Predictive modeling techniques use this data to turn uncertainty about the future into usable probabilities. Instead of

being taken by surprise, because they are unable to predict when a problem will occur, an agency can predict how likely each kind of problem is to occur in time to act.

YORKSHIRE WATER, part of the Kelda Group, provides nearly two million households and businesses with water and sewerage services. Responding to and dealing with floods was a major cost so Yorkshire Water analyzed the factors that lead to floods, and derived decision trees that let them rank-order 24,000 locations in their service area on a week-by-week basis according to the risk of flooding. Using data like the number of cellared properties, length of sewers, rainfall, minor and major excavation work in the area and more, Yorkshire Water was able to move from purely reactive work—simply responding to floods—to proactive maintenance of high risk areas on a weekly basis. Existing resources are utilized in a more cost effective way and services can be prioritized on a longer timescale, allowing contractors to optimize workloads.

ALAMEDA SSA meanwhile uses similar predictive analytics to detect fraud and abuse, potentially saving millions. Analytics detect problematic trends before the agency pays claims so that questionable claims are investigated before they are paid rather than chased after being paid.

These predictive analytics also allow an agency to become dynamic, focusing on the "next best" use of resources, the next best case. With constrained resources, the question every day can become how best to apply those resources to meet the agency's goals. Instead of simply taking claims, cases, issues in the order they were received (a classic first-in/first-out model), the agency can dynamically allocate each resource to the case that will have the most impact. Particularly when combined with the automation of the basic decision making for simple cases, this approach focuses resources extremely effectively and can show a dramatic return.

The SOCIAL SERVICES ADMINISTRATION, for instance, saved $200 million annually by developing predictive and test analytic models to estimate the likelihood of an individual's medical improvement. Reviews are now scheduled so individuals with the highest probability of improvement are reviewed within 18 months of determining eligibility, while those with the lowest probability of improvement are reviewed up to 7 years after determining disability eligibility. Using analytics to prioritize reviews for the cases that are most likely to make a difference, the agency became truly proactive.

THE NEW YORK STATE DEPARTMENT OF TAXATION AND FINANCE used this approach to close the "tax gap" between what was owed and what was collected. The department has transformed its approach to audit selection from "pay and chase" to "next best case." The new system proactively finds returns that are on the fringes—that are outliers—and focuses constrained audit resources on those returns that seem most unusual. Sophisticated behavioral models predict how likely a return is to be questionable, allowing the system to prioritize the cases that are least likely to be eligible for the requested refund. Combined with automation that rejects those refund requests that are clearly ineligible, this ensures that the department's resources are always focused where they will make the most difference.

With limited resources and a finite time in which to make a decision—refunds cannot be held up indefinitely—this system ensures those resources do the most good in the available time. In the five years the system has been operating, it has saved New York State more than $889M. $889M of taxes that would have had to be made up with more taxes on honest taxpayers or cuts in state services. The system is much more effective, increasing the percentage of audits that found questionable refunds. It is also much more efficient, with automated rejections and other efficiencies allowing fewer staff to process more cases - from $56M in refund details per year to over $200M today.

Next steps

Use information to transform government

"Data is a bunch of numbers or text characters. It's not information. People need information, not data, to make decisions. With analytics we can take data and turn it into information on a strategic and operational basis and link the two as needed."

Brian Osterloh Applications Development Manager for CRM & BI, City of Albuquerque

"Our planners can use ridership data to develop more optimal routes, which ultimately will reduce congestion and make public transport more appealing"

Silvester Prakasam, Director of Fare Systems, Singapore Land Transport Authority

Government agencies have become very effective at gathering a lot of data. They collect data about citizens, about the work of the agency and about the world in which they operate. Indeed a great deal of what goes on in most government agencies involves gathering data and working with it. Because of the size and scope of government, agencies represent the largest collectors of users of data, often far outstripping commercial companies. A new generation of analytical tools offers more predictive power, easier access and improved automation of decisions based on this data.

Government agencies must take advantage of these new capabilities, focusing on the decisions they make that offer the greatest return and involve the greatest expense. Specifically identifying the opportunities for using analytics, they need to integrate disparate data sources, automate core activities and analyze the effectiveness of their programs. Analytically focusing limited resources where they will make the most difference and becoming proactive, predicting and addressing problems before they occur will take agencies to the next level.

About Decision Management Solutions

Decision Management Solutions provides consulting and implementation services for all aspects of decision management. Decision Management improves business performance by identifying the key decisions that drive value in your business and improving on those decisions by optimizing your organization's assets: expertise, data and existing systems.

Our end-to-end, decisions-based approaches and methodologies address key business priorities, such as cost competitiveness, differentiation, customer retention and growth. We offer an array of consulting services for companies, ranging from advice about adopting decision management strategies to tactical support for successful implementation projects.

Decision Management Solutions is led by James Taylor, a leading expert in decision management. James has over 20 years experience in developing software and is the foremost thinker and writer on decision management. James has experience in all aspects of the design, development, marketing and use of advanced technology. He has consistently developed approaches, tools, processes and platforms that others can use to build more effective information systems. In addition, Decision Management Solutions has an extensive network of industry and implementation partners.

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