

The logo for Baroudi Bloor features the company name in a serif font. The text is white and set against a blue background that is shaped like a speech bubble pointing to the left.

BAROUDI BLOOR

**Business Needs
Systems Management that
Thinks on its Feet**

IBM Delivers it – On Demand

“What can be done by machine must be done by machine.”

Overview and Summary

The risk is high and it is growing. Organizations teeter on the edge of systems chaos. Systems administrators are stressed beyond tolerance by too many systems, too many devices, applications and requests for change, too much data, too few resources and too little time. The scope, frequency and diversity of demand are enough to make honest administrators cry uncle and make scared administrators hide. Most organizations are at far greater risk than anyone dares admit.

That’s the problem and the reason for it is obvious. Disparate systems and resources are being brought together in the continuous effort to use IT to further business. Yet, without the integrated view of events that systems management technology provides, no organization is under control, and informed decision-making is not possible. Too little time, too much to know.

The answer is also clear: What can be done by machine must be done by machine. Security breach detected? Fix it. More resources needed? Allocate them. Employees terminated? Deny access to all the systems and applications they have access to, alert coworkers, customers and suppliers as appropriate. And do it automatically. We simply can’t do it any other way.

So, in a nutshell, this is the problem and the solution. In this paper we examine the problem in depth, offer a vision of how it can be resolved and then examine the IBM Tivoli solution.

In our view:

- The problem is not going to go away and will likely get worse.
- Sophisticated systems management technology, particularly smart autonomic technology, is required to nail it
- Wrapped up in IBM’s drive to “on demand business,” IBM Tivoli’s products focus strongly on this problem and offer a viable, and even inviting road forward.

Stating the Problem

Managing the information, people, processes, systems and relationships within organizations has grown too complicated. Not only are there more systems to manage, but more intricate relationships among those systems, within and between organizations. Companies don’t have the option of being insular. Success relies on thoroughly understanding and managing the interactions among the data, proprietary applications, the internal and external contributors, diverse systems, and multi-vendor resources.

An organization needs to be *on* – dynamically aware, available, responsive, resilient, robust. It needs to be so tightly tied to its technology infrastructure that business can be transacted at any time, from any place, the way the customer wants it. It needs to be *on target* and *on track* to streamlining processes, meeting business goals, and moving the company forward.

For technology to support the business, it must be a living part of the business. Technology becomes the very lifeblood, the conduit through which business energy flows. Like a living body, interconnected systems deliver information, command and response. Every corporate action, reaction and interaction should be enabled by, verified by, and supervised by IT infrastructure that mirrors the business.

Companies have few tools that provide a clear view of the myriad parts and complex relationships. They need intelligent systems, data and process management to see what needs to be done and do it – management so intelligent that in many cases it simply does the right thing without having to be told to.

Less is More: Good Technology Makes Life Better

Technology promises to make things better. In the world of systems management, better means more control, less complexity. Yet, on the way to good technology, most organizations are bombarded by new technologies and demands for change that outpace the organization's ability to cope. Not long ago pundits predicted four-day work-weeks made possible by technological innovation. As most can attest, that vision is about as real as the paperless office.

The failure is not lack of innovation – wafer thin gigabit storage devices, Wi-Fi communication, and data analytics testify to technology's advancement. Rather, the problem is the surfeit of innovation and the overwhelming number of systems and devices available. The average large company has as many as ten different flavors of Windows systems at any given time, and that's just Windows. UNIX platforms are even more diverse. Upgrading a proprietary application on a single platform can be daunting enough. If it has to be upgraded on fifteen different platforms, the effort and time grow exponentially.

The roles and relationships of people matter too: The mix of individuals in the transaction chain includes full-time employees, contractors, temps, partners, consultants, and external suppliers. Each class of individual has policies, benefits, access and procedures particular to it. An individual may have more than one role that in turn may grant access to more than one set of systems.

Management needs to be able to control access and policy by class, role *and* individual. International companies with tens of thousands of users distributed around the globe have a hard time keeping employee lists current. Taxes, salaries and benefits are all costs that hinge on the accuracy of these lists, yet paid benefits and account access often persist long after an employee is gone. What organization can afford to keep paying for former employees or risk malevolent action because access was never denied? Add the demand that systems comply with legislative mandates, and most organizations struggle under their own weight.

At the level of the technology, the problem is similar. Outdated servers serve legacy function that is on no current network map and undocumented code lies embedded in critical applications. Combine volatile technology to continuing changes of staff and process, and it's easy to understand why organizations are out of control.

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“...until IT is correctly coupled with each element of process, user and system, it may be more of a problem than an asset.”

“Integrated information depends on integrated systems and ... open standards are critical to integration success.”

Switching On (to the Solution)

Turning complex enterprises into businesses that are available, on target, and on track is a tall order. The vision is of an organization with no blind spots, one that works unobtrusively, is resilient, predictive and proactive, one that delivers solid business value seamlessly – all the time. Here’s what it looks like:

IT is Business; Business is IT

Business and technology are converging. Wherever business processes can be standardized, automated and integrated, IT has a role. Sometimes IT follows the business process. Sometimes it changes it. Ultimately the two need to function as one.

IT promises better consistency, availability and scalability. But until IT is correctly coupled with each element of process, user and system, it may be more of a problem than an asset. Effective business process cannot exist without IT; we have to get it right.

Business transactions and IT transactions are both functions of cost and service level. IT codifies the business agreement. Technologies like XML for data exchange are enabling business and technology to function as one. Indeed, consider the airline business: From reservation to check-in to seat assignment to purchase and baggage routing – without IT, we wouldn’t fly.

No Blind Spots

You can’t manage what you can’t see. The ability to look across the entire enterprise is the most crucial aspect of intelligent management. Without a holistic view, companies aren’t able to see the big picture and risk making bad choices about what and how to optimize. This view must be entirely automated – manual processes are too slow to give timely, critical, accurate information.

A large company that has thousands of entities, be they users, applications, or servers must be able to tie all the relevant pieces together to create information that can be leveraged for business advantage. If one area of an organization is spending money with a supplier that delivers the same goods that another area is getting for half the price, a holistic view will reveal the inefficiency and enable the company to take action.

Nowhere is this more apparent than in the emerging grid computing paradigm, where multiple, disparate systems work together as a single entity. Clear reporting and intelligent analysis tools can gather the relevant information, make the appropriate resources available to the appropriate parties, and account for usage.

Integrated information depends on integrated systems and the progress of technology dictates perpetual integration. To that end, open standards are critical to integration success. They allow organizations to leverage existing technology to reduce deployment time and enable communication across all systems.

Do it Unobtrusively

Technology is at its best when it's invisible, taking care of its own information needs and proactively providing support. It enables people to do their jobs better, without making the job more cumbersome in the process. Creating clear and practical access to aggregate and integrated information allows decision makers to focus on the business issues, not on the technology.

Beyond making critical information easily available, intelligent systems software can perform ordinary business functions in unobtrusive ways. For example, consider storage management:

Storing scanned documents, video and audio files, click-stream data, event logs and e-mail puts a big squeeze on storage. Companies can create bad will by manually monitoring disk usage, hounding users, and leaving themselves vulnerable to complaints of favoritism and abuse. Alternatively, an intelligent management system can act as a silent partner, monitoring disk space, automatically e-mailing users close to their quotas, off-loading aged data to overflow servers, backing up, and reporting usage. Companies can plan for and project budget costs, and system administrators aren't tasked with being the bad guy. Intelligent systems management enables policy enforcement without personality.

Make it Resilient

Change is inevitable in all areas of business. A management system that cannot adapt to unanticipated events grows brittle with age. Systems need to be flexible and adaptable to changes in business process and model as well as to new technologies. And change should be reversible – we need to be able to roll back to the previous version of an application without drama.

Changes in business process mandate immediate changes in IT. Merging companies or disparate divisions of one company often requires the integration of different business models as well as divergent IT systems. Manually integrating user accounts, access and control is costly and creates vulnerabilities.

An intelligent management system can act automatically. Using identity management technology, user lists and access groups can be controlled through a central console and radiated automatically to all systems - with limited manual interaction.

Predictive, Proactive, Dynamic Management

Predictive systems management uses what it knows to anticipate future events. For example, it learns where and when processing power is available and maximizes it. A server that runs HR by day can be re-allocated to where it's most needed at night – perhaps in reconciling accounts.

“Technology is at its best when it's invisible.”

“Intelligent systems management enables policy enforcement without personality.”

“If systems management is not cost effective, it’s not viable.”

Proactive systems management uses what it knows to prevent or solve problems. For example, all companies and systems are vulnerable to attack. What matters most is the ability to contain and deflect attacks immediately. If product or system vulnerability is detected, remediation needs to be swift and comprehensive. Manually patching or reconfiguring all systems takes too much time – the attacker’s window of opportunity stays open longer than necessary. Proactive remediation fixes systems and deploys countermeasures as soon as the vulnerability is discovered – closing the window of opportunity and protecting the company.

Load balancing and auto-provisioning that leverages underutilized resources and prepares systems to handle the load are predictive and proactive.

Dynamic systems management actively monitors systems usage and reallocates underused resources to meet rising demand. Using resources where they’re needed when they’re needed reduces an organization’s need to buy extra to deal with peak demand.

Cost is the Bottom Line

While the above criteria are critical, if systems management is not cost effective, it’s not viable. For maximum value, systems management solutions must be deployed rapidly. Great technologies often consume their potential ROI in their deployment phase. Another “got’cha” can come in the hidden cost of administration. Solutions that cost less to install but more to administer are no prize. And most importantly, the technology must truly serve the business need. Without a validation of the appropriateness and viability of a prospective technology, it should never cross the threshold of the business. Money, time and resources are often lost on initiatives that should never have begun.

To realize on demand, to tightly couple IT to business value and process, companies must work with vendors that understand their unique requirements and that can provide technology solutions powerful and flexible enough to support them. Intelligent systems management provides three things:

- Reduced management overhead for the systems, users, and resources it’s managing
- Integrated information and business tools for improved business decisions
- Reduced Total Cost of Ownership for the management system itself

Beyond that, Baroudi Bloor believes intelligent systems management automates whatever can be automated, learns and gets better over time, and responds in real time to actual situations. Intelligent systems management thinks on its feet.

IBM's Vision for On Demand

IBM has translated the market need for on demand business into concrete, achievable criteria and is focusing all it has to make it a deliverable reality today. Here's how IBM sees the on-demand world:

- Businesses use integrated, end-to-end technology as an integral part of business process.
- Businesses interact with customers, partners, and employees seamlessly, intelligently and consistently, implementing policies, roles and processes that secure and enable the business.
- Businesses have comprehensive, integrated vision into whole business processes, enabling informed and timely decision making.
- Technology monitors itself, diagnoses itself, heals itself.
- Systems allocate and reallocate resources when and where they're needed.
- IT adapts flexibly to changing business models and demands.

On demand means business around the clock, around the globe, whenever and wherever. To support business on demand, business and IT become one and the same – intelligent business means an intelligent operating environment.

Integration, Virtualization, and Automation

Conceptually and practically, IBM is creating on demand environments using three principles:

- **Integration:** The integration of people, processes and information, anywhere, any time and from any device. An on demand environment is an integrated whole.
- **Virtualization:** Separating the layer of business applications from the underlying physical environment of networks, servers and storage systems, so that applications can be more flexibly deployed.
- **Automation:** Automating (and reducing complexity) the operating environment in line with defined policies and business objectives.

Key to delivering the on demand operating environment is intelligent system management. For that, IBM Tivoli takes center stage.

“On demand means business around the clock, around the globe, whenever and wherever.”

“...IBM is not being flip-pant in using the principle of automation as a key driver.”

IBM Tivoli On Demand

At the core of the operating environment, IBM Tivoli provides the management intelligence for the evolving on demand organization. Tivoli began life as a management framework, but eventually changed course after failing to deliver on some of the promise. IBM turned the Tivoli product portfolio around, transforming Tivoli into a systems management platform and adding the smarts to bring Tivoli to a new level. The Tivoli platform is now one of the major pillars of IBM's on demand initiative providing comprehensive, integrated vision to the whole of the operating environment and delivering the autonomic functionality key to IBM's on demand strategy.

Integration Drives Business Clarity and ROI

Integration is one thing; *integrated vision* is another. IBM Tivoli is delivering an accurate, comprehensive view of the virtual whole, not just the systems, resources, networks, applications and users, but an integrated view that includes all business processes. Tying all IT to business process enables management to see what it needs to see and do what it needs to do – just like that. Tivoli's holistic approach to systems management brings critical insight into:

- The relationships between users and their various roles
- Resources and their disparate uses
- Processes and their subtle contentions

This powerful, integrated view makes highly informed decision-making possible.

Transformation through Automation

For business to survive, more and more must be automated. Not only is the cost of labor prohibitive, humans can't respond to the current volume of data or speed of events. We are too slow. We have created machines and systems that demand response at a rate that only another machine can match. IT is fundamentally about automation, but IBM is not being flippant in using the principle of automation as a key driver in creating the on demand enterprise. IBM defines levels of automation and IBM Tivoli is delivering products to help organizations scale the levels.

Today, most IT infrastructure is at **Level 1**, the *basic level*, where there's little direct integration and each element of infrastructure requires separate management.

At **Level 2**, the *managed level*, organizations use systems management to collect information from disparate systems and devices, reporting significant events or failures to one or more operational consoles. This automates information collection, synthesis and analysis to some degree. As networks grow and systems become more complex, most organizations move to this level.

Level 3, *management by infrastructure*, requires less human activity to manage corporate systems and resources. Smarter system management technology can recognize patterns and predict the actions an administrator needs to take, often before problems arise.

At the *adaptive level*, **Level 4**, organizations approach an autonomic capability. Here the infrastructure itself recognizes most problems and responds automatically with corrective actions without any need for human intervention.

Level 5, the *autonomic level*, defines the highest possible level of automation. Here, all management activity is automated. IT users set management policies in line with business objectives. Intelligent systems management solutions monitor the outcome and inform IT users automatically. IBM's vision is of IT that is self-configuring, self-monitoring, self-protecting, self-healing, and self-optimizing. The concept of autonomic comes from biology where we see organisms, including us, that model these attributes.

The IT industry has never attempted to deliver automation at such a level and providing such automation across the vast range of software, hardware and legacy systems that exist is no simple task.

However IBM has clearly done a great deal of thinking and analysis in this area and has formulated what we believe to be a viable road towards a desirable goal - a road that embraces both business savvy and a good deal of common sense. Moreover, IBM is architecting its whole product portfolio in line with its on demand vision for business and its autonomic vision for technology.

Although IBM has defined these levels of automation for IT, they are recognizable in the maturation of other technologies. For example, take the history of automobile technology. Originally, all components were independent and failed independently - requiring a mechanic to replace parts (basic level). With time, car manufacturers added warning lights, failure lights and dials to alert the driver of problems so that corrective action could be taken sometimes before outright failure (managed level).

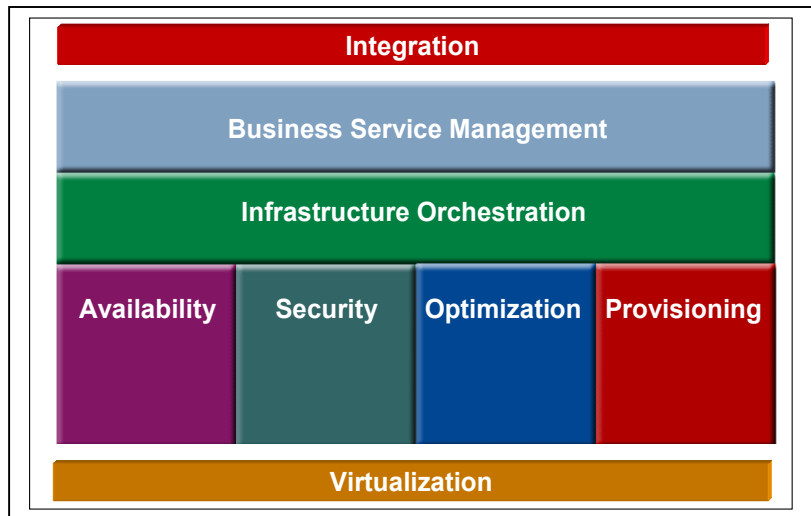
Today in-car computers gather information from sophisticated sensors and provide information readable at the automated garage (management by infrastructure). Also, with the addition of still more sensors the automobile began to be responsive and take a level of direct control, for example, dynamically adjusting the activity of the engine to ensure the efficient burning of fuel (adaptive level). As a result, newer cars fail far less frequently and require much less human activity in their maintenance.

In an on demand world, organizations will need to follow such an evolution. They will need to move to the highest levels of automation. It will no longer be possible to manually manage the infrastructures that run their information systems, because the infrastructures will be too extensive and too complex. Semi-automation will be too expensive, too slow and too damaging to the business.

IBM Tivoli and Automation

In addition to its definition of the levels of automation, IBM has formulated Automation Guidelines – a simple and elegant representation of the automation of infrastructure, aimed at reducing the complexity of technology and increasing the focus on business goals. This is illustrated in the diagram below.

“... Semi-automation will be too expensive, too slow and too damaging to the business.”



IBM Automation Guidelines © IBM Corporation 2003

Acknowledging the heterogeneous nature of infrastructure, the blueprint helps customers implement automation piece by piece, in an evolutionary manner. The layers cover all aspects of service and infrastructure management for business driven automation and are best explained from the bottom up.

Virtualization, the foundation layer, covers all software and system resources. Such resources need to be as flexible as possible to allow diverse usage and automated provisioning. Whenever possible they need to be usable as *virtual resources* and provisioned dynamically according to business need as defined by policy. IBM itself offers a wide portfolio of hardware and software with built-in autonomic capabilities. However this layer includes and addresses legacy and multi-vendor hardware and software less equipped for flexible deployment that can be dealt with as business policy dictates.

The next layer up, **Automated Management**, includes four elements.

- **Availability** defines system and service availability according to business need, which goes from 24x7 to low priority, and includes disaster recovery.
- **Security** includes defending systems from threats as well as identity management, which manages access to applications and services.
- **Optimization** makes the most efficient use of resources in order to provide the maximum return on hardware and software investment.
- **Provisioning** is the dynamic allocation and configuration of resources in response to demand. When fully automated, complete with identity management, it means the IT infrastructure changes and grows in direct response to the activities of the business.

The Tivoli product portfolio provides most of the automated capabilities in this layer. For example, Tivoli Risk Manager automatically analyzes security threats and responds to them. It aggregates and correlates data from firewalls, intrusion detections systems and other security devices, intelligently interprets the data to provide targeted threat assessment, and issues alerts or provides automatic fixes where needed.

Tivoli Storage Manager handles backup and archiving across multi-vendor systems, performs self-optimizing scans of storage devices across the enterprise, manages and balances disk and resource use, and sets policies to maximize return. Tivoli Storage Resource Manager, working in conjunction with TotalStorage Enterprise Storage Subsystem, automatically provisions storage resources.

IBM servers' availability features, disaster recovery offerings and fundamental provisioning capabilities complement Tivoli's systems management capabilities. Security systems embedded in IBM hardware augment Tivoli's extensive security offerings.

Infrastructure Orchestration rests on top of the automated management layer and provides the policy layer that coordinates management across the infrastructure. The definition of policy in line with business constraints and business goals determines what the automation actually does. Policy determines priority and order. Without policy, every application would contend with every other for every resource, all the time. Every event would have the same urgency, every user the same access.

Infrastructure orchestration defines the interplay between policies and provides the overarching guidance that ties all policy within an organization together. Policy-based orchestration is specific to the needs of each organization, allowing the flexibility critical to business excellence.

While we might easily be able to separate the activities of security and, say, provisioning in our minds, they are not so easy to separate in practice. We need policy to determine right action. The complexity of such considerations can only be resolved if an organization has set policy ahead of time. Tivoli gathers fine-grained information that can be analyzed to help organizations determine appropriate business policies.

On top, **Business Service Management** says how business is delivered to its users, both internal and external. IBM Tivoli provides the tools for managing service levels, recording resource usage and, if appropriate, billing partners and customers. In this layer, IBM Tivoli seeks to manage the business processes from end to end, tying IT directly to business processes. IBM Tivoli's service level management capabilities work with IBM WebSphere's end-to-end business process management and integration to help organizations realize on demand. Here again IBM is demonstrating its commitment to open standards by working to help tie business process to Web Services using XML.

IBM's Automation Guidelines paint a clear picture of the nature of on demand infrastructure and offers a road map to the future - of a virtualized infrastructure layer managed by autonomic software, governed by policy orchestration and providing business-driven service management.

“Without policy, every application would contend with every other for every resource, all the me.”

“While we might easily be able to separate the activities of security and, say, provisioning, in our minds, they are not so easy to separate in practice.”

The business impact of this kind of capability can be dramatic.

Technology that knows much more about the IT infrastructure than any human being can

IBM Tivoli Intelligent ThinkDynamic Orchestrator

IBM Tivoli added extremely powerful new automated management capabilities by acquiring Think Dynamics in May 2003. The IBM Tivoli Intelligent ThinkDynamic Orchestrator aggressively addresses the issues of availability, security, optimization and provisioning that cripple organizations.

Tivoli Orchestrator provides enormous flexibility allowing automatic, semiautomatic and manual response as appropriate. According to an organization's defined business policies, Tivoli Orchestrator responds to changes in demand, security threats and systems failures to make resources available when and where they're needed. It enables businesses to manipulate their IT environments in real time enabling IT to respond to the *immediate* needs of the business, providing what IBM touts as "Sense and Trigger" response to IT demand.

Tivoli Orchestrator provides smooth, quick, safe configuration, provisioning, allocation and reallocation of resources including servers, operating systems, middleware, applications and network devices acting as routers, switches, firewalls, and load balancers. By establishing shared pools of resources and dynamically provisioning as needed, organizations need fewer resources while still allowing applications to run as isolated, dedicated infrastructures.

Tivoli Orchestrator requires no ripping and replacing. Using existing hardware, software and network devices without rewiring can dramatically reduce the over-buying done to accommodate peak capacity. Industry research suggests that organizations on average use only 15 to 20 percent of the resources they purchase. Imagine spending 80 to 85 less on IT. Tivoli Orchestrator gathers information about the performance of application clusters and builds a workload model that can predict impending resource requirements. Extensible workflows and policies provide a kind of "packaged intelligence." Intelligent action whenever and wherever it's needed helps organizations move from "just in case" capacity to "just in time" promising a significant increase in operational efficiency.

Tightly mapping business goals and process directly to IT, Tivoli Orchestrator can profoundly reduce cost and risk, and ensure service levels. Automatic patch management helps keep systems secure. Using modular, reusable, extensible workflows to codify an organization's best practices, Tivoli Orchestrator extends the benefits of the IBM Tivoli Provisioning Manager.

Technology that can know what resources are being used, can recognize and predict demand fluctuations in real-time and can detect and rectify disastrous failures can also radically improve performance. Technology that knows much more about the IT infrastructure than any human being can not only reduces IT spend, but actually aligns IT with business goals and policies. Additionally it can greatly reduce the need for planning executing resource deployment and eliminates human error and its consequences, from the process.

Tivoli Orchestrator supports heterogeneous environments and is a software product built on open standards such as Linux, Java, XML and SOAP. As a result, the integration of Tivoli Orchestrator across the whole of IBM is being accomplished at record speed. This same open architecture makes it simple, easy and quick to implement throughout large IT installations.

A Future Based on Open Standards

IBM Tivoli is committed to creating an open-management ecosystem that helps organizations leverage and extend their current IT investments – independent of platform and product choice. This commitment, backed by tangible evidence, is one reason Baroudi Bloor believes IBM Tivoli is taking the industry where it needs to go.

To create the extensible, integrated environment, IBM Tivoli leverages open standards. Beyond philosophy and its own implementation, IBM Tivoli supports business with its ongoing work on standards bodies, such as the OASIS Consortium/XML. OASIS (Organization for Structured Information Standards) is a powerful, non-profit, international consortium with more than 600 members around the globe driving the future of technology.

For IBM Tivoli to deliver the comprehensive management solution enterprises desperately need, it must perpetually expand its support to include the open standards products and services enterprises choose, regardless of vendor, system or environment of origin. To this end, Baroudi Bloor lauds IBM's support for the very important not-invented-here technologies: LINUX and J2EE.

IBM Tivoli products support a broad range of systems, storage, and security management on the Linux platform, and make integrating new and emerging technologies straightforward and maintainable. Using open standards helps speed deployment and improves ROI. With support for open standards, companies can feel comfortable that the technology investments they make today have a long shelf life.

Automatic provisioning changes the policy from just-in-case to just-in-time.

“When organizations are empowered by intelligent systems management, rather than held hostage by it, they can put full attention on business.”

Conclusion

As an industry, we have overspent, overdeveloped and left ourselves with operational environments that are dangerously out of control. IBM has stepped back, looked at where technology and business are going and responded with concrete, visionary strategy, products and services to address the pain we have today and prepare us for inevitable changes yet to come.

IBM Tivoli’s Intelligent Management Software and its vision of on demand computing offer tangible relief to an industry hemorrhaging from rapid innovation and growth followed by economic deprivation. When organizations are empowered by intelligent systems management, rather than held hostage by it, they can put full attention on business, feeling confident that IT is there to deliver on business promises, not thrashing in the background out of control.

Only organizations that tie their IT directly to their business goals have a chance at surviving this harsh economic environment. Without comprehensive, intelligent systems management that is automatic, flexible and extensible, they haven’t a prayer.

This paper was created for IBM by Carol Baroudi and Robin Bloor of Baroudi Bloor, a research, analysis and strategic advisory company serving the IT industry.

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