DECISION MANAGEMENT SOLUTIONS

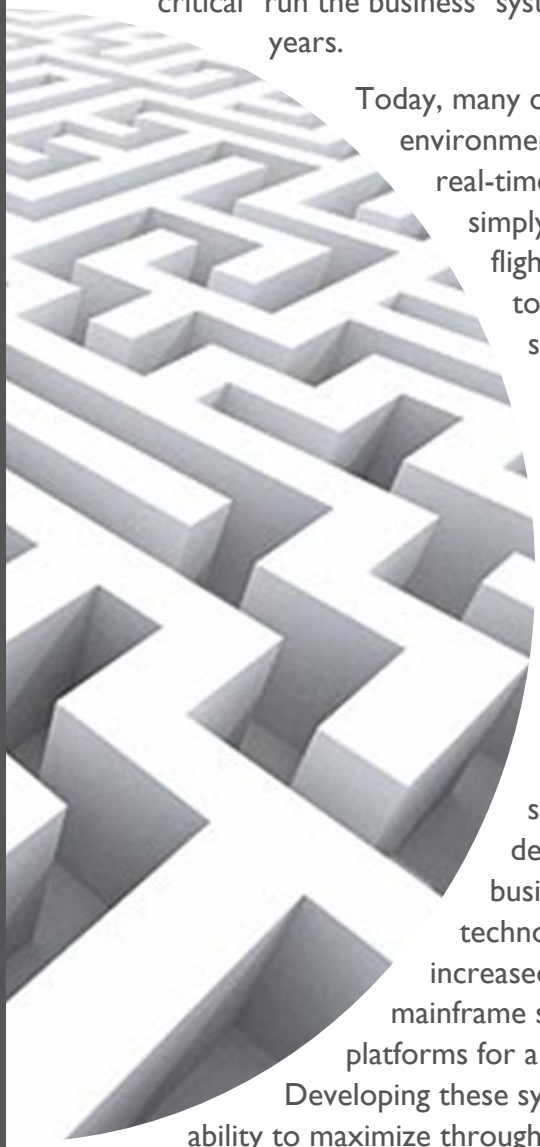
Transforming Operational Systems

From Transactional Systems to Decision Management Systems

A fixed mindset is holding back organizations in their use of mainframe systems. Modern mainframe technology allows traditional transactional systems to evolve into modern Decision Management Systems.

James Taylor
CEO

Operational systems, especially mainframe-based operational systems, handle high transaction volumes rapidly, safely, securely, and at high volume. These systems are critical "run the business" systems for many enterprises and have been for years.



Today, many organizations face a rapidly changing environment where business is personalized, localized, real-time, and hands-free. Operational systems can't simply take orders, process payments, or book flights mechanically any more. To be effective in today's business environment, operational systems also need to make business decisions about these transactions. They need to understand how to maximize the value of an order with cross-sells or free shipping, see if a payment is fraudulent or not before it enters the system, and price according to risk and demand. Furthermore, they need to do this without delay and without imposing any penalty or burden on the customer targeted by these services.

Extending existing transactional operational systems to handle decision-making and to develop Decision Management Systems requires business leaders to rethink the current mainframe technology model. The last few years have seen increased analytical sophistication being baked into mainframe systems. These changes make mainframes ideal platforms for a new generation of customer-centric systems. Developing these systems and putting the mainframe's proven ability to maximize throughput and minimize costs to work in this new context requires only a change in mindset.

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A Changing Business Model

Many businesses have operational, transactional systems that have run for years without becoming obsolete in relation to their business models. These systems deliver straight-through transaction processing for a payment or an order as a scalable batch process or deliver interactively in real-time. They are generally mainframe-based to deliver the scalability, performance, and operational data management needed to handle the volume of transactions in the available window.

Central to these transactional systems is consistency, treating each transaction the same regardless of customer, context, or source. This consistency was included in the beginning to manage volume and to reflect the business models of the day. Historically, any decision-making required for these transactions is typically made outside the system – either made before the system handles the transaction or made when the transaction is referred or escalated to a human user.

However, the business model of most organizations is undergoing rapid change. Real-time straight-through processing is now default behavior, and the focus is shifting from cookie cutter responses to customized, personalized, and localized interaction based firmly on data and analytics – not guesswork. The mainframe needed to evolve if it was to remain the right tool for the job.

Real-time complexity

Mainframe transactional systems traditionally delivered standard transaction processing with high throughput and real-time responses. However, customers increasingly are demanding a real-time response in more complex environments. When customers interact with a website or a mobile device, they expect a system response that is both real-time and sophisticated. They want an immediate response that is tailored to them. An organization's business partners expect the ability to handle transactions electronically and get an immediate, interactive response, even when that response must reflect their specific service level agreement or contract.

Organizations can't afford to abandon their operational systems to deliver sophistication – they cannot afford to rip and replace them, and they still need high performance and massive scalability. They need their operational systems to become more sophisticated. Their systems must detect and prevent more fraud, make more accurate risk assessments, and deliver customer-centricity.

Historically, this sophistication was added outside the system's environment. Fraud detection, for instance, was handled after transactions were processed in a "pay and chase" model that tried to identify the transactions that should not have been paid and claw back that money. Coarse-grained segmentation was used to divide transactions so they could be processed according to the customer segment involved. Special customers were flagged for manual processing, improving the customer-centricity only at the expense of performance.

Pressure to deliver more sophisticated yet still real-time, straight-through responses led many organizations to code standard responses to as many situations as possible. This created fragile, hard-to-change systems. Bringing data analysis into the transactional environment was simply not possible in the old model. Mainframe operational systems held current data for transaction processing, but all the historical data was copied off for later analysis. Real-time analysis couldn't be integrated into a real-time environment and suffered from latency issues thanks to the need to push batch data updates to the analytics systems.

Sophistication of transaction handling and real-time processing used to be perceived as alternatives or trade-offs. Today, operational systems must respond in real-time all the time, no matter how complex the transaction has become.

From cookie cutter to personalized and localized

The mindless consistency and cookie-cutter responses of highly automated operational systems are familiar to us all. Such systems provide the same response to everyone, display the same information every time, and always work off the same blueprint. They take no notice of which customer or supplier is the subject of the transaction. They focus on the data or the process but not the target of the transaction.

This makes it impossible to deliver the kind of personalized and localized response customers increasingly demand. The next generation of operational systems must deliver highly targeted responses to customers and partners, reflecting a real-time view of what is known about them and using that real-time view to deliver an appropriate, targeted response without the need for human intervention so that even these targeted transactions can run straight through. This targeted response increasingly requires analytics for data-driven decision-making.

Data-driven

In parallel with these changing business models, organizations have acquired much more data. They need to use this data to improve business results, to become a data-driven or analytic organization. Personalization, treating each customer uniquely and appropriately, is one of the key use cases for analytics, but companies also broadly apply analytics to everything from supply chains to customer service and marketing to product development.

Operational systems are not excused from this need to be analytic. This means more than just making sure that real-time, up-to-date operational data is available for analysis. It means taking the results of this analysis, pouring them into analytic models, and deploying the results and insights back into the operational context. It means using analytics to drive different and differentiated behavior in the operational environment. And it means continually refreshing these models as new data arrives.

Decisions are the Key

These changes in how large organizations operate put pressure on traditional operational environments. Transactional systems need to be transformed so they can deliver data-driven, personalized, customer-centric responses in real-time and at scale. Systems with an ability to automatically make customer-centric decisions – Decision Management Systems – are increasingly a requirement.

Operational decisions

Organizations make a wide variety of decisions, and it is useful to categorize them for discussion purposes into strategic, tactical, and operational decisions:

- Organizations make infrequent but large-impact **strategic** decisions. These one-off decisions typically involve a lot of people and significant time and capital investments. Much analysis is done before the decision is made, and the implications for a business can be dramatic.
- Regular **tactical** decisions about the management and control of the organization are also made. These are more localized in terms of their impact on the business, and there is generally time and energy for significant analysis. However, because these decisions are made repeatedly, there is a need for consistency and to learn what works.
- Finally, every organization makes large numbers of **operational** decisions about individual transactions or customers. Time constraints on these decisions are often extreme, and these decisions must generally be embedded into operational systems and processes.

To transform systems to match new business models, high volume operational decisions – that is, decisions about customers, claims, loans, and other transactions – must become an integral part of operational systems.

To deliver the real-time response the operational environment demands, these decisions must be made quickly and automatically every time. Automating these operational decisions means that operational systems can run straight through while still personalizing the response and embedding the analytics required by a modern, data-driven business.

"Smarter commerce is about transforming near-real-time analytics into personalized messages and offers for our customers. It's a system that ensures that we're not suggest-selling something the customer doesn't want to buy; we're offering him something he probably wants anyway, but he hasn't thought about it. IBM provides us with tools that align with smarter commerce, enabling us to deliver the right message to the right person at the right time, to understand product affinities and intelligently drive the sale, all in a customer-centric way."

Pavel Batista, Chief Information Officer, Petrol d.d.

Systems that make decisions run straight through

The new business model requires real-time responses from operational systems. Customers want interactive web pages and mobile apps, customer service representatives need systems that work within a conversation, and complex supply chains and automated environments require real-time control. Real-time responses require straight-through processing; every time an operational system waits for a human user or adds a transaction to a manual queue, it fails to deliver the responsiveness required.

In the world of Big Data where everything is digitized and integrated, operational systems stop and wait only when a decision is required. When a non-trivial decision must be made about customer eligibility, transaction validity, risk-based pricing, fraud prevention, or targeting a customer, too many operational systems fail to deliver. Either a mindlessly repetitive decision is made, sacrificing effectiveness for efficiency and performance, or the transaction is handed off to a human user. If a transaction is to flow through an operational system untouched and in real-time, then the system must be capable of automatically making these customer and transaction-level decisions without delay.

Systems that make decisions treat customers uniquely

Operational environments that integrate decision-making capabilities become Decision Management Systems that deliver real-time, straight-through processing by handling decisions in addition to the other elements of transactional processing. Treating decisions as a core competence, however, means more than just making decisions quickly and consistently. Decision Management Systems make precisely targeted decisions that can be changed and adapted so that they stay targeted. The ability to make decisions in this way means that the operational environment can become truly customer-centric.

A European oil and energy provider needed to leverage data from hundreds of retail locations as well as its home delivery services to improve sales performance. Detailed loyalty program information was going unused at the point of sale because it could not be leveraged to improve operational systems. A combination of the IBM DB2 Analytics Accelerator and an IBM zEnterprise 196 server made over 20TB of operational data available for advanced analytics with IBM SPSS Modeler. These analytics could be delivered in-stream in hundreds of thousands of operational transactions every day. Predicting individual customer behavior and integrating analysis of loyalty data into the operational environment allowed cross-sell and up-sell decisions at the point of sale, resulting in personalized, customer-centric transactions.

Customer-centricity, markets of one, and next best action are just three of many phrases that can be used to describe a focus on treating each customer uniquely. Customers want to be known and valued, not just "processed." Treating each customer uniquely requires that an organization make an explicit **decision** about

how best to treat that particular customer. Only by ensuring that customer treatment decisions are part of the operational system can an organization deliver a unique, personalized response to each customer.

Systems that make decisions can apply analytics

Operational systems that make decisions about customers and that embed decision-making into every transaction can deliver a unique, personalized response for each customer. Sometimes this is based entirely on policies or regulations that constrain the decision-making. However, organizations increasingly are using Big Data to understand how best to treat a customer.

Digitization has led to a wide range of data – both internal and external – being available about customers. Organizations are seeing huge returns when they can leverage this data to segment their customers more precisely, find patterns of fraud or opportunity in this data, or make predictions with this data. The power of data in customer treatment is driving an explosion in analytics, especially in data mining, machine learning, and predictive analytics. Applying analytics to improve decision-making improves outcomes and business results.

Systems that make operational decisions about customers - Decision Management Systems – embed these analytics in a real-time operational environment that delivers straight-through processing. Customer-centric, data-driven decisions are embedded deep in the operational systems that power the organization.

"IBM DB2 Analytics Accelerator enables us to support the additional workloads that come with business growth without activating more cores on the mainframe"

Thomas Baumann, IT Performance Architect, Swiss Mobiliar

Challenging the Traditional Mainframe Mindset

Delivering customer-centric, data-driven systems that run straight through requires operational systems that make decisions. Mainframe technology is central to the operational environment of large organizations. Many of these organizations, however, have a traditional mindset when it comes to how they leverage mainframe technology. Because of this fixed mindset, most organizations don't even consider embedding effective decision-making in mainframe systems. Mainframe technology has moved on to support data-driven and decision-centric systems, but the fixed mindset of many organizations has not kept up.

This traditional mindset makes three increasingly incorrect assumptions: that mainframe applications are mindlessly repetitive, if high performance; that analytic processing must be separated from transaction processing; and that mainframe applications are hard to change.

Mainframes: Mindlessly repetitive, but fast

Mainframes have always been high performance systems. Designed to handle high volumes of data and short response times, mainframes have acted as the mainstay of many organizations' computing infrastructure. The traditional mainframe mindset, however, holds that this performance requires lowest-common-denominator programming and straightforward transactions because mainframe systems can't handle decision-making.

A global reinsurance and insurance provider needed to better leverage 30 years of claims data. Over 2.5 billion transactions are available for analysis, and the challenge is to deliver effective analytics using all this data and so improve decision-making in both premium setting and financial analysis. Using the IBM DB2 Analytics Accelerator and an IBM zEnterprise System, this company was able to make over 40TB of operational data available to simultaneously meet both its transactional and analytic needs. Both transactional and analytical queries are handled through a single entry point, with over a 50% performance improvement, and all the data is maintained in only one location, reducing latency as well as lowering administration costs.

This mindset largely arises because organizations have been using mainframes for so long. For many years, operational systems generally did not make decisions. Typically, the operational system was only required to record the transaction, relying on human users outside the system for decision-making. Even when some decision-making was included in the systems, the scale and throughput required for mainframe systems, combined with traditional system development approaches, meant that only simplistic decision logic was included, limiting the complexity of decisions that could be handled. Over time, many organizations became convinced that this was the only kind of system that could be developed for the mainframe – mindless repetition delivered with scale and speed.

Analytical processing must be separated

The second fixed mindset common in mainframe development is that analytical processing and transactional processing must be handled separately. Although great at virtualizing resources to concurrently handle large numbers of users performing essentially similar tasks, early mainframes did a poor job of handling workloads with great variety in resource consumption requirements, such as those caused by combining transactional processing with data analysis. As a result, mainframes were focused on handling transactions as the systems of record, while decision-making got separated to support reporting and analysis "offline."

This separation led to the development of new kinds of software, new organizations, and new approaches that took this separation for granted. In a typical mainframe environment, transactions were handled on the mainframe, and operational data was stored and updated there. But then this operational data was extracted and copied somewhere else for analysis. These separate analytical environments resulted in offline analysis of largely stale data, meaning that the results were only really available to human users outside the mainframe environment. Feeding back lessons learned from this data, even keeping this data truly up to date, became something that such a siloed approach to IT infrastructure just couldn't support.

Mainframe systems are hard to change

The final aspect of the fixed mainframe mindset is that mainframes are hard to change. Traditional development approaches and the history of mainframe applications that combined everything into a single executable meant that any change involved massive amounts of risk and a significant IT project. Add in a fragile approach to copying data into an analytical environment, and many organizations simply stopped trying to change their mainframe applications. Mainframe applications became synonymous with low agility and the high cost of change.

"Working with IBM has been like opening a constant communication channel, and having them really listen to what we wanted to accomplish."

Reto Estermann, Director, Information Technology, Swiss Re

Business decisions, though, are high-change components. As policies, regulations, competitors, and markets change, so must decision-making. Organizations became adept at using manual workarounds to make it easier to change the overall behavior of their system. The need to support this manual decision-making with analytics reinforces the analytic separation noted earlier. As analytic tools become more flexible, the differences between the solid but hard to change transactional environment and the user-friendly, flexible analytic one are emphasized.

Moving Forward on the Mainframe

New mainframe technology supports a fundamental re-assessment of these fixed mindsets. As organizations face the reality of a new business model that requires more automated and more analytic decisions integrated into their fundamental business operations, this new mainframe technology model allows them to put their mainframe at the heart of this transformation.

Four changes are critical: improved processing, memory, and storage; integrated analytic databases; in-line advanced analytics; and integrated decision management capabilities.

Improved processing, memory, and storage

Improved processing, memory, and storage have changed the game for mainframe systems, allowing even very complex decisions to be executed in real-time as part of high-volume, low-latency transactional systems. Modern mainframes take advantage of the move to in-memory computing, providing more accessible memory than ever before. More caching, better threading and parallelism, and more dynamic workload management make it possible to apply more of the mainframe's compute power to a problem – and that compute power has also dramatically increased. Multi-system queues and memory sharing allow multiple mainframe systems to be combined effectively, letting them handle the most difficult problems.

This increased power means that even advanced analytics can be developed and delivered as integrated decision-making on the same machine image that is processing transactions.

"Running our mobile banking service on Linux on zEnterprise is another step forward in our continual evolution on the mainframe. The key value for our business is that the most important services can be managed together on a consistent, stable and highly secure platform that offers enormous scalability and performance."

Daniele Cericola, ICT Governance Manager, Banca Carige

Integrated analytic database

Recent years have seen an explosion in database technology to improve analytic performance, especially the performance of advanced analytics. Columnar databases, in-database analytics, massively parallel algorithms, and advanced query optimization appliances are all widely used to deliver maximum analytic power. Taking advantage of these technologies once meant using a separate system, one dedicated to analytics.

These same analytic technologies are now integrated into the mainframe environment and are usable on data stored in the mainframe's operational data

store. Enabling advanced analytics against operational data allows for in-situ analysis of data with no need to move it to a separate environment. Combined with the increased power of the mainframe, organizations can now handle the difficult mixed workloads of transactional and analytical systems. Applying in-database analytic techniques to these massively parallel environments means that 100% of available, up-to-the-minute data can be used to develop advanced analytics. This maximizes the accuracy and currency of analytic models.

In-stream application of analytics

Building effective analytic models is just part of the challenge, however. Unless advanced analytics are used to improve decision-making and can be applied to operational decisions, no value can be delivered. The integration of analytics processing into the mainframe environment allows in-stream application of analytics to decisions. Once analytic models are developed, they can be seamlessly deployed into the transaction stream, delivering analytic decisions at scale and with performance. As transactions are processed, data-driven decisions can be made to detect fraud, determine risk, and effectively target customers in real-time, as opposed to after the fact.

Integrated decision management

The final piece in the puzzle is effective management of the decision-making being improved analytically. The integration of powerful Business Rules Management Systems with mainframe technology allows flexible, agile decision-making systems to be developed. Wrapping easy-to-change and manage business rules around powerful analytics delivers true decision management on the mainframe. A rules-based, agile approach can be used to manage critical operational decisions, and the results can be deployed into the same operational context as the transaction handling system to ensure that the required performance and service level agreements are not compromised when increasingly sophisticated decision-making is added.

Figure 1:Moving forward with z Systems

Source: IBM

An Example of Transformation

Despite the proven benefits from applying data to customer treatment, such as a 7.6% annual increase in customer lifetime value, many organizations are not leveraging analytics to improve customer engagement. For instance, IBM surveys suggest that 80% of marketers still send the same content to all customers, while only 6% of businesses are extremely satisfied with their ability use customer data for decision-making. Add in the hundreds of millions of dollars in fraud losses and fines paid when transactional systems fail to comply with regulations, and the potential value of adding analytical decision-making to operations is clear.

IBM data suggests that 70% or more of the data accessed for analytics originates on the mainframe. A traditional mindset holds that this data must be moved to a separate analytical environment where it can be analyzed. This uses significant compute power; for some customers studied, up to a quarter of mainframe cycles are used to move data. It also results in analytics based on out-of-date data and analytics that are applied only after the fact to attempt a fix for problems already processed. The whole environment is complex and hard to manage, adding technical costs and challenges to the mix.

Modern mainframe technology allows for a radically more effective approach. A single mainframe environment can embed specialized analytical hardware to support both transactional and analytical systems, optimizing for the mix of workloads involved. Historical and operational data are stored in an integrated environment allowing advanced analytic models to be developed in-database using 100% of available data - data that is completely up to date. These analytics can be immediately and seamlessly embedded into the transactional system and wrapped with easy-to-change business rules to deliver precise, data-driven decisions, as well as the agility and business user control organizations need.

For instance, a customer might use a mobile device to initiate a funds transfer. A single mainframe environment can add this data to the operational database, score it using a range of predictive analytic models to assess fraud and other risks, execute business rules to handle fraud alerts, and immediately process valid transactions while pushing suspicious ones directly to a case management environment. Valid transactions get a real-time response and straight-through processing, but fraud and other problems are detected and prevented before they enter the system. And all done while the transaction is in flight, with the customer noticing no lag in service.

The same technologies that allow analytics to be applied to operational decisions in a transactional context also have value for strategic and tactical decisions. Organizations that have eliminated off-platform data warehouses and leverage in-database analytics, for instance, can dramatically improve the decision support environments they provide managers and knowledge workers. Operational data, and analytics based on that data, are critical to all kinds of decisions.

Learn More

- IBM DB2 Analytics Accelerator (The Accelerator)
  A high-performance appliance that integrates IBM Netezza and z Systems technologies to deliver extremely fast results for complex and data-intensive DB2 queries on data warehousing, business intelligence and analytic workloads.
  http://www-03.ibm.com/software/products/en/db2analacceforzos
- IBM Operational Decision Manager for z/OS
  A comprehensive and easy to use platform that detects situations in real time. It can capture, automate and manage frequently occurring, repeatable business decisions. IBM ODM for z/OS separates critical decision logic from mainframe application code to ease change management, implementation and governance.
  http://www-03.ibm.com/software/products/en/odm-zos
- SPSS Modeler for Linux on System z
  A powerful and versatile data mining workbench that builds accurate predictive models and rapidly deploys them, all without programming. It merges the predictive power of SPSS Modeler with the performance, security and scalability of z Systems. This combination enables organizations to extract insights from DB2 for z/OS, create models and score new data in real time.
  http://www-03.ibm.com/software/products/en/modeler-linux-system-z/
- Cognos Business Intelligence for z/OS
  Offers reports, analysis, dashboards, mobile apps and more that can scale to meet the needs of an entire enterprise on a single platform. With Cognos Business Intelligence installed on an IBM z/OS platform, business intelligence applications and data are more available, server utilization is higher and programming environments are more adaptable.
  http://www-03.ibm.com/software/products/en/cognos-business-intelligence-zos
- IBM InfoSphere Information Server for System z
  Helps organizations derive value from complex information spread across their systems. A software platform that profiles, cleanses and integrates information from heterogeneous sources to drive business insight faster, at lower cost.
  http://www-03.ibm.com/software/products/en/infosphere-information-server-z

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