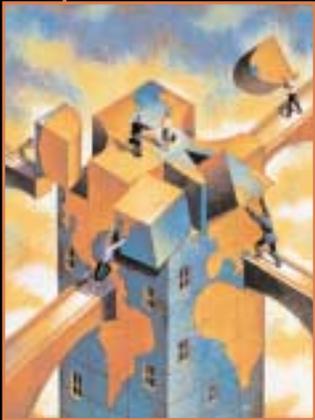


**B U S I N E S S
F O R W A R D :**



**HOW GROWING
BUSINESSES
ARE USING
I.T. TO
INNOVATE
AND THRIVE.**

A SPECIAL REPORT BROUGHT TO YOU BY:





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Today's engines of economic growth are, more often than not, mid-sized companies. These are organizations that typically have from 50 to 500 employees. Some are startups, aiming to exploit a new business opportunity; others are units of larger companies focused on exploiting specific market opportunities; still others have identified a niche and have become dominant players within that niche. While they vary in these and other details, they are united by their characteristic responsiveness and readiness to innovate—particularly when it comes to adopting new information technologies. Often, though, limited resources and skills constrain the leaders of mid-market companies from adopting current and emerging

information technology [IT]. They need to see the broad trends as well as the key details that comprise today's information technology world.

This report is designed for them. Its aim is to educate mid-market companies on how to grow their businesses and strengthen their vision through the adoption of smart technology. In addition to providing an overview of some of the “top-of-mind” information technology topics of today, the report also focuses on examples of real companies and how they are using technology to build new markets, grow new revenue streams, and enhance work group productivity—through remote access to company data, better integration across business applications, and the streamlining of escalating IT costs.

INNOVATORS MAKE THE WORLD GO `ROUND

More than half a century ago, renowned British historian Arnold Toynbee observed that the world was rapidly being knit into an integrated economic and social unit.

Twenty years later, Marshall McLuhan, Director of the Center for Culture and Technology at the University of Toronto, Canada, coined the phrase “Global Village” to describe the way in which electronic technologies were rapidly integrating human culture. Both men were prescient about how technology would affect society. Today, their vision is fulfilled as organizations as diverse as hospitals, universities and manufacturers routinely engage global opportunities. International barriers are coming down, distances shrink, and the pulse of a 24/7 world economy powers the daily life of us all.

Those who thrive in this environment are those who have learned to make innovation a way of life through seeking out and adopting new tools and techniques. Georges F. Doriot, a founder of INSEAD, the global business school based in France, noted more than three decades ago that “new ideas and conceptions are the basis of new ventures but also the support of existing ones.”

In his classic business book, *Innovation: The Attacker's Advantage*, Richard Foster, Director of McKinsey & Company, a US-based consultancy, identified some of the characteristics that helped established organizations regain leadership and new enterprises carve out successful markets. Crucial to Foster's thesis is the idea that picking the right technology is a critical activity. Organizations must recognize what technology is best for them and apply that technology in the most fruitful way.*

While organizations depend upon and deal in a wide range of technologies specific to their products or industry, and to the specific focus of their businesses, for almost all, information technology has become the common focus and a universally recognized component in achieving success.



Today's growing businesses are looking for third or fourth generations of improvement.

In business, innovators come from every industry and every corner of the globe. They are companies (old and new) and individuals that have seized the chance to change, grow, and move forward. Their methods, tools, and technologies have varied but they are united by a willingness to adapt and the thoroughness with which they explore their options.

Many of today's most compelling innovations are born out of an exploration of the potential of information technology. Of course, information technology is far more than just bits and bytes or MIPS and megaflops. IT is the art of solving problems and creating value—a powerful tool for increasing efficiency. From the days of the punch card, information technologies have powered successive revolutions in productivity and efficiency—familiar technologies such as bar coding, the application of point-of-sale terminals, and word processing have successively revolutionized the way business is conducted.

AIMING FOR THE BEST

Today's growing businesses are looking for third or fourth generations of improvement. They want to share information across departments and between business partners, and they want to be able to link the customer and the producer in a functioning value chain. That means making intelligent decisions—decisions based on an understanding of business processes and value creation as well as the ability to solve problems and shift paradigms. Indeed, information technology investments may not only provide direct productivity and profitability enhancements, they may also have the potential to enhance the decision-making processes that in turn support all organizational activities.

SUPPLY CHAIN MANAGEMENT EMPOWERS CHURCHILL CHINA

Consider the value derived from implementing a successful supply chain management (SCM) solution. Understanding and managing the supply chain is one of the keys to business success. In some industries it is perhaps the most critical task. Supply chain management allows an organization to have the products or services it produces at the right place and the right time. SCM touches suppliers and customers as well as in-house functions such as inventory management.

Churchill China, plc, an established UK-based manufacturer and distributor of high-quality ceramics, recognized the importance of successful SCM. Published reports describe how the company evolved to where it is today by moving away from just manufacturing volume retail ceramics to producing products that target the special needs of the catering and hospitality market. In 1994, the company went public and now has two divisions focusing, respectively, on the retail and hospitality trades.

But sustaining growth at Churchill China has involved working to continually ward off tough competitors—especially those based outside of the UK. Recently, the company took a key step in deploying a state-of-the-art e-business SCM system. The technology supported the creation of a customer-friendly e-commerce solution for Churchill China's trade buyers.

Besides delivering a competitive edge, the technology has also provided dramatic cost savings and the power/performance to run different applications on different computer operating systems—all on a single IBM @server iSeries™ server.

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MANUFACTURING: TIGHTENING THE LINKS OF THE SUPPLY CHAIN

Quality and reputation have made it possible for Churchill China, a UK-based manufacturer, to become the licensee to produce tableware and mugs for a host of high-profile brand names including Jeff Banks Ports of Call, Warner Brothers Harry Potter, Looney Tunes Tom and Jerry, the Royal Horticultural Society, and Historic Royal Palaces. Crucial to the future, though, is the company's adaptation to e-business.

"For us, commerce for e-business has become a core business competence," says David Garnett, Information Technology Director. "Many of our customers told us that in future they would trade exclusively online," explains Garnett. "Therefore, we needed a robust and scalable commerce and supply chain management system."

"Our productivity has improved and the system ensures 24-hour dispatch on transactions."

— David Garnett, IT Director, Churchill China, plc

To achieve this innovation, Churchill worked with IBM Business Partners Clover Business Associates, Ltd. and Byford to install Clover's Wizz400 on IBM iSeries. Wizz400 is middleware that sits at the heart of Churchill's e-business system.

The benefits were immediate and clear. "The system is customer-focused and has really delighted our trade clients," says Garnett. "It has significantly improved customer service and saved time and resources. Our productivity has improved and the system ensures 24-hour dispatch on transactions. We are now fully able to face the challenges of commerce for e-business."

Wizz400 dynamically interacts with Churchill's enterprise resource planning (ERP) system, which runs on the iSeries 820, supplied by Byford. Garnett says,

"Wizz400 is very powerful and very closely integrated into our existing systems. The key factor in commerce for e-business is accuracy. Wizz400 on IBM @server guarantees that we get orders right every time."

In addition to a Web storefront, Churchill has extensive plans for the use of XML and Wizz400's powerful capabilities in this area were a key factor in its selection.

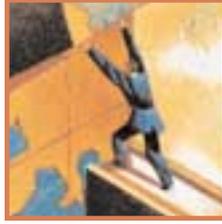
An important feature on Churchill's new installation is the use of a logical partitioning (LPAR) that allows separate applications to use the full resources of the server, thus eliminating the need for multiple servers. This technology has permitted Churchill to consolidate from three servers to a single iSeries while achieving better performance than ever before.

"Using Wizz400 on iSeries has given us the flexibility to adapt our systems to market conditions," says Garnett, allowing us to take control of all aspects of our customer relationships." By extracting live data from the existing computer system and publishing it online, Wizz400 allows Churchill to display accurate stock and account information and to collect order data from their Web site.

"The system is extremely flexible and we can easily adapt it to support a number of different languages," says Garnett. "This will be a major advantage as we are a major player in the international marketplace."

Churchill's new commerce for e-business system is already producing excellent results and the company plans to develop it into an even more powerful tool. As Garnett explains, "Wizz400's open and flexible architecture will allow further developments to improve customer service, such as XML, document exchange for orders and invoices."

Both the iSeries and Wizz400 can be scaled as business grows. "We anticipate that eventually as many as 200 major distributors will use the system and we have absolute confidence that IBM @server iSeries can handle this with no drop in availability," says Garnett.



“Savvy customers know that they can and should be treated as individuals when they shop.” —Bob Blumstein, IDC

CUSTOMER RELATIONSHIP MANAGEMENT THE THEORY OF ONE-TO-ONE MEETS ROI

Similar results can come from harnessing the innovation potential of CRM—a technology that links information technology and business processes to provide a clear and accessible portrait of every customer’s needs so that the company can engage them most effectively.

According to a recent research report from IDC (a global IT market intelligence and advisory firm), *CRM Digests One-to-One (#26068)*, one-to-one marketing is now viewed by many businesses as an integral methodology for achieving their CRM results. “Marketers have had the theoretical benefits of CRM pounded into them for years, while savvy customers know that they can and should be treated as individuals when they shop,” notes Bob Blumstein, Director for IDC’s CRM Analytics and Marketing Applications. “Together those forces will help the CRM market to flourish. One-to-one is a valid concept, but it has become a secondary talking point. It’s now a game of “show me the ROI,” said Blumstein.

Indeed, others believe that, for organizations implementing CRM, finding the ROI can be challenging. That’s because poorly implemented CRM solutions can have a reputation for being expensive and for falling short of their design goals.

As some companies have discovered, without a strategy and effective implementation, CRM is simply a buzzword—and an expensive buzzword at that. If implemented poorly, CRM can institutionalize and even worsen organizational failings. However, with management commitment, a bit of imagination, and the right technology, CRM solutions can help attract customers and keep them loyal.

What’s involved? It takes a combination of business vision, the right tools, and mastery of the supporting infrastructure. Again, the lesson for innovators is that there is no magic formula or a one-size-fits-all strategy. But the right marriage of technology and methods can produce results.

INTERNET TRACKING STREAMLINES SALES FOR GROWING MANUFACTURER

Consider the experience of Thomas Engineering Company (TEC), a manufacturer based in the north central United States. The company has been an innovator in the production of micro miniature, miniature and medium sized metal stampings. From the simple to the nearly impossible, TEC’s skilled employees use the most advanced production equipment and techniques to ensure the highest quality.

TEC needed to track sales leads and integrate them with its e-mail calendar system. The existing system was outdated, and relied on paper to keep things organized. The system made it difficult to respond to customers and track leads efficiently and quickly. The company needed a single database of information about customers that would be accessible to all employees.

To meet this challenge, Thomas Engineering Company adopted IBM @server iSeries servers, Lotus® Domino™ software and a CRM solution from independent software vendor Clear Technologies to improve the way it handled sales leads. The software consolidated all of the company’s customer information onto a single database, allowing all facets of the organization to access current and consistent information at any time. TEC’s sales team now has the latest

CONTINUED ON PAGE 8

E-BUSINESS: CANADA'S GROCERY GATEWAY BLAZES A "LAST MILE" TRAIL

Around Toronto, Canada's largest city, located in the province of Ontario, shoppers are discovering a new way to buy groceries—online. Grocery Gateway is Canada's leader in online sales of home-delivered groceries and related products. The brainchild of Bill Di Nardo, Grocery Gateway currently enables 24/7 grocery shopping over the Internet for its 100,000 registered customers—18,000 of whom use the service once a month or more.

Unlike many Internet-powered businesses, Grocery Gateway was created on the idea of controlling every stage of the e-commerce transaction. "Our primary objective is to help make life simpler," says Di Nardo, who believes that Grocery Gateway can accomplish this by building its business straight to the customer's door. "We call it the 'last mile' infrastructure," explains Brian Miller, Vice President of Technology at Grocery Gateway. Once the company establishes its brand through grocery delivery, it will leverage its infrastructure to deliver a wider range of products and services. That means taking the service concepts that were developed when the company started in Di Nardo's basement and stretching them to apply to a large workforce and dedicated warehouse facilities. And it means keeping very careful management.

Grocery Gateway's commitment to keeping its systems in-house led its top executives to reconsider their reliance on the company's legacy servers. Chris Hindy, IT Manager, explains that a few glitches in reliability prompted him and his team to wonder if they could find a better Web farm platform for the business. A thorough evaluation of the IBM @server xSeries™

(Intel processor-based) was enough to convince the Canadian grocery that IBM held the answer.

"The IBM @server architecture gives us the tools to deploy technology that helps ensure great customer service. When we fill orders without failure, we earn our customers' loyalty, and that enables us to establish our brand," says Miller.

"We liked the performance, features, light-path diagnostics, as well as the price-point," says Hindy, describing his team's reaction to the xSeries. "The entire product matrix offers significantly more power in a better package."

Today, Grocery Gateway's data center is based almost entirely on the IBM @server architecture. Its front-end system, used to capture and sort customer orders, consists of 10 xSeries servers certified and optimized to run Microsoft® Windows® 2000. More than a dozen rack-mounted IBM @server pSeries™ UNIX® servers run IBM AIX® and form the grocery's back-end system.

The pSeries server supports inventory and SCM applications, handles the financial processes and is largely responsible for running the Grocery Gateway market center.

According to Grocery Gateway, the IBM system architecture has the appropriate bandwidth and scalability to support Grocery Gateway's growth. The platform's small footprint enables the company to optimize its floor space. According to Hindy, uptime is notably improved. "We're completely satisfied," says Hindy. As more loyal customers log on to Grocery Gateway for its snappy response times and on-time delivery, Di Nardo is closer to firmly establishing his company's brand and building that last mile.

**"The IBM @server
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— Brian Miller, VP of Technology at Grocery Gateway

The Internet itself remains, of course, a vast and still underused creator of value—perhaps the best route yet devised to reach customers.

accurate account information, the marketing team can target campaigns to the right customers, and service personnel can pull up the current account information when they service customer requests. Clear Technologies C2 CRM software is Ethernet-connected to the xSeries server where Thomas Engineering Company's other business applications reside.

With this investment, TEC has realized increased productivity through consolidation and consistency of information; reduced costs for tracking leads; increased orders and reorders from customers due to a smoother process; and, a high quality server environment.

Months after the Clear Technologies C2 installation, TEC's sales people are documenting 100 percent of all quotations from the initial submission to the receipt of a purchase order. The company's outside sales people are also receiving monthly activity reports and updates on the status of all existing quotations.

This collaboration across departments has allowed TEC's internal sales people to connect and access the same information as the external sales people. Now everyone in the company has access to all the same sales information. This, combined with the creation of a single database, has improved the way TEC communicates with its customers. Additionally, Clear Technologies C2 has allowed the sales and marketing departments to automate their processes, leading to increased productivity, effectiveness and collaboration.

E-COMMERCE OPPORTUNITIES BECKON

Of course, no discussion of innovation and information technologies can ignore another IT topic that is very much a front-of-mind issue for every organization and also focuses on welding tighter people-to-people connections: e-commerce. Although the dot-

com bubble may have burst, interest remains high in using electronic technologies to drive the wheels of commerce through a growing range of Business-to-Business [B2B] and Business-to-Customer [B2C] initiatives. The Internet itself remains, of course, a vast and still underused creator of value—perhaps the best route yet devised to reach customers. Consider that, according to recent research from IDC's Internet Commerce Market Model, the total European Internet Commerce is set to explode from \$153,735 million in 2001 to \$1,985,539 million in 2006.

“Despite the dampening effect of the aftermath of September 11 on the western European economy, the demand for e-commerce is still unbroken,” says Carla Arend, Research Analyst for IDC's European Internet Group.

Particularly noteworthy is that even though all western European countries are among the most industrialized in the world, differences in the stage of adoption of Internet usage and e-commerce are quite pronounced. For instance, there is a distinct difference between northern and southern Europe, and Internet penetration and e-commerce adoption vary as well, according to the gender and age of the Internet user and even more so the Internet buyer. “The typical western European Web user is between 15 and 34 years old and, especially in southern Europe, male,” said Arend.

Those facts underscore the reality that the Internet is still a young medium with vast potential for companies ready and willing to explore its opportunities. And for those pursuing the promise of e-commerce, that means getting past the glitz and focusing on a judicious application of technology to achieve clear goals.

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SERVICES: TECHNOLOGY GIVES REGIONAL BUSINESS A NATIONAL STAGE

OnLine Taxes and the simple OnLine Taxes program were created in 1999 by company President Bill White, Certified Public Accountant (CPA). White has provided tax and auditing services to individual and corporate clients, primarily in his home state of Missouri, for the past 15 years.

OnLine Taxes' only product is a program where individuals can prepare and electronically file their taxes. Its mission is to provide individuals with simple, secure,

Although OnLine Taxes was self-funded by White's business and had modest initial goals, White says the IBM @server xSeries (Intel processor-based) and integrated hosting services have allowed OnLine Taxes to attain a national presence and begin to compete against such industry giants as H&R Block. In fact, notes White, "only about one percent of our OnLine Taxes customers now come from the state of Missouri."

IBM expertise and stability provided OnLine Taxes with an integrated database and mail server solution that pro-

*"... only about one percent of our Online Taxes customers
now come from the state of Missouri."*

— Bill White, president, Online Taxes

and fast tax returns and get their refunds back quickly, all at a low, single price. Preparing individual taxes online is OnLine Taxes' only business. The company is entering its third year providing simple online e-file tax returns and its third year as an authorized IRS e-file partner.

As an authorized IRS e-file partner, OnLine Taxes needed a reliable and secure multi-server solution to ensure swift processing of tax returns and tax-related questions, as well as protect the sensitive nature of their customers' personal data.

"We operate two businesses," explains White. "I'm a CPA and, in 1999, we started an Internet tax preparation company to let individuals log on, prepare their own taxes, and then file them electronically."

vide the performance, responsiveness and security necessary to deliver needed continuous uptime during the peak tax season. Impressed with the state-of-the-art technology of the xSeries, OnLine Taxes purchased five x330 servers and two x342 servers. Of the x330 servers, four are used as Web servers and one is used as a mail server. The x342 machines function as database servers that operate in failover mode. One acts as a backup to the other. Applications running on the xSeries servers include Microsoft Exchange, Microsoft Windows 2000 and Microsoft SQL. Fully redundant Nokia/Check Point firewalls provide high levels of security.

WORKGROUP COMPUTING —GIVING TEAMS AN IT EDGE

CRM, SCM, and e-commerce are not the only ways innovative, growing companies are using information technologies to strengthen connections between people in new and productive ways. Within and across the enterprise, another goal has been to better connect work groups and teams. For instance, PharmaLinkFHI, a US-based clinical research organization, works with IBM to decrease the time it takes for new drugs to reach consumers. Running IBM @server platforms in an IBM Web Hosting environment PharmaLink uses the Internet to link remote clinical sites to the research teams conducting the clinical trial.

Of course, work group computing can include all the means by which IT can enhance the productivity of employees and other team members through remote access, the Web, shared files, and scheduling tools. It presumes that all individuals have access to computers that are networked. Elaborate work group systems even help to define workflows so that information is automatically forwarded to the appropriate people at each stage of a process. Work group computing systems must not only tolerate, but also support different activities by members of the group, and capture the collaborative effort itself in a way that is useful and helps increase the sharing of ideas.

For example, Lotus Domino makes it possible for businesses to rapidly build, deploy and manage applications that engage co-workers, partners and customers in online collaboration and coordination of

SOME COMMON INDICATORS THAT YOU NEED TO INVEST IN SERVER TECHNOLOGY

- Difficulties of deploying applications to users
- Troublesome printer queues
- Difficulty standardizing look and feel, work flow, or business rules across the company
- Limited access to enterprise-wide data
- Web site updates taking too long; site not responsive enough
- Application launch delays
- System failures
- Significant cost overruns
- Physical complexity of server platforms
- Lengthy deployment cycle
- Lack of scalability
- Uneven usage rates
- Slow networks
- Excessive server proliferation
- Application software that is no longer supported or difficult to update and replace

critical business activities. Lotus Domino intranet server applications provide enterprise messaging, group calendaring and scheduling, and intranet workflow application on IBM servers for automated forms processing. It is a technology being widely embraced. For instance, Lotus Domino (combined with Lotus Notes® communications infrastructure) provides advanced intranet collaborative computing and messaging to employees of USBancorp, a US bank, across multiple locations.

IDC also took a look at the future of work group and collaborative computing and its outgrowths in a bulletin called *Contextual Collaboration: On Tap, Targeted, and Inside Web Sites and Applications Near You*. The report identifies an emerging opportunity for the

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“What needs to happen for collaboration to rise to the next level and reach a much broader audience is for collaborative functionality to be available as an integral part of business applications and Web sites.” —Mark Levitt, IDC

collaborative applications marketplace. According to IDC, companies who can bridge the gap separating most collaborative applications and business process applications will help a larger group of end users to collaborate more effectively than ever before. Indeed, IDC has coined the term “contextual computing” for this new approach that it’s said to be the key to bringing collaboration to the masses by enabling people to be more interactive and collaborative in many different business situations. Says IDC, contextual collaboration will give employees the power to leverage corporate information, immediately reach out to colleagues and partners in their ecosystems, and make decisions.

“Most collaborative applications are deployed in the same environment and often for the same end users as are other business applications, yet collaborative and business applications are almost always separated by different information repositories and user interfaces,” says Mark Levitt, Research VP for IDC’s Collaborative Computing program. “What needs to happen for collaboration to rise to the next level and reach a much broader audience is for collaborative functionality to be available as an integral part of business applications and Web sites.”

“Contextual collaboration will usher in a tighter integration of existing offerings with business process applications like customer relationship management [CRM] and enterprise resource planning [ERP] applications . . .” says Robert Mahowald,

Research Manager for IDC’s Collaborative Computing program. “Application developers will also take a modular approach to collaborative products and hosted services to make it easier to embed collaborative functionality on an as-needed basis within specific business contexts,” he continues. “People will have a better window on corporate information and a clearer path to discussing that information with the right people to make quick, informed decisions,” adds Mahowald.

SECURITY: MANDATORY AND ACHIEVABLE

Of course, the breadth of information technology and the critical nature of the business information it touches, invokes another universally important need: the necessity of ensuring record/transaction security. Paper records have always been subject to safeguards, and still are. Since the advent of PCs, networks, and, the Internet, the challenges have escalated. Rich Pethia, Director of the CERT® Centers, a government-funded center of Internet security expertise at Carnegie Mellon University, recently testified before the US Congress that current IT security solutions are often not keeping pace with the increased strength and speed of attacks. “Our information infrastructures are at risk,” he says. “In the past, intruders found vulnerable computers by scanning each computer individually, in effect limiting the number of computers that could be compromised in a short period of time. Now intruders use worm technology to achieve exponential growth in the number of com-

“Now intruders use worm technology to achieve exponential growth in the number of computers scanned and compromised. Likewise, system administrators and users have little time to protect their systems.” —Rich Pethia, CERT

puters scanned and compromised. Likewise, system administrators and users have little time to protect their systems” he says.

What’s the solution? Increased redundancy, offsite backup, and more potent security solutions running, in some cases, on dedicated servers. US-based OnLine Taxes, a contender in the growing market for electronic tax filings with the US federal government, got security help from IBM (see sidebar on page 9).

IBM helped the company with an integrated database and mail server solution that provides the critical level of security necessary to handle sensitive personal financial information as well as continuous uptime during the annual tax-filing season.

Similarly, while not the prime focus, security was never far from sight when UT Medical Group, a multi-specialty physicians practice affiliated with the University of Tennessee Health Science Center, needed to build a data warehouse for its 8 million patient records. “The task of storing and securing our data warehouse was solved by IBM’s new iSCSI storage system,” explains Shane Smith, Server System Analyst at UT Medical Group. Smith said his organization has a total of about 1.3 terabytes of storage space online, which is shared by many servers, including a patient data warehouse server. It is connected via gigabit fiber to a dedicated layer-2 switch that is isolated from the outside network. There are tight restrictions for user-level access to the data on the iSCSI system. Patient information is only accessible using the data warehouse applications, and those applications are limited to a small number of business managers, adds Smith.

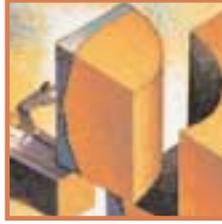
ENTERPRISE APPLICATION SOLUTIONS— PROVIDING A BUSINESS-WIDE PERSPECTIVE

Organizations seeking to gain the maximum leverage from IT investments sometimes find that the integrative approach of enterprise application solutions [EAS]—tying together multiple facets of functionality with the right infrastructure—is exactly the right investment. In many cases, organizations seeking to implement complex changes or enhance capabilities will discover that they can do so more cost-effectively and more quickly with EAS.

Enterprise application solutions are designed to be flexible and scalable—able to grow with an organization. EAS automates and integrates business process applications to help companies reduce production costs, improve time to market, strengthen customer interactions and increase information sharing throughout the value chain.

Enterprise application solutions, which combine traditional CRM, ERP and supply chain management (SCM), are supported by IBM @server platforms. Key features of IBM hardware include reliability and scalability, broad support of open standards, and self-managing features that allow the system to continually support infrastructure requirements.

IBM has an extensive record of successful EAS implementations in companies of many sizes, across a full range of industries and in nearly every country in the world. For example, more than 4,000 customers have chosen a UNIX solution, the IBM @server pSeries and its predecessor, the RS/6000, for EAS implementations.



TARGETING AFFORDABILITY

A promise of the open-system era has been reduced cost. Mixed computing often creates environments within enterprises that can be complex and pose new challenges in management. Often there are many servers from different vendors and different architectures that require skills in multiple operating systems. Sometimes it is subtle or not-so-subtle differences between devices that cause challenges. Or, it may be that a vendor has gone out of business or merged with another company that is less interested in handling on-going support issues. And when end users get into the act of vendor proliferation, the result can be slowed networking, software problems, or worse. (What's more, end users who are trying to solve IT problems are probably not being as productive as they should be in their primary area of specialization.)

Thus, without the right infrastructure and integration strategy, the reality of mixed computing can pose additional costs and complexity.

One way to reduce these costs is through building an IT infrastructure that can completely manage itself—even in a heterogeneous operating environment.

IBM AUTOMATES COMPUTING THROUGH SELF-MANAGING FEATURES

Like the human body's self-regulating autonomic nervous system—the system that tells our hearts when to beat faster, regulates our breathing, and ensures proper blood-sugar levels—autonomic computing is the term that defines IBM's next generation of computing.

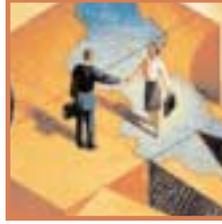
In a recent Gartner Group "First Take," Mike Chuba, Thomas Bittman, and George Weiss note; "the pressing need for self-managing and self-heal-

ing systems...caused by the dramatic growth in the number of systems and IT staff's inability to manage those environments."

IBM is developing hardware and software designed to address this need and manage themselves without intervention from humans. Committed to delivering on this vision, IBM is focused on four core tenets: self-configuring, self-healing, self-protecting, and self-optimizing.

Self-configuring refers to the ability for servers to define themselves "on the fly." This aspect of self-managing means that new features, software and servers can be dynamically added to the enterprise infrastructure with no disruption of services. Today, IBM systems are designed to provide this at a feature level with capabilities like plug-and-play devices, configuration setup wizards, and wireless server management. These features allow for the dynamic adding of functions to the business infrastructure with minimum human intervention. Self-configuring not only includes the ability for each individual system to configure itself on the fly, but also for servers within the enterprise to configure themselves into the enterprise's e-business infrastructure. IBM aims to provide self-configuration capabilities for the entire IT infrastructure not only for individual servers, but also for software and storage devices.

For a system to be self-healing, it must be able to recover from a failing component by first detecting and isolating the failed component, taking it offline, fixing or isolating the failed component, and reintroducing the fixed or replacement component into service without any application disruption. IBM's objective in this area is to predict the failure and prevent it from having



“The ultimate test of an information system is that there are no surprises.”

—Peter F. Drucker

application impact. In other words, to minimize outages in order to keep the enterprise applications up and available at all times. This strategy includes maximizing the reliability and availability design within each hardware and software product to help maintain continuous availability of applications and systems.

Self-protecting systems provide the ability to define and manage the access from users to all the resources within the enterprise, protect against unauthorized resource access, detect intrusions and report these activities as they occur, as well as provide backup/recovery capabilities that are as secure as the original resource management systems. A substantial number of self-protecting technologies are already included in IBM systems today, including LDAP (Light-weight Directory Access Protocol), Kerberos, hardware encryption, and SSL (Secured Sockets Layer).

Self-optimization requires a system to efficiently maximize resource utilization to meet end-user needs with no human intervention required. Today's IBM servers already include industry-leading technologies like logical partitioning, dynamic workload management, and dynamic server clustering. These capabilities are being extended across multiple heterogeneous systems to provide a single collection of resources to be managed by a single workload manager across the enterprise. This will allow the systems to be used in an optimal fashion to meet end-user needs across the enterprise. IBM's resource allocation and workload management allows dynamic resource movement to appropriate workloads, and for workloads to be moved to the locations and resources where their needs can best be met. These features

allow enterprises to optimize resource usage across the collection of systems within their infrastructure while also maintaining the flexibility needed to meet the ever-changing needs of the organization.

MAKING THE RIGHT CHOICES

No matter the specific goals your company has and regardless of what kind of innovation you are seeking to harness, selecting and leveraging the right IT solution can help ensure success. As international Management Consultant Peter F. Drucker observes in one of his most recent books, *Management Challenges for the 21st Century*, “The ultimate test of an information system is that there are no surprises. Before events become significant, executives have already adjusted to them...and taken appropriate action.” **

That, in essence, is the benefit provided by smart, innovative IT investments. Whether looked at tactically or strategically, good IT means no surprises. Individual customers' wants and needs are understood, their requirements met, and their problems solved. Ideal shop-floor practices are captured and imbedded in productivity tools that make repeating good results easy and achieving better results a simple matter-of-fact proposition. And, for top managers, the “feel” of the business, the pulse of the customer, and the trend lines of the marketplace are all equally accessible.

The power of IT has never been greater. And, with today's powerful, innovative solutions, IT investments are better able to pay dividends far into the future—providing a long-term foundation for business growth. •

Technology is a business advantage.

THE IBM @server STORY.

It's all too easy to think of servers (if you think about them at all) as the 21st Century technological equivalent of the boiler in your building—a "take-me-for-granted" commodity. However, in this world of ever-decreasing margins and ever-increasing competition, technology—especially server technology—can be a business advantage.

@server FROM IBM.

The universe of e-business is server-centric—that is, revolving around the server. Because servers are the infrastructure that runs your infrastructure. Your file and print, your e-mail, your CRM software, your datacenter, your Web site, the security of your data, in short, most vital facets of e-business touch the server. So if you want to improve your business, your ROI, your responsiveness, start with the server.

THE IBM @server DIFFERENCE. PART 1.

It's called Linux. And it's not hyperbole to say it's the future of e-business. In fact, you might even say the future is now. Because Linux is non-proprietary and therefore, open. It runs on a wide range of platforms. And what's more, many of IBM programmers are working on Linux based solutions that will be relevant to your business needs. No wonder that according to ¹⁾IDC, Linux is the world's fastest-growing server operating system—with a projected 38% of the server operating system market by 2004.

THE IBM @server DIFFERENCE. PART 2.

Server, Heal Thyself. Remember the phrase. Because many people believe self-healing, self-managing abilities are the biggest news in servers since the server itself was invented. But first a little background. The Internet, as you know, is driving fundamental change. It is transforming traditional IT businesses and is becoming the computing platform of the future. Behind all this, naturally is the server. And so, the more important the Internet becomes the more important the server becomes. Therefore, IBM @server is endowed with technology designed to make them self-managing, self-optimizing, self-configuring, self-healing and self-protecting. In other words, virtually

self-sufficient, now and into the future. Simply put, the self-healing, self-managing technology in IBM @server is designed to decrease systems outages and increase server availability, and perhaps most importantly, lower your Total Cost of Ownership.

INSECURE WORLD. SECURE SERVERS.

Protecting your business starts with protecting your infrastructure. And that starts with IBM @server. After all, as your e-business grows, so does the potential for disaster. ²⁾ In fact, a recent survey by the Computer Security Institute discovered that 90% of respondents reported detecting a computer security breach within the past year. ³⁾ What's more, 80% acknowledged financial losses from security breaches averaging a staggering \$456 million over a 72 month period. That's one of the reasons why IBM is using technology that allows for the integration of software, storage, and servers onto a single system. This can help protect your system from violations and help detect any improper access. It also reports this activity immediately.

AND IN CONCLUSION.

Servers are not the rock stars of the technology world. But, because they help run the vital functions of your company, they can make a profound difference to your company. And its future. Another profound difference can be made by the people who support your growing business. With IBM, you own more than a server. Through our network of Business Partners, you'll find over 90,000 people who can offer no-nonsense service and support. So whether you need an on-site installation package, a Support Line and hardware maintenance package or solution providers that develop applications for an industry like yours, you can find it with IBM. These 90,000 strong focus on getting the job done. Right. We have a track record of helping growing businesses implement e-business solutions that deliver measurable ROI and greater efficiency. By phone, by Internet, we're here for you.

Let us prove it to you. Visit IBM @server at **ibm.com/eserver** and get yourself every business advantage you can.

All numbers and results reported are from customer sources. This customer example is intended as an illustration only. Costs and results obtained in other customer environments will vary depending, among other things, on individual customer configurations and conditions. ¹⁾ IDC source: IDC, Worldwide Client and Server Operating Environments Market Forecast and Analysis Summary, 2001-2005, August, 2001. ²⁾ 2002 CSI/FBI Computer Crime and Security Survey ³⁾ 2001 CSI/FBI Computer Crime and Security Survey. IBM, the e-business logo, xSeries, iSeries, pSeries, Lotus and Domino are trademarks or registered trademarks of International Business Machines Corporation. Linux is a registered trademark of Linus Torvalds. Intel is a registered trademark of Intel Corporation or its subsidiaries in the United States and other countries. UNIX is a registered trademark of The Open Group. Microsoft and Windows are trademarks of Microsoft Corporation in the United States, other countries, or both. Other company, product and service names may be trademarks or service marks of others. ©2002 IBM Corporation. All rights reserved.