CHAPTER ONE

The Need for Smart Enough Systems

The world is changing fast, and well-documented business and economic changes, such as the growth of outsourcing and Internet retailing, are increasingly affecting the way organizations must operate. Some organizations will see these trends as creating opportunity and adapt to take advantage of them. Others will try to deal with these trends with a minimum of change but will still have to face competitors that are using these trends to their advantage. Given the importance of information systems to most organizations, all organizations need systems smart enough to handle their operations effectively in this new environment.

The Importance of Operational Decisions

Smart enough systems deliver effective automation of the decisions that drive organizations' day-to-day operations. Although organizations have automated standard processes with enterprise software, these operational decisions haven't been the focus of investment. They are overwhelmingly made manually or automated poorly, which is a mistake. Embedding business processes in systems to streamline operations but not managing and improving these decisions leaves half the opportunities for improvement untouched. The means and the resources are now available to close that gap.

For more than a decade, organizations have strived to make their operations more efficient by rationalizing business processes, eliminating the handoffs between people that added latency and cost, driving down the cost of support with software standardization and data center consolidation, and outsourcing. None of these efforts, even the most successful ones, provided much more than a short-term competitive advantage, because they attacked the problem from the denominator—revenue per employee, sales per store—always focused on taking out cost but not emphasizing the numerator: benefits. Unfortunately, this approach is what's known as a "Red Queen" exercise, a reference to the Red Queen observing to Alice in Wonderland, "In this place, it takes all the running you can do, to keep in the same place."

Operational Decisions Matter

In 2004, an Opinion Research Corporation[1] survey of executives found a clear opportunity to automate and improve decisions. Operational decisions were high-impact, but only a fraction had been automated, and maintenance cost and time to market were real problems. Specifically, the findings included the following:

- More than 90 percent felt that front-line operational decisions affected profitability.
- About half had not yet automated about 25 percent of these decisions, and nearly 80 percent still lacked automation for more than half of them.
- Making the right decisions with a high degree of accuracy and precision was very important to more than 90 percent of respondents. More than 60 percent also rated consistency of decision making and effective management as important.
- 85 percent expressed difficulty in changing decision-making criteria in their systems, with more than 50 percent saying it took months to get business changes implemented in production.
- 60 percent felt that automated decisions were carried out inconsistently or they were forced to deal with redundant logic in multiple systems to prevent this problem.
- 70 percent of chief information officers/chief technology officers (CIOs/CTOs) didn't believe they were getting the most value they could from their data. The most common reason was that their inability to blend business rules with data prevented them from maximizing the value of their data.

In a survey by Teradata[2] in 2004, 75 percent of the senior executives of top U.S. companies said that the number of daily decisions has increased over the past year, and more than 50 percent said that decisions are more complex this year than last year. The overwhelming majority of respondents, more than 70 percent, said that poor decision making is a serious problem for business. The top casualties of poor decision making are profits, company reputation, long-term growth, employee morale, productivity, and revenue.

For many organizations, the only way information technology has been applied to decisions is in the form of business intelligence or **decision support**—analyzing of data to help someone make a decision. Decision support as a discipline has always been aimed at the small segment of the population that uses data to make important decisions in organizations: managers and knowledge workers. It hasn't been effective at more fine-tuned, operational decision making that's just as crucial to the organization's well-being, if not more so. In addition, current enterprise data architectures are cleanly divided between operational systems and those that support the analytical and reporting processes behind decision support. This division leads to excessive duplication of data, latency in its accessibility, and usually a high degree of mismatch between analytical and operational data. Coupled with the rapidly increasing volumes of data being generated and the increasing rate of disparity as data arrives from external sources, the situation needs a better solution.

What's needed is a blueprint for orienting data, systems, and people to manage operational decisions more effectively and a way to automate decisions when appropriate and streamline those that still require some level of human intervention. Smart enough systems are computer applications that have enough intelligence to make these kinds of decisions without intervention. These systems offer a true strategic advantage. To understand why, you need to consider what "strategic" advantages involve, as discussed in the next section.

Strategy Drives Decision Making

"The essence of strategy is choosing to perform activities differently than rivals do."
–Dr. Michael Porter, Bishop William Lawrence University Professor at Harvard Business School

Dr. Porter's quote is more relevant today than ever. With fewer geographic barriers and always-on connectivity, your organization must *behave* differently to stand out from the crowd. You might choose to perform activities that your competitors don't perform, not perform activities your competitors do, or (most likely) perform the same activities but perform them differently.

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[1] Opinion Research Corporation. "IT Professionals and Decision Automation." A sample of 200 IT professionals at companies over $100 million in revenue, including 40 CIOs/CTOs. Companies included retail banking, credit card, mortgage, property and casualty, health, life insurance, telecom, retail, and healthcare providers. Survey was conducted July 1–29, 2004.

[2] Teradata 2004–2005 Report on Enterprise Decision-Making, fielded by BuzzBack online market research between July 23 and August 3, 2004, querying 202 executives, with follow-up conducted September 3–9, 2004.

Critical to behaving differently is an ability to *decide* differently. Deciding when to omit or add an activity and when and how to change the way you perform an activity are essential. A strategic advantage must make an impact on strategy, which means it must change your decisions.

The decisions you must change could be occasional strategic decisions, such as whether to acquire a certain company or enter a new market. Or they could be more tactical and operational, focused on how you treat a customer the next time he calls your call center or how you price a product on your Web site. All these decisions must be driven by your strategy if you are to deliver effectively on that strategy. Although your organization probably focuses on getting major strategic decisions correct, you might struggle to keep your operational activities—the way front-line members of staff and applications behave—synchronized with your strategic plans. For example:

- You might want to treat all gold customers a certain way, but you have a self-service application that doesn't differentiate between customers.
- You might want to get more aggressive about retaining customers who are likely to leave, but your call center representatives have too many campaigns to remember, so they treat everyone the same.
- You might want to offer dynamic pricing to suppliers, but the software that drives your Web site does not use the pricing algorithms sales representatives use.

Unless your operational activities reflect your strategy accurately, your organization can't succeed. You can't even be said to be implementing your strategy.

Strategy Is Not Static

The problem of ensuring that your operational activities match your strategy is exacerbated by the need for **business agility.** Business agility is critical to survival in a rapidly changing world, so your strategy can't be static. You must constantly refine and update it to keep up with competitors, market shifts, and consumer preferences.

Most executives say their companies are facing a more competitive environment than they were five years ago; in fact, 85 percent say "more" or "much more."[3] Organizations that want to compete effectively must change continuously and base those changes on feedback about what is and isn't working. Those unwilling or unable to do so must recognize that they will soon be competing with organizations that have changed, if they aren't doing so already. No organization can remain immune; all will have to change somehow.

[3] McKinsey Global. "An Executive Take on the Top Business Trends." Survey conducted 2006.

Not only must your strategy change more rapidly, but you also have more information about why and how it must change than ever before. The growth in business intelligence and performance management systems[4] means you have more insight into how well (or poorly) you are doing. To respond effectively to this new understanding, however, delivering new processes, skills, and expertise rapidly to front-line workers and information systems is essential.

For instance, if your analysis of last week's sales shows that a competitor is eating into your sales, and you decide a new pricing model is required, many factors influence how quickly you can respond. Your cultural willingness to change, for example, or your escalation and sign-off processes determine how quickly you go from recognizing a problem to *intending* to respond to it. The key issue, however, is likely to be how quickly you can move from that *intent* to a change in the operational behavior that implements your new strategy. After all, if your operations haven't changed, no customer or other associate is likely to notice—they won't detect the change in your pricing or how it affects them.

However, changing your operations means changing the way your operational information systems behave. Your information systems characterize your operations in such a fundamental way that you can no longer separate them from your business—your systems *are* your business. The time it takes to change your operational systems determines how fast you can modify your operations and is the ultimate determinant of your business agility.

Agility also contributes to **strategic alignment**—how well your strategies are reflected in your business operations. Without agility, your organization can't consistently carry out a new strategy without an extended period of change. Indeed, you risk never achieving strategic alignment if changes to the strategy occur faster than the organization can respond.

Often this alignment, or lack of it, can be seen in the organization's operational or front-line activities. Indeed, divergent agendas and miscommunication between those working on an organization's strategy and those carrying it out operationally are chronic problems. These disconnects can hinder executive leadership's access to information about what's really going on and their ability to effect change in organizational behavior when they see the need. A recent study[5] included the following statement:

> *"Most devastating, 95 percent of employees in most organizations do not understand their [organization's] strategy."*

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[4] Business intelligence systems is used here to refer to reporting and analysis tools for managers and knowledge workers, while performance management systems are those driving more real-time monitoring tools such as dashboards.

[5] Q&A with Robert Kaplan, "The Office of Strategy Management," Working Knowledge for Business Leaders, Harvard Business School. March 27, 2006.

Many things contribute to these disconnects between strategy and operations. Among them are a lack of agility (the strategy has changed too often for the employees to keep track), execution problems (the decisions made by front-line employees aren't affected by the strategy), and secrecy (the strategy is confidential, proprietary, and a competitive advantage, so fear that it will "get out" prevents its dissemination). You must solve these problems to ensure that your strategy is carried out continuously and effectively, top to bottom, by both people and information systems.

Therefore, a dynamic, agile strategy means being able to decide to act differently and then being able to apply that decision to the way your operations work. However, to change the way your operations work, you have to change the way you make operational decisions.

Operational Decisions Matter

> *"Most discussions of decision making assume that only senior executives make decisions or that only senior executives' decisions matter. This is a dangerous mistake."*[6]
>
> *—Peter Drucker*

When most organizations think about the decisions that matter, they think about the decisions executives or boards make: the major strategic decisions that can make or break an organization. However, Peter Drucker noted that the decisions front-line workers make matter. They interact directly with your customers, partners, suppliers, and other associates but are often among the lowest-paid staff you have. They probably also have the highest turnover and are among the most likely to work for a third party or on a contract basis, yet they make crucial decisions about how your organization treats associates every day.

However, at least you actually have someone interacting with your customers or other associates when front-line workers are making decisions. Sometimes no one is involved when your computer systems interact directly with your associates. The options your interactive voice response (IVR) system lists, the way your Web site promotes products, the letter your campaign management system decides to send, the price your online booking system calculates for a customer—these operational decisions also influence your associates.

Although the influence of each operational decision is small, their cumulative effect can be huge. As shown in Figure 1.1, the value of individual strategic decisions is much higher than that of individual operational decisions. However, the cumulative value

[6] Peter Drucker, "What Makes an Effective Executive," Harvard Business Review, Vol. 82, No. 6, June 2004.

shows a more balanced picture. The large volumes involved in operational decisions mean that their cumulative impact can meet or exceed that of strategic decisions.

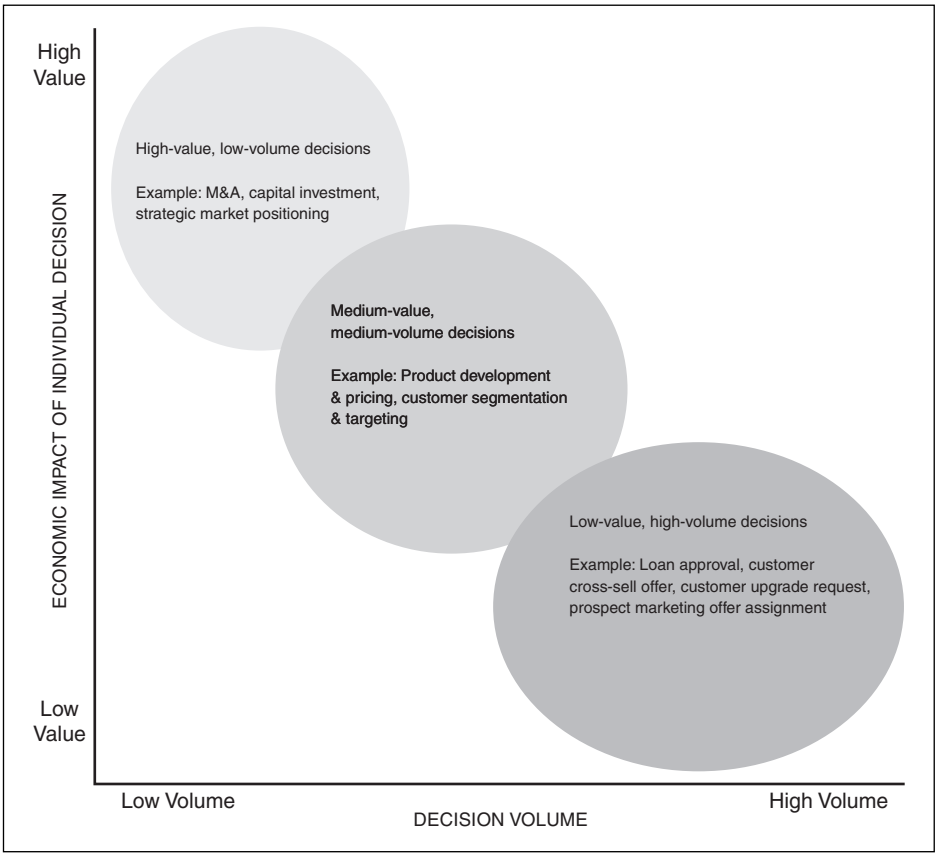

Figure 1.1 The value and volume of different kinds of decisions

Although a single big strategic decision has a high value, it's likely to be made with planning and analysis, thoughtfully and by the best minds in your organization. In contrast, operational decisions often aren't made so deliberately. This lack of focus is the result of several factors:

- Each decision has a low individual value; it doesn't seem that important to get the cross-sell offer for this customer just right, for example.
- The sheer volume of decisions involved is high—hundreds, thousands, and even millions for larger organizations.

- The number of workers who handle operational decisions makes managing these decisions seem impossible.
- The time available to make most operational decisions is short, not lending itself to time spent in analysis.
- The "right" way to make these decisions changes constantly, so investing in the current approach can seem ill advised.
- Many of these decisions have been effectively delegated to the IT department by embedding them in the code of an existing system, making the decision logic hard to find or change.

Your organization will perform at its best if these high-volume operational decisions can be made at a lower cost, in real time, and with maximum consistency. The systems front-line workers use aren't smart enough to make decisions, however—certainly not good ones. These workers also need technology to help them discover, assess, and address new opportunities and threats as they present themselves. The first person in a position to notice a customer who's unhappy or seems interested in a new product or service is likely to be a front-line worker, not someone in an office looking at a report.

What front-line workers need is better decisions. They need to be able to make decisions in high volume and narrow time windows. If they can't make or execute decisions, they can't deliver good service or effective support. If the decisions are wrong or even sub-optimal, your organization will suffer. Operational decisions are critical, and making them poorly undermines productivity, prevents customer-centricity, and lowers revenue. Poor decision making reduces your organization's overall ability to be successful.

Likewise, your associates assume that the way your systems treat them is the way you want them to be treated. If the Web site, ATM, or IVR system is ineffective, that reflects badly on you. If the systems can't do what customers want, customers will call and speak to representatives, creating wait times that delay other customers.

The operational decisions at the front-line of your organization are, cumulatively, essential to your ability to run your organization the way you intend. Unless these decisions, too, are driven by your strategy and carried out with maximum effectiveness and efficiency, your organization won't perform at its best. Making good operational decisions, however, is getting harder.

Operational Decisions Are Under Pressure

Napoleon Bonaparte said, "Nothing is more difficult, and therefore more precious, than to be able to decide." Making the right operational decision is only getting harder as pressures on the decisions you must make grow:

- Decisions that once might have taken days now have to be made at the speed of the transaction, such as while your customer is completing an online purchase.
- Business objectives used to be simpler and set at the local level. Now those objectives are often set at the corporate level and involve trade-offs between risk, resource constraints, opportunity costs, and other factors.
- You're being forced to comply with more new regulations, stricter and more complex rules, shorter deadlines, and more serious consequences for noncompliance.
- You need to change your strategy—such as how to manage customers to retain them in the face of competition—more frequently and more rapidly to deal with competitive forces, environmental changes, and changes in your customer base.
- Decisions once owned by a single group might now be shared by multiple departments and have to be coordinated across channels and regions.
- Some decisions that were handled with manual review processes now occur in volumes or time frames that make manual processes impractical.
- The value of a decision could once be measured in terms of the cost and time needed to make it; now other objectives are also used to measure value.

Implementing your strategy means making decisions that support it every day and at all levels. It means making these decisions quickly and keeping them aligned with a strategy that adapts and changes. It means turning operational decision making into an asset, not a liability.

Operational Decision Making as a Corporate Asset

If operational decisions must be made well for your organization to deliver on its strategy, they can't be made randomly. They have to be made systematically. You have to turn operational decision making into a corporate asset you can measure, control, and improve. After all, when associates interact with you, they consider every decision you make to be a "corporate" one—that is, a deliberate one.

Every day you must make decisions faster and across more channels and product lines, which makes it harder to ensure that the decisions your organization makes are the best ones *and* the ones you intended to make. What makes an operational decision the right one?

Characteristics of Operational Decisions

To be effective, an operational decision must be precise, agile, consistent, fast, and cost-effective:

- **Precise**—Good operational decisions use data quickly and effectively to take the right action, behaving like a knowledgeable employee with the right reports and analyses. They use this data to derive insight into the future, not just awareness of the past, and use this insight to act more appropriately. They use information about customers to target them through microsegmentation and extreme personalization. They use behavioral predictions for each transaction or customer to ensure that risk and return are balanced properly, and they use the information a customer (or supplier or partner) has provided (explicitly or implicitly) to improve the customer experience.
- **Agile**—Operational decisions can be changed rapidly to reflect new opportunities, new organizations, and new threats; otherwise, they rapidly decline in value. No modern business system can stay static for long. The competitive, economic, and regulatory environment simply doesn't allow it. When organizations automate their processes and transactions, they often find that the time to respond to change is affected largely by how quickly they can change their information systems. To minimize lost opportunity costs and maximize overall business agility, operational decisions must be easy to change quickly and effectively. The agility of these decisions—both the speed of identifying opportunities to improve and the readiness with which they can be changed—ensures that they remain aligned with an organization's strategy, even as that strategy changes and evolves.
- **Consistent**—Your operational decisions must be consistent across the increasing range of channels you operate through—the Web, mobile devices, interactive voice response systems, and kiosks, for example—and across time and geography. They allow you to act differently when you choose to—to offer a lower price online to encourage the use of a lower-cost channel, for example—but ensure that you don't do so accidentally. These systems support third parties and agents who act on your behalf and the people who work for you directly. They enforce your organization's laws, policies, and social preferences wherever it does business and make sure you avoid fines and legal issues. They deliver a consistently excellent experience for your associates.
- **Fast**—You need to take the best action that time allows. The saying on the Internet is that your competition is three clicks away. Your associates are learning to be impatient and have short attention spans. Meanwhile, your supply and demand

chains are becoming more real-time, and the systems that manage them must respond quickly as well as smartly. With fewer employees handling more customers, partners, and suppliers, you must eliminate the wait time for these associates. You must decide, and act, quickly.

- **Cost-effective**—Above all, operational decisions must be cost-effective. Despite the massive efficiency gains and cost reductions of recent years, reducing costs continues to be essential. Good operational decisions help eliminate wasteful activities and costly reports. They reduce fraud and prevent fines. They help your people be more productive and spend their time where it really matters. They make sure you do as many things right the first time as possible and avoid expensive "do-overs." They reduce the friction that slows processes and increases costs.

Operational decisions are what make your business strategy real and ensure that your organization runs effectively, right down to the front-lines interacting with your associates. To ensure that operational decisions are effective, you need to manage operational decision making. The change in mind-set required is akin to the changing view of data over the past few years. Data is no longer just something needed to run systems; it has become visible to many and is managed as a resource for the whole organization—a corporate asset. Managing operational decision making as a corporate asset means treating it as strategic, managing it explicitly, making it visible and reusable across the organization, and improving it constantly.

Characteristics of Corporate Assets

A focus on operational decision making means treating decisions as corporate assets, which means ensuring that these assets have the following characteristics:

- **Strategic**—A corporate asset is strategic. Planning exercises consider how it can be used and applied to reduce costs, increase revenue, and expand the business. Ensuring that decision making is strategic means considering the process of making low-level operational decisions critical to the business and worthy of executive and management focus.
- **Managed**—Corporate assets must be managed, maintained, and kept in good working order. They must be reviewed and improved dynamically and continuously. Decision making is similar to equipment that needs constant maintenance, replacement of small parts, and upgrading. Because decisions must change and adapt, they must be managed.

- **Visible**—A corporate asset must be available and visible to management if it's to be used correctly. It must be understood as a competitive weapon and subject to reporting and analysis. Making decision making visible means managing decision-making assets as you would other aspects of the organization's infrastructure, storing information about decisions in technology designed for that purpose, and making the use of this technology and supporting techniques standard across your organization.
- **Reusable**—Assets aren't casually duplicated or left idle but are reused and leveraged as much as possible. Decision making must be reusable across manual and automated processes and systems, internally and externally.
- **Improving**—Decision making must improve constantly; in other words, you must close the learning-improvement loop. Closed-loop decision making, as shown in Figure 1.2, enables you to capture results from production systems and put what you learn from them into a useful form rapidly. It means updating decisions based on your results or outcomes. Decision automation requires supporting all these steps.

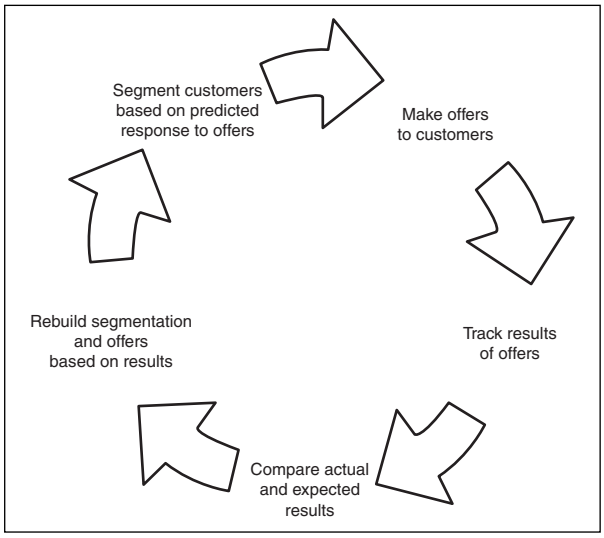

Figure 1.2 An example of closed-loop decision making for marketing

Systems that can treat operational decisions as a corporate asset, deliver the best operational decisions, and ensure that those operational decisions reflect your business strategy are what we call Smart (Enough) Systems.

Introducing Smart Enough Systems

What kind of systems would deliver this vision of operational decisions? The term "smart enough systems" is used in this book to describe them. A smart enough system is not some kind of artificial intelligence device like HAL 9000 (from *2001: A Space Odyssey*). Equally, a smart enough system can't be developed the same way you build traditional "dumb" information systems.

Building smart enough systems means taking a new approach to bringing automation to operational decisions. Instead of hard-coding decision rules into systems, it means using separate tools to build, manage, and carry out decisions in concert with other operating processes. It means developing new services that can deliver operational decisions that perform well enough to be used in real-time front-line systems and processes. It means developing services that are agile enough to keep up with a changing world and, indeed, learn from it. It means services that make customer-centered (associate-centered) decisions and services that can support an extended enterprise.

Characteristics of Smart Enough Systems

Smart enough systems have some key characteristics. In particular, they are operational and capable of real-time performance. They are agile, capable of learning, and customer- (associate) centered as well as compliant and supportive of an increasingly extended enterprise.

Operational

The increasingly distributed and always-on nature of organizations puts a premium on **high-performance execution,** which means operating quickly, flawlessly, legally, and profitably at every level. It's about more than how your employees perform; it's about how your *systems* perform.

For organizations to exhibit high-performance execution in day-to-day operations, their top performers' expert judgment must be made available everywhere. This means making sure the systems everyone uses embody that expertise—not in an expert system, ask-if-you-get-stuck way, but with systems that are embedded in the operational processes necessary to the business. This expertise, however, must be balanced by analytic insight developed by a careful analysis of the organization and its operational history. As Malcolm Gladwell said:

> *"Truly successful decision making relies on a balance between deliberate and instinctive thinking."*[7]
>
> *–Malcolm Gladwell*

[7] Malcolm Gladwell, *Blink: The Power of Thinking Without Thinking.* Little, Brown and Company. January 2005.

Not only must the organization's expertise be balanced with an effort to run the organization "by the numbers," but the interaction skills of those who serve as the point of contact with associates also must be considered. For the moment, no system can replace human interaction. Ensuring that these interactions make use of decisions informed with an analysis of past success and experts' judgment can ensure that customers get the best possible experience and organizations can get the best possible results. Smart enough systems make organizational knowledge "explicit, executable, actionable, and adaptable."[8]

Capable of Real-Time Performance

Smart enough systems must operate in a no-wait, multichannel world where customers and other associates expect responses, actions, and decisions immediately. Suppliers expect immediate updates on the demand chain, and retailers and distributors expect to know about problems in the supply chain instantly. Real-time connections between organizations are also essential, because organizations must become more loosely coupled. They must deliver their products and services by coordinating and orchestrating many distinct organizations, both internal and external.

In the past it was sufficient to coordinate operations within an enterprise, but today successful organizations must be able to operate with both known and unknown entities without delays. Systems can't wait for someone to wake up before acting, and people want to be told what has been done to make their life easier, not asked for decisions. Smart enough systems must make decisions fast enough to be used in operational, real-time systems.

Agile

An agile organization can effectively change the way it operates when it needs to, but only if it has a good understanding of how it's operating and why it operates that way. Smart enough systems support this agility by making how they operate explicit, easy to understand, and easy to modify. Agility is a measurement of the total time and cost in getting from having the data that means you *should* change your business to actually making the change.

[8] Peter Fingar, *The Real-Time Enterprise*, Meghan Kiffer Pr. October 2004.

Agile Compliance

In the heavily regulated environment in which many organizations must operate, agility can't come at the expense of compliance. Every time an organization shifts its strategy and changes its operations, it needs to be sure that the new approach is compliant and can be demonstrated to be so. Compliance, then, can act as a drag on an agile organization by preventing it from making changes as quickly as needed unless the approach it uses to achieve agility allows it to remain compliant—which can be called "agile compliance."[9]

Gartner Group Inc. defines agility as "the ability of an organization to sense environmental change and to respond efficiently and effectively to that change."[10] Gartner uses an agility cycle,[11] shown in Figure 1.3, to show how agility is achieved and to indicate that it's ongoing. The basic steps are sensing a threat or opportunity, strategizing about options, deciding on the most appropriate action, and then communicating it before acting. This cycle must be continuous, because each change must be monitored for subsequent changes.

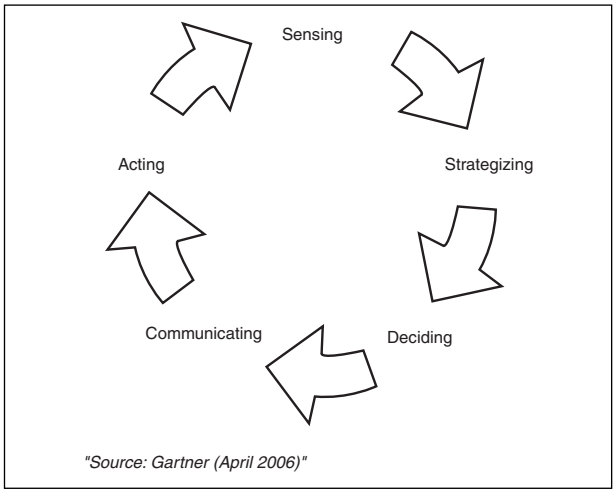

Figure 1.3 The agility cycle

[9] A phrase first used by Hugh Taylor in his book *The Joy of SOX*, Wiley, April, 2006.
[10] Daryl C. Plummer, and David W. McCoy. "Achieving Agility: Defining Agility in an IT Context." Gartner Group, Inc. 4/20/2006.
[11] Ibid.

Human Latency *People will always be a bottleneck when it comes to change. Gartner defines "human latency" as something that reduces agility, for instance. Some technology approaches make it harder to be agile, and some make it easier. Some help you persuade people to change; others help you make the changes after they have been agreed on. Organizations in the future will have to improve their agility organizationally and in terms of the technology they use and how they use it.*

Capable of Learning

Smart enough systems need to "learn" as new data is collected. Organizations collect an enormous quantity of data, and the volume of data is increasing steadily. Generally, organizations don't have systems that are smart enough to take advantage of this data. For instance, a PricewaterhouseCoopers Barometer survey[12] in late 2006 gave an accurate summary of how organizations think their data should give them a real competitive edge and why it currently doesn't:

- 71 percent of senior executives describe the data in their company's information systems as potentially very valuable.
- 68 percent of these executives expect this data will become even more valuable as a source of competitive advantage during the next 12 to 18 months.
- 84 percent cited their inability to mine and interpret data as the highest-ranked obstacle to achieving value.
- 75 percent said that an ability to mine and interpret data was key to getting value from data.

You have to do more than collect, organize, and report on your data. You, and your systems, have to learn from it, mine it for insights, and interpret what it means for the future. Doing so is a key to taking advantage of one of your last remaining areas of competitive advantage—knowledge of your associates—and is a way to improve performance by insisting on realism. If your business decisions are based on what your data tells you, you're more likely to get realism than if you rely on hunches and how you have always done something. Even Malcolm Gladwell, in his paean to instinctive reactions, noted that informed snap judgments outperform uninformed ones.

[12] Results from interviews with 107 top executives of large, U.S.-based multinational businesses, for PricewaterhouseCoopers' Management Barometer.

Competing on Analytics

In their book,[13] Davenport and Harris describe competing on analytics as "the extensive use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions." They define an analytical competitor as an organization that uses analytics extensively and systematically to outthink and outperform its competition. They see a growing cadre of companies competing this way and identify a number of trends as a result:

- More automated decisions
- More real-time decisions
- Increased use of alerts
- More prediction and less reporting
- More mining of text

Companies wanting to compete with analytics will require far more than a few "PhDs with personality" using data-mining tools on existing enterprise data. They will need a systematic framework for using analytics to make their systems smarter.

You must also realize that a generation of workers, the baby boomers, is retiring. The new generation of workers is more technology-literate but is unlikely to take the kind of jobs their parents and grandparents took. Even if they did, they lack the depth of experience on which organizations have been relying. Those retiring baby boomers know all the tricks, exceptions, and workarounds that make your manual decisions work. Without them, you need some other way to get this knowledge to your workers, and these workers will look to information systems for that knowledge.

[13] Tom Davenport and Jeanne Harris. *Competing on Analytics*. Harvard Business School Press, 2007.

Customer- (Associate) Centered

"Customers can access more information about more vendors, negotiate more effectively with still more vendors, and switch from one vendor to another whenever they find greater value."[14]

Much money and energy have been spent using technology to improve customer relationships, ***yet much of it has been used as a technological alternative to talking with customers, not to empower customers.***

Many organizations fail to respond to customers in a consistent, focused, targeted way and have customer processes that are costly in terms of customer satisfaction, operating costs, and profits. As the world moves faster and gets more complex in terms of regulations and competition, this situation will get worse. Customers expect quicker decisions and are no longer willing to wait for them. With all the information about competitors and quick Web-based access to them, they can find an alternative easily.

With the many channels now available, the potential for annoying or ignoring customers unintentionally is rising. Competitors are constantly forcing reactions, because customers might find another supplier who offers them something more compelling. These customers want to self-serve, to actively manage their relationship with their suppliers, and the organization of the future must make it possible for them to do so. As interactive web applications get better, many people will prefer "self-service" over "customer service."

The information an organization has about its associates is widely regarded as one of the few advantages an "incumbent" has. The current frenzy for customer data integration (CDI) is clear evidence that more attention is being paid to managing the resource of customer data. However, it doesn't matter how well managed and integrated this information is unless it contains customer preferences, and unless their preferences and your insights are used to tailor interactions with them.

[14] John Hagel and John Seely-Brown, *The Only Sustainable Edge*. Harvard Business School Press. May 2005.

The information you have about associates is a critical advantage only if you can learn from it. This learning can't be static, either; you can't discover an interesting piece of information about your associates and then stop. This insight must make it into your systems. Smart enough systems focus on better decisions for how to treat associates.

Support for an Extended Enterprise

The growth of outsourcing and smartsourcing[15] is leading to more loosely coupled organizations or groups of organizations. As Hagel and Seely-Brown said, "Loose coupling represents a more modular approach to process management."[16] **Loose coupling** means creating independent activities with clear owners and interfaces and performance guidelines. These activities can then be assembled and disassembled more easily to meet changing needs. This kind of business structure parallels the more flexible approach to information systems represented by a service-oriented architecture (SOA). This approach implies trusting relationships.

Organizations adopting this approach need systems smart enough to work in this environment and smart enough to allow associates to change how decisions are made in the processes that span organizations—that is, processes that require multiple organizations to deliver. Business processes, which once belonged to a single organization, are now composed of agile mini-processes that must be configured dynamically across organizational boundaries. This is impossible without the handshake of industry standards, directory services, and orchestration—and, once again, loose coupling in a service-oriented architecture. The systems supporting these processes must also be smart enough to generate the kind of audit trails and decision outcome logs that build trust between companies and between companies and their regulators.

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[15] Thomas M. Koulopoulos. *Smartsourcing: Driving Innovation and Growth Through Outsourcing*. Platinum Press, Inc. April 2006.

[16] John Hagel and John Seely-Brown. *The Only Sustainable Edge*. Harvard Business School Press. May 2005.

Web 2.0

There was a time when trendy expressions were durable. "Groovy" lasted about five years before it was no longer "cool" to say it. In business, "impact" as a verb stuck around for a decade or more. During the Web Bubble, "disintermediation" was cool for a year or so before, as with other trendy words, using it indicated you were a little behind the curve. The problem is that technology moves so fast now that these terms fall out of favor long before they have a chance to prove themselves. This trend is already happening with "Web 2.0."

Web 2.0 has real merit and staying power, however. It might no longer be avant-garde because of overuse and overexposure, and by favoring it we may find ourselves a bit derriere. But the term is an intermediate point between the original "World Wide Web," a collection of pages and a protocol for using them, and "Web 3.0," the truly semantic Web, where the entire collection can be mined for meaning. Web 2.0 offers some fascinating features and capabilities that enable people, organizations, governments, and even machines to interact based on some simple principles:

- **The Web as a platform**—The Web itself becomes the place where computing happens, which is part of the growing interconnectedness or "flattening" of the world. Services on the Internet can be assembled and disassembled at will.
- **Collective intelligence and wisdom of crowds**—Some evidence exists that the collective behavior of large numbers of people is a better predictor than expert judgment.
- **Using data, not just collecting it**—Data is gathered from both internal and external sources with the intent to use it to act differently.
- **The end of release cycles**—Continuous, unnoticed software change without conflicting and overlapping release cycles replaces point releases and disruptive, crippling maintenance efforts that drain IT budgets.
- **Designs for "mashing" and "hacking" applications**—These application designs provide a rich user experience in the corporate IT environment by "mashing" multiple applications together or by "hacking" an application to alter its behavior. This is all made possible by adherence to standards precipitated by the dynamic nature of the Web.

Operational decisions being reflected in services, the use of predictive analytics to apply the implications of group behavior to transactions, the focus on getting insight from data rather than just collecting data, and the ability to refine decisions continually without affecting other systems are characteristics of smart enough systems and Web 2.0.

Service-Oriented Architecture

Service-oriented architecture (SOA) is one of those phrases that gets thrown around in everything from technical standards to business books. Thomas Erl makes four key points in his books: [17]

- SOA can establish an abstraction of business logic and technology that allows a looser coupling between an organization's processes and its technology.
- SOA is an evolution of past approaches, preserving successful characteristics of traditional architectures and adding distinct new principles that foster service orientation.
- SOA is ideally standardized throughout an enterprise, but achieving this requires a planned transition and still-evolving technology.
- SOA is a technology architecture that supports and promotes service-oriented principles throughout an enterprise.

What SOA does, at a fundamental level, is allow the development of individual pieces of business functionality in a way that lets them be combined and modified effectively and without tightly coupling them to each other.

Organizations must also handle more jobs that aren't located in one building or even one country but are outsourced or "homesourced" by using the Internet and related technologies to connect workers. The systems these workers use must be smart enough to let them do their jobs effectively and to act on behalf of the organization yet ensure compliance with company policy and more.

[17] Thomas Erl. *Service-Oriented Architecture (SOA): Concepts, Technology, and Design*. Prentice-Hall, 2005.

Thomas Friedman says, "There are currently about 245,000 people in India answering phones from all over the world or dialing out to solicit people for credit cards or cell phone bargains or overdue bills."[18] He describes a series of trends and technologies that have, in his words, "flattened" the world by making it more interconnected. He explains how this flattening fits with globalization and how companies are reinventing themselves in the face of these changes and describes some of the problems, risks, and effects on political and public policy.

For example, deciding where to locate work is becoming more complex. More options, with advantages and disadvantages, are available, thanks to the overall increase in interconnectedness. Friedman explains that work will go where it can be done most effectively.

Another concept emphasized in the book is that of global, dynamic supply chains that "[coordinate] disruption-prone supply with hard-to-predict demand." For most of history, location has been critical for businesses of all kinds: where to open a store, where to put a factory, where to find customers. Improvements in connectivity and network bandwidth, however, mean that location is no longer a factor. Now the trend is work taking place where it can be done best and for the lowest cost. In addition, organizations find customers as well as suppliers and staff all over the world. They can reach out to new markets, take advantage of new opportunities, and collaborate with new partners worldwide. The parallel growth in information content of products and the overall shift from products to services in the world economy have forced organizations to consider their "digital supply chain." You can no longer consider just how and when physical goods are moved through your supply chain; you must also manage the knowledge and information that flow through it.

This ability to build a more distributed, electronically connected organization has consequences, however. In particular, how do you control it? When you outsource work to India or homesource it to Peoria, how do you make sure the work is done the way you want it done, following your policies? You need to be able to ensure that people working all over the world for you and your partners or suppliers treat your customers, your products, and your employees the way you want them to. You must equip them to act as though you were sitting in the next cubicle, even though they are geographically dispersed and perhaps brought together only temporarily to meet a business need.

Will you rely on just policy manuals and training? Will you assume that the people making decisions on your behalf can interpret data correctly from their reports and apply your business strategy to what the data tells them? With homesourced booking agents, for

[18] Thomas Friedman. *The World Is Flat: A Brief History of the Twenty-first Century*. Farrar, Straus and Giroux. April 2006.

example, you want to make sure they offer your best travelers upgrades when they can and know how to prioritize customers who need rerouting. Those 245,000 phone operators in India need an automated system for approving credit and recommending what kind of collections strategy will work. They need smart enough systems.

Demonstrably Compliant

Each new scandal seems to result in a new piece of regulation. Government and nonprofit organizations struggle under their own burden of reporting and compliance, and the penalties for noncompliance grow for organizations and individuals. For these reasons, governance and compliance are popular topics on the conference circuit.

Not only do organizations face more restrictions, but also many restrictions now demand *demonstrating* compliance. Organizations must be able to *show* that they are compliant with regulations. No one has to sue them or demand the information; they must report it annually, quarterly, or more often. In this environment, allowing front-line workers to make critical decisions is risky. They are less likely to be well trained, more likely to have high turnover, and most likely to be employed by third parties in the form of outsourcing. They don't necessarily make the best decisions. More important, showing that they made legal, appropriate, compliant decisions isn't easy. If more of your decisions are embedded in your information systems, however, you risk pushing the enforcement of these rules onto programmers who don't understand them, not onto businesspeople who do.

Additionally, more organizations must contend with multiple layers of regulation. They are obliged to follow local and national regulations, as they always have, and doing business on the Internet or using outsourcers around the world increasingly involves new sets of national regulations. Many international organizations, from the European Union to the World Trade Organization, also have rules that must be followed. Even knowing which set of local, national, and international rules must be applied to a specific transaction becomes a problem, let alone actually enforcing and demonstrating compliance with those rules.

Formal regulations are not the only rules an organization might need to follow. Socially conscious consumers, activist shareholders, and nongovernmental organizations also play a role. An organization might need to enforce rules to show that it's "green" or to defuse an unpopular perception of it. These "rules" must be enforced just like regulations, but they will be truly valuable only if made public. Those who care about these rules want to know exactly what the organization is planning to enforce. They want accountability—knowing what you did with their money, goods, and so forth. Managed transparency becomes important for most, if not all, organizations. Demonstrated compliance with publicly auditable rules creates new demands on systems and people.

Regulations are also becoming more sophisticated. No longer are they simply a set of rules to be enforced; some are starting to embody best practices and statistical measures. Two examples are Basel II,[19] with its enforcement of best practices in risk management, and court rulings forbidding personnel actions that might reasonably result in discrimination against a class of employee, even when no actions specifically do so. Being compliant won't get any easier.

The push toward compliance has a cost, however. As Taylor[20] notes, "The biggest problem with SOX . . . and [other regulations] is that it assumes a relatively static mode of business operations, and today, to be static is to be dead."

Organizations must deliver agile compliance; they must maintain business agility despite the burden of increased compliance. The increase in regulation tends to slow the rate of change in organizations by making it more expensive to make changes, but it can't stop change. Some organizations will find a way to evolve and be agile despite the regulations they operate under, and their competitors will need to do likewise. Achieving agility despite regulatory burdens requires smart enough systems.

Current Approaches Fail

> *"We have established that you cannot code your way into the future."*[21]

Different approaches to technology and systems development have failed to deliver smart enough systems so far, but why?

> *"The problem is that computers and the software that runs on them . . . are notoriously difficult to change with any speed or accuracy."*[22]

First, decision logic (policy rules, formulas, thresholds, regulatory mandates, and other elements used to make decisions) traditionally has been hard-coded into operational systems. As a result, development is time-consuming and costly. Developers have to translate business requirements ("If this condition is encountered, respond in this manner") into abstract representations in programming. This is a laborious process full of possibilities

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[19] New regulations from the Basel Committee on Banking Supervision (BCBS) in Basel, Switzerland, aimed to produce uniformity in the way banks and banking regulators approach risk management across national borders.

[20] Hugh Taylor. *The Joy of SOX: Why Sarbanes-Oxley and Services Oriented Architecture May Be the Best Thing That Ever Happened to You.* Wiley, 2006.

[21] Unknown Gartner Analyst, 2006

[22] Hugh Taylor. *The Joy of SOX: Why Sarbanes-Oxley and Services Oriented Architecture May Be the Best Thing That Ever Happened to You.* Wiley, 2006.

for error through misinterpretation. Developers have to try to anticipate all possible requirements and conditions because any changes after deployment could affect other parts of the program and require unraveling a good part of their work. Businesspeople requesting a change usually have to wait weeks or even months for the change to be coded and deployed, and because the hard-coded decision logic is buried in a system, it must be written (and rewritten) for each new platform or channel.

In addition, decision logic is difficult to understand. Because it's lodged in application programming code, business managers often have difficulty saying exactly how decisions are made. Different programmers might have coded layer after layer of policies and other types of rules in various ways. Some companies have tens of thousands of rules coded into their systems, including many that are irrelevant because they're based on market conditions and business requirements that no longer exist. Also, as organizations have moved from proprietary programs and applications to packaged applications from independent software vendors, the range of available decision rules and criteria has shrunk to those that could be "configured" with software system tools and workbenches.

Second, good decision making requires insight, especially into the probability of specific outcomes. Retail banking and other credit-extending companies have used this type of analysis extensively in automated decision systems. These "predictive analytics" are equally valuable—and still largely unused—for decision making in other industries. Business managers who want to bring predictive models into their decision processes might be daunted by the complexity of the data and analysis, however. Additionally, there's the impact of analytics deployments on IT resources. Predictive analytics, like decision logic, must be programmed into application code.

Third, although many companies can capture data from front-line systems and have invested heavily in data warehouses to store it, too much time might go by before they draw insights from the data. Most companies, in fact, often operate on stale data, partly because of what must be done to turn the data into a form useful for gaining insight.

Massive investment in business intelligence (BI) and data warehouse technology has undoubtedly helped management understand the impact of their decisions and detect trends in their business. What this technology hasn't done is improve the way employees and information systems that interact with customers make operational, front-line decisions. The purpose of using BI is to put it in the hands of people who can use analytic and business operations skills to understand what it's telling them. No matter how much visualization or smarts are embedded in these tools, they remain focused on knowledge workers who aren't the people making most of the decisions involved in day-to-day operations. These decisions are made by customer service representatives, counter staff, drivers, Web sites, or telephone support staff.

The Data Tipping Point

More and more data is now available to organizations about their operations, their customer interactions, and their Web sites. With the arrival of radio frequency identification (RFID) chips on every palette, case or box of products, and eventually on every individual product, organizations will have more data about their supply chain than ever before. With mobile devices that are always on and fitted with global positioning system (GPS) chips, every vehicle and employee will be a source of a continuous stream of data. Customers, too, as their mobile phones interact with organizations' systems, will deliver constantly updated information about their whereabouts and activities. Growing sensor networks and the integration of massive external consumer databases with enterprise and government databases will only add to this increase in information. We will, if we haven't already, reach the tipping point where the volume of data overwhelms current data reporting and analysis systems.

Two other factors complicate an organization's ability to take advantage of this embarrassment of riches. First, most tools, techniques, and methods for managing data are largely for transactional, relational data. Much of the new information that's available isn't. It might be unstructured text, as in e-mail or blogs, or structured but not semantically understandable. Social network software accounts for some of the most popular Web sites and can be a gold mine of information, if it can be extracted and understood. Second, all these types of data require technology such as voice recognition, image recognition, and text analysis to turn previously unusable data into information. Bigger volumes of unfiltered data, however, won't be valuable to organizations unless the data can be turned into useful insight.

Fourth, much money has been spent on customer relationship management (CRM) and other enterprise application technology. Too few CRM implementations have successfully created a unified view of customers, identified their preferences, rewarded them for providing information, and then marketed to them and interacted with them the way they want. Many companies fail to respond to customers in a consistent, focused, targeted way, despite massive investments in CRM. Too many call centers and other groups of front-line workers have been neglected. These agents don't have what they need to help

customers solve their problems, too much cross-selling and up-selling are done without sensitivity to customers, and the feedback loop to improve interactions is broken. The move to outsource call centers has only exacerbated this problem.

Current practices in coding, data analysis, data capture, and data management and the priorities represented by enterprise applications have resulted in systems that just aren't smart enough anymore. Chapter 3, "Why Aren't My Systems Smart Enough Already?" gives more details on this problem. But if the current approaches to information systems don't work, what can provide smart enough systems?

Modern IT Architecture Is Helping

The recent growth of standards-based service-oriented architecture and related approaches and technology, such as business process management and event-driven architecture, is moderating the negative impact of many of these trends. The approach in this book is complementary to these changes in how IT tackles problems. How this approach interacts with and complements a modern IT architecture is explained in Chapter 10, "EDM and the IT Department."

Decision Management Is Required

Fundamentally, a smart enough system must automate the operational decisions that drive your business. If you identify and automate operational decisions, you can separate them from the rest of your applications so that they can be managed and reused.

Managing decisions isolates the logic behind the decisions, separating it from business processes and the mechanical operations of your applications. Treating decision logic as a manageable enterprise resource means you can reuse it across applications in different operational environments and treat your decisions as a corporate asset.

Managing decisions means applying analytics to make decisions more precise. Using analytics in this way makes it possible to ensure that your decisions are informed by the data you're capturing. Indeed, with experience, you can apply more advanced analytics, take market and economic uncertainties into account, and arrive at optimal decisions.

Managing decisions makes it easier for you to improve decisions over time. You can focus efforts on improving decisions and be certain that improvements will be spread throughout your organization. This focus means your return on investment (ROI) is higher, because any improvements in decisions improve results in *all* applications that use them, essentially multiplying the value of your investment by the number of applications used.

Managing decisions has a cultural component. By recognizing and separating out operational decisions, you can focus your business thinking and investment on these decisions more easily. You can apply your strategic vision and management approaches to achieve optimal decisions.

So what might an organization that used smart enough systems to run its business look like? How would an organization that managed its decisions act,?

Introducing SmartEnough Logistics

SmartEnough Logistics is a glimpse into the immediate future. SmartEnough is a company that ships packages around the world for its business clients and applies smart enough systems to maximize returns and minimize costs.

Customers interact with drivers collecting packages, who can price, up-sell, and cross-sell effectively, thanks to their handheld devices. These devices can record customer preferences and needs, predict whether the service being purchased is more or less than required, match this prediction against the customer's contract and established preferences, recommend cross-sell and up-sell opportunities, and get the price right, given the relevant contracts.

Packages are tracked using RFID and trucks with GPS, so the tracking system knows where each package is (in which truck and at what location). The dispatch system also uses this information to make adjustments. For example, it predicts that a driver's truck won't have the capacity for the second-to-last scheduled pickup because of the volume of orders at that location, so it changes the truck's route dynamically and transmits this information to the anticipated driver, who's used to this kind of just-in-time changes to routes. The historical data from the GPS allows the dispatch system to predict which trucks can make the pickup (by predicting the additional time needed) and select a different truck by balancing this data with each truck's open capacity.

As another example of making just-in-time changes, while a truck is in transit, a customer realizes that one of her packages was shipped with too low a priority. She logs on to the company's Web site to change the shipping priority. The site uses the same decision engine as the driver's handheld device, so it gives her exactly the same information about likely delivery dates, times, and pricing as the driver did, reassuring her that everyone involved knows what they're doing. The customer requests expedited delivery online, and the system responds immediately with available upgrades based on the rules and analytics built into the scheduling system. New pricing is displayed, and the customer accepts; because her relationship with the shipper is established, she doesn't need a credit check or additional credit card.

When the truck arrives at the cross dock, the unloading crew takes each package off the truck. The RFID tags trigger an automated sorting belt that routes them to the correct loading areas for different delivery schedules and destinations. This system routes the changed package differently at this point, given its new information. The manager of the loading area notices this change because he received an automated alert from his activity-monitoring system when a label configuration unusual for the load being assembled was scanned. When he checks, the system can tell him exactly why the routing has been changed.

While the plane carrying the package is in flight, the customer calls the call center from her cell phone on the drive home, worried about her package. The customer service representative (CSR) sees the shipping information, the rerouting and the reason for it, and he has access to the same system for predicting delivery time. This delivery time, of course, now reflects the impact of the rerouting. Despite reassurances from the CSR, the customer is still concerned the package won't arrive on time. The CSR asks the system for other options on the package, and it shows that no additional rush options are available (given the package's current routing). The CSR also sees that an extra notification offer is available for free; this offer is based on the package and its delivery location, and the pricing is based on the customer's status as "concerned" (entered by the CSR) and "long established" (from the system). The customer accepts the offer and goes home to bed.

This package must also go through customs at its delivery location. SmartEnough has another system that applies current rules for the destination (a combination of rules established by the locality and rules from the federal government about exporting the items in the package) and generates the correct customs paperwork. This system ensures that the package won't be held up in customs. Some rules were added just today when new export rules were announced unexpectedly. Fortunately, SmartEnough's system could be updated directly by the legal department as soon as they understood the new rules' implications.

During the flight, bad weather closes an airport on the route, forcing a diversion. This information enters SmartEnough's system directly from the airport's system. Automated routines run in response to see what rerouting options exist for packages on the flight (package by package) and determine that some won't make their scheduled delivery, no matter what. The system immediately notifies these customers of the delay and gives new delivery times. It also makes retention-oriented "we're sorry" offers based on calculated retention risks for those customers and the kind of service they ordered. Packages that can be rerouted are.

Two options are available for the concerned customer's package. The first means it might arrive on time but has the risk of a lengthy delay. The second means it won't be on time but guarantees that it will be only a little late. Given the kind of service ordered,

customer preferences, and the package's transit history, the system chooses the first option and informs the customer. At this point, there's time for the customer to change the option if she notices the notification in time (it's now night), but the system has made the best decision it can for now.

When a package is delivered in a foreign country, a third-party delivery company is used. Because SmartEnough makes all its systems available to its extended enterprise, the delivery company's driver has access to the same information and same decisions as the driver of a SmartEnough truck. When the package is delivered—on time, as it happens—the third-party delivery staff are notified that acknowledgment of receipt is important for this package, so they double-check with the hotel staff at the delivery location. The system prompts for a name and phone number from the person signing for the package and transmits this information to the customer.