Chapter 2 The Extent of an Organization's Connectivity

Chapter Objectives

This chapter will discuss:

- The evolution from isolated functions to business processes,
- Who requires access to an organization's networks, and
- From where they require the ability to access the networks.

2.1 Access in the Age of the Extended Enterprise

Over the past few decades, the ability to communicate with others electronically has advanced dramatically, leading to first the creation of the Internet and later the World Wide Web. The impact of this phenomenon on organizations concerning the pace of operations and the need for efficiency in their business processes is significant and will only become more so for the foreseeable future.

Originally a project of the U.S. Department of Defense (DoD) Advanced Research Projects Agency (ARPA), its task was to give various DoD activities the ability to share information through networked computers, hence eliminating the need to wait for surface mail to be delivered. As the cost of both computers (also originally developed by the U.S. Government) and connectivity decreased, private industry's ability to implement information technology grew.

Since its invention in the 1950s, the Internet has facilitated communication among an ever-increasing community of users—as costs have decreased and capabilities have risen, the applications developed for the medium have multiplied. One application is integrating the functions of an enterprise into an increasingly seamless data management system. Companies such as SAP and Oracle have developed applications to provide this

data management system. As is typical, the private sector led the way in implementing information technology, but the U.S. Government is now experienced in procuring enterprise resource planning (ERP) systems.

Before IT evolved to the point at which geographically distant parties became able to communicate with each other in beyond talking to each other or faxing each other, the only way to gather information was from the individuals responsible for their particular functionality. These "stovepipes", established based on how labor was divided at the time, were only concerned with their specific requirements and had little or no regard as to how their processes related to those of other parts of the organization, as shown in Figure 2.1. With ERP systems, the power of IT to enable an organization's business has literally exploded.

ERP systems give organizations the ability to streamline their supply chain and their front- and back-office business processes into a more "flat" or "seamless" regime leveraging IT's ability to distribute information to authorized (or unauthorized if one's not careful) parties to allow formerly functional smokestack sections of the organization instantaneously. For example, rather than a customer service employee being required to telephone or e-mail a colleague and wait for a response to a query, ERP solutions employ integrated applications with all information relevant to a customer user "case" available as shown in Figure 2.2. This real-time ability to access the most up-to-date information available as well as to generate reports based on that information is, according to Ptak (1999), critical to allowing decision makers to make good business decisions.

A major implication of a process-centric approach to information technology implementation is that an organization will be forced to change its emphasis on how it rewards its employees from doing one's job in isolation to helping to enable the business process or processes in which they reside. In the public sector especially, it is extremely difficult to realize organizational change. Instead, the organization goes through great pains to maintain the status quo. Many in government remember the days when new systems were custom-built and implemented functionality as specifically defined by the procuring organization's requirements. ERP systems, on the other hand, establish its options on already-coded best business practices and forces the organization to choose among available options, with "downstream" choices constrained by those made "upstream."

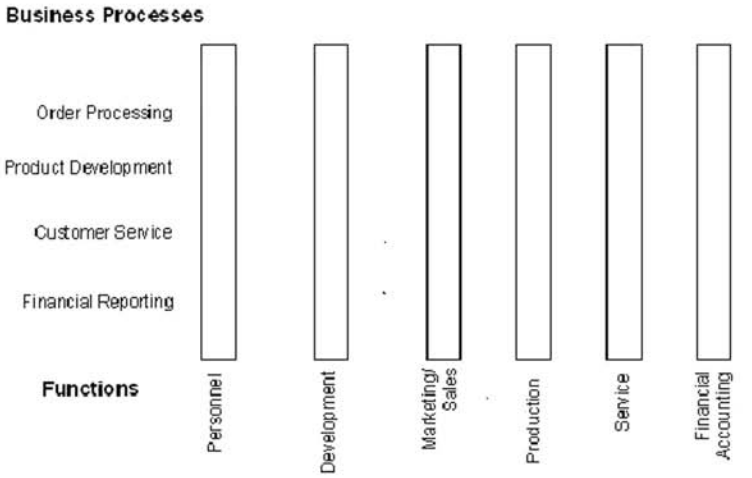

Figure 2.1 Non-ERP Enabled Processes (Adapted from Perez, et al, 1998)

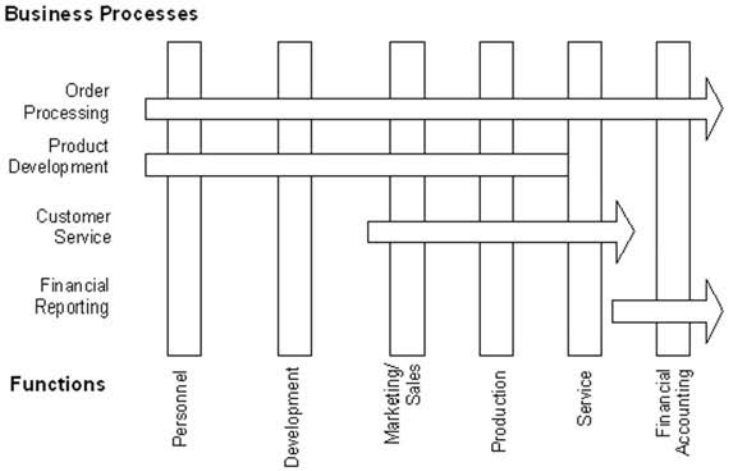

Figure 2.2 ERP Enabled Processes (Adapted from Perez, et al, 1998)

The next section discusses many of the "moving parts" of an organization required to access its IT systems.

2.2 The Players

The number of people and the roles they play in ensuring an organization fulfills all of its functional and legal responsibilities might be somewhat surprising to the reader, not in that they would not have heard of any of these actors but that they had never put them together in a comprehensive mental framework. In fact, this discussion is likely far from a complete listing itself.

2.2.1 Customer-Facing Employees

Those employees who interact with the customer should have as much information as possible at their disposal to allow them to be able to provide a complete and accurate answer to any customer inquiry.

Sales is one of the groups with which the rest of the organization has a love-hate relationship. Because sales folks are how much of a company's business is generated, everyone else relies on them to stay employed. A common problem with sales representatives, however, is that because they aren't usually experts in the technologies involved in what they are selling they will sometimes make promises or leave impressions that are, in the case of IT, contrary to the "laws of physics" of the system they are trying to sell. On the other hand, sales folks are often unable to generate proposals and tailored marketing material or to even know how to describe a product to a potential customer because they lack access to the data describing it.

Another issue sales associates face is how many of a product are "available to promise." When talking on the phone with a customer or even when face-to-face, it is extremely helpful in gaining a commitment to buy at that moment when the associate can look into the organization's ERP and know how many of an item may be purchased at that moment, the price per item and when they would be delivered. Should a customer need to hold for too long or if they are forced to receive a callback they might inquire with a competitor and place their order with them before the original company would be able to get back to them with an answer.

Marketing professionals have the responsibility to generate the material sales people and the organization's website use to promote their offerings to potential and existing customers. In order to do so and to keep the ma-

terials as up-to-date as possible, marketers have a need to know not only the most current information on each product available, but also what will be released in the foreseeable future. Marketing professionals, along with sales and the technical people who produce the products to be sold, staff the booths at trade shows and conferences, at which valuable contacts and sales leads are often generated. Marketers are often not as knowledgeable about the technical details of a product and as such will rely on an ability to provide a potential customer with a brochure or data sheet about the organization's offering, which would be generated most efficiently by accessing the product data directly from the system versus a "data call" from the product team.

Customer service representatives also have significant interaction with customers but will likely only know the history of the transaction in question by what they are able to access on their computer. In the case of a sales associate not being available to a customer, they will be able to call customer service to place their order or to inquire as to the price and availability of what they would like to purchase. In addition, customer service representatives will often be forced to deal with customer complaints, especially about overdue orders or those with quantity, quality and billing issues. For issues requiring the customer to return product, the process to receive return items, known as "reverse logistics", must be enabled. In this instance, the customer service representative must provide the customer with the ship-to address and often a code to include on the box or return invoice to give the receiving department the information it needs to enter the return in the system to enable credit minus any restocking fee to be applied to the customer's account.

Technical Support is both a customer-facing and internal job which, as the name suggests, helps callers (or e-mailers or chatters) resolve problems relating to the functionality of products they have bought from the company. In order for the tech support person to be able to assist the callers, they must know how to diagnose the problem in order to be able to turn to the correct "script" to guide the user through the repair process if they are not already familiar with it. In order to do this, diagnostic procedures followed by the technical data to fix the problem must be available within a few seconds to the representative, as quite often the customer must resolve the issue quickly in order to complete their task as soon as possible.

Technical support is a major candidate for what is known as "offshoring," or outsourcing to an overseas contractor in a country such as India, which has a large amount of highly trained technical experts who are far

less expensive than domestic employees or contractors. Whether offshoring makes economic sense is beyond the scope of this book but is an issue to be considered when deciding whether to keep technical support in-house or to contract it out domestically or internationally.

2.2.2 Internal Functional Employees

Another type of worker under management is the "functional," who has a large hand in making sure the day-to-day workings of the organization go smoothly. In this section, those who actually make or design the product and those who enable the production are discussed.

Manufacturing and Production workers are what most people see in their minds when they are asked to picture a company employee, at least traditionally. These are the men and women who, for example, work the assembly line in an automobile plant. In the IT or "information worker" industries, they are the people who write the code or compose the documents that comprise the organization's products. Factory workers are the epitome of what was once the predominant economic model for an organization: tasks separated out to an extent that sometimes the individual worker did not know how what they did on a daily basis fit into the overall picture of the organization's mission. Because production workers mostly worked on a quota system, and were rewarded or punished based on whether or not they met the company's expectations, they had no reason to care how what they did contributed to the organization.

Now, while they still don't need to as much information as many other workers, they do need access to the IT systems to know what they are to make and how many of each. In many fields, such as the computer industry, the mix of product to be made each day can vary widely, and the factory worker must know what they will need to make that day or even that hour. The most efficient way for them to find out that information is by receiving it from the production planning system.

In today's age of the information worker, the business or production process they are within is critical knowledge. Despite their increased reliance on an IT system's output, factory workers typically have only one job to do at a time and that job has been integrated into the overall business process by someone else; it's not the line employee's job to think about it. For the information worker, however, it is imperative that they realize how what they do impacts the rest of the process. In an ERP implementation, for example, a decision on how to meet a specific requirement will influ-

ence or even dictate how another requirement is met. If the decision is not coordinated beforehand in a complex organization, such as the U.S. DoD, it may inadvertently cause the system to be non-compliant with a regulation or policy. Because of this, close communication and decision-making among senior leaders throughout the organization is needed from the start of the project.

Operations and Logistics are two other "hands-on" fields of work. In operations, employees ensure the infrastructure is in place for workers to be able to do their jobs, be it as simple as a new employee has a desk ready for them when they arrive or as complex as that the extremely expensive machine used to make the organization's product is running perfectly. Several bits of information are needed in operations. First, they either need access to or automatically generated reports from the human resources system to see if new employees are coming to the facility or if some are leaving in order to know if they need to order materiel to accommodate the incoming employee or if they may transfer something from the outgoing employee to the new arrival.

For the expensive machinery, operations must, for example, know when to take it offline for maintenance. To determine the maintenance schedule, operations must know from the production schedule when the best time to do so would be. If there is no "best time," the production planning system must be notified of when the system will be taken offline in order to allow the systems customers, customer service and sales access to be updated with accurate availability status and dates. If all this is accomplished automatically, it is seamless. If not, it is a potentially long process of manually accessing and updating several different systems, which leads to input errors and incomplete updates, meaning that the data in one system is different than the data in another system, which is disastrous. Instead, it is always preferable to rely on an "authoritative source" for each piece of data throughout the enterprise to ensure consistency (and assuming the single source is correct, of course).

Logistics professionals deal in the transport of materiel from one location to another, be it internally within the organization (such as from one location to another), from the organization to a customer, or in reverse logistics, in which the organization receives something it shipped out back from a customer. Because the shipping and receiving department is highly labor-intensive, and having too few or too many workers on hand to process the incoming and outgoing materiel is expensive, the scheduling system must know from the production planning system how much materiel is

to be produced and shipped out on a given day or even during a given shift. In addition, incoming shipments must be received, including customer returns as discussed earlier. Some organizations, such as Wal-Mart, are moving to implementing Radio Frequency Identification (RFID) chips in their warehouses and stores (currently down to the pallet level), which will, when adequately mature, reduce reliance on humans to account for what has gone out and what has come in. In another example, one may remember the recent U.S. television commercial in which a Wal-Mart truck had its destination changed "mid-flight" to restock a store that had an urgent need for an item in the truck. When this happens, the logistics system must trigger the sending of the goods to its original destination on a future shipment.

2.2.3 Internal Support Employees

It is perhaps unfair to label this next group of employees as "support," because they do perform quite valuable functions for an organization, not the least of which is to help keep the company and its employees out of court and maybe jail, but the term applies in that these employees do not actually produce anything to be sold to or consumed by a customer.

Human Resources is the part of the organization in charge of administering its employment policies. Posting open positions and screening resumes is one part of the HR professional's duties, but it is also their purview to ensure all required documentation, such as non-disclosure agreements, non-compete agreements and all relevant policies (appropriate computer use, for example) have been signed and are on file. For many organizations, some of its work will require the employee to be approved for a billing category, have a security clearance or to have received training in a specialization, such as the handling of hazardous materials. In the U.S. military, by way of example, a combatant commander planning a mission or expecting a particular situation to arise will, among other things, check to make sure there are sufficient numbers of trained personnel at their disposal to undertake the mission or to deal with the anticipated situation should it come to bear.

Accounting is a thankless job, in that financial requirements are so well-defined and specialized that accounting's requirements and most everyday workers' view of what is adequate documentation is far from the same. As anyone who has had to correct an expense report or timesheet multiple times will attest, the level of negative feedback the accounting department receives is quite high. The biggest issue for them in dealing with employ-

ees, of course, is ensuring that all hours charged to the client and all expenses charged to the company or to the client are adequately documented to ensure the organization is able to pass an audit. For companies who are contractors to the U.S. government, the documentation requirements are quite strict and cumbersome. The information generated by the system, however, allows for managers and senior leadership to see if the expenditures on a contract or investment capital (also known as the "burn rate") is below, at or above the targeted rate. They also submit payroll and expense reimbursements, so we should all try to be as nice as possible to them.

Auditing is a department that strikes fear into even the most honest of employees, if nothing else for the sheer time-consuming nature of being involved in an audit. As will be discussed in Chapter 8, however, new laws stemming from the recent Enron scandal and the unintended release of private health and financial records require companies to establish that they are compliant with its mandates as enacted in federal regulations. This also impacts public sector implementations, as personal information as well as classified data, for example, must be protected.

2.2.4 Management

To many, "management" is simply an amorphous cloud of people to whom one must answer but whose function in the organization is unknown to the lower-level workers. In fact, managers at all levels have responsibilities that are key to the overall success of the organization. Three levels of managers and the type of information they require to do their job are summarized here. In many organizations there are many more levels, it should be noted.

Line managers, those who manage the workers, need to know the information generated by those under their direct supervision in order to report to the next level of managers above them. While this information can be many and varied, for purposes of simplifying it for this example, assume that it is simply a consolidation of all the output the workers in the manager's group produce. The managers are then responsible to their next level of supervision to demonstrate they are meeting their business goals as required to implement the organization's business processes. Line managers are typically responsible for approving timesheets and expenses as well as monitoring how their area of responsibility is performing regarding schedule and quality.

Middle management is the next level of accountability, and these managers are those who were traditionally in charge of the line managers within their functional area, which holds true in many organizations today. In other organizations, middle managers are part of the business process governance structure. Middle managers are required to coordinate with their peers from other parts of the organization to ensure decisions they make do not have negative impacts on other parts of the operation. To aid their analysis, middle managers have a need to see additional data from IT systems in order to allow them to confirm that their area of responsibility conforms with relevant laws and meets business objectives.

Senior management is charged with ensuring that large areas of the organization are working according to plan, such as the person in charge of security for the entire organization. In order to ensure all is well, senior managers will not often be required to see how individual functionalities are being performed but will rather need to have access to timely and accurate data "rolled up" into the measures they need to know their areas of responsibility are meeting objectives.

For all of the required access to information to happen, the business process, involved data, IT infrastructure and user roles must be modeled and configured precisely in order for the information to flow the way it must for someone to be able to have the data they need when they need it. This is the ideal state of affairs, obviously. Very few if any organizations have achieved this level of sophistication to this point; most will continue to rely on some sort of export or physical transfer of data to compile the reports workers need to be able to do or know how well they are doing their jobs and to be able to ensure their areas of responsibility will withstand an audit.

2.2.5 External Players

It is difficult at best for access within an organization to be controlled, but in this era of ubiquitous access and business process across an extended enterprise comprised of multiple organizations it is not always enough to have only one's own employees able to access its systems.

Suppliers, at the beginning of an organization's supply chain, need to know what they will be required to deliver and when. Companies such as Dell (as documented in Frye, 2004) have implemented systems which allow suppliers to know what they need and when they need it. Because the Dell's production planning is recalculated very often, suppliers are con-

nected to the company's system to enable them to receive updates to the delivery requirements as quickly as they become available. Dell pushes a large amount of the inventory risk onto its suppliers, but it does its best to coordinate with the supplier to let them know the range of product they will need in order to allow them to plan their own purchases and production schedules.

Customers, at the other end of the supply chain, always have one question: "Where's my stuff and when is it going to get here?" In the U.S., customers are able to track many of their orders from Amazon.com from receipt of the shipping notification through delivery by, for example, UPS. UPS and FedEx have very good package tracking systems, to the point where one is able to trace the path of the package from where it leaves the Amazon distribution to the UPS distribution center from which it is delivered, when it goes out for delivery and when it was in fact delivered.

Just like with internal users but even more critical is the access external actors enjoy. Special care must be taken to ensure that those outside of the organization have no more information access than is absolutely necessary for them to do their jobs.

2.3 Locations from Which Access is Required

Today's extended enterprise in many cases reaches around the globe. In software development, for example, it is not uncommon for work to be done on project 24 hours each work day. Workers in California pass off their progress to programmers in India, who in turn send it to developers in Israel, for example. For an Intel computer chip, for example:

> "The process starts in Japan, where a single crystal is grown into a large ingot of silicon by Toshiba Ceramics. The silicon ingot is then sliced by suppliers, like Toshiba Ceramics or others, into thin wafers that are flown across the Pacific to one of Intel's semiconductor fabs in either Arizona or Oregon. At the fabs, hundreds of integrated circuits are etched and layered on each wafer, forming individual dies on the wafers. Finished wafers are packaged and then flown back across the Pacific to Intel's Assembly and Test Operations in Malaysia. The wafers are treated and cut into die, and the dies are finished into sealed ceramic 'packages.' The packages are then placed in sub-

> strate trays that are put into Intel boxes and then packaged again in blank boxes (to conceal that they are Intel products) for shipment back across the Pacific to Intel warehouses in Arizona. Having traveled across the Pacific three times already, the chips are then shipped to Dell factories in Texas, Tennessee, Ireland, Brazil, Malaysia, and China, or one of its contract manufacturers in Taiwan, to be used as components in Dell computers. The journey ends when the product ships from Dell to the customer's home or office anywhere in the world, amounting to a fantastic and complex global voyage." (Sheffi, 2005)

The key point to remember based on the above discussion is that people in each location must know how much materiel is coming into the facility, when it will arrive, how many must be shipped to each location and when they must arrive. This process is highly coupled and, as Sheffi noted, very complex. There are also, for example, import/export, financial and security issues connected with many of the shipments.

2.3.1 Fixed Locations

As was seen in Sheffi's example, the creation and distribution of an Intel semiconductor is a very involved process. In a complex enterprise, there will be several facilities that will not change their physical location during the process. These plant sites, fabrication labs, distribution centers and others require current and accurate information to flow into them to enable them to plan. Multiple sites in the *same country* must communicate and are subject to domestic laws governing, for example, the transport of hazardous materials. Multiple sites in *multiple countries*, however, have this and other issues, such as import/export and data protection. At all times, however, in the newly-enabled extended enterprise, everyone with a need to know should be able to access the information from their desktop based on their role and the availability of data.

2.3.2 Mobile Locations

In the Intel example, there were several instances of the materiel traveling by boat across the Pacific. What if rough seas were to delay the shipment's arrival? With satellite communications, the facility expecting the shipment and all those who need to know can be updated quickly with a new estimated time of arrival. The advantage to being able to do so is that the receiving facility is now able to reschedule its work based on the up-to-

date information and notify all involved in the enterprise of the revised delivery schedule.

2.3.3 Alternate Work Locations

Myriad ways to access an organization's systems with myriad devices are available to individuals at inexpensive costs by business standards. Discussed in future chapters, laptops, desktops, combination devices (cell phones and personal digital assistants for example) are all able to access an organization's IT systems.

Several places are available to a worker when they are not in the office:

- Home-Telecommuting is an option with many organizations now. This is convenient, especially in urban areas where commutes are routinely an hour or more each way, but it is also a challenge in that the worker's connectivity must be established in a way that the organization will be certain the employee is able to do their work without having access to more information than they are entitled to have, as this causes both competitive and compliance issues.
- Transport- Whether on a bus, train or in a car the commute is a good time to be productive for many workers, although functionality could be limited by the type of connection available.
- Public Access- Some eating establishments and bookstores in the U.S. offer complimentary wireless internet access, and many more serve as "hotspots" for services such as T-Mobile. Internet cafes, in which users rent access to a computer and the internet, are also popular.

2.4 Conclusion

The new world of IT as enabled by ubiquitous connectivity and ERP systems affords the opportunity for an organization to act much more efficiently than before by enabling business processes and their related data to be shared across the extended enterprise. For security professionals and senior leadership, the challenge of the new regime is to only allow those who have a legitimate right to access information to do so. To allow unauthorized access could have major competitive consequences and could also put those responsible in legal jeopardy, as will be discussed in Chapter 8's coverage of the Sarbanes-Oxley and HIPAA laws. The following chapters will discuss the infrastructure of an organization's IT networks, and in

Chapters 16 and 17, for example, the ways in which an employee may be informed of the importance of maintaining security and how they should be trained to properly protect proprietary information.

2.5 Discussion Questions

Think of the process one goes through in your organization to be reimbursed for expenses incurred.

- How many people are required to approve the submission before accounting is authorized to pay you?
- Do you need to fill out a paper form, an online form, or both?
- What form of documentation do you need to provide to prove you spent what you're claiming? Is there an amount below which you don't need to produce documentation or are there some instances in which the amount of your reimbursement is fixed?
- Do you receive payment by check or direct deposit into your bank account?
- If you know, how does the accounting department submit its reimbursement authorizations to the bank? Or does your organization use a payroll service?

Next, think of a key function you perform in your job (if you're a student, think of the process you go through to register for classes, but also add in the possibility that you may need to convince a professor to let you add the class you want even though the computer says its full.)

- Is there a standard procedure to accomplish what you need to do?
- Are there multiple paths to accomplish what you need to do?
- Can you create a flow chart of the process and all its possibilities?
- In your job do you know everyone to whom you might provide proprietary information? Do you have security procedures to follow to authenticate that the person requesting the information is entitled to have it?

How does your job fit into the overall mission of your organization? Why is it necessary? Which business processes do you support?

In how many ways are you able to access your organization's IT systems?

Do you have access to the IT systems of other organizations? Do any employees of other organizations have access to your IT systems?