When the butterfly flaps its wings

Adapting to chaos and uncertainty in the electronics industry

An IBM Institute for Business Value executive brief
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When the butterfly flaps its wings

In Brazil, a butterfly flaps its wings, setting off a chain of events that ends with a tornado in Texas.¹ In layman’s terms, chaos theory states that the most unpredictable and seemingly inconsequential events, such as a butterfly flapping its wings, can have a reverberating and unpredictable impact on the most seemingly unconnected systems, such as hemispheric weather patterns. Seemingly random and unrelated events are having similar reverberations in the electronics industry during a period when a fundamental structural shift is muddying the once black-and-white mantra of electronics – “innovate for value.” Events like the worldwide outbreak of SARS (severe acute respiratory syndrome), the terrorist attacks of September 11, 2001, geopolitical upheaval in countries like India or China, earthquakes or blizzards near factories or distribution centers – not to mention the “mundane” worries about such things as demand and earnings volatility – can shake globally dispersed electronics companies’ operations and top-line performance. Investors have turned sour since losing US$4 trillion in shareholder value during the technology bust. Traditional avenues of innovation – the former hallmark of the electronics industry – are now commodities. Just creating a faster processor no longer thrills. Neither do claims of new killer apps and solutions. Over the past 40 years, technology has held business in a trance, with its quest for success. Technology has not delivered the value. And now it is business’ turn to call the shots.

How do you create organizations that are resilient to chaos when you cannot predict the moment that the butterfly will flap its wings, or know where the butterfly is or what the impact could be? Electronics companies need to create new business models and networks that can flex with the unknown and the unpredictable – resulting in an ability to manage earnings volatility in a quarter. This means building more resilient and autonomic capabilities for globally dispersed operations. We call this e-business on demand™.
The on demand challenge: These scenarios describe a few characteristics of on demand companies. More and more electronics companies are redefining operations, and using technology to anticipate and respond to industry changes.

Can you manage volatility in the quarter?
The U.S. announces war with Iraq. Continued recession, and concerns about the length of the war and its cost cause stocks to plummet. Corporate executives decide to continue to postpone capital investment in information technology (IT). CFO Vikram Sethy is unhappy about this situation, but not overly concerned. His company has already globally outsourced non-core activities and holdings in high capital-intensive assets through partnerships. It will not take much to adjust expenses to any fluctuations in revenues and maintain earnings targets. Because of the global dispersion, he also can shift operations as necessary, depending on what happens. While his peers sweat about missing earnings and the subsequent loss of shareholder value, Mr. Sethy can kick back and enjoy his company's continued solid valuations.

Can you or your executives look at company performance anytime, anywhere and get the extended enterprise and partner supply chain to respond autonomically?
It's Sunday night, and Michael Curley, the CEO of a global electronics company, logs onto his computer. An on demand workplace tool instantly sends him a “dashboard” that shows performance across all his company’s major brands and geographies. Mr. Curley notices a potential blip in a new product launch due to an earthquake in northern China. He instant-messages the global head of manufacturing, who reports that the supply chain system has already generated an impact analysis of options, and they have determined optimal strategies to minimize cost and delays and have already begun transferring production to Singapore and other nearby manufacturing locations. All necessary communications have been made with other supply chain partners, and the entire supply chain is moving in concert to manage the fluctuation in capacity. Relieved, Mr. Curley then turns his attention back to the financial news channel on the television.

Can you sense and shape demand?
PC marketing manager Arnold Stallone gets a system-generated alert that notes excess inventory of brand x processors. Mr. Stallone quickly and easily pulls necessary data from multiple legacy systems to model the impact of different promotions and to determine which will have the quickest impact and will be the most cost-effective. He chooses the promotion that will best meet these goals, and alerts about the promotion are sent instantly to channel partners, and prices change automatically in all relevant systems. As a result
of the promotion, customers are convinced of their need to purchase and their ability to get great value from the deal, and start buying in droves. One week later, Mr. Stallone reviews a report, pushed to his Blackberry handheld device, of point-of-sales information from direct and indirect channels. The message notes that inventory and demand are back in line, so Mr. Stallone closes down the promotion. Problem solved.

Can your company act and respond to problems, before customers know there is an issue?
The Smith’s home in Long Island is never too hot and never too cold — the temperature is always just right. The Long Island Power Authority has implemented a thermostat system that measures and remotely controls temperature. The system also analyzes weather forecasts to plan for heat waves, optimize production and avoid power outages. This means that the Smiths never have to think about adjusting the thermostat. It adjusts itself before they even know there has been a temperature change. Savings to the Power Authority and individual customers average about 15 percent.

The electronics industry grows up
It seems like it was only yesterday that electronics companies were flying high. Now like all sectors, the electronics industry has hit middle age. Electronics companies are no longer the fast and flexible startups whose value rocketed with each new product launch; nowadays, factors such as general economic health are more predictive and relevant to performance than technical prowess seems to be. But middle age can be the prime of life. Companies need to let go of their memories of past technology booms and recreate business models to meet new opportunities.

Electronics are the new plastic. Embedded technologies are in everything from cars and appliances to entertainment devices – which means that there are tremendous new opportunities for electronics companies that can talk to customers about how technology solves business issues (e.g., cost, low power, integrated devices). This also means new types of partnerships to create solutions, not product-based business models.
Companies are already looking at the causes for the industry’s shifting in order to find cues about how to enter middle age gracefully and profitably. We examine five primary forces that are driving change in the electronics industry:

Figure 1. The electronics industry is more volatile than GDP.

- **Threats are unpredictable** – The electronics industry has historically been more volatile than gross domestic product (GDP). Short product lifecycles and intense competition drive demand volatility. A consumer electronics company can launch a product today and be certain that, if not tomorrow, then one day soon, there will be a substitute for that product that works just as well for half the price. In addition, globally dispersed companies have to plan for unpredictable nonbusiness threats, such as SARS, September 11, natural disasters and war. In a heavily networked environment, an hour’s worth of downtime can cost a company something like US$50,000 an hour.\(^1\) Because of the capital investment required, electronics companies have to plan for a far-off future, while fending against shortening lifecycles and unpredictable and seemingly daily threats. A rapidly changing environment means that long-term investments may be obsolete by the time they are realized. This results in a kind of schizophrenia, with companies trying to operate simultaneously in two time frames – both the long term and the immediate term.

- **Profits matter** – On some days, it seems that all a butterfly has to do is think about flapping its wings and the market tumbles. One hint of missed earnings or potential shortfalls, and an electronics company’s stocks can plummet 20–30...
percent. The markets are intolerant, particularly after having lost US$4 trillion in value. In a recent study, IBM assessed the earnings of 28 major electronics companies, finding that in the past year alone, revenues were down an average 8 percent, but net income was down a shocking 233 percent. Still saddled with high and inflexible cost structures, electronics companies have yet to figure out how to adjust their expenses to revenues in the same quarter in the face of fluctuating revenues.

Figure 2. The unrelenting price/performance dynamic in the PC industry.


- **Price trumps technology** – The electronics industry is plagued by the tyranny of choice – multiple substitutes, and multiple protocols and standards mean that all technology becomes “good enough,” and price is the primary decision point. Now that the industry has entered middle age, companies cannot just focus on building faster technology widgets and leave the software companies, systems integration consultants and customers to figure out how to use the technology. This model no longer works because faster is no longer significantly better. For example, technical advancements allow us to achieve levels of resolution quality that are more precise than the eye can detect. Particularly in capital-constrained times, for most companies the old stuff seems “good enough.”

Just a few years ago, customers bought into the promise of innovation, only to have their expectations deflated by immature technology. Meanwhile, electronics innovations allow customers to buy more for less. For example, the storage density trend is doubling area density every year so that what cost ten dollars just ten years ago might cost pennies today. There is no room for margin, and the impact of being second into a profitable market is greater.
The profit zone has moved up the solutions stack. Electronics companies now have to develop innovative ways of applying technology to real business issues – hence the drive from hardware to solutions and software. Moving up the solutions stack also means that electronics companies need to get closer to customers in order to understand how to apply technologies like wireless, services, etc., to their business. Brand becomes increasingly important. The right partnerships for access to intellectual property (IP) and markets become more critical. Companies which are able to evolve successfully from product/manufacturing to customer/solutions providers will rediscover the growth and profit potential from their youth.

- *It's an electronics world* – Embedded software, in everything from automobiles to appliances, is only the beginning of a new age for electronics companies. Materials science innovations, such as nanotechnology, may soon allow companies to achieve better, faster, cheaper products. Wireless and middleware and other integration technologies are enabling new ways of doing business. The new opportunities for growth through innovation are in applications, not just faster processor speeds or higher resolution. However, there is a breakdown in the chain. Processing capacity is high relative to demand, but we still don’t have all the broadband and wireless access we need to deliver rich content to all types of devices. Furthermore, the companies that control content (e.g., music companies and Hollywood) still hold on tightly to their intellectual property rights, as business models have not matured sufficiently. Electronics firms are already beginning to innovate to fix the breakdown and unlock new value.

Electronics companies are no longer just selling to other electronics companies, and as a result, need to learn the language of business as they define the value of technology innovation in terms of how they solve customer problems rather than how they show engineering excellence. As an example, entertainment is infiltrating technology.

Figure 3. Successful companies will put the value chain pieces together in new ways to create value (illustrative).


*Note: In a customer-in point of view, customers, not technology are first, so we call this first mile, not last.*
Soon, entertainment will trump business in terms of use – as the number of entertainment devices grows exponentially. Now, technology companies are going to Hollywood in search of new business models and sources of innovation through content delivery. For example, Apple Computer recently launched an online music site where buyers can download their favorite songs for 99 cents. This innovation has paid off. In its first week of business, Apple reported one million downloads, and its stocks rose 27 percent. Chip-maker Intel is at odds with Hollywood, testifying before the U.S. Congress that current digital copy protections wound the public interest. Electronics companies are pushing beyond product-based models to create new sources of value that will require new partnerships for content.

- **Globalization isn’t what it used to be** – Electronics companies have long outsourced manufacturing to South Korea, Singapore and now China in order to access low-cost labor. Increasingly, these companies are looking to India and Romania for application development outsourcing. More and more are moving other processes – application development, finance, human resources, etc.– to offshore sources. We looked at a random sample of eight technology companies, including IBM – and on average, these companies moved 1,500 jobs offshore in 2002. Foreign investments in research and development (R&D) are on the rise. In 1970, the United States accounted for 70 percent of global technology R&D. Today the U.S. accounts for only one-third of the world’s R&D, according to the Alliance for Science & Technology Research in America.

For on demand companies, globalization is not just a cost or outsourcing game – it is about optimizing operations for skill and cost, no matter where. In the past decade, electronics companies have developed truly global operations. However, they have not developed labor and skills sourcing that optimize global reach. IBM built a high-tech factory that makes integrated circuit chips, known as “fab” in New York because that is where the right skills and technology existed. It also happens that the fab, which can operate in lights-out, touchless mode, allows IBM to obviate the low cost with no-cost labor advantage.
Globalization also requires thinking in new ways about how to organize processes to take advantage of scale and reach – like global sourcing, serving global customers or how to handle new emerging markets. Companies are still struggling with how to provide one face to their customers who are global and expect consistent global service no matter where, no matter when. The emergence of newer economic powers also means potentially different requirements, channels and business models. By 2025, it is predicted, Asia will reassume its place at the center of the world economy, accounting for 55 percent of the world's income. Today the West accounts for about 45 percent of the world's economy – and that is expected to decline to between 20 and 30 percent. The average per capita income in Asia is expected to rise to around one-third of the U.S. level, compared with 13 percent today – representing a major potential market.

Electronics companies are feeling the pain of these industry drivers as they try to reduce high and inflexible cost structures, to overcome buyer cynicism and create new value through solutions, and to integrate across an extended enterprise. With interdependent processes across competencies and business units and partners, electronics companies still struggle with operational complexity. Connections between different areas of the enterprise tend to be inflexible and sometimes manual. Without adequate integration, the cost associated with the resulting organizational complexity can sometimes rise to the point where it offsets any benefits that may have been gained from shared processes. Organizational complexity has another negative impact – it impedes electronics companies’ ability to “get religion” about customers and to truly show an integrated face to global customers – increasingly non-technology customers, who expect industry-specific solutions, not just products.

**Responding to the changing environment**

In response to this industry evolution and the rising unpredictability of business, electronics companies need to create more autonomic operations. We describe on demand operations as being more:

- **Focused** – committed to concentrating on core competencies and differentiating tasks and assets that drive productivity, innovation and return, using tightly integrated strategic partners for access to IP and non-core business activities. On demand companies outsource non-core functions to achieve top-quartile performance for less.
• **Responsive** – anticipating customer needs, business changes and unpredictable events and responding – before others can – across an extended and global enterprise (e.g., internal divisions and trading partners) and where it makes the most impact. The concept of “sense and respond” applies to all operations, from customer management to supply chain and manufacturing to IT management and finance, allowing processes to sense issues, assess their impact and autonomically correct them in order to manage volatility.

• **Variable** – able to adapt business process capacity and cost structures in realtime to respond to volatility and to reduce risk while doing business at higher levels of productivity, cost control, capital efficiency and financial predictability.

• **Resilient** – prepared for changes and threats – be they technological, economic, or political – enabling the extended enterprise to operate with the required capacity, security and privacy, 24 by 7 by 365.

Adapting these attributes to operations will help electronics companies deal with market volatility; solve pain around high and inflexible cost structures; shift from manufacturing/product to solutions and customer focus; and support integration across the enterprise and with partners.

It is even more urgent for electronics companies to do this because of the volatility of the market. More than just outsourcing technology, companies must respond with business transformation. New technologies are coming online that have the potential to enable transformation into integrated, adaptable and autonomic operations.

The question is, how do electronics companies create these capabilities?

**Autonomic operations** – Remember back to high school biology: The autonomic nervous system regulates your body’s basic functions without your conscious awareness. For instance, when you run to catch the train, you don’t need to consciously decide to excrete adrenaline, reallocate oxygen to the muscles in your legs or increase your heart rate. Your body does these things automatically.

Technology and operations should demonstrate the same ability to regulate themselves. As we continue to expand the network of partners and systems, they must. There are simply too many operations taking place for humans to oversee.
Reconstructing business

Already, companies are aggressively dismantling empires in an attempt to be more focused and flexible. We can already see the industry disaggregating and attempting to break down product and service silos. In the future, it will be made up of the following types of companies:

- Brands (e.g., consumer electronics, original equipment manufacturers)
- Infrastructure and process providers
- Contract manufacturers (consumer and hardware)
- Component and equipment providers.

This means breaking down businesses to their component parts. Under a component-based structure, the business is divided into autonomous yet interdependent parts that can be optimized to produce greater value. A network of partners enables enterprises to respond rapidly to change, reconfiguring as required for resiliency. A network also allows the company to play big, without getting big. With this business design, process competencies – composed of interlinked components – provide the general operational framework, not products.

Technology is a key ingredient to this transformation. More than any other industry, electronics companies have deployed technology to enable business. Now smart technologies push those capabilities further. For example, technology will ease the friction of enterprise reconfiguration and change will proceed quickly in an industry already used to collaboration.
You know you are on demand when…

These on demand concepts are nothing new. Electronics companies have long talked about the promise of networks, realtime data and analysis and action. What is different is that the technology is now mature enough, and collaboration habits can support these concepts. As a result, new business models will begin to emerge, supported by technology. Partnerships and network models will increasingly become the sine qua non of electronics on demand operations. Companies that can manage a network and continuously shape it to meet new business requirements, rather than just be a node on that network, will lead.

Figure 6. On demand maturity indicates the extent to which companies are focused, responsive, variable, and/or resilient

Source: The IBM Institute for Business Value surveyed 24 IBM global electronics accounts to determine the extent of on demand characteristics and the correlations to business performance. The IBV also performed extensive secondary research, including the examination of financial statements, market studies and analyst reports.
These concepts create tangible, not theoretical, value. Looking at a cross-section of electronics companies, those who are furthest along the path of on demand grew revenues and profits, despite volatility – while those less mature companies saw their revenues and profits erode.\textsuperscript{11}

e-business on demand can change everything about the way electronics companies operate. \textbf{You will know you are on demand when}…

- \textit{Your finance/legal systems can manage volatility in a quarter.} All companies try to match expenses to revenue. Usually there is a two- to three-quarter lag. Our analysis of leading electronics companies showed that revenue is down eight percent, while IT spend has increased three to four percent.\textsuperscript{12} As on demand companies transition fixed costs to more variable structures, they improve their expense-to-revenue ratios and significantly reduce or eliminate earnings volatility. One semiconductor equipment client outsourced non-core processes (e.g., human resources, finance, application management, etc.), creating a variable and virtual company. The result was rapid declines in operating expenses and best-in-class performance metrics. These results are superior to anyone else’s in the industry (operating expenses down 42 percent against the industry decrease of 10 percent, with Property Plants and Equipment (PP&E) down 52 percent against the industry average increase of 11 percent).\textsuperscript{13} This plan made sense in light of variability and the long lead time to adjust expenses in this very capital-intensive industry. The operational flexibility allows our client to quickly adjust expenses as revenues fluctuate.

What would the financial payback be if your company could manage volatility in a quarter? What if you could get best-in-class performance for less cost by outsourcing?

- \textit{Your customer management senses and shapes demand.} For a decade now, companies have tried to orient themselves to be more responsive to market demand. On demand companies don’t just respond to demand, they drive customer requirements. This means, for example, that they have mechanisms that enable them to compile realtime data from multiple sources, such as point-of-sales information and data from remote sensing devices. They can then compare that data with external factors that might impact demand, analyze the comparison and generate a viable action plan in response. As a result, they can understand what is selling and what they have to sell – using promotions and other campaigns to better align supply and demand. Furthermore, they can
provide customers better solutions and service, and customer defections are close to zero. Every customer segment has the potential to be profitable because the companies’ profound knowledge of their customers allows them to vary costs to increase returns.

Today, companies struggle to pull together an integrated view of the customer internally and with external partners. Channels are predominately product-centric and management control remains within business units. All of this impedes companies’ ability to develop true customer intimacy, consistent service and value-added solutions.

Imagine the value of being able to drive demand, rather than simply reacting to it. What if your customer intimacy allowed you to anticipate need and fill it before customers knew they had the need? How would that increase the value to your customers?

- Your internal and external supply chains and manufacturing partners and processes respond in equal time to demand. All companies struggle with time lags in the supply chain – and getting demand wrong can have disastrous results. In 2001, for example, Cisco was forced to write off US$2.2 billion in inventory when it overestimated demand. What if your supply chain/manufacturing operations were designed to flex and change as demand does? Consider the theory behind supply and demand economics. In order to have what “Johnny consumer” wants to buy tomorrow, you have to be able to predict what he will buy and when he will want it in order to have all the components in place to sell it. There is always a certain amount of latency in the supply chain. To reduce that latency, on demand companies are moving from manufacturing/product-oriented companies in which production is based on internal supply chain constraints to customer/configure-to-order supply chains. Among other things, this means product design and manufacturing processes that enable mass production with last-minute customization. It can also mean component solutions that can be “built to order” as the customer makes the purchase.

Electronics companies have long struggled with trying to match supply and demand perfectly in order to reduce supply chain latency, costly oversupply or losses from undersupply. In recent years, as companies tried to restructure and make supply chains more efficient, they actually increased the percentage of buyers that had to wait six weeks or more for a delivery–to 30–40 percent from 15–30 percent in 2001.
What if you could organize your entire value chain to act in time to meet demand, ensuring that products got to market in the right time and right quantities? What if you could see work in progress, or finished product, at any point in time, from any data source (e.g., internal and external) and make course corrections on the fly? How much would you gain?

- Your PLM/innovation processes help ensure that you are consistently first into a market. IBM Business Consulting Services surveyed 75 leading electronics companies on their product lifecycle management pain points. Time-to-market was the top business challenge; and development costs was the second. As the industry matures and products are commoditized, many companies are divesting costly R&D operations or at the very least, reducing their R&D investments. They are turning to partners for access to critical intellectual property, and sharing risk with customers.

On demand companies realize that either they have the scale and skills to have best-in-class R&D or they should outsource it. This may seem like heresy to the innovation-centric electronics industry, but business models are changing. Different from the product innovators of the past that focused on technical advances, a new set of operationally outstanding companies like Dell are leading the industry. These companies make relatively small R&D investments, but they succeed with precision customer focus and re-create operational advantage through process innovation. Dell spends about US$440 million on R&D a year, compared with Hewlett-Packard, which spends about US$4 billion. Furthermore, much of Dell’s innovation is on manufacturing processes, not product. This has not hurt Dell’s stock performance as a technology company.

Efficient development and speed-to-market are critical to electronics companies, for which the window of profitability is becoming shorter and shorter. At one semiconductor company, we worked with the engineering design group to improve PLM processes. Abandoned projects fell from 25 percent to 1 percent; suppliers dwindled from 5,000 to 1,200; reused parts rose from 2 percent to 59 percent; and the time the company was able to spend on its core – product design – grew from 25 percent to 75 percent. In other words, on demand PLM results in massive, multiple and mutually reinforcing gains.
What is the value to you of developing products better, faster and more cheaply? What if your process helped ensure that you were first into a profitable market?

- **Your IT systems automate operations so you don’t even have to be around.** Most companies still consider IT to be a cost center. However, in the on demand world, technology is increasingly a strategic tool that is critical to enabling on demand businesses. Technology tools now truly can enable autonomic management of global processes in realtime. This trend is resulting in CIOs being more strategic business partners. Companies are launching IT projects and making business results core to measuring success. For on demand companies, IT spend will be split 60/40 on new functionality/maintenance. Additionally, industry standards and open architecture are enabling grid computing so that companies can virtualize their infrastructure and cut costs up to 50 percent without giving up capacity.

What if your capacity could expand and contract as business conditions changed? What if your technology investments and spend truly lived up to their promise?

- **Your human capital management strategies help ensure quick, effective decision-making internally and with partners, and therefore, e-mail strings are never more than three messages long.** To improve efficiency, electronics companies are already beginning to break out of their product and service silos by identifying and sharing common enterprise processes such as procurement, human resource management, accounting and elements of the IT infrastructure. They are also beginning to appoint executives responsible for nurturing horizontal competencies such as distribution, manufacturing, risk and processing.

Figure 7. Revenue per employee from 1998 - 2002.

![Bar chart showing revenue per employee from 1998 to 2002](chart.png)

Note: n=23; 1998 n is not significant.

Furthermore, they are optimizing global reach for skills and cost – application development in India, high-technology manufacturing in New York and call centers in Argentina. Global electronics companies are taking global dispersion to the next level, creating on demand workplaces that allow their people to work wherever and whenever they want. They are able to shift teams to meet needs as unpredictable events such as the SARS outbreak arise. When some companies scramble to figure out how to respond, on demand companies were moving global teams from non-affected areas to support client obligations for those units in affected areas. They communicated quickly and efficiently to employees, partners and customers. They used mobile infrastructure to reduce reliance on travel and still enable sales calls and support. In a very real example, the Hong Kong government responded to rampant rumors about the city being quarantined by sending out 6 million text messages.

On demand companies have higher revenues per employee because they are able to deploy resources more effectively and because they have created lean organizations, focused on core skills. Average revenue per employee was about US$300,000 vs. US$150,000–250,000. Cisco Systems’ CEO John Chambers has declared his target of revenue per employee as US$1 million. This is possible due to new workplace productivity tools, outsourcing of non-core processes and general efficiency of on demand organizations.

What if you could communicate to 300,000 employees, partners and customers almost simultaneously – not to mention 6 million? What if you could match people to work and work to people as skill requirements or demand changed? What would you change to achieve sky-high employee-to-revenue ratios?

**Stepping up to on demand**

The urgency for electronics companies to act is greater today due to the volatility inherent in the industry. A true on demand environment will take time to develop as the industry and technology evolve. However, incremental benefits can be realized all along the way if companies learn to apply on demand concepts strategically and systematically. You may not be able to predict when or where the butterfly will flaps its wings. You cannot control chaos. But by creating more flexible and responsive organizations, you can help ensure that chaos will not control you.
Take the on demand challenge. These questions can help you identify where to begin your on demand journey:

**Customer management**
- How effectively can you sense and shape demand?
- Can you anticipate and respond to customer issues before customers know they have a problem? In cases of unexpected turmoil, can you maintain service levels?
- Can you create a comprehensive view of customer data virtually anywhere, anytime and from almost any source (internal and external)?
- Is every customer segment profitable – and how easy is it to make adjustments to increase profitability?

**Supply chain and manufacturing**
- How effectively can you anticipate demand changes?
- How quickly can you shift capacity for supply or manufacturing (in the extended value chain) as demand changes? Can the extended manufacturing chain respond simultaneously – as if it were one factory?
- How autonomic are your factory operations? Can they operate in lights-out, touchless mode?

**PLM and innovation**
- How much investment has been wasted because you were late to market or had the wrong product/solution for the market?
- How closely aligned are you with your customers’ technology road maps? What would they say if they were asked the same question?
- Do you have the engineering economies of scale to have the industry’s best engineering design operations? If not, how much do you outsource? Can you vary design skills and capacity to match needs so you have the right mix – no more, no less?
- Can you flexibly manage your design resources, without regard to where or when?

**IT management**
- Is the CIO role a path to the CEO seat?
- Is 60 percent of your IT budget allocated to new functionality rather than maintenance?
- Is IT held accountable for business results?
- Can your IT capacity adjust in realtime to demand requirements?
- Have you virtualized your IT infrastructure to reduce capital investment? Can your IT spend adjust with revenue fluctuations?
Human capital

- Is your revenue per employee double that of the industry?
- How much do spans and levels of control matter? Do governance systems support distributed decision-making across the enterprise and with partners, and do they support rapid decisions?
- Can you align skills and resources to shifting business objectives in realtime?
- Do you have access to a network of partners and skills databases to ensure that you can fill a job opening within 24 hours? Do you have a just-in-time training infrastructure (e.g., online training) to promote re-skilling and continuing training for key workers?
- Do you have a workplace portal that allows you to match work to people and people to work with no time lag (e.g., they get the information they need when they need it to do their jobs)?
- Do you have single global process owners with authority equivalent to that of product GMs?

Finance/legal

- Can you manage volatility in a quarter or are you still struggling to get costs in line with rapidly eroding revenues?
- Does your CEO have access to performance metrics at any point in time? Do your managers have access to the data they need for decisions?
- Does the speed of your cash management cycle allow you to operate on negative working capital?
- Have you optimized variability and flexibility in terms of cost (e.g., process costs, labor, fixed assets, investment)?
- How effective are your strategies in distributing an appropriate portion of that risk to partners?
To start your on demand journey, we recommend the following simple actions:

- **Determine where you are** – Assess how on demand your operations are and how far they need to go. Determine how to break down siloed structures and internal/external boundaries with partners. Identify possibilities for outsourcing major components that do not hold a comparative advantage for you: customer management, supply chain, PLM/innovation, IT management, human capital, and finance/legal. Analyze how effectively your technology infrastructure can support on demand requirements, e.g., integrated data, smart tools, grid computing for flexibility, capacity and efficiency.

- **Focus on on demand targets** – For core components, develop a business case for the potential economic value that could be unlocked by making that component operate in an on demand fashion and the level of effort needed to get there. Look for opportunities to make the transition using self-funding models. Some portion of the savings from each project should be reinvested in the next step that moves you closer to on demand.

- **Seek partners who will help speed you along the way** – Evaluate your current partners in terms of value to your solutions, access to new markets, ability to supply critical competencies or even contingencies. Determine which can best adapt to your new on demand operations, e.g., technology/network infrastructure, culture, ability to respond with speed and agility, etc. Establish new governance systems that enable your extended partnership to act in concert, as if it were one enterprise.
To learn how IBM Business Consulting Services can help you plan and prepare for an on demand future, we invite you to visit:

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About the authors
The Global Electronics Industry Team created this executive brief.

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References

1 Chaos theory is based on the following two concepts: 1) systems may appear to lack order but there are always underlying, if inexplicable, rules governing them; and 2) small or simple events can cause bigger or more complex events within the same system. Meteorologist Edward Lorenz first described the butterfly effect in 1972. The example of a small event such as the flapping of a butterfly’s wings creating a tornado in Texas illustrates the impossibility of making completely accurate predictions about complex systems. Although the impact of events may be determined by underlying conditions in the system, precisely what those conditions are and what the impact will be can never be sufficiently articulated to allow long-range predictions; www.whatis.com.


3 IBM Research Group.

4 IBM Business Consulting Services analysis.

5 IBM Research Group.

6 IBM Research Group.


8 Companies surveyed included IBM, Dell Computer Corporation, Veritas Software Corporation, Cisco Systems, Intel Corporation, Oracle Corporation, SAP and Sun Microsystems, Inc. IBM Business Consulting Services analysis.

9 www.aboutastra.org.

10 U.S. Bureau of Economic Affairs.

11 IBM Institute for Business Value study on the maturity of on demand in the electronics industry.

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