

White Paper

STRATEGIES FOR SMART SERVICES

The new world of Smart Services is one in which every networked product turns its manufacturer, and in many cases others along the value chain, into a new kind of service business. Early adopters of pervasive computing and connected services are creating unprecedented barriers to competition

The Networking of Every
Manufactured Thing

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Everyone agrees that the world is rapidly moving toward a global, service-based economy. But one rarely hears much detail about how this will come about, and how it will actually work. A global, service-based economy represents a paradigm-shift that arises out of an equally important shift in underlying technologies—the shift from purely human-centric electronic communication to global device-centric communication. The new realm of profitable services required by the new global economy will depend upon the availability of ubiquitous digital information from these newly connected devices.

Today, it's conventional wisdom to say that product companies should embrace services as a new means to generate growth and a sustainable position. The logic has been examined many times: services typically involve a recurring revenue stream, less fixed capital, and potentially much higher margins than those of a strictly product-centric business. Designed and executed properly, services can offer an escape from the downward spiral of commoditization, and create a nearly unbreakable bond with the customer.

It's also quite common to point to GE as a classic case of just how profound the transformation can be. GE went from being from a great product company that offered services to being a great services company that sells products. In fact, GE as a whole now derives almost 38% of its revenues directly from services.

The company's new services must be a wholly different animal than the service offerings of the past, and the customer must perceive them as having entirely new value. They must be "smart services" that are fundamentally preemptive rather than reactive or proactive. Preemptive means action based upon hard field intelligence. You launch a "preemptive strike" to head off an undesirable event when you have real- world evidence that the event is in the offing. Smart services would thus be based upon actual evidence that a machine is about to fail, or that a customer's supply of consumables is about to be depleted, or that a shipment of materials has been delayed, and so on.

Such smart services create new value by removing unpleasant surprises from the customer's life—by preventing the customer from being blindsided by happenstance. Further, the field intelligence makes product performance and customer behavior visible as never before, giving the manufacturer unprecedented R&D feedback and insight into the customer's needs, and thus able to provide ever greater ongoing value.

Gathering and analyzing the necessary field intelligence is not a role for human beings. The only way to achieve it is to have the product's own "machine intelligence" continually delivered back to its creator. This requires three things:

- ▶ Giving products something worthwhile to say and the ability to say it. "Something to say" comes from sensors and microprocessors in the product, most of which are already there. The ability to speak comes from giving the product some form of wired or wireless connectivity.
- ▶ Putting the product in an "atmosphere" where it can speak and be heard. This requires connecting the product to a global data network. The man in the street calls this network "the Internet."
- ▶ Listening to what the product has told you. This means collecting and analyzing the device-data to yield actionable business information, and then integrating it across the enterprise.

All companies considering machine-to-machine (M2M) or connected device adoption agree that the future of their businesses will be shaped by new, significant revenue opportunities emerging from the availability of the information provided by these newly connected devices. This world of smart, connected devices is becoming the enabling platform for smart services.

THE PARADIGM SHIFT TO PERVASIVE COMPUTING

If you cook a nice tomato or leek soup in your kitchen, and then "finish" it by stirring in a cup of cream before serving, where's the cream? Has it "gone away"? Does the soup "end" somewhere, and the cream "begin"? The cream is quite definitely "there," just not in the way it was before. And the soup has been profoundly changed by the pervasive cream, even though the cream is no longer cream in the pure, discrete sense.

Now, think of the entire manufactured world as the soup, and digital computing as the cream. For decades, we have been steadily building electronic intelligence into manufactured objects by means of sensors, controllers, and microprocessors. Today, virtually all products that use electricity—from toys and coffee makers to cars and medical diagnostics—possess inherent data-processing capability. It thus follows that virtually all electronic and electro-mechanical products now contain a wealth of information about their status, usage, and performance. And if a manufacturing machine, or a consumer product, or a building is not presently monitoring every detail that its creator might wish to extract, it can easily and cheaply be made to do so.





Until recently, this information has gone largely unharvested and unleveraged, even though it can offer extraordinary business advantage to the companies that manufacture and service those products, especially in terms of customer relationships. Most electronic and electro-mechanical products are still viewed as standalone objects, not things that could or should be connected. But with the advent of the Internet (which is, after all, a global data network), along with recent developments in large-scale storage and data mining, the major obstacles to intelligent device networking vanished almost overnight.

For some years now, Harbor Research has used the term “Pervasive Internet” to describe the convergence of pervasive computing and global data networking, and the profound business opportunities that this convergence represents.

Underlying the Pervasive Internet is an overarching vision of “smart things” and system automation that has been explored by futurists since at least the 1950s.

Networked “embedded intelligence” is what the Pervasive Internet is all about. It puts the “smart” in smart services, and it will bend the traditional linear value chain into a “feedback loop” through which the heartbeats of manufactured objects will continually flow back through the complex business alliances that create, distribute, and service those objects. As it evolves, this infrastructure for “living intelligence” will amount to nothing less than a “global digital nervous system” for commerce—indeed, for society itself.

If you applied this vision in a practical way to business, it might simply be called “electronic commerce”—but not the e-commerce of the dot-com era, which is really “e-shopping.” Genuine e-commerce, by contrast, re-thinks the whole relationship of people and devices to business systems. In a true e-commerce infrastructure, reliable and blindingly fast microprocessors do what they are very good at doing (and what people are very bad at doing): digesting billions of data-points, talking to each other about the data, controlling each other based upon the state of the data, all in a matter of nanoseconds. Human beings cannot do this, nor should they; this incessant stream of ongoing business information should be “invisible” to people. At the same time, all this invisible machine activity makes the state of (i.e., the information about) a business’s assets, costs, and liabilities vastly more visible to managers and to the decision-making process—when decision-makers need or want to know.

Unfortunately, while most “product-centric” businesses are now embracing services they are not thinking “smart services.” Thus they are in serious danger of moving aggressively to implement—by about 2010—a 1990s “dumb services” strategy in which the blind continue to lead the blind-sided. In so doing, they will destroy value rather than create it.

IT'S "NOT THE FUTURE" -- IT'S NOW

If this all sounds too “geeky” and futuristic to be of present-day importance to business leaders, you should know that a number of leading global companies have already taken significant concrete steps toward adoption. These companies have seen the opportunities enabled by “intelligent device management” — along with the clear early-mover advantages—as too strategically vital to be postponed until the rest of the world accepts the proposition as validated and “safe.” At the same time, core IT and connectivity “arms merchants”—including the likes of IBM, Cisco, and SAP—are now scrambling to seize the supplier side of the opportunity, supported by aggressive activity by standards bodies and industry consortia.

Let's briefly consider the cases of a few major adopters.

HONEYWELL

Honeywell is a highly diversified technology company engaged in many businesses. One business in which Honeywell is a clear global leader is the production of control and automation systems for petroleum refining. The company's controls are used in plants that produce over 70% of the world's gasoline.

Over the last two decades, as the markets for these control systems have become more competitive, Honeywell has looked increasingly to services and new value-added opportunities to increase its revenues and sustain its high profitability. Recognizing that the start-up of a new facility to process petroleum represents a fraction of the total expense associated with maintaining and optimizing the facility, Honeywell developed a new mode of customer services called Experion Process Knowledge System. Experion is a collection of embedded-intelligence technologies deployed at a customer facility to enable what Honeywell calls “advanced optimization services.” Via remote monitoring and control, these smart systems and services perform a variety of support and optimization tasks that were formerly handled by a broad array of customer facility-maintenance personnel. By automating what most people would call maintenance, Honeywell reduces the need for expensive troubleshooting engineers on-site, and provides a layer of predictive diagnostics for anticipating technical support needs. Honeywell's networked-enabled services approach has dramatically reduced the number of false alarms, unanticipated downtime, cumulative maintenance costs, and various associated risks and liabilities.

The clear value of the program has allowed Honeywell to charge a premium for its network-enabled, automated services, and in many cases the company has been able to increase its scope of services and value to its customers. Honeywell has achieved a dominant global market-share position in its control systems business over the last ten years, growing services from less than 15% of revenues to almost 40%.



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AIR PRODUCT AND CHEMICALS

Air Products is a North American-based producer of industrial gases. The company is a world leader in its field, conducting business in over sixty countries. In the early 1990s, Air Products began an aggressive effort to understand customer needs, and to develop automated mechanisms for delivering new services in served markets such as healthcare/hospitals, semiconductor fabs, and metalworking production.

To initiate this process, Air Products first places its own technical personnel on customer sites as part of its traditional services programs. The on-site Air Products employees had a very specific mission: to find ways to improve customer operating efficiencies, improve quality, and, ultimately, reduce capital requirements. In many cases, making these improvements involved taking on responsibilities for the customer, such as handling critical/hazardous inventories, managing quality systems, and optimizing supply chain and logistics.

Once Air Products had an intimate understanding of a customer's situation and needs, the company built a small, smart production plant adjacent to the customer's location to create required gases locally. Today, over 90% of Air Product's global gas production is remotely monitored.

Starting with careful human observation of its customers, and then following through with embedded intelligence and remote monitoring and control, Air Products has become a pioneer in innovative new applications for gases that reduce customer costs and liabilities, and ultimately improve customers' processes and quality. The company's investment in this vision has directly driven new incremental services opportunities.

GENERAL ELECTRIC POWER

General Electric's power turbine business is a global leader in the power-generation marketplace. GE's turbines are used across the globe, and its reputation is unsurpassed.

GE has developed a very close and complementary relationship with its major utility industry customers. In fact, GE has created a significant level of customer dependency. Because utility customers incur huge opportunity costs from downtime when their equipment fails, power turbine makers like GE have implemented an unusually high degree of network and remote monitoring enablement designed to reduce the customers' risks and costs of failure (costs which almost inevitably include significant regulatory compliance fines).

Ultimately, GE and its peers have invested heavily in remote monitoring and diagnostics to help optimize their customers' ability to supply consistent and high-quality power.

These services have been bundled into what GE hopes soon to convert to transaction-based business relationship models. GE has instituted this approach in several sectors (GE Medical, Locomotive, Aircraft Engine, etc.). GE customers are now being ushered into a new value-added

relationship based on optimal performance, not on product value. In these relationships GE has begun to bundle remote diagnostics as a means to insure that it can deploy a technician or engineer ahead of a failure (proactively) as opposed to doing so on a schedule based upon assumptions (proactively) or, worst of all, after the power has gone off (reactively). In addition to diagnosing turbine failures before they occur, GE is able to take on additional tasks such as synchronization of spare parts inventory and handling, and to provide customer and GE service and support personnel with unified and complete access to data and knowledge (virtual diagnostician and support systems).

By almost any measure, GE's power turbine business is a global leader in financial performance. Its contributions to GE's overall performance have been stellar. On a more focused note of performance measurement, almost any industrial B2B business is trapped in a business model that yields approximately \$90-\$110 per hour for technician support (largely because "local" competitors will charge less and often provide more value). Indications are that GE's Power Systems Business has been able to achieve the equivalent of \$500-600 per hour for the same technician in these networked-enabled remote service contracts.

THE VALUE OF NETWORKED PRODUCTS

Historically, the value of an electronic product has been confined to the product itself. In the B2C world, customers purchase a device from a certain location and use it until it breaks or becomes obsolete. For the most part, these transactions generate minimal information for the manufacturer—usually nothing more than date and location of purchase—and no actionable information at all. As soon as the product leaves the store, the manufacturer has lost touch with it altogether, unless the customer voluntarily elects to register the product for warranty purposes. But a networked product continues to generate informational value over its lifespan. The manufacturer can now know where the device is located, when it was installed, critical specifications, diagnostics, availability of spares, replacement alternatives, repair instructions, and so on. This information can then be used throughout an organization for sales and marketing efforts, product development, and customer service.

The B2B world presents a much more complicated picture. Transactions between companies involve chains of alliances that extend far beyond the simple customer/seller transaction. A company that builds networked medical equipment may buy their software application from Sun Microsystems, which may buy another part from a third company. These supply chains mean constant interaction regarding systems and device health, expensive site visits for maintenance, and complicated upgrades that can cause system downtime. Networking systems and devices in the B2B world will have a huge impact on the efficiency of businesses. The ability to remotely



diagnose problems, upgrade programs and machines, and generally maintain systems uptime will save companies millions of dollars.

THE MANUFACTURER OWNS THE INFORMATION

Any venture into new business carries risk. But a manufacturer that chooses to network-enable its intelligent products holds a brand-new trump card: the manufacturer owns the information generated by the networked device. This creates a profound empowerment that is surprisingly unappreciated.

For OEMs “disintermediated” by channel partners and distributors, or out-finessed in services by multivendor providers, it should come as a revelation. It used to be that your competitors and even your partners could live off your standalone dumb products without you. They could cut you out of the loop and there was nothing you could do about it. They won’t be able to do that anymore.

In some cases, OEMs may not wish to aggregate and mine device data themselves, and will offload this task to an ally. In other cases, OEMs may not wish to act on device-data themselves, and will sell access to device-generated data to third-party services providers. In any case, the OEM remains in the catbird seat because it possesses the field intelligence upon which others will base their own offerings. OEMs should thus be very careful about precedent-setting agreements that cause them to lose control of the data-stream from their connected products.

Few product manufacturers seem to understand that a device-enabled, services-centric approach is a radical departure from their current business mode.

Services-centric really means customer-centric. Customer experience and customer relationships are not things that most product companies have understood well or acted upon effectively. Networked devices can provide these companies with a galaxy of hitherto unavailable data upon which to build significantly enhanced—and even entirely new—service offerings.

But technology alone is not the answer. Neither the networking of “smart” products nor the “Web apps” for mining and analysis of their data will automatically turn a company into a successful services-oriented business. The technologies can lead the horse to water but they can’t make the horse drink. For most companies, the embrace of technology-driven smart services must be matched by nothing less than a completely re-envisioned business model.

When products become networked, the predominant value shifts from the product itself to the experience of owning and using the product inside an “aware,” responsive support environment. Eventually, this environment optimizes the customer’s own processes, saves the customer money, makes the customer more profitable, and thus becomes the core value that the product company

delivers. To accomplish this, product companies need to do something difficult, alien, and even counter-intuitive: Move away from the notion that their product is valuable in and of itself.

The Pervasive Internet & Smart Services Drive New Business Models

First, though, a company needs to think through its decision whether or not to adopt Pervasive Internet technology. The next few sections will detail the kinds of new business models that accompany connectivity, and the strategic planning process that helps successful companies think through their own implementations of online-product business.

TWO FAMILIES OF OPPORTUNITIES

Thinking about the business opportunity associated with a connected product is a highly creative process. Often there are no cut-and-dried markets to identify and size. Rather, there are whole new markets that *might* develop as networked products are brought to market. The trick is in knowing how to think about how those markets might develop. The easiest place to start is with the customer, and a great deal of progress will be made by asking just three questions about the customer:

1. What are the activities the customer engages in, in order to procure, own, use, and dispose of our product?
2. For each of these activities, what else is the customer close to or in contact with when performing the activity?
3. What other activities precede and follow the activities uncovered by question #1?

The first question leads to what we call “Life Cycle Opportunities,” while the second and third lead to “Adjacency Opportunities.”

LOOKING AT THE LIFE CYCLE

We have already said that service is at the center of most Pervasive Internet opportunities. This is because a connected device gives its manufacturer a superior position to help the customer with various activities. The first question we have asked involves those activities that are directly connected with owning and using the product. The obvious activity that a connected product can streamline, while at the same time allowing the manufacturer to intervene, assist, and reap benefits, is maintenance. When a product can detect that one of its parts is approaching failure, and can alert the manufacturer of the fact, the company is in a perfect position both to benefit the customer and to own the opportunity to deliver the benefit.

Let’s get concrete with a very simple example: it’s well known that the profit in printers is in the replenishables, the toner cartridges. But there are clones of most cartridges, and these eat at both the revenue and the margin in a printer manufacturer’s toner sales. HP has seen a tremendous opportunity in adding a very simple bit of connectivity to a printer: it can detect when its toner is low and can initiate





a just-in-time order for new toner. By this simple new function, HP has retaken ownership of a high-profit transaction in which it had suffered encroachment.

There are many activities that are involved in owning and using a product. They include:

- Determining requirements and justifying purchase of the product
- Finding a product supplier
- Financing the purchase
- Installing the product
- Modifying other products or processes to work with the product
- Adapting the product to its environment or to a specific use
- Maintaining the product and replacing parts
- Replenishing materials (e.g. paper and toner for a copier)
- Training personnel to use the product
- Using the product
- Upgrading the product
- Disposing of waste from the product
- Disposing of the product

Each of these activities in the life cycle of a product may or may not be an opportunity.

PERIPHERAL VISION: ADJACENCY OPPORTUNITIES

Having looked at the customer's activities in the life cycle of the product, it's time to look at them again. Our first glance at the life cycle was focused on our own product. Our second look will be through the lens of our second and third questions: For each of these activities, what else is the customer close to or in contact with when performing the activity? And, what other activities precede and follow the activities uncovered by question #1?

The purpose of these questions is to find opportunities that aren't necessarily connected with our own product, but are somehow adjacent, so that our product might be a gateway to those opportunities. One example is a digital camera. Nearly all cameras need some form of connectivity to a computer, where the photos are viewed, judged, sorted, edited, and stored. Kodak has found an opportunity in those activities which follow using the camera, by closely integrating its software, both on-camera and PC, to those follow-on activities and beyond. "Beyond" includes the high-





value activity of producing quality prints of photos, which is done by specialty service providers, with whom Kodak has partnered.

STEPPING BACK: PERSPECTIVE ON THE WHOLE OPPORTUNITY

So far, we've been discussing how to look for opportunities, but, to be precise, we have seen how to look for *elements* of an overall business opportunity. For example, in thinking about adding connectivity to an MRI scanner, we might find that connectivity will help us in several ways. It might enable the just-in-time ordering of replenishable materials, alert us to maintenance needs and so allow us to lock in service contracts, and to perform calibration and validation, functions previously performed by hospital personnel, for which we can now receive separate compensation. Each of these services is an opportunity, but is only an element in the overall business opportunity. In order to understand Pervasive business models, we must look at this aggregate level: the overall business opportunity.

Between the two examples we just used, HP and Kodak, there is a difference that is almost hidden, but is actually rather important. In the case of the HP printer, a single product made by a single company was the sole gateway to the opportunity. In fact, other players in the space are effectively cut out of their positions by HP's move. In the other case, Kodak has tapped an opportunity in which it needs partners, who will supply expertise in user interfaces and presence in photo processing.

This difference points to what is in fact a correlation between opportunity elements and overall business opportunities. If an opportunity is primarily or completely made up of elements that are uncovered by our question #1 (those which attach directly to our product's life cycle), then it is likely that we'll be able to tap the opportunity alone. However, if the elements of an opportunity are mainly adjacencies, we'll probably have to partner in order to get on board.

SOLO AND TEAM OPPORTUNITIES

While looking for and identifying the elements of opportunities is essential for knowing what might happen in our world and who (hopefully it's we ourselves) might make it happen, it's the difference we've just identified, the difference at the level of the overall business opportunity, that determines our Pervasive business model, or in other words, what kind of business we'll be after connecting our product. Simply put, the overall opportunity can be a solo opportunity, one we can seize alone, or a team opportunity, which we will in one way or another have to share with others.



Four New Models

Within each category of opportunities, solo and team, there are two business models. Within each category, what business model a company molds itself to depends on a second criterion that relates to the opportunity. That second criterion is unique to each category, so we'll uncover them one at a time.

TWO SOLO-OPPORTUNITY MODELS

In a solo opportunity, a single product is the dominant gateway to the opportunity. The two business models within this solo-opportunity category are differentiated by the scope of activities which make up the economic value of the overall opportunity. Where the scope is low, we call the company an embedded innovator. Where it is high, the company is a Solutionist.

Let's look at two examples at the extreme ends of the scale:

Where the scope of high-value activities associated with the product is broad, there are many services that can be made part of the business model. An extreme case is an MRI scanner. The activities associated with this product's life cycle include:

1. Determining requirements and whether having a scanner is justified
2. Financing the scanner
3. Installing
4. Testing, calibration, validation
5. Maintenance and replacement of parts
6. Replenishment of materials (gases and image media)
7. Training personnel to use the scanner
8. Determining the need for a scan (preliminary diagnosis)
9. Preparing the patient for a scan
10. Scanning the patient
11. Interpreting the scan
12. Updating software (firmware)
13. Upgrading the hardware

Because of the high value, complexity, and cost of MRI scanning, nearly all of these activities represent an opportunity for the scanner manufacturer. All are of high value, and only 8, 9, 10,

and 11 are primarily medical matters and thus cannot be the province of the manufacturer. This leaves nine activities that are economic opportunities for the manufacturer.

GE Healthcare has stepped into just this situation and positioned itself as a complete solution provider, or Solutionist.

At the other end of the scope-of-opportunity scale is the case of a small-scale laser printer, which we have already looked at.

While there are many activities that are associated with a laser printer, there are few that represent an economic opportunity for the manufacturer. Some activities might have high economic value but simply be too peripheral to the printer to be an opportunity. For example, the purchase of paper has considerable economic value, but the printer holds too little paper to be the keeper of a user's inventory information, and the PC or the telephone are perfectly good ways to order the paper.

Some activities may be very directly associated with the printer and yet not have enough economic impact to be attractive opportunities. Let's take two activities we listed for the MRI scanner: the decision to buy, and financing, and apply them to the printer. The decision to buy (both whether to buy and what to buy) is not a major one and it is hardly worth the manufacturer's while to provide an hour of a printer consultant's time to help the decision-maker, except at the high end of the product line or for a large institutional buyer. And small printers are seldom sold in such large lots that it makes sense for a specialized manufacturer to set up a financing arm. Even where these two activities are of high value, a printer in use has little role to play in them, so the printer's connectivity is not a route to the opportunity.

The opportunity presented by adding connectivity to a laser printer is fairly narrow, and HP found it. They decided that a printer could detect toner levels and could initiate a just-in-time order for more toner. In developing a printer with this capability, HP was stepping into an Embedded Innovator model.

So, between HP with its printers and GE Healthcare with its MRI scanners, there is a world of difference in the scope of services that could be offered with or through the connected device. What they both had in common was that there was an opportunity in which the device was the dominant player in the activity chain; in each case it was a solo opportunity.

In HP's case, the change amounted to little more than a product improvement. The change in business model was incremental; the company remained a manufacturer of printers and toner

cartridges, and made money by selling these things. Connectivity simply gave them a lock on the toner sales, which is where the profit is.

For GE, the new model is far from that of a simple manufacturer and seller of products. The connected scanner opens up many service opportunities, and to tap these, GE must build a large, well-tooled and complex service infrastructure.

As noted above, what GE and HP have in common in these examples is that the opportunity they found and tapped was one dominated by their own device. Data from other devices did not play a major role in developing, defining or tapping the opportunity, and thus the companies were not very dependent on partnerships, although they could certainly use them, and in GE's case, certainly do.

TEAM OPPORTUNITIES MAKE TWO AGGREGATION MODELS

The other two models are those in which the opportunity cannot be tapped by a single device and a single vendor. There are situations in which a device may collect valuable data, but not valuable enough in and of itself to create the opportunity. Instead, several disparate devices work within an environment, and only by connecting all or most of them is a body of data created that is of high value. An extreme example of this is a simple table lamp in a home. It can be enabled to sense and to communicate such data as when it is on and when off, the wattage flowing through it, perhaps even the age of the bulb or bulbs it is burning. This body of data may be of various kinds of interest, but not of economic interest because none of it is of high economic impact. Even if a table lamp burns a 100-watt bulb constantly in an empty room, the wasted electricity will hardly break most families, and if it would they would probably not need the lamp to tell them the waste is occurring.

The body of data becomes valuable in combination with data from other devices. If all the electrical devices in a home collect data, then that aggregated body of data can be of high value. The sum of all electricity that might be wasted in a home is worth a homeowner's attention, and so an application that collects and deploys all that data may be of enough value to represent an economic opportunity. Further, there is value in a lamp's not only sending data to an aggregating application, but also in its being controllable by that application. Here again, to make a single lamp remote-controllable is of questionable value, but to make all the electrical devices in a building controllable by a system that collects, aggregates, and processes data (in other words, that reads and understands a lot of indicators), can be of very high value.

Where a system aggregates and processes data from a number of devices, there are two roles for a device to play in such a system: it can be central or peripheral; the hub or a spoke; the brains of the operation or an eye, an arm, or a finger; the team captain or a role player.

This last variable defines our third and fourth business models. When an aggregating system is required in order to define and tap an opportunity, then there will be an Aggregator, who controls the application's data aggregation and central processing power, and there will be Synergists, whose devices contribute valuable data and/or functionality which is controlled by the application.

There are other situations which are team opportunities, but are not characterized by multiple disparate devices. Rather, they are team opportunities because multiple vendors, most of whom are service providers, must be available to completely tap the opportunity. If there is a single device vendor whose device is the gateway to the provision of multiple services, that company is in a sweet position, as most of the partnering service providers will pay for access to the customer.

Thus we have four models that may be arrayed in a simple matrix.

SMART SERVICES: THE NEW CUSTOMER RELATIONSHIP

Networking brings manufacturers new benefits but also increased customer expectations. Customer relationships become increasingly important as networking becomes more pervasive. Smart services essentially involves responding preemptively to a customer's needs. When a product fails—or is about to fail—OEMs should be ready to offer the owner of that product uninterrupted satisfaction in order to ensure continued business. The ability to communicate with a networked device will vastly improve the methods and modes for customer interaction and service. Perhaps most importantly, it enables the OEM to resist disintermediation. By regaining and retaining at least some measure of direct customer interaction and control, OEMs can better cater to the cultural, language, or usage differences that exist in the global marketplace—ensuring that all its customers receive a consistent quality of service, and that those customers continue to do some level of direct business with the OEM.

Because product OEMs will have constant access to their deployed products, customers will expect value-added offerings. Increasingly, OEMs will become service providers and will need to offer a range of new services, including repair and maintenance, energy management, remote diagnostics, financing, and information management. In addition to keeping customers happy, this positioning will provide OEMs with better information for their own product designs and strategy, information such as usage-tracking behavior, demographics, and product management.

It will also become possible for an OEM to follow a product from the design phase all the way through to the disposal or remanufacturing stage. Companies will find great strategic advantage in being able to track how a customer purchased, used, serviced, and disposed of their products.



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Networked devices will enable a more informed and precise approach to customer service that will ultimately enhance all of a company's interactions.

Instead of using expensive field assets (people, trucks, equipment, gas, time) to fix a machine or appliance, product OEMs will be able to remotely diagnose and order parts for repair, and—in some cases—provide fixes without visiting a customer site. This kind of remote customer service results in timelier problem resolution and saves everyone money by avoiding expensive maintenance visits.

Remote diagnostics will allow companies to better utilize employees with particular skills, languages, or schedules in a more effective manner for customers. OEMs will be able to reduce costs, explore new revenue opportunities, and fix problems while providing a much higher level of service to their customers.

Leadership Challenges

GET CLOSE TO YOUR CUSTOMERS AND STAY THERE

Most product companies do not maintain a close relationship to end-users of their products. They haven't needed to, or haven't wanted to, or haven't been able to. Happily, intelligent device networking will make "closeness to customer" possible as never before. But companies must make cultural and business-model changes in concert with empowering technologies.

They have an excellent incentive for doing so: survival. Commoditization is as "pervasive" a phenomenon as any the technologies we've been discussing. But like any other challenge, commoditization presents opportunities. Perceptions of value and sources of revenue may shift and re-locate over time, but they don't go away. Commerce doesn't go away, and the old adage "find a need and fill it" continues to apply. There's no rigid formula for seizing services opportunities because they come out of careful observation of customers in specific situations, and an imaginative response to their needs.

What are your customers' problems? What constitutes value to them? How can you make their lives better? Answer that, and you'll make your own life better.

INVEST AGGRESSIVELY BUT WISELY

Successful services require a different business model than product manufacturing and distribution. They are more people-, knowledge-, and skills- intensive. Frequently, new services initiatives need adequate autonomy to seek their own destinies. And they require adequate investment. But the measures of success for adequate investment are different, particularly in the case of networked-enabled smart services. Providers of new services often apply product-oriented metrics to services.

FORGE ALLIANCES

You will not offer profitable smart services to customers by yourself. The goal is to create a seamless services environment for your customers, and that means partners and alliances. Business-webs of alliances have always been important.

Smart Services make them a matter of life or death. No single company will supply an end-to-end “Pervasive Internet” solution. Vendors must create interoperable products based on standards, and forge the far-reaching and diverse supply-side alliances that customers will require in full solutions.

The business and intellectual-property landscape has been revolutionized since (and partly because of) the dot-com boom. The era of monolithic vendors is over. Competition no longer means a single company/single standard going up against another single company/single standard (e.g., Windows vs. OS/2).

Today, business-alliance “webs” or “ecosystems” compete against other webs/ecosystems. To create the value that customers will come to expect in this era, manufacturers need to engage, imagine futuristic business possibilities beyond adopters’ wildest dreams, and then forge inspired, foresighted partnerships to deliver them.

Intelligent device management will open an entirely new portfolio of “killer apps” that will transform the way business is done around the world, and profoundly improve customer satisfaction and vendor profitability. This represents an entirely new life for the IT and telecom industries—one that will literally dwarf their starring role in the “dot-com” era.

ENTERPRISE IT & APPLICATIONS: GET YOUR HOUSE IN ORDER

Intelligent device networking and management will generate the intelligence you need to deliver smart services that create profits and customer loyalty. But what form will this intelligence take? Automated information-gathering can easily generate trillions of data-points every day for a typical product manufacturer. Each of these data-points may be very tiny (the torque, pressure, or temperature of a specific component, or the physical location of a product), but they must all be validated and stored, and then subjected to the sophisticated techniques (data-smoothing, data-mining) that turn data-points into actionable intelligence that can be shared and leveraged across the enterprise.

This intense data-processing activity cannot simply be thrown at any existing corporate IT structure or enterprise-application suite and expected to produce actionable information. You need to prepare for it. In the case of RFID tagging initiatives, for example, companies need enterprise-wide data standards and new software (RFID middleware) to “synchronize” data from disparate sources into compatible formats.



Whether outsourced or done in-house, your human-centric corporate IT infrastructure must be made compatible with device-centric technologies and applications across your organization. Vendors of pervasive-computing solutions can help evaluate your needs.

CONCLUSION: THE INFORMATION AGE -- FOR REAL THIS TIME

We have been living in “the Information Age” for a long time now, at least that’s what we keep telling ourselves. It would be more accurate to say that we’ve spent the last several decades in the lobby of the Information Skyscraper, waiting for the elevator. With the sudden availability of global public Internet access in the mid-1990s, the elevator arrived and opened its doors. But we’re still standing in the lobby. We must now make the decision to get on, because the elevator isn’t going to sit there forever.

At the end of the day, all business is about delivering honest value and making a profit, and that occurs because you’re smart and your customers are happy. When your customers send you an unbroken stream of information without anyone needing to lift a finger, you’re really smart. When you base your business decisions upon that information, your customers are really happy. The term “feedback loop” was coined for it long ago. We like to call it an “information circle.”

The phenomenon we’ve been discussing offers any enterprise nearly perfect real-time, real-world information, with short-term ROI and long-term advantages too numerous to name. That’s the Smart Services value proposition.

THE “NETWORK EFFECT”

By 2010, the Pervasive Internet could drive a total opportunity in the hundreds of billions of dollars for the companies involved in device enablement, device monitoring, and new services driven by device-generated data. The largest opportunity will exist for value-added services providers, and thus access to device information will become a de facto part of most service or sales contracts.

Large opportunities are developing for companies handling the data being generated. Because the Pervasive Internet is a circle of device feedback rather than an old-fashioned “value chain,” the opportunity to add service value will exist for both technology suppliers and adopters, as well as for third parties.

THE ONE WITH THE MOST NETWORKED STUFF WINS

Why should an OEM step up to the plate and network-enable its manufactured objects now? Because in any given market, the first players to do so will own the information feedback loop to the customer, and it will be very hard for competitors to pull customers out of that loop.

Inside this “information circle,” a whole world of new, attractive, and more profitable services will take shape. Because those next-generation services cannot be offered without device information, and because even traditional service relationships will be made vastly more efficient inside the information circle, channel partners can no longer cut an OEM out of the services action.

In fact, the real-time enterprise turns “disintermediation” completely on its head. When a company decides to make a smart product that sends out its “heartbeat,” the company owns access to that heartbeat, and thus access to the customer. Now, no third party can sell profitable services to the manufacturer’s customer without making some arrangement with the manufacturer for access to the diagnostic or status data coming from the networked product or device.

As we leave the human-centric PC era, the new rules of the game are abundantly clear: The one with the most networked stuff wins.

CLEAR FIRST-MOVER ADVANTAGES FOR ADOPTERS

Some companies have already launched new businesses enabled by networked devices, and many others have made their decisions and started the process of designing their connected products and their new business models. The move to the Pervasive Internet is happening, and the pace of adoption is accelerating. It is not only possible, it is here.

We have seen evidence of first-mover advantages in industrial asset management, vehicle telematics, industrial gases, networked building systems, energy monitoring, and medical imaging systems. Early adopters have not only brought their connected offerings to market, but may already have locked down lasting dominant positions in their respective industries. The following are only the most obvious impacts:

- ▶ Break-out “double digit” top line growth in traditionally GDP-driven businesses.
- ▶ Line-of-business ROS increases in the 5-10% range.
- ▶ Service force productivity improvements of 20-35%.
- ▶ Dramatic, quantifiable customer retention improvements.

At the same time, technology suppliers have ensured that the tools for device connectivity are largely in place. Except in the least developed parts of the world, where there may still be infrastructure issues, there is no place on earth where a connected product cannot be deployed to the advantage of both its manufacturer and its users.





THE BIG RISK IS DELAYED ACTION, NOT TECHNOLOGY

Yet many companies will fail to make the shift. Is it because the technology is immature and not to be trusted? In some areas of the technology value chain, the pieces may not be mature. Certainly, it will be some time before the losing suppliers have been shaken out and the remaining winners can be counted on to supply the quality products and complete services required to minimize risk for adopters. Yet even today, robust systems can be—and are being—built with existing offerings, and what remains of technological risk pales next to the risk of delayed action.

MACHINE-TO-MACHINE (M2M) IN BUSINESS REPRESENTS A RADICAL PARADIGM-SHIFT

The key word is risk. The leadership in many manufacturing companies is not accustomed to the volatile, high-stakes world of business driven by networked devices, and it is this transition, not the technological shift, that many will fail to make. Many changes in thinking will have to take place for companies to succeed in networking their devices and updating their organizations for the next era of information technology.

These changes come in many areas:

- ▶ In **internal leadership**, we have already seen and expect to see more cases where many members of organizations have a clear view of where the company needs to go, yet are unable to present the business case for change in a compelling manner.
- ▶ In **planning**, companies may not know whom to invite to the planning table, let alone what to do when everybody's there. They may have strategic planning processes in place that are ill-equipped to deal with major paradigm shifts.
- ▶ In **business execution**, manufacturers may have little understanding of the nature of a new, information-intensive offering, or of the needs of a market that will be trained by the companies that have made the shift successfully. Such customers will be far more demanding than in the past.
- ▶ In **organization**, companies may fail to understand that the new skills, shifting alliances, and new customer bases that can come with the Pervasive Internet may demand radically new organizational structures.

In short, many companies will fail due to the inadequacies of their leadership. Many companies will be hampered in their thinking by a tendency to assume that the company after networking will be the same company and in the same business as before networking. This is a safe assumption in almost no case.

Most changes brought about when information becomes central have the effect of moving a company toward a services-based business model. This is a simple proposition, but not an easy one. The fact that information makes services move to the fore is not hard to grasp. But in practice, “services” represents a business paradigm so foreign to many manufacturers that they cannot understand, let alone implement, the changes necessary to make the shift successfully.



In fact, the phrase “shift to information-driven services,” though accurate, could be dangerously misleading if it makes the required corporate culture and business model changes sound almost tame. They aren’t. The era of near-perfect, near-real-time information about physical assets and customer behavior is looming like a tanker coming out of the fog. Any degree of complacency about it will be deadly.

About Harbor Research, Inc.

Harbor Research Inc. has more than twenty years of experience providing strategic consulting and research services to high technology clients. Harbor’s strategy and business development work is organized around emergent and disruptive opportunities, with a unique focus on the impact of the Pervasive Internet—the use of the Internet to accomplish global device networking that will revolutionize business by unleashing entirely new modes of system optimization, customer relationships, and service delivery.

Harbor Research’s clients are leaders in communications, computing, control, and content. Harbor Research has built extended relationships with larger multi-line companies including AT&T, ABB, Agilent, General Electric, Danaher, Eaton, Emerson, Hewlett Packard, Hitachi, Honeywell, Hughes, IBM, Intel, Invensys, Motorola, Rockwell, Siemens, and Texas Instruments, as well as with growth companies such as EMC, Cisco Systems and Qualcomm. We also work with a broad array of emergent start-ups and pre-IPO technology ventures. We have built relationships with a number of significant Pervasive Internet players, including Ember Corporation, Qestra Corporation, GridAgent, DeepStream Technologies and Dust Networks, to name a few.

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