

# *The Case for Lean Architecture*

*A Retail CIO Perspective*

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Sponsored by:



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## SECTION I: THE BUSINESS CHALLENGE

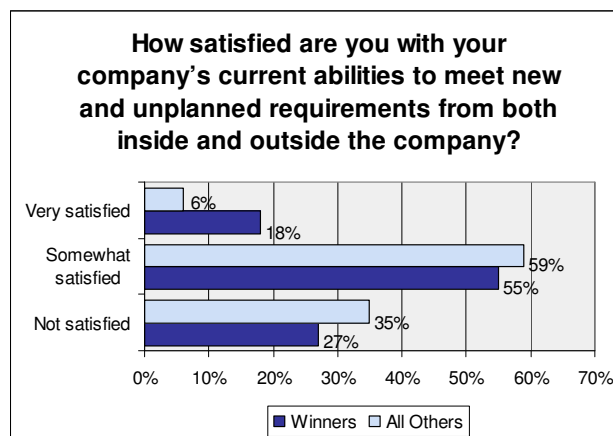
### A RETAIL PARADOX: HOW TO MEET TODAY'S DEMANDS WHILE TRANSFORMING IT TO PREPARE FOR TOMORROW'S CHALLENGES

There is no doubt that the cycle of business change in retail is accelerating. And with it, demands on Information Technology departments (IT) are ever-increasing. At the same time, IT is under the same pressure as other operational groups to hold the line on costs. RSR's research has shown that retailers still expect IT to deliver important new capabilities to support changes in the business while holding the line on costs. These capabilities include:

- *Enabling a new generation of business intelligence to respond more quickly to changes in the marketplace;*
- *Integrating multi-channel operations, enabling the business to present a consistent brand to consumers across all channels;*
- *Making the shopping experience more relevant to consumers by providing the business one view of the customer, one view of product and inventory, and one customer order fulfillment process;*
- *Addressing global supply chain issues associated with speed-to-market, quality and cost;*
- *Getting IT to respond more quickly to changes in the business environment; and,*
- *Addressing the "green" agenda*

RSR's research consistently shows retailers' concerns with the inflexibility of their technical architectures. These infrastructures inhibit the company's ability to face new market realities. So it is no surprise that in an April 2008 RSR study entitled *The Future of Application Delivery in Retail*<sup>1</sup>, retailers (even Retail Winners – those companies that outperform the competition) expressed ambivalence about their IT organization's ability to meet unanticipated challenges from the business (*Figure 1*).

*Figure 1:  
IT's Ability to Respond Quickly – There's Room For Improvement*



Source: RSR Research, May 2008

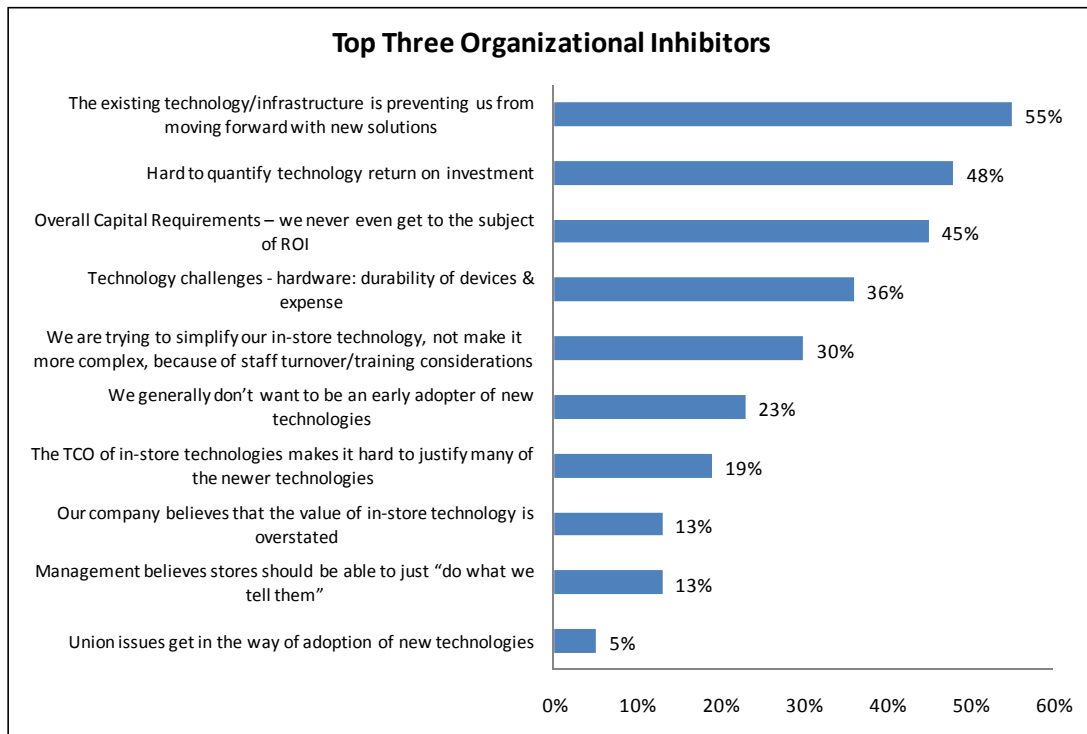
<sup>1</sup> *The Future of Application Delivery in Retail – Benchmark Study 2008, May 2008, © RSR LLC*

## TECHNOLOGY: AN INHIBITOR, NOT THE ENABLER

In the face of such “faint praise” from the business, retail IT’ers must ask themselves, “Why?” Simply put, the cost and effort to maintain the existing infrastructure and application portfolio is destroying retailers’ ability to create new value needed to remain competitive. It is inhibiting their ability to change. **Retailers today understand that they are put at strategic disadvantage by the absence of IT-enabled processes that work and they only achieve temporary tactical advantage by those IT applications they do have in place.**

Recent RSR studies bear this out: retailers indicate that they are growing alarmed that their technology infrastructure, intended to *enable* the business to deliver new value and efficiencies to the business, is actually *preventing* retailers from responding more quickly to changes in the business. For example, in **The Customer-Centric Store Benchmark Report: 2008**<sup>2</sup>, the existing in-store technology infrastructure is identified as the top inhibitor preventing retailers from moving forward with new solutions (Figure 2).

*Figure 2:  
In-store Technology Infrastructure Issues Now Trump All Other Inhibitors*



Source: RSR Research, April 2008

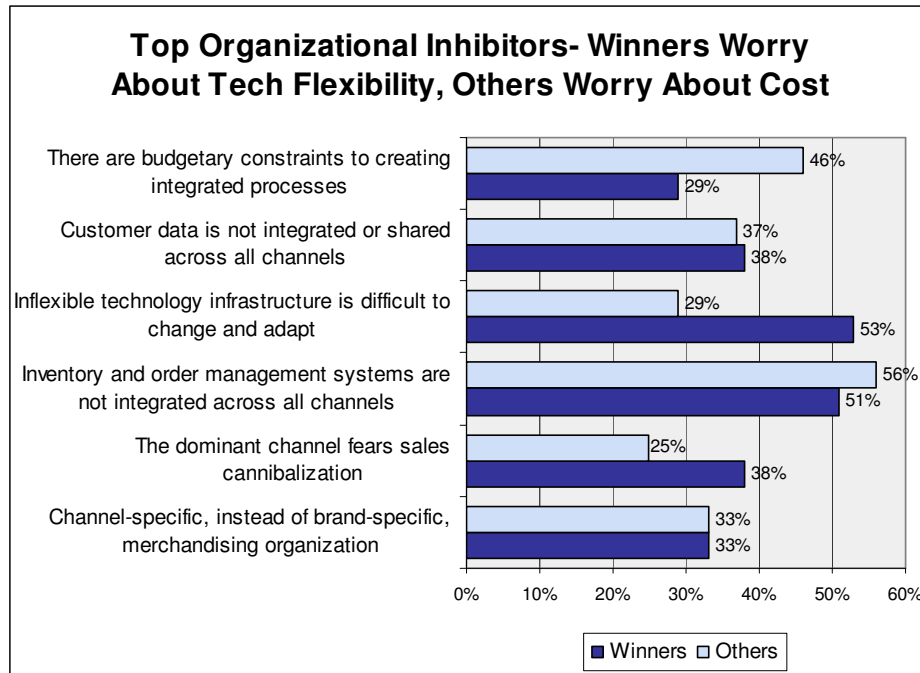
These problems extend far beyond the in-store environment. In RSR’s April, 2008 study, **Finding the Integrated Multi-Channel Retailer - Benchmark Study 2008**<sup>3</sup>, “an inflexible technology infrastructure” ranked near the top of concerns of Retail Winners. These retailers indicated that they are concerned that

<sup>2</sup> The Customer-Centric Store - Benchmark Report: 2008, May 2008, © RSR LLC

<sup>3</sup> Finding The Integrated Multi-Channel Retailer - Benchmark Report: 2008, April 2008, © RSR LLC

their legacy applications portfolios are so inflexible that changes required to enable cross-channel data visibility and functionality will come too slowly to meet increasing consumer demands for a consistent experience across all selling channels (Figure 3).

*Figure 3:  
Legacy Technologies Remain a Stubborn Inhibitor to an Effective Multi-channel Program*



Source: RSR Research, April 2008

Clearly, something has to give. Line-of-Business users, who have shifted from IT Oversight Committees to IT Budget Holders are clearly frustrated by the situation. Absent big-budget integration projects that lack obvious ROI, retailers are deadlocked. ***The Future of Application Development in Retail*** study makes it clear that IT practitioners, hamstrung by existing poor point-to-point integration, feel they fall further behind, rather than becoming more responsive. Retailers are looking for ways to deliver IT-enabled efficiencies more quickly, and to lower their support costs in the future.

The solution to this problem is not simple. **Retailers must revamp their entire application delivery and integration strategy, or even create a first pass plan at one** (since many have none at all). **If they don't, they will never be poised to accommodate new channels for product discovery, research and purchase.** An integrated platform for improved, more holistic performance metrics will also remain a dream, rather than a reality.

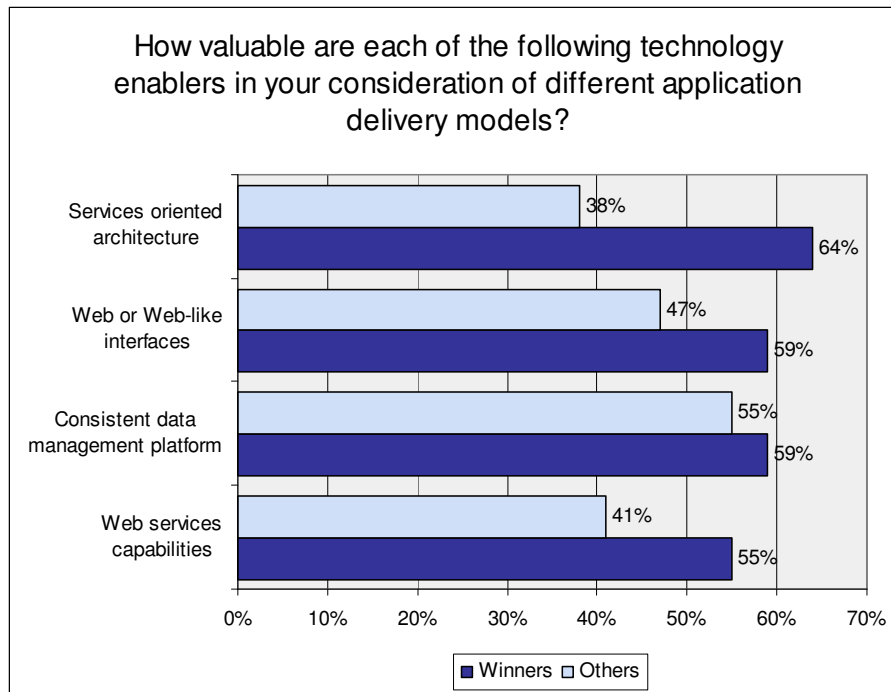
## SECTION II: THE OPPORTUNITY

### WINNERS ARE READY FOR AGILITY

In his 1999 book, *Adaptive Enterprise: Creating and Leading Sense-And-Respond Organizations*, Stephen Haeckel contended that designing the business around adaptive systems is imperative because the rate of discontinuity of change can overwhelm an organization's ability to fix incorrect assumptions in their plans.<sup>4</sup> In the context of business application delivery, this implies application architectures that enable the business to quickly redeploy digital assets (business rules and data) as business processes change. The good news is that 21<sup>st</sup> century network-centric technology architectures enable applications to be constructed in such a way to support this kind of flexibility. The bad news is that most "legacy" systems retailers have in their portfolios *aren't* constructed that way, and that can limit the retailer's flexibility to quickly respond to changing business conditions.

Retail Winners certainly see the opportunity to implement more flexible, adaptive solutions (*Figure 4*). Responses from these retailers reveal that unlike others, Winners focus on technologies that promise to give them the flexibility to respond much more quickly to unanticipated changes in the business environment.

*Figure 4:*  
*Retail Winners Understand the Need for an Adaptive Enterprise Infrastructure*



Source: RSR Research, May 2008

<sup>4</sup> *Adaptive Enterprise, Creating and Leading Sense-and-Respond Organizations*, Stephen H. Haeckel, Harvard Business School Press, ©1999 President and Fellows of Harvard College

RSR research findings indicate that **retail decision makers are concerned about the cost** of modifying rigid “verticalized” *business applications and operational data* to meet new business requirements **and the difficulty** of integrating legacy applications with new functionality. But there may also be a more fundamental opportunity, by challenging assumptions about the nature of the highly-distributed technology environment found in most retail companies.

## THE POLAR EFFECTS OF “THE STORE MULTIPLIER”

IT planners tend to assume the status quo when it comes to the physical IT architecture – servers, clients, network devices, and peripherals. The focus for savings typically centers on the ability to systematically lower costs on a per-unit basis (such as acquisition cost for hardware and associated software license fees). Retail CIOs understand, and count on, the magic of the “store multiplier;” even small improvements in the cost of one asset can equal big savings when multiplied by the number of stores the asset will be deployed to. Although there are certainly efficiencies to be had from such strategies, the potential for savings is finite.

On the other side of the coin, retail CIOs understand that few projects are more expensive or time consuming than store technology rollouts, and as such, often seek to extend the expected useful life of an asset by anticipating potential future resource requirements (storage, CPU speed, etc.). Although most retailers have a business application roadmap that projects 2-3 years into the future, in-store hardware assets are expected to last much longer – often 7-10 years. It is very difficult (if not impossible) for IT planners to fully anticipate future resource requirements beyond 2 years. As a result, there is a great tendency to over-configure hardware assets, particularly server technology – and the “store multiplier” can work against the CIO, actually driving costs up.

## REDUNDANCY IS ASSUMED

The typical retail IT architecture assumes high levels of redundancy of operational data and business applications, the attendant hardware to support those replications, and the system management and maintenance costs associated with maintaining high service levels. ***The reasoning for such an architecture is simple but important: retailers never want technical failure to prevent them from servicing customers.*** With the advent of scanning systems in particular, retailers began deploying highly distributed computing power to the stores, often with redundant servers for critical customer-facing processes such as POS scanning and payment & returns processing, as well as other in-store processes such as merchandise management, ordering and receiving, labor scheduling, energy management, communications, cash, receipts, and settlement processing, and “flash” reporting.

This redundancy was borne of a limitation that doesn’t exist anymore. In the 1980’s, when POS scanning reached critical mass, network technologies were extremely slow, brittle, and expensive. Data exchange rates were measured in 100’s of “baud” (pulses emitted by an analog modem). The notion of a digital network was unheard of, and Internet technologies were confined to government agencies and universities. Some retail CIOs will remember “the sneaker net,” where operational data and application updates were sent to stores via floppy disk (or by the early 90’s, CDs). But the days of dial-up connection from stores and warehouses to the home office are essentially behind us. In a 2007 study<sup>5</sup>, 86 percent of all retailers in the study said that they had some form of persistent connectivity to their stores. This was

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<sup>5</sup> *Technology-Enabled Customer-Centricity in the Store - Benchmark 2007*, March 2007, licensed 2007 by RSR LC

true for even the smallest retailers, with under \$50 million per year in revenue. More than 70 percent of these retailers also had persistent connectivity to their stores. Almost one-half (46%) of retailers in the study also reported that they have near real-time updates between the stores and corporate host databases. While today these finding may seem like the classic “no-brainer,” just six years ago, specialty retailers and category killers still used dial-up connections to the home office. Price reductions have radically changed the cost structure of persistent connectivity, and even the smallest specialty retailer can now afford to be on-line, all the time, virtually anywhere.

## HOW TIMES HAVE CHANGED

For many retailers, virtually every aspect of retail operations is now being re-examined as companies respond to the need to be more agile in the marketplace, responding to customer cross-channel buying behaviors, and taking advantage of global supply while at the same time offering a highly localized and relevant value proposition to consumers. All the while, the drive to find more operating efficiencies continues.

To meet these demands, Retail Winners seek ways to deliver IT enabled solutions more efficiently and more effectively, with lower initial costs and with lower ongoing support costs. Ready availability of extremely high-speed and reliable digital networks, new “virtualization” capabilities that enable computing power to be managed like a “utility,” and modern application design techniques, provide an opportunity to implement more flexible, adaptive solutions. These solutions can process business rules and data in a highly efficient enterprise technology environment in near real-time, and deliver actionable information where and when it is needed, via the interface of the end user’s choice.

This opportunity is enabled by “Lean Architectures.”

## WHAT IS A “LEAN ARCHITECTURE” AND WHAT OPPORTUNITIES DOES IT ENABLE?

The basic concept behind “lean architecture” is the idea of computer resource “virtualization.” A 2004 article in Computer Technology Review <sup>6</sup> explained that, “Virtualization eliminates ‘islands of processing’ and optimizes the use of resources through a common, shared platform available to applications by location, business unit, operating company and even the whole enterprise. In this model, the business can exploit resources effectively and fundamentally change the cost-growth equation.”

Businesses have found that simply consolidating computer assets doesn’t necessarily solve the problem of making those assets available to handle workloads more reliably and at lower cost. “Virtualization” is a concept where the technology assets are hidden from users, whether those users are application processes or humans. An everyday example of this kind of architecture is the power grid that our homes and businesses use. As power consumers, we have no idea where the electricity comes from, nor do we care. What we do care about is that it is reliable 24x7 and can handle peak load times (for example, in the heat of summer).

Technologies exist that enable requests for computer technology resources to be serviced by the next available resource, whether it’s CPU, memory, storage, or bandwidth. Technology architectures that have been implemented with this kind of services-oriented resource management are said to be “lean architectures.”

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<sup>6</sup> Computer Technology Review, August, 2004, Tony Bishop

The achievable opportunities from adopting such a concept are potentially big, both from the perspective of rationalizing the TCO for the enterprise, and from the view of delivering value more quickly and effectively. Potential benefits include:

- Reducing replicated code and data. This benefit has many components including:
  - Lower overall technology acquisition costs (fewer replicated hardware components);
  - Reduced ongoing application maintenance and system management focus (fewer copies to maintain);
  - Less information lag time and data errors (resulting from reduction in the data distribution, collection, and aggregation characteristics typical of highly distributed computing environments);
  - Lower ongoing TCO of the technical environment; and,
  - Faster rollout of new business applications (fewer integrations, fewer copies).
- Better service levels than highly distributed and redundant production technologies
  - Getting resources “on demand” in such a way that your organization can manage for the most efficient use of CPU, memory, storage, bandwidth, and energy.
- Whole-enterprise support
  - The association between where the service is used and where it originates is obscured. This helps retailers to realize one view of information assets, such as customer (multi-channel integration), inventory (optimization of both *buy* and *sell* processes), product and price; and,
  - Creating the ability to support new human interfaces, (such as mobile device support), without changing the underlying structure of the services.

## SECTION III: ORGANIZATIONAL INHIBITORS

### UNWILLINGNESS TO CHANGE (THE ENEMY WITHIN)

It's surprising that after only 25 years of in-store computing, retailers large and small assume "the way it is" is "the way it should be," particularly when it comes to mission-critical customer-facing computing assignments such as POS scanning. Granted, technologies targeted for the selling environment must be sufficiently hardened to survive the harsh conditions found in most stores. However, with today's technology architectural concepts, it is possible to separate how information is processed and how it is presented. Any user of the Web understands this.

### CHRONIC UNDER-INVESTMENT IN INFRASTRUCTURE

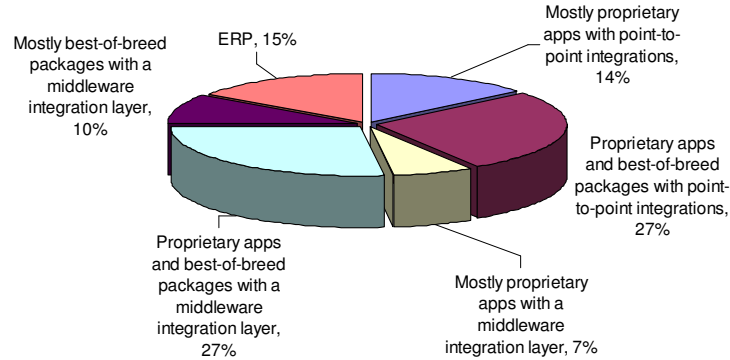
RSR has seen in its research that Retail Winners win not by doing what other retailers do "better," but by doing things differently. When it comes to technology, Winners are proactive – they support IT enabled value delivery. In *The Future of Application Delivery in Retail* study, only 18% of Winners expressed a concern that lack of funding on infrastructure projects was keeping the maintenance burden high. However, non-winners made that claim 41% of the time, and a stunning 60% of "laggards" (underperforming retailers) agreed. Winners are poised to leverage investments in IT infrastructure to create a commanding market dominance; others are in a catch-up game.

### LEGACY APPLICATIONS

Stovepiped legacy applications pose perhaps the biggest challenge to implementing "lean architecture" concepts. Retailers typically support a multi-generational portfolio of applications, including fully-depreciated software assets that are still operational but in need of replacement, assets that are still "on the books," and provide the backbone of support for retail operations, and new applications that either are being rolled out or are in development. These portfolios are often comprised of either proprietary applications or commercial applications, or a combination of both, that have been integrated with middleware or via point-to-point interfaces (*Figure 5*).

Figure 5:  
*The Application Portfolio: Heterogeneous & Brittle*

### The Retail Application Portfolio



Source: RSR Research, May 2008

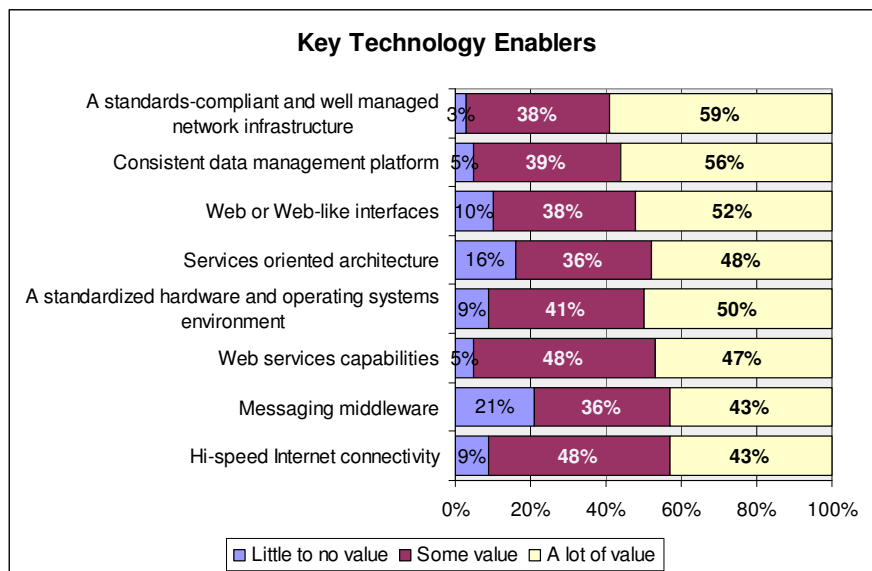
Many legacy applications assume tight integration between business rules embodied in the application code and databases, and often with the user interface as well. These types of applications are not well suited for services oriented environments. Retail Winners understand this better than their competitors, and therefore are more focused than others on enabling business applications that utilize the network to deliver “loosely coupled” business rules and data via web-like interfaces. **What’s the goal? In a word: flexibility.** Architecting applications as a set of services rather than tightly vertically-integrated stacks of code and data would enable retailers to re-deploy those services quickly and cost-effectively as the business changes. Winners are transforming their application portfolios to achieve more flexible solutions.

## SECTION IV: TECHNOLOGY ENABLERS

### “THE NETWORK IS THE COMPUTER”

John Gage, co-founder of Sun Microsystems, is credited with the visionary statement, “The network is the computer.” This vision has in fact come true over time. Retail Winners certainly see the opportunity to implement more flexible, adaptive solutions that are service-oriented and deployed over an enterprise network. In RSR’s *The Future of Application Delivery In Retail* study, retailers across all segments agreed that network-oriented and highly standardized technologies are critical to the implementation of services oriented business applications (Figure 6).

Figure 6:  
*Technology Enablers: Standardized & Services-Oriented – And on the Network*



Source: RSR Research, May 2008

### THE RIGHT MANAGEMENT FRAMEWORK

Even though the concept of “lean architecture” is attractive, the transition from a “physical” technical architecture to a “virtual” one is complex. In a lean environment, physical resources are managed as resource pools. Independent devices appear to the user as one resource managed centrally, even when they are widely distributed over the network. This is true computer science – and so it is important for IT to implement a proven management framework, that can manage a heterogeneous environment. Retail IT’ers need to ensure that their hardware and software are compatible with the chosen management framework. It is also critical that the management framework can manage the security risks inherent in a “virtual” environment. A recent RSR study entitled *Customer Data Security: PCI and Beyond- Benchmark Study 2008* stated that, “...retailers generally have not connected the dots to establish a connection between ensuring ... the security and privacy of ... data, and being a **Retail Winner**.<sup>7</sup>” A reactionary

<sup>7</sup> *Customer Data Security: PCI and Beyond- Benchmark Study 2008*, November 2007, © RSR LLC

attitude toward security is ill-advised in any production environment, but especially dangerous in a “virtual” one. This architecture introduces new types of exposures from malware. Security is not necessarily more fragile, but certainly more critical.

## SECTION VI: BOOTSTRAP RECOMMENDATIONS

### CONSIDER IT

“Lean” is worthy of the retail CIO’s serious consideration, since it could help the company address pressing business challenges that will not wait, including:

- Enabling a new generation of business intelligence capabilities with “near real-time” visibility into the business;
- Integrating multi-channel capabilities that present a consistent brand to consumers across all channels (without “exploding” costs);
- Delivering One view of the customer, one view of product and inventory, one customer order fulfillment process;
- Enabling Real-time visibility into the global supply chain; and, the ability to
- Focus less money, time, and resources on maintaining replicated data and code

### ASK YOURSELF THESE QUESTIONS:

- What are the opex cost savings from eliminating the costs associated with replicating and re-aggregating operational data across the enterprise?
- What are the opex cost savings from reducing maintenance costs associated with store-level “back office” computing?
- What are the cost savings to deploy new applications on time and on budget more consistently?  
And,
- What are the cost savings and revenue impact to lower costs and improve performance during peak load times?

### “LEAN” IS “GREEN” TOO

A Lean Architecture has the potential to lower the energy used for servers and storage in the stores and the data center. For example, SAN virtualization and load balancing in the Data Center decreases the amount of storage and servers and the resulting energy costs.

## APPENDIX A: ABOUT OUR SPONSOR



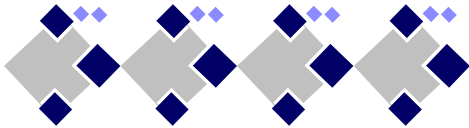
Cisco Systems, Inc. is the worldwide leader in networking for the Internet. Cisco hardware, software, and service offerings are used to create Internet solutions that allow individuals, companies, and countries to increase productivity, improve customer satisfaction and strengthen competitive advantage. The Cisco Intelligent Retail Network provides the foundation for delivering a set of common services to a broad range of devices and applications. This platform enables retailers to provide a single, centrally managed network for consistent and efficient data integration across functions and channels, as well as better security, manageability, and availability. Information on Cisco can be found at [www.cisco.com](http://www.cisco.com). For Cisco Retail news, please go to [www.cisco.com/go/retail](http://www.cisco.com/go/retail).

## APPENDIX B: ABOUT RSR



Retail Systems Research (“RSR”) is the only research company run by retailers for the retail industry. RSR provides insight into business and technology challenges facing the extended retail industry, providing thought leadership and advice on navigating these challenges for specific companies and the industry at large. We do this by:

- **Identifying information** that helps retailers and their trading partners to build more efficient and profitable businesses;
- **Identifying industry issues** that solutions providers must address to be relevant in the extended retail industry;
- **Providing insight and analysis** about a broad spectrum of issues and trends in the Extended Retail Industry.



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