Reading Assignment

Chapter 6:
The Cloud

Chapter 7:
Processes, Organizations, and Information Systems

Suggested Reading

See information below.

Learning Activities (Non-Graded)

See information below.

Course Learning Outcomes for Unit IV

Upon completion of this unit, students should be able to:

2. Distinguish the similarities and differences between the personal knowledge management tools.

5. Evaluate the approaches to developing organizational knowledge management strategies.

Unit Lesson

In Unit III, we discussed the basic concepts of hardware and software. We also discussed open source software development, database management systems, and compared the differences between native and thin-client applications. Lastly, we explored mobile systems and the characteristics of quality mobile user experiences. In this unit, we will discuss the cloud and how the cloud works, the types of business processes, and ERP systems.

Networks and IP Addresses

The author of your textbook does a great job of breaking down computer networks as described below:

> A computer network is a collection of computers that communicate with one another over transmission lines or wirelessly… A local area network (LAN) connects computers that reside in a single geographic location on the premises of the company that operates the LAN. The number of connected computers can range from two to several hundred. The distinguishing characteristic of a LAN is a *single location*. A wide area network (WANs) connects computers at different geographic locations. The computers in two separated company sites must be connected using a WAN… An internet is a network of networks. Internets connect LANs, WANs, and other internets. The most famous internet is "the Internet" (with an uppercase letter *I*)…In addition to the Internet, private networks of networks, called *internets*, also exist. A private internet that is used exclusively within an organization is sometimes called an intranet (Kroenke, 2015, p. 206).

An IP address is a number that identifies a particular device. Public IP addresses identify a particular device on the public Internet. Because public IP addresses must be unique worldwide, their assignment is controlled by a public agency known as ICANN (Internet Corporation for Assigned Names and Numbers). Private IP addresses identify a particular device on a private network, usually on a LAN. Their assignment is controlled within the LAN.

The private/public IP address scheme has two major benefits. First, public IP addresses are conserved. All of the computers on the LAN use only one public IP address. Second, by using private IP addresses, you need not register a public IP address for your computer with ICANN-approved agencies. Furthermore, if you had a public IP address for your computer, every time you moved it the Internet would have to update its addressing mechanisms to route traffic to your new location. Such updating would be a massive burden.

Once again, Kroenke gives a wonderful description; this time of the virtual private network:

> A virtual private network (VPN) uses the Internet to create the appearance of private, secure connections. In the IT world, the term *virtual* means something that appears to exist but in fact does not… a VPN uses the public Internet to create the appearance of a private connection on secure network… The remote user is the VPN client… Once the Internet connection is made, VPN software on the remote user's computer establishes a connection with the VPN server… The VPN client and VPN server then have a secure connection. That connection, called a tunnel, is a virtual, private pathway over a public or shared network from the VPN client to the VPN server (Kroenke, 2015, pp. 223-224).

The Cloud

Cloud computing is defined "as the elastic leasing of pooled computer resources over the Internet" (Kroenke, 2015, p. 199). The term *elastic* is used because the amount of leased resources can grow or shrink in response to needs seamlessly and quickly, and fees are charged only for resources used. The term *pooled* is used because many organizations share the physical hardware through virtualization. The term *Internet* is important because cloud resources are accessed using standardized Internet protocols and standards.

Cloud-based computing does not require a large investment in typical computing center resources. Organizations will not have to invest in significant development costs, maintenance costs, support costs, personnel costs, management costs, and will not bear the risks of technical obsolescence. Cloud computing customers expect excellent computing resources to be provided and expect excellent security and support.

If an organization chooses to utilize in-house computing, it retains control over its physical computing resources and knows exactly how its computing resources are secured and protected.

Some of the most salient advantages of cloud computing are:

- lower costs,
- known cost structure,
- scalability of resources to meet varying demand,
- access to skilled resource management, and
- no worry about technical obsolescence.

Three factors have made cloud-based hosting advantageous today:

1. Processors, data communication, and data storage are so cheap as to be nearly free. Because data communication is so cheap, getting the data to and from that processor is also nearly free.

2. Virtualization technology enables the near instantaneous creation of a new virtual machine. The customer provides (or creates in the cloud) a disk image of the data and programs of the machine it wants to provision. Virtualization software takes it from there.
3. Internet-based standards enable cloud-hosting vendors to provide processing capabilities in flexible, yet standardized, ways.

For example, the cloud [iCloud] will give Apple a competitive advantage over other mobile device vendors because the iCloud enables Apple to offer significant enhancements to its mobile device product line. The ability to synchronize each device's content is an incredible advantage, and relieves users of a common frustration when the content of their various devices is not synchronized. This definitely differentiates Apple's mobile device offerings from their competitors.

The iCloud will help to lock in customers who will not consider moving to another provider's devices and hence give up the advantages of the iCloud. Apple has already moved to lock in suppliers by only accepting apps developed by committed Apple developers. This huge investment in the iCloud data center will be difficult for new entrants in the market to duplicate, thus raising barriers to entry. Apple should experience lower costs with the almost self-managing data center it has created.

AllRoad Parts has been using a traditional, third-party hosting organization. It pays for a monthly plan for certain servers. Those servers may or may not be virtual (AllRoad does not know how they are managed within the vendor), but they are most certainly not elastic. The benefits of the cloud are substantial to a business like AllRoad Parts, especially considering the need to store the new, large 3D printing design files. AllRoad Parts does not know if it will sell one or 100,000 such files. Elastic servers provide strong benefits.

Also, regarding security concerns, the major cloud service vendors employ thousands of highly trained, skilled specialists to create, manage, administer, and improve their cloud services. It is nearly impossible to imagine that the security they provide could be done better in a private internet managed by the IT department at AllRoad. If security is paramount, AllRoad should consider a Virtual Private Cloud, which is a subset of a public cloud with highly-restricted, secure access.

The cloud is based on the Internet as its foundation. It also utilizes a design philosophy called the service-oriented architecture (SOA). According to this philosophy, all interactions among computing devices are defined as services in a formal, standardized way. This philosophy enables all the pieces of the cloud to fit together. For many organizations to use the cloud and to be able to mix and match Web services, they need to agree on standard ways of formatting and processing service requests and data. That leads us to cloud protocols and standards. The protocols that run the Internet also support cloud processing.

WSDL (Web Services Description Language)

Web services description language is a standard for describing the services, inputs and outputs, and other data supported by a Web service. Documents coded according to this standard are machine readable and can be used by developer tools for creating programs to access the service.

SOAP

A protocol for requesting Web services and for sending responses to Web service requests.

XML (Extensible Markup Language)

XML is a markup language used for transmitting documents. It contains much metadata that can be used to validate the format and completeness of the document, but includes considerable overhead.

JSON (JavaScript Object Notation)

JSON is a markup language used for transmitting documents. It contains little metadata and is preferred for transmitting volumes of data between servers and browsers. While the notation is the format of JavaScript objects, JSON documents can be processed by any language.

> Cloud-based hosting makes sense for most organizations. The only organizations for which it may not make sense are those that are required by law or by industry standard practice to have physical control over their data. Such organizations might be forced to create and maintain their own hosting infrastructure. A financial institution, for example, might be legally required to maintain physical control over its data (Kroenke, 2015, p. 203).

Be careful not to confuse the cloud with the Internet. The Internet is a group of interconnected computers that span the globe called the World Wide Web. Through the World Wide Web, you are given access to web sites and hyperlinked web documents. The Internet is also known as the largest network in the world because it consists of thousands of networked computers. Cloud computing is technology that provides resources and services such as software distribution over the Internet. Another service is SaaS (software as a service), which eliminates the need for proprietary email and local servers. Instead, businesses can choose SaaS cloud services like Google for email, rather than setting up local email servers.

> An organization that provides software as a service (SaaS) provides not only hardware infrastructure, but also an operating system and application programs as well. For example, Salesforce.com provides hardware and programs for customer and sales tracking as a service… The second category of cloud hosting is platform as a service (PaaS), whereby vendors provide hosted computers, an operating system, and possibly a DBMS. Microsoft Windows Azure, for example, provides servers installed with Windows Server. Customers of Windows Azure then add their own applications on top of the hosted platform… The most basic cloud offering is infrastructure as a service (IaaS), which is the cloud hosting of a bare server computer or data storage (Kroenke, 2015, pp. 219-220).

Below is a visual illustration of the cloud (Figure 1).

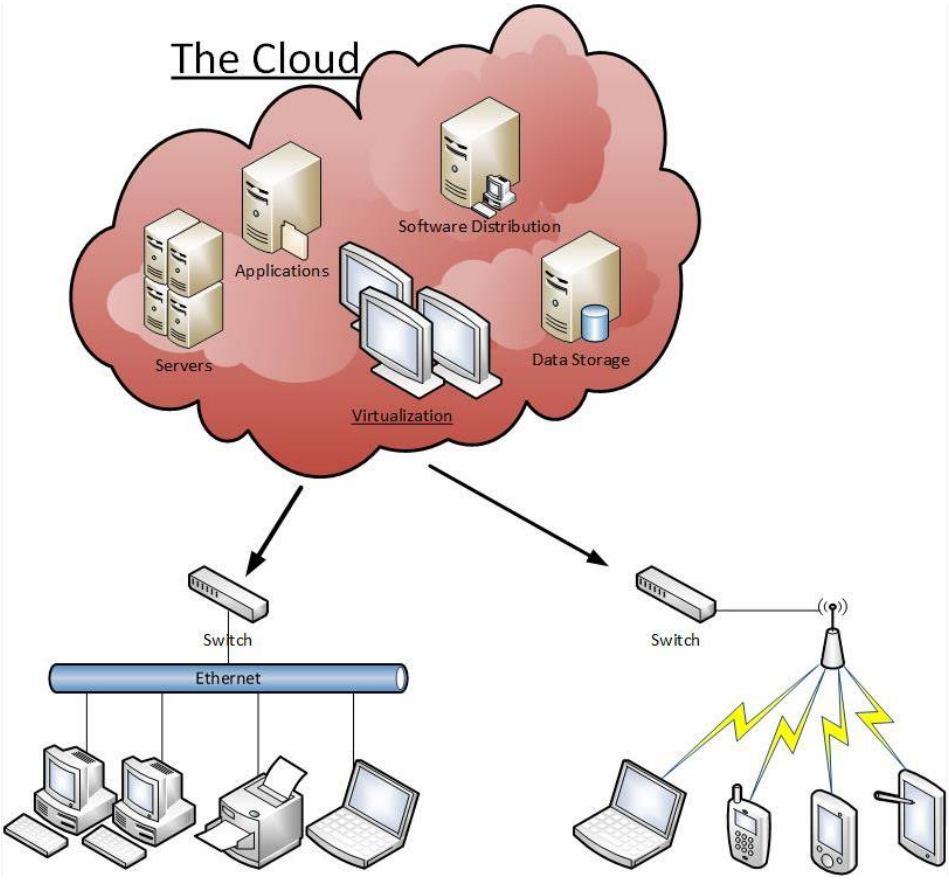

Figure 1. The Cloud

Connecting to the Internet

The best way to connect to the Internet is to connect employees' computers on a LAN and the network using a single device to connect to the Internet. Each computer must have network interface card (NIC) installed. Connect each NIC to a switch using unshielded twisted pair wire (preferably Ethernet CAT 5 or CAT 6). Connect the switch to a router or gateway (Firewall), enabling the computers to share a single Internet connection. Connect the router to a modem (DSL or cable or alternate ISP device), and pay your ISP for the Internet connection.

An ISP has three important functions. First, it provides the user with a legitimate Internet address. Second, it serves as the user's gateway to the Internet. The ISP receives the communications from the user's computer and passes them on to the Internet, and it receives communications from the Internet and passes them on to the user. Finally, ISPs pay for the Internet. They collect money from their customers and pay access fees and other charges on the user's behalf.

Digital subscriber lines (DSL) operate on the same lines as voice telephones, but they operate so that their signals do not interfere with voice telephone service. Because DSL signals do not interfere with telephone signals, DSL data transmission and telephone conversations can occur simultaneously. A device at the telephone company separates the phone signals from the computer signals and sends the latter signal to the ISP. Digital subscriber lines use their own protocols for data transmission.

This setup provides the most effective and flexible plan for Internet access for the business. Below is a diagram of how a company can connect a group of employees in a small business to the Internet (Figure 2).

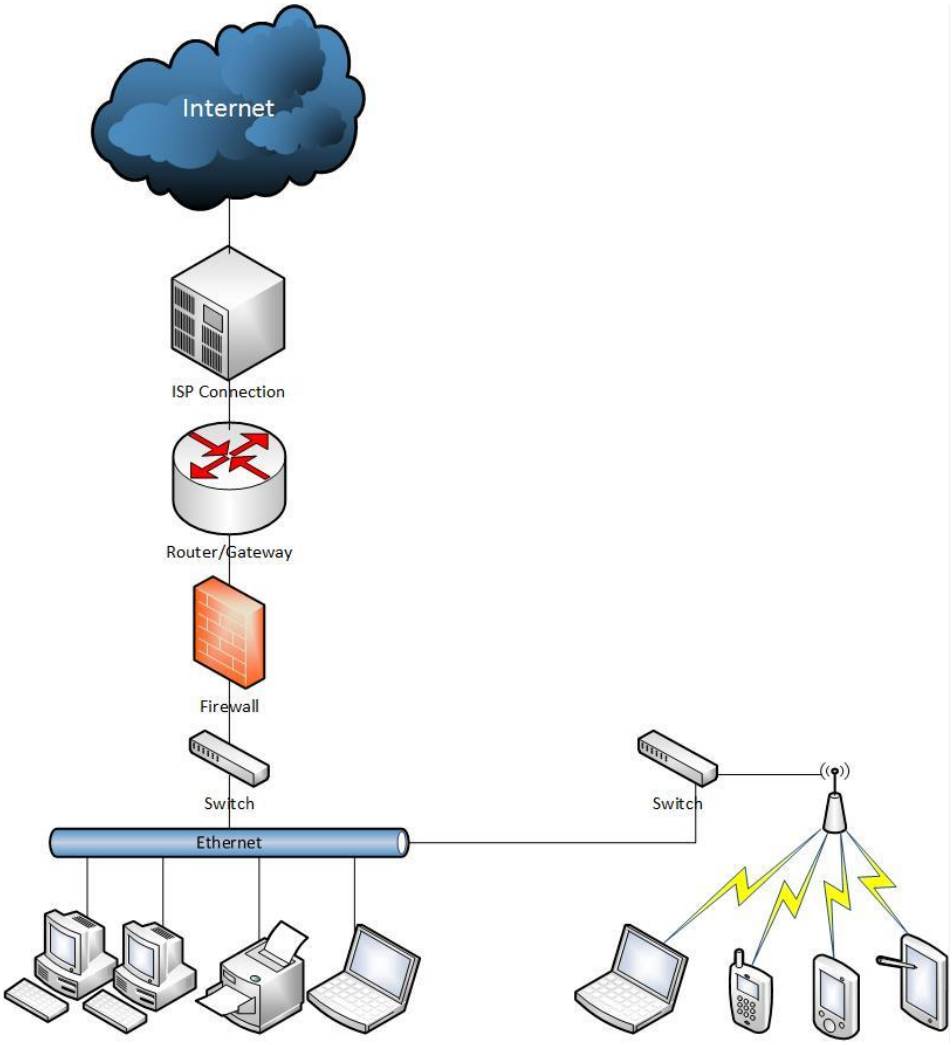

Figure 2. Typical Office Network

Further Discussion

Now that we have explored the cloud, let's discuss how the cloud will affect job prospects between now and 2024. There will be fewer small companies providing information systems services to their local communities. The number of employees involved in managing the computing infrastructures associated with the cloud is relatively small. In other words, businesses that have been focused on creating and maintaining an IT infrastructure for other businesses, it is likely that they will experience difficult times as existing customers and new businesses choose to utilize cloud-based computing resources. The cloud is a viable, inexpensive alternative to owning and managing computing resources, hence, our traditional business services will no longer be needed.

Because of the availability of cheap computing infrastructure, there may be more startup businesses that can quickly and cheaply acquire the computing infrastructure they need. However, the demand for people who know how to create, use, and manage information systems will continue to be strong. Also, companies will still need

help in determining the right cloud-based computing options. They will need help in building their databases on the cloud. They will need help in learning to use the cloud-based resources, and they will still need training so that their people are comfortable with the systems obtained from the cloud vendors. Under existing conditions, the business emphasizes technical expertise. Now, the business will need to emphasize detailed understanding of their customers' needs for the cloud-based environment. The focus will be on what you can DO with cloud-based offerings to make the business more efficient and effective, not just providing the technical expertise to create the infrastructure. Services will be very people-oriented and will be much less technically-oriented. It is not likely that everyone on the IT staff can adapt to the more people-centered focus of the business. Unfortunately, some highly technical folks are not well suited to providing training and support to business people.

The most important lesson to be learned here is that technological change is constant. While the changes can be confusing and even frightening, business professionals should welcome the opportunities provided by new technological options and look to the future instead of trying to cling to the past. The information technology world is one of constant change and evolution. No company can assume their market will remain constant over time, no matter how large it is.

Processes

"Structured processes are formally defined, standardized processes that involve day-to-day operations: accepting a return, placing an order, purchasing raw materials, and so forth" (Kroenke, 2015, p. 244).

The characteristics of structured processes are:

- standardized,
- usually formally defined and documented,
- exceptions are rare and not (well) tolerated,
- process structure changes slowly and with organizational agony, and
- support operational and structured managerial decisions and activities.

"Dynamic processes are flexible, informal, and adaptive processes that normally involve strategic and less unstructured managerial decisions and activities" (Kroenke, 2015, p. 244).

The characteristics of dynamic processes are:

- support strategic and less structured managerial decisions and activities,
- less specific and fluid,
- usually informal,
- exceptions frequent and expected, and
- adaptive processes that change structure rapidly and readily.

A workgroup process is a structured process that "exists to enable workgroups to fulfill the charter, purpose, and goals of a particular group or department" (Kroenke, 2015, p. 245).

Kroenke defines enterprise processes as structured processes that "span an organization and support activities in multiple departments" (Kroenke, 2015, p. 246), and inter-enterprise processes as structured processes that "span two or more independent organizations" (Kroenke, 2015, p. 246).

Structured inter-enterprise information systems are information systems that support inter-enterprise processes. Such systems typically involve thousands of users, and solutions to problems that require cooperation among different, usually independently

owned, organizations. Problems are resolved by meeting, by contract, and sometimes by litigation. Data are often duplicated between organizations, but such duplication is either eliminated or is carefully managed. Because of their wide span, complexity, and use by multiple companies, such systems can be exceedingly difficult to change. Supply chain management is a classic example of an inter-enterprise information system.

Process Quality

The two dimensions of process quality are process efficiency and process effectiveness. The first being a measure of the ratio of process outputs to inputs, and the second a measure of how well a process achieves organizational strategy.

Organizations can improve the quality (efficiency and/or effectiveness) of a process in one of three ways:

- change the process structure
- change the process resources
- change both

Information systems can be used to improve process quality by:

- performing an activity
- augmenting a human who is performing an activity
- controlling data quality and process flow

Information silos are instances where information is stored and isolated from other information systems.

The problems associated with information silos include:

- data duplication and data inconsistency,
- disjointed processes,
- limited information and lack of integrated information,
- isolated decisions that lead to organizational inefficiencies, and
- increased expense.

The fundamental problem of information silos is that data are duplicated in isolated systems. The most obvious fix is to integrate the data into a single database and revise applications (and business processes) to use that database. Another remedy is to allow the isolation, but to manage it to avoid problems.

ERP

> Enterprise resource planning (ERP) is a suite of applications called modules, a database, and a set of inherent processes for consolidating business operations into a single, consistent, computing platform. An ERP system is an information system based on ERP technology... The primary purpose of an ERP system is integration; an ERP system allows the left hand of the organization to know what the right hand is doing. This integration allows real-time updates globally, whenever and wherever a transaction takes place. Critical business decisions can then be made on a timely basis using the latest data. (Kroenke, 2015, pp. 254-258)

In Chapter 7 you are given an opportunity to use the PRIDE system as an example to assess, evaluate, and apply emerging information technology to business, connect

applications of IS to the fundamentals presented in the prior chapters, show a realistic application of mobile and cloud technology, and demonstrate the need for, the creation of, and some of the issues involving an inter-enterprise IS.

The functions of Enterprise application integration (EAI) are as follows:

- It connects system "islands" via a new layer of software/system.
- It enables existing applications to communicate and share data.
- It provides integrated information.
- It leverages existing systems—leaving functional applications as is, but providing an integration layer over the top.
- It enables a gradual move to ERP.

ERP vendors have developed training curricula and numerous classes because of the complexity and difficulty of implementing and using ERP solutions. ERP training falls into two broad categories. The first category is training about how to implement the ERP solution. This training includes topics such as obtaining top-level management support, preparing the organization for change, and dealing with the inevitable resistance that develops when people are asked to perform work in new ways. The second category is training on how to use the ERP application software.

The four primary challenges or factors affecting implementation of enterprise systems are:

- collaborative management,
- requirements gaps,
- transition problems, and
- employee resistance.

There are ways for organizations to manage employee resistance to change in the context of new enterprise systems.

> First, senior-level management needs to communicate the need for the change to the organization and reiterate this, as necessary, throughout the transition process. Second, employees fear change because it threatens self-efficacy, which is a person's belief that he or she can be successful at his or her job. To enhance confidence, employees need to be trained and coached on the successful use of the new system. Word-of-mouth is a very powerful factor, and in some cases key users are trained ahead of time to create positive buzz about the new system. Video demonstrations of employees successfully using the new system are also effective. Third, in many ways, the primary benefits of a new ERP system are felt by the accounting and finance departments and the senior management. Many of the employees who are asked to change their activities to implement ERP will not receive any direct benefit from it. Therefore, employees may need to be given extra inducement to change to the new system… Implementing new enterprise systems can solve many problems and bring great efficiency and cost savings to an organization, but it is not for the faint of heart. (Kroenke, 2015, p. 267)

PRIDE

The author of your textbook developed a prototype of PRIDE in 2011-2012 for the owner of a health club who wanted to connect the workout data of his club member to their workout data at home and to their employer, insurance company, and healthcare professionals. PRIDE was written in C Sharp (C#), and the code runs against an Azure database in the cloud. As a prototype, the author wanted to demonstrate

capability quickly, so he used the Windows Phone emulator that is part of Visual Studio to demo the phone interface. The plan was to port the application to iOS and Android devices after demonstrating feasibility and after the club owner obtained financing.

As it turned out, the health club owner lost interest in the project and released all the code, database designs, and other project material to the author. The author suspected that the owner lost interest for the following reasons:

- the amount of time that it would require him to devote to the project,
- the size of the financial commitment involved, and
- the risks inherent in any startup venture.

The author then recast the PRIDE application from the health club to a doctor's office because he wanted to connect it directly to the medical community and he wanted it to appeal to the student's experience. Every student has been to a doctor, but not all students have been members of health clubs. A stand in for the owner, Dr. Flores, was used and many of his comments were similar to the statements by the health club owner. The least realistic aspect of this case is that it assumes Dr. Flores would have the time to manage the project.

However, this is a good project because it can go in many different directions. Regarding the topics in Chapter 7, the fundamental issue that PRIDE addresses is the existence of information silos among patients, doctors, health clubs, employers, and insurance companies. The PRIDE database integrates those disparate data sources. PRIDE uses the ANT+ protocol to obtain exercise data from exercise equipment. All of the leading exercise vendors support this protocol, and devices such as the Garmin watch are able to gather that data. In the prototype, a PC in the facility gathered the ANT+ bike exercise data and pushed it onto the health club's wireless network from which it was sent to the Azure database over the Internet. At home, the connection was to be via the patient's cell phones; this part of the prototype was not developed.

PRIDE illustrates the problem of managing various parties in an inter-enterprise system. Doctors, nurses, staff, patients, health club owners, personal trainers, employers, and insurance companies have different objectives, interests in the system, work cultures, and financial incentives. One must understand that getting this group of people to share data, use common procedures, and understand each other's problems and issues will be challenging. Problem solving and dispute resolution will also be difficult.

The reason employers and insurance companies are involved in the PRIDE project is because this gives employers a way to prove to their health insurance vendors that their employees engage in exercise. The goal here is to enable the employer to use that data to negotiate lower healthcare premiums.

Privacy and security of data are paramount. Patients may not want their exercise data to be shared with their employer or healthcare company. Accordingly, several tables in the database contain privacy permission data; this aspect of the design is discussed further in Chapter 12.

PRIDE demonstrates a need because certain patients, such as cardiac patients, need just the right amount of exercise, not too little or too much. The application can provide motivation to exercise by providing social support for coming to the virtual, online class and by providing some control over under- and over-exercisers. PRIDE demonstrates that mobile and the cloud is feasible by using the ANT+ protocol to obtain readings from heart monitors, shoe pads, bikes, and so on, and integrates this. This means all parties have access to the data and saves Dr. Flores and other users the trouble of setting up and managing a network-facing database.

Summary

The technology you learned in Chapters 1-6 is useful in evaluating new applications. The PRIDE application solves exercise data information silos in an interesting and potentially useful way. Cloud and mobile open the door to many novel and potentially useful inter-enterprise applications.

Reference

Kroenke, D. (2015). *Using MIS 2014* (7th ed.). Upper Saddle River, NJ: Prentice Hall.

Suggested Reading

Chapter 6 Presentation

Chapter 7 Presentation

Abbadi, I. M., & Martin, A. (2011). Trust in the Cloud. *Information Security Technical Report.* Retrieved from http://www.cin.ufpe.br/~redis/intranet/bibliography/middleware/abbadi-trust-2011.pdf

Minar, N. (2001). Distributed systems topologies: Part 1. Retrieved from http://www.openp2p.com/pub/a/p2p/2001/12/14/topologies_one.html

Minar, N. (2002). Distributed systems topologies: Part 2. Retrieved from http://www.openp2p.com/pub/a/p2p/2002/01/08/p2p_topologies_pt2.html

Saatcioglu, O. (2007). What determines user satisfaction in ERP projects: Benefits, barriers or risks? Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.103.4235&rep=rep1&type=pdf

In order to access the resource below, you must first log into the myCSU Student Portal and access the ABI/INFORM Complete database within the CSU Online Library.

Anthes, G. (2010). Security in the cloud. *Association for Computing Machinery Communications of the ACM, 53*(11), 16.

Learning Activities (Non-Graded)

Course Flashcards:
http://media.pearsoncmg.com/ph/bp/bp_kroenke_umis_7/flashcards/index.html

From the Textbook:
Ethics Guide, Cloudy Profit? pp. 204-205
Ethics Guide, Dialing for Dollars, pp. 256-257
Using MIS InClass 6, What, Exactly, Does That Standard Mean? p. 226
Using MIS InClass 7, Choosing a CRM Product, p. 255
Security Guide, You Said What? About *Me*? In *Class*? pp. 230-231
Security Guide, One-Stop Shopping, pp. 270-271
Guide, Is It Spying or Just Good Management? pp. 232-233
Guide, ERP and the Standard, Standard Blueprint, pp. 272-273
Using Your Knowledge, pp. 235-236
Using Your Knowledge, p. 275
Case Study 6, FinQloud Forever…Well, at Least for the Required Interval… pp. 236-238
Case Study 7, Using the PRIDE Database, pp. 278-280

Non-graded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions, contact your instructor for further guidance and information.