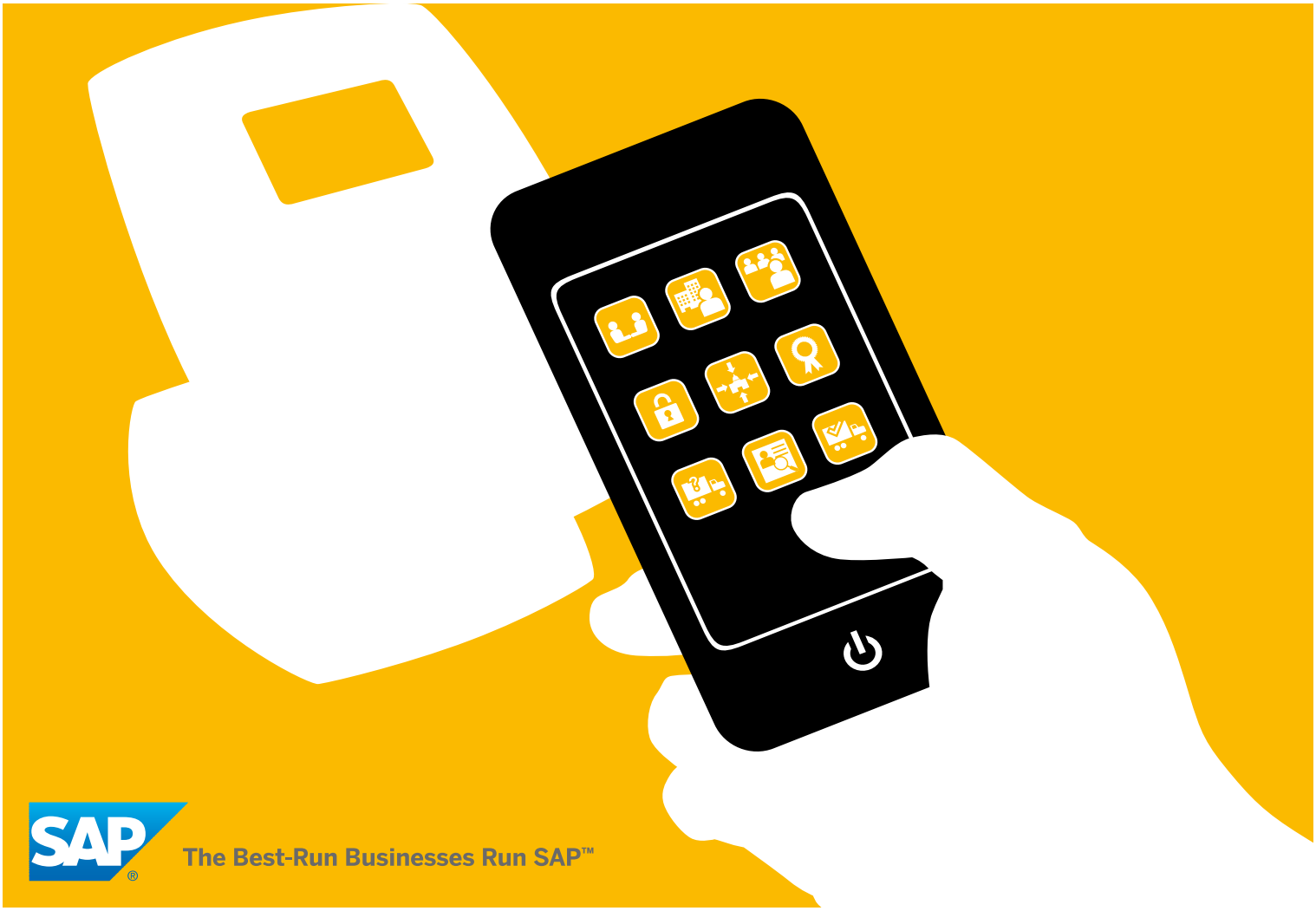
SAP Thought Leadership Paper
Retail

Reacting in the Retail Moment

Analyzing Big Data in Real Time to Forge a Competitive Advantage



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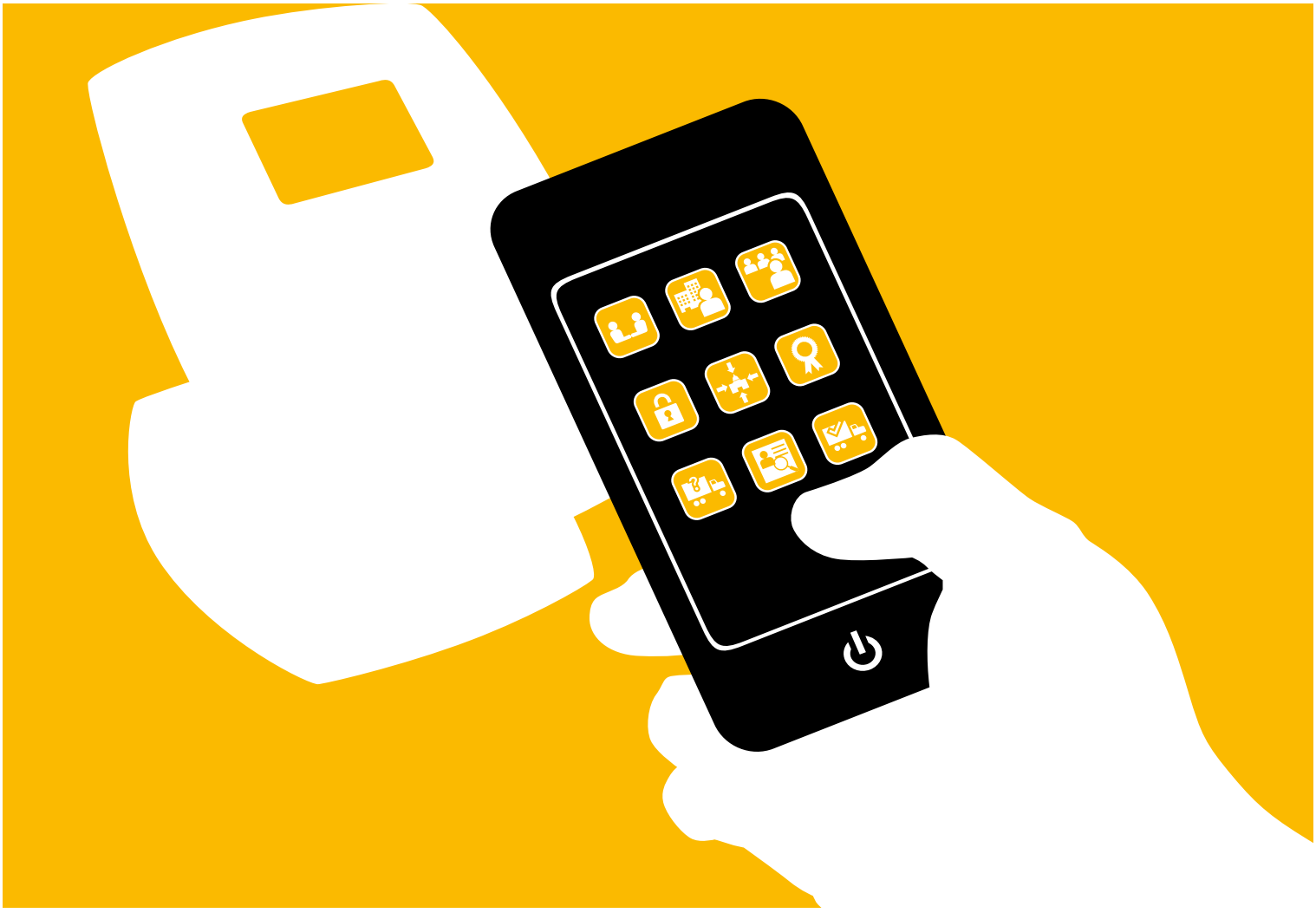
Transforming ever-multiplying data into information that supports real-time decisions is the key to better addressing customer demand, outperforming the competition, and improving margins. Demand changes not monthly or weekly but by the day, hour, and minute. In-memory computing is the only information management technique that reliably impacts performance as it happens.



Executive Summary

Under any circumstances, retail is an extremely competitive industry. But today, an uncertain economy and low consumer confidence, coupled with shorter product lifecycles and well-informed, demanding customers, make it especially difficult to execute a profitable strategy. Retailers have only a narrow window to make the sale and seize the opportunity. Thriving in this environment means maximizing the profit potential of each interaction, transaction, and customer contact.

To reach the right customers at the right time with the right offer, retailers must be able to react to events as they happen – which means having, and using, the right information. But information is more than just data. In fact, most retailers can access an enormous amount of data – from point of sale (POS) data to market research to supplier reports, and its sheer quantity just continues to multiply. Somewhere in there is a treasure trove of insight that can help retailers improve total sales, reduce out-of-stock situations, and increase gross margin.

Of course, this preponderance of data is at once an asset and a liability: sheer volume can bury critical insights and slow decision making. Most retailers have the time and expertise to analyze and act on only a fraction of what they find, and incomplete or inconsistent information presents numerous analytic difficulties. Meanwhile, data warehouses can be rigid and hard to access. These challenges limit visibility into real-time transaction trends, keeping retailers from affecting sales as they happen. And without the ability to support timely, meaningful decision making, it becomes hard to drive sales, keep shelves full, and ensure profitability as transactions are occurring.

Faced with these challenges, retailers can't just react to outcomes; they need to accelerate insight, act decisively, and influence performance as it happens. Fortunately, in-memory technology breakthroughs now make powerful data analysis more possible than ever, allowing some complex queries that previously took days to be done in seconds. In-memory technology finally enables true real-time analysis, bringing information and indicators to life in ways not previously imagined, dramatically altering how everyone – from executives to store personnel – makes decisions and affects outcomes.

Harnessing data for a radically new approach requires retailers to:

- Collect, manage, and analyze data – regardless of amount or source
- Turn big data into actionable information in real time
- Act on that information to affect current transactions and events

By reimagining what is possible, retailers can use in-memory computing to manage and utilize internal and external data for a significant advantage. They can better understand and fulfill customer needs, optimize the supply chain, and competitively differentiate their retail experience through price and product assortment – all in the moment the transaction happens.

Retail Trends and Challenges

DYNAMIC, INFORMED CONSUMERS

Today's consumer is more informed and more connected than ever. He or she can easily collect and exchange information on products and offers through a growing number of interaction points, including tweets, texts, and online stores. Social networking rapidly publicizes the customer experience – both positive and negative. Powerful new mobile applications enable research and purchasing from anywhere at any time. Hundreds of Web sites dedicated to comparison shopping provide detailed specs, pricing, and availability on thousands of brands and products anywhere in the world, in seconds.

Much of this information interaction is two-way: retailers, brands sites, and consumer products manufacturers constantly solicit product feedback and reviews. Did the buyer like the product? Would he or she recommend it to a friend? Was there a problem? Was it resolved? Detail plus availability makes consumer feedback more powerful than ever.

THE EVOLVING STORE EXPERIENCE

The traditional storefront – far from being the main place to gather product information – is often the last stop on the buyer's journey. After reading online product reviews and searching for special offers, many consumers arrive at a store knowing exactly what they want. Mobile devices and smartphones allow for research even when the product is in hand, so the retailer must be ready to interact with a well-informed consumer. Embracing online price comparison, some retail giants – with actively promoted lowest-price guarantees – are known to actually search the Internet on behalf of in-store customers to ensure the lowest advertised price. Such real-time, personalized offers keep the sale from going elsewhere.

FAST RETAILING

Rapid-fire product introductions are bringing products to market with unprecedented speed. Fast retailing requires analytical applications to bring intelligence to internal and external data, and to provide insight into what is selling where. Armed with customer sentiment, retailers can rapidly adjust assortments that attract new customers or respond to growing trends by immediately modifying orders or diverting products from one selling location or channel to another.

MULTICHANNEL CONSISTENCY

Managing a multichannel sales environment can be challenging. Retailers need to ensure consistent brand execution across online, catalog, and in-store sales. Here's a common scenario. A shopper goes online to research product prices, specification, and delivery options. He then visits a store to comparison shop, finally placing an order either in the store or online, with the option of home delivery. Such customers touch multiple channels before the final purchase; each interaction becomes part of the final brand connection. In this environment, rationalizing processes and execution with a single, overarching set of stock, sales, and customer information supports consistent customer service, balanced and accurate stock holding, and quality control across all channels. The buyers' needs are met regardless of how and where each customer shops.

THE BIG DATA CHALLENGE

Retailers are faced with ever-increasing data from a range of sources: the internal supply chain (POS transactions, logistics data, and sourcing information), social media, online platforms, market research, customer relationship management (CRM) information – even weather forecasts. Access isn't the hard part; everything is readily available. Instead, the difficulty lies in data management and aggregation, since structures and standards are rarely consistent. Retailers struggle with logic problems and matching master-data objects such as SKUs with market data from researchers that use unique product categories and codes. Processing the results as quickly as possible takes significant computing power and expertise. To make matters worse, data quickly ages into irrelevancy. No one is interested in last week's weather.

The challenge is to collect and manage heterogeneous data from all these sources, then combine and analyze it as one complete picture. Doing so enables a retailer to:

- Better understand consumer demand
- Increase supply chain transparency and optimization
- Clarify views of the competition, enabling differentiation
- Offer information that closes the sale

What You Need: Information that Matters

REAL-TIME DATA ANALYSIS INFORMS DECISIONS

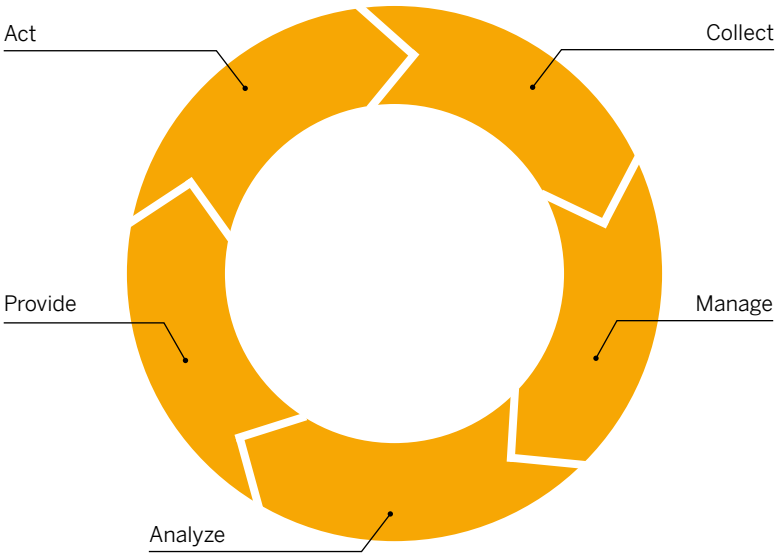
Transforming ever-multiplying data into information that supports real-time decisions is the key to better addressing customer demand, outperforming the competition, and improving margins. Demand changes not monthly or weekly but by the day, hour, and minute. In-memory computing is the only information management technique that reliably impacts performance as it happens.

In-memory computing enables real-time decision making by allowing retailers to collect, manage, analyze, provide, and finally act on data in the moment (see Figure 1). The first step in this process is to collect relevant data, which requires a structured methodology to identify information from an array of heterogeneous sources. The quality of an analysis is directly related to the amount of relevant and useful data gathered. The data must then be organized, combined, and otherwise managed so that the right pieces of information are brought together to form a complete and rich picture – a view of a single consumer, group of consumers, the competition, or suppliers. The next step is analysis; sophisticated algorithms may be used to perform predictive analysis, modeling, scenario planning, and more. Finally, the resulting real-time information must get to the right people to make the right decisions, yielding actions that affect a transaction or behavior.

TYPICAL RETAIL KEY PERFORMANCE INDICATORS

- **Average customer spend or basket spend**
- **Sales per square foot or square meter**
- **Same-store or like-for-like sales**
- **Product availability**
- **Market share**
- **Customer satisfaction rating**
- **Earnings before income and taxes, or operating income**
- **Margin contribution**

Figure 1: In-Memory Computing Cycle



Harness the Power of In-Memory Computing

In-memory computing is a technology that combines a flexible, multipurpose, and source-agnostic in-memory appliance, powerful software, and optimized hardware. Storing and analyzing data in local memory, in-memory computing effectively eliminates latency issues related to transferring and loading data from the disk. Unique memory-optimized data structures mean faster processing with no boundaries on volume, granularity, or timeliness of data. In-memory computing puts the results of complex analyses and transactions at your fingertips for real-time business decisions on issues such as pricing, promotions, spot purchases, and more.

With in-memory computing, retailers can instantly explore and analyze all transactional and analytical data from virtually any source. Operational data is captured in memory as business happens, and flexible views can expose analytics based on customized key performance indicators at the speed of thought. External data can be added to analytic models to expand real-time analysis across an organization.

This radically faster and fundamentally different approach to analysis is made possible by technology advancements in three areas. First, Moore's Law soldiers on – resulting in significantly faster processing speeds and rapidly declining memory prices. Second, the mainstream availability of 64-bit processors raises the amount of memory a computer can utilize. A 32-bit processor can use a maximum of 4 gigabytes of memory, whereas a 64-bit processor can use 18 billion gigabytes – a factor of 4 billion more. Third, hardware manufacturers have shifted from favoring a few fast processors to a multicore architecture that utilizes multiple lower-power, lower-speed processors working in parallel.

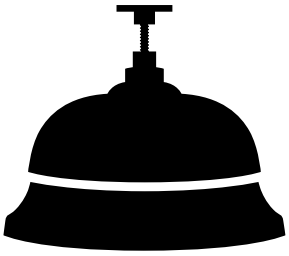
USING IN-MEMORY TO BECOME MORE CUSTOMER CENTRIC

Retailers can use in-memory computing to redesign and optimize the way they work – becoming more efficient and customer centric in multiple ways.

IT BENEFITS OF IN-MEMORY COMPUTING

- **Simplify the IT architecture**
- **Reduce cost of ownership**
- **Eliminate performance drain on enterprise resource planning (ERP) operational reporting from existing transactional systems**

To reach the right customers at the right time with the right offer, retailers must be able to react to events as they happen – which means having, and using, the right information.



Access Precise Data to Make Informed Decisions

When you can process and consolidate massive amounts of data from multiple sources, you empower people with the information they need, at the level of detail they need, when they need it. For example, real-time, what-if analysis can help a perishable-food buyer determine the projected profitability of additional pallets of produce, or decide whether a discounted exotic vegetable is a worthwhile investment. You could use in-memory computing to remind customers of a gift card or promotion from a previous shopping experience. Provide real-time insight into stock availability, down to the shelf level, automatically alerting employees to restock shelves and avoid out-of-stock situations. Use real-time insight into data to determine vendor rebates while placing an order, assuring optimized rebates and cash flow.

Speed Decisions that Affect the Business

Real-time information lets you focus on processes that accelerate revenue generation and brand loyalty. Enable personalized, targeted, or cross-sell offers based on items already in shopping baskets. If a customer has a return or complaint, you can quickly discern whether others have had the same problem. Or maybe this customer has complained many times and needs special attention to avoid a negative experience. And in-memory can improve location-specific pricing – for example, by analyzing sales of perishables midday to determine if a markdown is needed to maximize margins.

Simplify and Unify Business Processes

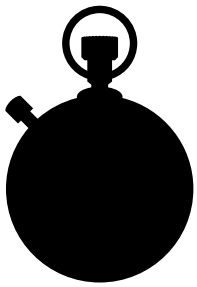
Sophisticated real-time data analysis makes results and information immediately available, reducing complexity and opening up new avenues to excite customers and increase competitive differentiation. You can execute order fulfillment based on enterprise-wide stock availability, maximizing a positive shopper experience and satisfaction across sales channels. A great application for in-memory computing is inventory management in multichannel retailing – including online and in-store sales – where retailers often struggle to get up-to-date inventory information. A consumer might order a camera online, choosing to pick it up at a local store. Or, if a consumer is in the store and the camera is out of stock, a salesperson could find it at another store for immediate pickup or have it delivered to the customer's home.

THE SPEED OF IN-MEMORY COMPUTING

In-memory computing can radically reduce the time it takes to collect and analyze data. Take a look at some typical results:

- **Optimized profitability analysis by understanding profitability trends in fine-grained detail for sales of 1 billion units per day**
- **Realized 2,000x performance improvement in speed and efficiency over traditional approaches**
- **Improved response time for complex analysis by 120x**
- **Delivered tremendous time savings, reducing some processes from 77 minutes to 13 seconds**

Fortunately, in-memory technology breakthroughs now make powerful data analysis more possible than ever, allowing some complex queries that previously took days to be done in seconds.



Precision Retailing

USING IN-MEMORY TO SUPPORT PRECISION RETAILING

Precision retailing seeks to influence in-store buying decisions via one-to-one marketing and special offers based on past purchases and identified preferences. It requires an in-memory, analytics-driven approach to improve product assortments, pricing, and promotions.

Many Web retailers already use real-time visibility into a shopper's "search and decide" process to customize sites and offers to fit specific interests. For example, with dynamic preferencing, an online retailer can change how a shopper navigates, offering "only for you" promotions and recommending additional products based on viewing history. In-memory computing makes a similar personalization process possible in the store. Retailers can analyze market research, product ratings, previous purchase history, loyalty programs, and lifestyle choices and preferences – then make product recommendations or pitch new offers.

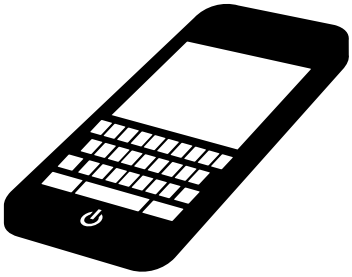
A large multiformat food retailer, for example, can use precision retailing to promote one-to-one customer relationships, aligning consumer lifestyle preferences with the shopping experience. Using an innovative, interactive mobile application, the retailer can incorporate personalized product information, special offers, and social media to develop an optimized shopping list for each customer. The customer uses the list to manage in-store shopping, while the retailer extends up-sell or cross-sell offers based on fair trade, organic food, gourmet, health, or eco-friendly preferences. Shoppers receive product recommendations that include accessories, private label alternatives, bestsellers, and best-rated products they might not otherwise consider – as well as product discount or loyalty program offers that can influence their purchasing. For example, a shopper has an optimized online shopping list in the grocery store. Before she reaches the coffee aisle to purchase her usual brand of ground coffee, she is offered a promotion for a fair-trade organic brand at a slightly lower price point. Since she prefers to buy fair-trade products when she can, she opts to purchase the new brand. The store's promotion is successful.

CUSTOMERS BENEFIT FROM PRECISION RETAILING

Retailers aren't the only ones that benefit from the advances of in-memory computing. Your customers will thank you too. In-memory computing can help uniquely identify customers based on loyalty card, POS data, current location, or Web clicks. This way, your customer experiences personalized recommendations regardless of channel. Suppose your most loyal customers could be identified when they walk into your store. In-memory computing helps you collect and analyze recent buying patterns and deliver that information to store personnel, who can quickly and easily begin a conversation about new products, targeted promotions, or a package deal unique to the customer.

Customers benefit from instant one-to-one shopping assistance, savings, and reward offers based on inputs such as personal preferences, available stock, and lifestyle history. Customers save time and money and quickly find the products they prefer – from organic produce and fair-trade products to the latest fashion trends in eyeglass frames and products for styling curly hair.

Mobile devices and smartphones allow for research even when the product is in hand, so the retailer must be ready to interact with a well-informed consumer.



Affect Performance as It Happens

At SAP, we've identified several opportunities where you can apply in-memory to innovate and improve performance in retail settings.

SALES AND STORE OPERATIONS

Here are a just few ideas for in-store analysis:

- **Profitability analysis on the fly** – Search and identify appropriate control and sales data at Google speed for even the most complex analysis. Gain insight into the most complex data in real time, performing sophisticated calculations and analysis on the fly. The result? Unprecedented control of margins and service levels.
- **Real-time sales analysis** – Use in-memory computing to access and analyze vast amounts of granular data, identifying sales performance on an item-by-item level. Then make real-time changes to promote low-performing items.
- **Loss prevention** – Use in-memory computing to detect cashier mistakes or patterns in real time. Improve margins by reducing POS errors and reconciling differences as they happen.

SUPPLY CHAIN

In-memory computing can help you keep a finger on the pulse of the supply chain:

- **Out-of-stock analysis** – Retailers need insights that illuminate specific supply chain constraints, workloads, and opportunities – at an aggregated level across the supply chain. Detect real and possible out-of-stock situations to improve service levels and increase customer satisfaction and loyalty.
- **Consumer activity repository** – Enable new processes, including multichannel performance analytics and predictive analytics.
- **On-shelf availability analysis** – Use in-memory computing to assess real-time out-of-stock risk at the store level and analyze causes. Then act to solve service issues.
- **Integrated demand planning** – Use in-memory computing to increase responsiveness to demand changes, optimizing subdaily replenishments of fresh products such as produce and bakery items.

MULTICHANNEL ANALYSIS

In-memory computing can help you leverage data across channels, regardless of how many you use to engage with customers:

- **High-volume customer segmentation** – Increase promotion profitability by leveraging detailed sales data to better understand buying patterns across channels. Optimize targeted marketing campaigns and support segmentation by aligning customer attributes with detailed SKU sales data.
- **Extended customer behavior analysis** – Increase customer engagement by understanding influence potential by channel – including store, mobile, computer, and social networks. Use in-memory computing to perform real-time analysis of consumer mobile or Web activity. See and experience what your consumers see, as well as what they purchase.

MERCHANDISING

Get granular insight, support ongoing promotions, and gain the ability to react in real time:

- **Affinity insight** – Improve merchandise and assortment decisions with more granular customer-type and channel-specific market-basket insights. Advanced basket analysis gives you a detailed understanding of individual transactions, with correlations to seasonal, weekly, and daily patterns.
- **Promotion management** – To optimize supply chain response and support ongoing promotions, even on a subdaily level, use real-time sales information and customer selection. Smooth sales across the day while increasing margins and maximizing cross-sales potential.
- **Perishables management and in-store production** – In-memory computing supports real-time processing of sales information and execution of what-if simulations to react to in-the-moment sales patterns. Optimize in-store pricing and promotions for perishables, smoothing intraday demand, improving margins, reducing end-of-day write-offs, and maximizing shelf availability. Optimize pricing, promotions, and replenishment at the item and location levels.
- **Cluster and product optimization** – In-memory computing supports real-time, what-if cluster and product optimization through integration with assortment planning. Take advantage of a comprehensive, real-time view of risk and opportunities with integrated end-to-end supply chain, sales, and inventory, and financial data.

Let's explore two examples in more detail.

ON-SHELF AVAILABILITY ANALYSIS

If customers come into a store to buy an item and find the shelf empty, they may buy the product elsewhere or forgo the purchase altogether. Some customers may not realize that the retailer normally carries the item, so the retailer not only loses the initial sale but could lose future sales as the customer continues to patronize a competitor.

If you are running a promotion that's successful, you'll sell loads of product. But suppose you have limited visibility into promotional effectiveness and end up selling more than you planned. Then a good situation can quickly turn bad: a stock-out. Customers finding empty shelves during a promotion are likely to feel frustrated – or even bitter and resentful.

Traditional technology couldn't analyze the volume of data required to detect out-of-shelf or out-of stock situations on an intraday basis. By the time a retailer was alerted to an out-of stock situation, the damage was done; it was too late to react.

With in-memory computing, however, real-time out-of-stock or out-of-shelf detection allows retailers to react quickly, filling the shelf from the back of the store or placing a rush warehouse order.

In-memory-enabled benefits: In short, the benefits include tighter control of sales performance, faster understanding of out-of-stock and out-of-shelf situations, and faster resolution. Most important: more satisfied customers and increased sales.

FRESH-ITEM PROCUREMENT

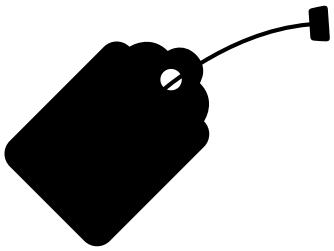
For many food retailers, fresh items are purchased in daily markets. The buyer must match product available in the wholesale market to expected store demand, which is influenced by factors such as weather, holidays, and item appearance. Product offerings change daily within these markets, making simple replenishment impossible. Additionally, buyers are often confronted with special offers – which could fly off the shelf, boosting sales and profitability, or fail to sell, only to be thrown out (and written off as a loss) in the next few days.

Combined with mobile devices, in-memory computing enables buyers to use sophisticated what-if analysis to optimize fresh-item procurement at daily wholesale markets. Using a mobile device, a buyer can simulate the impact of a purchase, such as 100 boxes of apples at a special price, simply by entering the offer details. The software then analyzes expected sales quantity and profit, accounting also for cross-sales effects on items already in stock or planned for purchase.

In-memory-enabled benefits: Better support of fresh item procurement can result in improved sales, minimized write-offs, and optimized profit – plus increased customer retention and satisfaction.

Ultimately, in-memory computing can help you gain competitive advantage and realize margin improvement on every transaction and every deal. In fact, retailers that can turn big data into information and act accordingly can realize margin improvements of up to 60%.[1]

Armed with customer sentiment, retailers can rapidly adjust assortments that attract new customers or respond to growing trends by immediately modifying orders or diverting products from one selling location or channel to another.



Moving Forward with In-Memory Computing

To benefit from in-memory computing, retailers should assess in-memory opportunities, build a solid technical foundation, and then use in-memory scenarios to fully transform the organization (see Figure 2).

ASSESS

The assessment phase lets you explore in-memory technology, diving deep into possible scenarios to understand the tangible improvements in-memory can offer over your current technology. First, identify and prioritize your business challenges. Where are you really losing money? Loss prevention, mistakes at POS, or too many out-of-stock situations? How would you benefit if you could perform sophisticated data analysis and make decisions in near-real time?

Next, analyze the available information and identify any missing data. Where is information stored, and how quickly is it available? Where is information unavailable or not available quickly enough?

Now, assess opportunities where in-memory computing could solve specific business issues. Reimagine how your processes could be transformed if you could analyze data in real time instead of in days or hours. Try constructing a matrix that includes the following information for each issue:

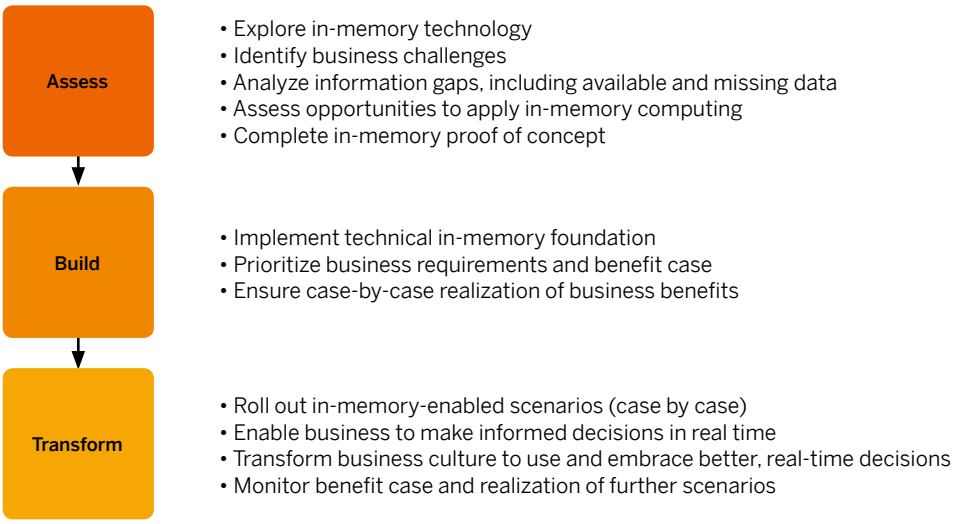
- Business priority
- Data availability
- Missing data
- Main challenge solved with in-memory computing (big data, timely availability, sophisticated data analysis)
- Expected benefit

IN-MEMORY CRITERIA

In-memory computing is especially powerful for business situations that:

- **Use massive amounts of data**
- **Require time-sensitive decisions**
- **Affect behavior, transactions, or events as they happen**
- **Use predictive analytics to alter results as they happen**
- **Need only a limited number of decision makers (too many decision makers might delay the process and defeat the in-memory feature)**

Figure 2: Getting Started with In-Memory Computing



Finally, complete a proof of concept. The proof of concept should demonstrate the benefits of in-memory technology, validate the business requirements and priorities, and identify metrics for measuring performance improvements to show quick results to the organization. Proving results can in turn drive further buy-in. Further, the proof of concept should address transfer of knowledge between IT and business users.

BUILD

The right technical foundation for in-memory computing consists of a system landscape that includes a logical and physical data model implemented on an in-memory appliance with appropriate hardware and software. Use your proof of concept to generate a prioritized list of business requirements – then ensure that the required data is available, accurate, and complete. Load data into the in-memory appliance and test the analytics. Be sure to closely measure performance and calculate benefits for each trial; this ensures both case-by-case delivery of quick results and longer-term benefits to the organization.

TRANSFORM

Roll out in-memory-enabled scenarios on a case-by-case basis, introducing new reports and processes to key users in the organization. Enable the business to make informed decisions in real time, understanding that this may require a cultural or mind-set shift for employees. Processes and organizational behavior must also change – for example, prioritization of one-on-one interactions with in-store shoppers using special, targeted offers. Continue to monitor business benefits and adoption of new processes by the organization, and look ahead for the next in-memory opportunity.

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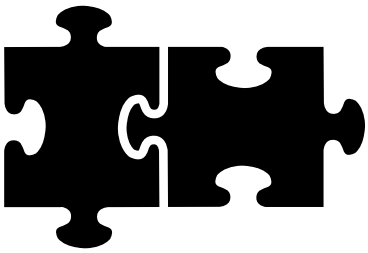

Transforming Retail with Every Customer Interaction

Today's retail environment is challenging, to say the least. Connected, informed consumers expect the best products at the best price, regardless of channel. At the same time, competition continues to intensify in all areas. Retailers have more access than ever to a monumental amount of customer and product data, but abundance creates its own problems. Such a massive data flow has, until now, been nearly impossible to analyze in time to effect real change.

In-memory computing addresses that challenge, allowing retailers to collect, manage, analyze, provide, and act on data in the moment – and so enabling true real-time decision making. For the first time, retailers can have the results of complex analyses and transactions at their fingertips, streamlining processes for real-time effects on pricing, promotions, spot purchases, sales, operations, supply chain, merchandising, and multichannel transactions.

Just as important, the resulting insight allows you to truly differentiate your business from the competition. Use in-memory information to personalize interactions, and deliver the products and services that drive customer loyalty. Send the message that you understand each customer's needs and preferences, combining traditional service levels with the advantages of technology – and identify new opportunities to capitalize on sales and maximize margins.

Start transforming your retail organization today – by assessing and building in-memory scenarios that reinvent your business, boosting sales and driving profitability.

ABOUT SAP

As market leader in enterprise application software, SAP helps companies of all sizes and industries run better. From back office to boardroom, warehouse to storefront, desktop to mobile device – SAP empowers people and organizations to work together more efficiently and use business insight more effectively to stay ahead of the competition. SAP® applications and services enable more than 172,000 customers (includes customers from the acquisition of Sybase) to operate profitably, adapt continuously, and grow sustainably.

ENDNOTE

1. McKinsey Global Institute, "Big data: The next frontier for innovation, competition and productivity," May 2011.

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