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Managing Information Technology in the Digital World

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MANAGING INFORMATION TECHNOLOGY IN THE DIGITAL WORLD

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Anil Gowda,

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CHAPTER 1

RECENT INFORMATION TECHNOLOGY TRENDS

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ABSTRACT:

IT workers must maintain their skill sets to be competitive since the IT sector is continually changing. The importance of digital skills like coding, data analysis, and machine learning will increase in the future. In this chapter author is discusses the managing IT in organizations. Recent years have seen significant advances in information technology (IT) that are transforming the way people live and work. Among the most prominent trends is the rise of cloud computing, which allows users to access data and applications from anywhere with an internet connection. This has spurred the growth of software as a service (SaaS) and other cloud-based business models.

KEYWORDS:

Accounting, Business, Company, Employee, Information Technology.

INTRODUCTION

The use of information technology has spread widely. Companies compete with dot-com enterprises through web-based retail and online customer service channels in addition to having information systems that link frontline staff with back office accounting and production systems. High-speed wifi networks are available for travelers to use at airports, on public transit, and even inside aircraft to stay productive. Teams at work often utilize video conferencing and meeting software, without ever meeting in person. Employees have the option of using a BlackBerry, iPhone, or other smartphone to access work e-mail from anywhere at any time. Also, rather of using card catalogs in school libraries, students increasingly use Internet searches to access information. Consumers now also live in what has been referred to as a "flatter globe," where Technology connections between industrialized, developing, and rising countries assist to "level" the playing field economically. Online access to international news is available to people all around the world. Geographical positioning systems may make it easier to discover a local restaurant or business in addition to assisting passengers in choosing the best route to their destination. IT workers are responsible for building and managing the networks, software, and hardware that support this ubiquitous digital environment. All business managers, not only IT managers, are in charge of making appropriate investments in and using modern information technology to the advantage of their companies. By the year 2000, firms in industrialized nations accounted for more than half of their capital expenditures with IT acquisitions [1], [2].

This book's main goal is to expand your understanding of IT management so that, as a manager, you can efficiently invest in and make use of both new and existing information technology. We will discuss current and upcoming technologies, software applications to support business operations and business intelligence, best practices for selecting and putting into practice new systems, and planning and managing the resources of an IS department in the sections that follow.

Setting the scene for the following 14 textbooks and the in-depth case studies that will come after is the goal of this first textbook. The word "information technology" refers to both communications technology and computer technology, both of which are used to process, store, and transfer information. The organizational division or department that is primarily in charge of overseeing IT is referred to as the information systems department.

The following section provides a quick overview of some current IT developments that have given companies new methods to compete and workers new ways to do their jobs. Next, we quickly go through the main duties of IT management in modern firms as well as the different IT assets that must be managed in coordination with business executives. The subjects that will be addressed in the remaining Parts I–IV of this course are briefly summarized in the. You are probably already aware of some of the advancements in computer systems and networks that IT vendors have launched over the last ten years if you regularly use a variety of computers and communication devices. It is difficult to correctly anticipate the IT goods and services that will be "winners" tomorrow due to the rapid speed of technological development, and big predictions regarding technology have often proven wrong in the past. It seems reasonable to assume that, despite this, computer and communication devices will continue to permeate practically every part of our life. We will go into great detail about the fundamental ideas that underlie modern computer systems and network technologies in Part I of this textbook. Let's take a quick look at a few of the technological advancements that have already contributed to ubiquitous computing in the first decades of the twenty-first century [3]–[5].

DISCUSSION

While computer-on-a-chip technology existed as early as the 1970s, desktop computing didn't really take off until the 1981 release of the first IBM Personal Computer. The processing capacity of modern desktop and portable computers, which are created by manufacturers all over the globe, is equivalent to that of a 1960s-era organization's complete computing center. The standard computer that people use today includes graphical icons, point-and-click or touch screen navigation, and preloaded software to access the Internet. All of these features are more affordable than they would have been 12 months ago, with greater computer virus protection. Lightweight laptop and notebook PCs are replacing bigger desktop computers in companies nowadays due to their mobility and wireless capabilities. They may be used to connect remotely to office systems from home, when traveling for work, and while attending meetings.

Smaller, portable devices have also continued to advance in capability and have emerged as essential tools for accessing email and other apps both inside and outside of the office, on the production floor, and in sick wards. Apple Computer started marketing a new smartphone in the middle of 2007 that included touch screen scrolling and navigation, as well as streamlined calling from an address book, e-mail and text messaging, visual voice mail, video playback, and Web browsing through Wi-Fi access. Since then, other IT companies have created smartphones with comparable features, and Apple has released a portable notebook computer with a comparable user interface [6], [7].

Integrated, Social, Downloadable Computer Software

The majority of microcomputers used as desktop and portable computer "clients" by the early 1990s employed Microsoft Corporation's Windows software as their default operating system. Microsoft's Office suite and Web browser became the de facto applications used by American organizations and international corporations by the end of the 1990s. Even while working from

different offices, their staff were still able to collaborate and communicate with one another because to the existence of software standards. Enterprise systems are software packages with integrated modules that really can easily share data across dispersed work teams, business divisions, and national boundaries in "real time." Today, many large companies as well as now midsized and smaller organizations have made capital investments in enterprise systems. Enterprise systems are now extensively used by businesses providing goods and services of all shapes and sizes both in the US and abroad. Suppliers may now more readily replace supplies for a client using software applications that can access that customer's database, and consumers can monitor the progress of their purchases online. Bit-size software packages for smartphones and bigger apps for other portable devices are now widely available as downloads. Apple's App Store had 85,000 apps available for download by millions of iPhone owners two years after the device's debut. The fact that there are more software programs available for the iPhone than for any of its rivals really contributes to its continued success to some extent. Therefore, a completely new software industry market has been sparked by today's mobile devices.

The development of so-called Web 2.0 or social media applications, such as profile sharing software, cogenerated information tools, and information messaging tools, has been another notable development in software. While these software programs were first housed on websites made for public communities, today's marketing and public relations departments of businesses may utilize these same tools for branding and other marketing initiatives. Internal networks are also using tools of a similar nature to connect staff members across divisional, geographical, and temporal boundaries. Social networking tools, for instance, are being used at IBM to build bridges between younger and more experienced employees all over the world.

High-Bandwidth, Wireless, Cloudy Computer Networks

A "killer application" has been described as the introduction of a Web browser in the middle of the 1990s, which used an Internet communications standard to connect businesses and individuals to the Internet. Government and business sector investments in the installation of fiber-optic connections have been prompted by the need for high-speed Internet access. Many households in developed nations now pay a monthly fee for integrated data, voice, and possibly television services in their homes through cable, satellite, or a telephone utility. When this textbook goes to print, new investments by Western nations on high-bandwidth lines to their own rural areas as well as to developing nations in Africa are also being announced.

Today's remote employees are connected to central support centers through satellite and cellular technology, as are passengers to travel services and delivery workers to transportation planners. However, some developing nations have been able to forego costly expenditures in hardwired telecommunications connections to reach more rural regions thanks to wireless technology. Recently, more money has been put into wireless connection to assist mobile employees inside of an organization's borders. For instance, by being able to communicate more easily with clinicians on other hospital floors or at other workplaces and by having access to electronic patient records and test results at the patient's bedside, doctors and nurses with mobile computer and communications devices have increased their productivity and service quality.

Using the Internet to access distant "hosting" or other IT services from "the cloud" is another emerging trend. Third-party service providers install, operate, and remotely host software applications under a rental or leasing arrangement in software-as-a-service models. This is a particularly appealing choice for small businesses, but industry leaders also provide Fortune 1000

companies' spread organizations and remote employees 24-hour access. Some vendors provide online computer infrastructure services including data storage and server processing that help businesses more effectively manage peak processing demands.

New Means of Competing

Companies may compete in two main ways thanks to computers and communication networks. Becoming a low-cost provider of an item or service in order to compete with other companies. Differentiation is the act of competing with other companies by providing goods or services that people prefer owing to better qualities like product innovation or image, good quality, or customer service. By automating company processes, reducing order cycle times, and giving data for improved operational decision making, computers may reduce the prices of goods or services. Since the 1980s, a flood of IT innovations has increased efficiency in manufacturing firms only. Examples include reducing the time it takes to develop new products with computer-aided design tools, optimizing a plant floor process with software that implements human expert's decision rules, and quickly changing a production line with computerized planning systems based on sales information. Businesses have also utilized Technology to set their goods and services apart from those of rivals. IT applications can give sales staff information to help them better serve a particular customer, just-in-time supply replenishments for business customers based on inventory levels rather than manually initiated purchasing orders, and decision support applications with embedded industry knowledge, such as best practices for first responders to treat a patient suffering from a heart attack or stroke.

Most businesses first started using the Web to establish a brand "presence" on the Internet after the Web browser was invented in the mid-1990s. Managers registered memorable names for the URL of their company's public Web site and then posted information for prospective clients, stockholders, and other stakeholders. During the late 1990s, established businesses could see how dot-com pioneers like Amazon.com and others were utilizing the Web to reach consumers, and they started to come up with creative methods of their own. Yet, it has also become more challenging for businesses to compete by product or service difference through the Web than it may have been for them in an offline environment since the elements of a public Web site are also available to rivals and may be readily duplicated by them.

Customers of a business could, for instance, utilize websites that make it simple for them to compare other companies' products and services, as well as their costs. Also, customers have the option to choose their "own" pricing and get electronic notifications if prices change. Particularly under pressure from the business to provide cheap pricing, the airline firms have a harder time differentiating their services. On the other side, a company's "reach" to new clients and suppliers, who may even be on other continents, may be expanded via the use of the Internet. Airlines no longer have to pay travel agencies or internet middlemen to sell all of their tickets since they now have a direct route to consumers and corporate clients. Online advertising is also becoming more prevalent. Depending on the user's browser location or chosen preferences, websites may be configured to show displays in a different language, foreign currency, and sometimes even local pricing. Also, a lot of firms use online auctions to acquire or sell goods from suppliers or clients that they would never see in person.

New Working Methods

People can now work more effectively as employees in an office, as telecommuters at a location far from their home office, as members of "virtual" teams, or even as "free agents" hired by

businesses for a brief period of time thanks to recent IT innovations in computer hardware, software, and networks. Salespeople and other mobile managers who need access to corporate data may now work remotely from almost anywhere with an Internet connection thanks to portable PCs and other mobile devices. To benefit the environment, several towns have also experimented with legislation that force companies to encourage telecommuting by establishing work patterns that demand less travel, such as four days in the office and one day outdoors. Some startup companies may not even have a physical headquarters or office space. The business may instead function as a "virtual corporation" made up of individual professionals dispersed across many local or international locations. It has also become more typical to operate as a part of a virtual team, which consists of individuals who are geographically too far from one another to collaborate in person. Members of the team may utilize software that enables online team meetings, document sharing, and maybe videoconferencing through a webcam or in a room with specialized videoconferencing equipment. Team leaders have developed their ability to inspire employees and coordinate efforts across time zones at various job locations on several countries.

Specialized workers may elect to operate independently as independent contractors who contract out their services rather than becoming a long-term employee of any firm. In order to take advantage of time zone variations for slide show creation, website development, telemarketing, or other specialized abilities that are momentarily required for a particular project or just sometimes, businesses may find and recruit free agents. Companies may avoid making a long-term pay and pricey benefit commitment to an employee by hiring free agents.

Manage It in Organizations

The information systems department inside a company is in charge of supporting these new methods of communication and new approaches to using computer systems and networks. While most contemporary firms today rely on IT networks and applications to handle transactions and assist management decision-making, not all organizations rely on IT to the same extent. Others may be heavily reliant on information systems being available 24 hours a day for all of their business operations but don't invest aggressively in newer technologies to support newer strategies. Some organizations may still use IT primarily for back-office support while heavily relying on person-to-person communications to run their operations. Also, the degree of an organization's reliance on IT changes with time. For instance, more aggressive IT spending may emerge from a shift in the organization's business leadership.

Managing IT Resources

Today's growing reliance on IT by organizations across several sectors necessitates both IT executives who can efficiently plan for and manage the organization's IT resources as well as business leaders who are IT aware and can foresee smart IT use. Three different kinds of IT resources are introduced in Section 1.1; they are further explained below.

Science Infrastructure: A computer and communications infrastructure, or information "utility," must be efficiently planned, built, and operated in order for managers and other employees to have access to the proper information whenever and wherever they need it. Computer users want computers to be up and running, and networks to be accessible and fast, so they can access software programs and data quickly and easily, much as mobile phone users expect to be able to make and receive calls without the network "dropping" them. High operational reliance on IT systems means that workers cannot complete their task if an information system is down for more than a minute or if the online response time is more than a few seconds. Business revenues suffer when suppliers

cannot fulfill requests for materials and client transactions cannot be performed. The author argued that today's primary role in IT management is to control the costs and vulnerabilities of the computing "utility" the data centers and networks that enable access to business data and applications in a widely read but poorly titled article published in the Harvard Business Review a few years ago. Yet, even while this is a crucial IT management position that is sometimes contracted out to IT companies, it is not the only one. In order to effectively manage IT, one must also decide which new technologies to invest in and how to particularly customize these new IT solutions to enhance the way a particular company does business. So, in addition to qualified IT managers and IT professionals the human resources asset effective administration of the technology asset also requires active engagement from business managers, as reflected by the third IT asset: the business/IT relationship asset.

Employee Resources: Each corporate function that involves managing human resources must pay close attention to finding, developing, and keeping the greatest personnel available. Not only are IT professionals with specific technological skills in great demand today, but also IT professionals with a combination of business expertise and interpersonal abilities. Those with expertise of an industry and the ability to comprehend the IT requirements of employees in marketing, accounting, manufacturing, and other business operations are needed for business analyst and systems analyst jobs. So, those IT specialists who possess both technical expertise and a business background are in high demand for these kinds of positions. These kinds of business-facing jobs are best filled by internal employees rather than by temporary external workers or employees of an outsourcing company. There are rising worries in the US today about whether there will be a shortage of new college and university graduates with IT-related degrees compared to the need for entry-level, domestic IT jobs. IT specialists are still desperately needed to fill critical "in-house" IT roles, despite the fact that businesses in developed nations like the United States are increasingly using IT workers in less developed nations to benefit from lower labor costs for tasks related to software programming in particular.

It/Business Relations

The significance of this kind of IT resource was first recognized in the middle of the 1990s as a result of the rise in new IT investments spurred by packaged software systems and the Internet. Nowadays, the efficiency with which an organization employs collaborative IT-business decision-making for purchasing a company's technological assets is so crucial that there must be a "blending" or "fusion" of IT and the business. Business managers and IT managers must work together effectively to develop the business case for investing in new IT solutions and skill sets, to specify the business requirements that will be used to design new IT applications, and to successfully implement these new IT solutions so that the potential benefits become realized benefits in order to realize the business value from IT investments.

Roles for IT Leadership

The chief information officer is an officer-level job that has been formed by several corporations today for the top IT executive. While the senior IT leader may not be legally recognized as a CIO in other organizations, all of today's IT executives are required to collaborate closely with other senior managers to maintain the alignment of the organization's IT resources with its business objectives. Top IT executives may report directly to the company's president or CEO or to another official, such as the chief operational officer or the chief financial officer. Senior IT executives, including CIOs, come from a variety of backgrounds. Some managers are selected to oversee the

IT company due to their extensive technical expertise, but others may be picked due to their ability to collaborate successfully with top business executives.

An organization diagram for an IT department in a big enterprise with several business divisions. IT managers who report to this CIO are in charge of system operations, IS department technology and financial planning, creating and constructing the company's IT architecture, and purchasing and managing software applications. The latter group consists of three IT vice presidents who are in charge of purchasing and managing applications for the company's three business divisions, along with three IT managers who oversee corporate applications. These three vice presidents, in contrast to the other IT managers, report both directly to the CIO and through a "matrix" to the general managers of the business divisions they serve. This dual reporting arrangement is one strategy for building and sustaining a solid business/IT connection. It helps to guarantee that the IS department's resources are properly aligned with the business. IT managers are now now playing other crucial new tasks. For instance, some businesses have established the post of chief security officer to prepare for, monitor compliance with, and ensure that adequate investments are made in technologies and processes to handle IT security threats. Additional new positions in middle management contribute to the effective completion of contracts with important outsourcing vendors.

Senior business managers may also play a leadership role in IT by sponsoring IT investments for their respective business units and working on committees that approve and prioritize new IT initiatives. On IT project teams, other business managers may act as business process specialists to choose, create, and execute software packages. All of these business manager positions are essential because business leaders have the most understanding about the adjustments to business procedures required to get the most out of a new IT solution. Business managers are also better able to foresee any operational roadblocks that may arise during the implementation of a new software program and what steps may be done to prevent them.

The Matter and Form of This Textbook

This book's main goal is to expand your understanding of IT management so that, as a manager, you can efficiently invest in and make use of both new and legacy information technology. The remaining sections of this textbook have been divided into the following four categories. We provide many in-depth case studies that were mostly developed by the authors exclusively for this course at the conclusion of each section. All of these examples are based on actual procedures and occurrences, despite the fact that certain company names are disguised. Basic technological ideas and significant advancements in the IT sector are presented in Part I, sections 2, 3, and 4 on computer systems, networks, and data. Business managers are typically designated "owners" of system initiatives and organizational data sets, as will be explained. The responsibility for maintaining data quality and proper security levels, thus, falls on both IT and business management. The summary discussions, industry updates, and sections on more recent technological advancements such Web services, WiMAX networks, and cloud computing may be helpful to readers who have previously examined the technologies discussed in Part 1.

In-depth explanations of three major kinds of software programs employed by modern enterprises are provided in Part II, sections 5 through 7. 5 focuses on enterprise systems, such as applications used in supply chains that connect businesses with their clients or suppliers, as well as back-office systems used in financial reporting and human resource management. In section 6, numerous kinds of management support systems are discussed, including tools for supporting tactical decision-

making on a daily basis as well as strategic decision-making with highly developed analytical toolkits. 7 focuses on Internet-based systems, such as business-to-business and business-to-consumer apps and websites that serve as middlemen. Successful e-business cases from both established and start-up businesses serve as helpful examples of how businesses from all sectors may utilize the Internet to compete in the digital age.

We authors take pride in having lived through the first decades of a digital age that offers great opportunities for people in developed countries as well as governments, organizations, and people in developing and emerging nations worldwide as we prepare the seventh edition of this textbook for publication. We must all be aware of how to develop and utilize IT successfully, as well as how to uphold our social and environmental obligations for the responsible use of today's and tomorrow's information technology, in our capacities as managers, IT professionals, consumers, and global citizens [8], [9].

CONCLUSION

Businesses, governments, and people all benefit from information technology in terms of efficiency and effectiveness. Consumers are compelled to buy new, useful technology due to the rapid advancements in hardware and computing power. Its quick turnover generates demand on a market level. The world is improved by technology. It helps to make our lives simple and provides us the flexibility to live better. Wherever you turn, technology is there. It improves communication, aids in the treatment of illnesses, has allowed us to go into space. People may now communicate with each other more quickly, easily, and cheaply than ever before because to information technology. These days, exchanging texts, video calls, and emails is so simple. Online, there are a ton of applications that provide these services.

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CHAPTER 2

ROLE OF THE OPERATING MANAGER IN INFORMATION SYSTEMS

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ABSTRACT:

The efficient operation of the computer systems is the responsibility of an information technology director of operations. They make ensuring that computer systems operate in compliance with plans, budgets, and deadlines. In this chapter author is discusses the operations division. The operating manager plays a crucial role in ensuring the success of information systems (IS) within an organization. This role encompasses a wide range of responsibilities, including managing the resources required for the IS, defining requirements for the system, ensuring the system is implemented on time and within budget, and managing the ongoing operation and maintenance of the system.

KEYWORDS:

Database, Information System, Operating Manager, Marketing, Sales.

INTRODUCTION

On September 22, 2006, at 7:30 p.m., Midsouth Chamber of Commerce Vice President of Marketing Leon Lassiter was still in his office lamenting the disappointments of the day. In addition to his marketing support supervisor and a number of other staff members, Lassiter had met with four territory managers. All of them were frustrated by their inability to use the new computer system and the issues they were experiencing with it. They had received assurances from Lassiter that the issues were being resolved. He emphasized the need for patience amid the continuous transition to the new system. Lassiter was beginning to understand the challenges and complexity he faced with the system changeover at this point, in his quiet period. His marketing team's work had come to a complete stop since they were unable to access the new computer system to manage their accounts. Even worse, the majority of the workstations' data had been corrupted, necessitating manual completion of tasks like conference registration. These inconveniences, however, paled in comparison to Lassiter's unsettling perception that Midsouth's whole approach to the administration of information technology was flawed. Although having no prior experience in information technology, Lassiter was aware that time was of the importance and that he could need to step in and oversee the changeover [1]–[3].

History of the MSCC

Early in the 20th century, the Midsouth region's economic growth was heavily reliant on its transportation infrastructure. Legislative actions prevented many Midsouth towns from having access to affordable transportation services, which slowed down commercial and economic growth. A group of influential entrepreneurs established the MSCC to influence the legislature on the subject of transportation access since they lacked a representative to voice their concerns to the state government. When its mandate was altered in the 1930s to include a wider range of matters

impacting the business sector, such as state banking rules, transportation, industrial development, and company taxation, the MSCC dealt only with this one problem. Midway through the 1990s, the MSCC under President Jack Wallingford's new direction developed into a forceful business community lobbying group.

The organization underwent significant transformation as a result of the MSCC's expanded responsibilities. The MSCC had 14 employees, 3,000 firms and individuals as members, and a $1,720,000 yearly budget in 1988. The MSCC had managed to accumulate a reserve account worth little more than $1.5 million over the years. By 2000, there were 24 employees, a $1.5 million cash reserve had been depleted to $250,000, and there were 2,300 members, partly as a consequence of the loss of several significant manufacturing in the area, the bust of the Internet bubble, and the ensuing recession in the economy. The reserve decrease had significantly driven internal development in terms of personnel and skills, and the Board of Directors had encouraged this expansion. The MSCC also improved its workstations and moved into bigger premises during this period. In the early 2000s, the MSCC was regarded as the Midsouth region's most effective organization for business lobbying and one of the most cutting-edge chambers of commerce in terms of its methods for addressing issues that affect the business community. The biggest issue the MSCC management faced at the time was the growing worry that its rapid expansion could need to be limited because it could no longer afford to support its yearly operating budget.

Lassiter, Leon

Midway in 2000, Wallingford had a significant problem. A $330,000 loss was anticipated by the MSCC for the 2001 fiscal year. Wallingford recognized he would have to either find a means to expand the organization's earnings more aggressively or cut both the number of employees and the number of programs. Ed Wilson, Wallingford's vice president of operations and public affairs, was tasked by Wallingford with hiring a new person to oversee the sales and marketing division. Leon Lassiter, who had worked for American Brands for 12 years in sales management and marketing, and where he had just declined a promotion to regional sales manager, joined the MSCC in December 2000. He reasoned that the MSCC provided a greater opportunity to make a difference than American Brands. Lassiter reported to Wallingford in her capacity as vice president of marketing and membership.

He started a comprehensive evaluation of all programs, departments, and procedures after settling in to the organization. He discovered that the sales functions were less well-coordinated and managed than the marketing support functions. Also, the MSCC had placed some customized software on the workstations it had bought for sales and marketing, but the information system's capabilities were still rather constrained. No staff person had access to all the data required to run the marketing and sales operations of the MSCC due to security concerns. Each workstation had the necessary data stored on it and was configured to carry out certain tasks. After finishing his study, Lassiter set out to create a brand-new sales and marketing process that was based on measurable targets, outlined operating procedures, and ongoing training sessions. He was aware that a new information system would eventually need to be created.

The Sales & Marketing Division

Lassiter was able to manage the activities of his organization for a few years using the current collection of individual workstations, all of which were linked to a print server. The main information technology tasks for the marketing division were monitoring member-ship activity. Main applications included.

1. The creation of the membership database
2. Building the database of potential members
3. Updating both datasets on a daily basis
4. Creating a string of letters for individualized mail contact
5. Generating prospect and member lists and labels according to parameters such as mailing designator, company size, industry sector, and zip code.
6. The territory managers are processing call records.
7. Monitoring member actions and issues via a comment field
8. Establishing audit trails to evaluate changes

Word processing in general

Much of the computer work for the marketing division was done by the marketing support department using local workstations. All requests for labels, lists, and modifications from the sales and marketing department were fulfilled. Requested updates to the member database sometimes took two or three days to process. This was unacceptable in Lassiter's opinion, and he aimed to complete member-change tasks in two hours. The marketing division was manned by four area managers, a marketing support supervisor, and five secretaries. The area managers produced between 75 and 80 call records daily, necessitating database updates, correspondence, and invoice processing. The administrative team handled these requests. The administrative team also handled member cancellations, membership sales commissions, and basic database upkeep. Also, the clerical staff handled all regular secretarial tasks and created customized letters as requested by the area managers.

DISCUSSION

Operations Division

The operations department was overseen by Ed Wilson. Operations were managed by eight managers and support personnel. This team was in charge of supplying financial data and guaranteeing accounting controls. The operations team continued to:

1. The accounting software program
2. Money in the bank
3. Functions of accrual accounting
4. Monitoring of payment history
5. Plans for the commission
6. Monitoring of membership cancellations
7. Generation of reports

Wilson also intended for users to be able to follow the progress of bills from introduction through passage or veto by the governor, death in committee or chamber. On a daily basis, this data would be entered into the system, updated when changes happened, printed, and delivered to certain staff members.

Division of Human Resources

The development of a conference and seminar monitoring and reporting system that could also print badges for conference or seminar attendance was under the purview of the human resources division, which included two managers and two support personnel. Also, the division kept personnel files.

A Shifting World

By 2002, the MSCC was seeing strong financial growth as a consequence of Lassiter's restructuring of marketing and sales and Wilson's proactive control of spending. Wilson and Lassiter frequently fought, despite the fact that the success was largely due to their collaboration. According to Lassiter, the MSCC may significantly reduce labor and related expenses by automating a large portion of the territory managers' job and marketing support tasks. Lassiter thought that in order to meet the MSCC's expanding information needs, a full-time systems analyst should be hired. Wilson, on the other hand, was concerned about how much the information systems at the MSCC would cost. The MSCC had previously employed a consultant named Nolan Vassici to provide advice on hardware and software as well as to create the customized software utilized by each division. Wilson believed that the best course of action was to keep using Vassici whenever additional or corrective work was required.

He was opposed to adding more staff members. Wilson was aware that the MSCC had limited resources for the expansion of its computer capabilities as a tiny nonprofit organization. It would be much harder to meet expanding staff needs in other areas if a full-time systems analyst was added to the team. Wilson was able to define precisely what Vassici worked on and what should be put on hold until there was the time and money for it thanks to the continuation of their connection. Despite their ongoing disagreements, Lassiter could appreciate Wilson's need to keep expenditures in check given the MSCC's restricted funding. Lassiter understood that once the tap was completely opened, the staff's gradually increasing computer proficiency would burst. Lassiter believed that once the MSCC established the scope of the staff's demands, the demand could be properly met.

Lassiter and Wilson collaborated on a plan for the MSCC, which currently has more than 4,500 firms and people as members, to provide a health insurance program in early 2003. The analysis led Wilson and Lassiter to realize that the MSCC might explore various revenue-producing alternatives that would need a considerably greater degree of information systems utilization, even if the Board of Directors ultimately rejected the plan. To improve the capabilities of the MSCC, Wilson quickly recruited a systems analyst. Simon Kovecki joined the MSCC in June 2003 as a recent computer science graduate without any prior experience working for a membership organization like the MSCC or using accounting software. He spent his first three months on the job gaining knowledge about the MSCC and its computing systems. He put in a lot of overtime, trying to comprehend software for which there was no manual. Vassici couldn't be reached for assistance because his company had shut down.

Until the beginning of 2004, Wilson continued to oversee the computer systems and, with Kovecki's assistance, upgraded the workstations' hardware. The program continues to function rather effectively thanks to Kovecki's continual attention. Wilson created an online legislative information system in 2005 with Kovecki's help on a workstation that was regarded as cutting edge in the chamber of commerce sector. The MSCC senior management started to worry about the separation of systems for membership and marketing, finance, conferences, and other applications which needed regular data entering as a result of this application, as well as the expansion in members and kinds of computer applications. With about $2.8 million in dues income and 4,750 member companies in 2005, the MSCC was one of the biggest state-level chambers of commerce in the nation. The number of employees had increased to 42, and the cash reserve was close to $2.6 million. While Lassiter was somewhat pleased with the MSCC's development and financial stability, he was troubled by the lack of planning that went into how the MSCC would create a

thorough strategy to utilize information in the future. Wilson concurred that an entity engaged in the business of obtaining, evaluating, and exploiting information to influence legislative outcomes would benefit from information systems.

Activator of Change

The MSCC has to make several organizational adjustments by 2005 because of its current state. In response to the Board of Directors' request, Wallingford gave Lassiter the additional responsibilities of communications, graphic design, and printing operations. Harry Taska was given control of the controller tasks, while Jeff Hedges, the new vice president of public finance, was given charge of the computer operations. Wilson, who was getting close to retiring, continued his work in public affairs and was requested to concentrate his efforts on creating a significant initiative. Kovecki confessed in Lassiter shortly after the staff changes that he was unhappy with the shifts in staff responsibilities. He believed he ought to have received more personnel and been promoted to manager of information systems. Hedges, who had minimal computer experience, was also in charge of supervising the Controller's duties and doing research on other topics of interest to the MSCC members. Kovecki was worried that Hedges wouldn't have enough time to effectively oversee the expanding computer activities.

Lassiter agreed with Kovecki that senior management should be paying more attention to the information systems sector. His fear prompted him to submit inquiries to several companies that provide software to organizations like the MSCC. He concentrated on software from Cameo, MEI Colorado Association of Commerce and Industry, Connecticut Business and Industry Association, TelePro 2000, and Data Link since he was primarily interested in sales and marketing software. Other top managers were not very responsive when Lassiter provided them the information he had obtained from these suppliers. Wilson was preoccupied with his brand-new endeavor, Taska was getting used to his new responsibilities as Controller, and Hedges had little time to investigate computer activity. When Lassiter visited a national association conference in August 2005, he learned about a tiny software company named UNI- TRAK during a seminar on management software. Lassiter was certain that the company's software package would satisfy the MSCC's requirements. He based his evaluation on Kovecki's 2004 analysis of the MSCC's existing and projected future computing requirements. Designing the New Information Technology System Lassiter had highlighted UNITRAK areas where he believed a more potent information system would enable the MSCC to operate more effectively. Staff members would be able to: thanks to these improvements:

1. Add special member details to the notes area.
2. Create telemarketing scripts based on numerous sales objections to enable "tree scripting"
3. Use a statistical inquiry tool to provide quantitative analysis of sales activity from all marketing initiatives.
4. Also, the new information systems would enable area managers to: Access their account information directly from their workstations without needing to ask a staff member
5. Instead of manually connecting information housed in many different databases, users may develop messages and attachments from their workstations using data from a single database.

"The UNITRAK system not only fulfills our demands today, but it is also strong enough to give the MSCC with the capacity to develop over the next five years," Lassiter said in a note to the management group. Lassiter thought that the software's user friendliness was the key to freeing up Kovecki's time. Hedges wanted to keep using the present accounting program, but he agreed that

the time had come to look for a more potent software program to solve the issues the MSCC was facing. Lassiter described the program to Hedges. Hedges agreed that other UNITRAK system components may be turned on at a later date.

Greg Ginder, President of the UNITRAK Software Company, was invited to the MSCC by Lassiter in October 2005 for a demonstration of the system's capabilities. Wilson watched the three-hour rally for approximately 30 minutes before saying to Lassiter, "I'll back it if you want it. It will be useful for my public affairs project. Hedges agreed that Kovecki will have more time to devote to planning and system development thanks to the new system. Kovecki made different remarks. Indeed, the program has its advantages and disadvantages, and it would definitely help me save some time, he said. But I object to the concept of giving employees such unrestricted access to data. What they'll do with it is unclear.

The Initiative

Lassiter made the decision to approach Wallingford and the Board of Directors with a proposal right now. He created easy flow charts that displayed the number of hours required. To carry out certain tasks, such as the staff time required for new member sales under the present workstation setup and the time required under the new software. Lassiter understood that substantial reason would be needed for the Executive Committee of the Board to authorize a "off-budget" capital expenditure that would severely deplete reserves. Moreover, he had calculated that each area manager would be able to raise revenues by $150,000 via more connections if the new method worked as he had planned. Lassiter intended to be able to show a payback of less than six months in the event that he was questioned by an Executive Committee member, even though he was aware that this aim was aggressive and very hard to explain.

Lassiter anticipated that UNITRAK would bring down the cost of the program. The Northern State Chamber of Commerce was the only other statewide chamber of commerce to whom UNI-TRAK had supplied the brand-new software. We considered creating our own bespoke software as well as a number of other software packages, but our consultant decided on the UNITRAK program, according to Jeff Fritzly, Vice President of Marketing and Development at the NSCC, who spoke to Lassiter. We received a nice discount on the required new hardware when we bought the software from UNITRAK. They have been exceedingly supportive of our requirements and helpful.

Ginder and Lassiter reached an agreement on a price for the software a week before the Executive Committee meeting. The price was 30% less than what Northern State had spent, which satisfied Lassiter. Lassiter was also able to get a great deal on new server hardware with the aid of Ginder and a member of the Executive Committee who oversaw the area branch office of a computer equipment company. He believed that the project's cheap cost was another another basis for acceptance. Lassiter also made a point of scheduling meetings with Wilson and Hedges to update them on the negotiations and solicit their input. He believed that by communicating with Hedges and Wilson more often, he would be able to win their attention and support, which he believed to be crucial for the project's success [4], [5].

When the Executive Committee of the Board met in November 2005, Lassiter explained that the MSCC had outgrown the capabilities of its current system design and that, in order to take advantage of present and upcoming growth opportunities, an investment in a central server connected to networked workstations was required. While the MSCC has made sizeable and appropriate investments in the workstations required for the MSCC to increase its operational

sophistication, Lassiter stated during his presentation that we have reached the limit of these smaller machines. Our needs and demands have significantly increased as a result of the phenomenal revenue growth we've experienced over the past five years. The MSCC's future expansion and services will be in peril without an urgent investment in greater capacity.

Lassiter responded, "I believe we will see a 10-15% increase in sales and a 20% increase in staff productivity once the new system is operational," in response to questions from the Executive Committee about what the new system would mean to the bottom line and the MSCC's reserves. The members of the Executive Committee praised Lassiter for his efforts and authorized the acquisition of the software based on these assurances and a cost that would only use 10-15% of reserves.

Implementation

Greg Ginder of UNITRAK was overjoyed with the choice and pledged unrestricted assistance for the installation of the new system at no additional cost. However, Kovecki persisted in voicing his worry about employees making use of the system's new features. I understand that Lassiter anticipates this new program to be user-friendly, but I don't like how passionately he feels about teaching the workers how to utilize as many capabilities as possible, the guy remarked. I disagree with him that educating the employees in anything they choose to learn would increase the effectiveness of the MSCC. We would be releasing Pandora's box and would be unable to stop what was happening. People becoming involved in situations they don't need to be in is the last thing we need. Lassiter had not received any information regarding the purchase of the new system by February 2006. Lassiter was informed by Kovecki that the purchase order had not been authorized. Hedges was then questioned by Lassiter, to which he said that he had heard nothing more and had been preoccupied with reading up on topics of concern to the MSCC members. Hedges instructed Lassiter to go ahead and get the program. It's your system, after all. Lassiter felt that even though he made an effort to clarify that it was not his responsibility to carry out the purchase or conversion, the project would not proceed without him doing so. You and Hedges are the project managers, Lassiter instructed Kovecki after signing the purchase order. At this point, I shouldn't be engaged. You guys have to finish the project."

Lassiter questioned Kovecki about the project's status at the end of March. The new hardware had been delivered, but Kovecki claimed he wasn't able to work on the new software because he was too busy with Wilson's project. When Lassiter asked Wilson how long the project Kovecki was working on was expected to take, Wilson replied that it should be finished by mid-April. Lassiter knew he would have to use his influence to move things along, even though he felt awkward about pushing Hedges and Kovecki. In a meeting with his staff, Lassiter announced the acquisition of a new system that would improve operations across the board. Many employees voiced concern over the lack of consultation or notification they received prior to the idea's approval. Regarding word processing, new member recruitment, and commission processing, specific questions were posed. Lassiter asked Kovecki to respond to the questions because he assumed Kovecki had read the documentation. Kovecki said he needed more time to review the paperwork since he was unable to respond to the queries.

Lassiter scheduled a training session for Kovecki and himself with UNITRAK. Lassiter requested Kovecki to spend half a day with him to create a project flow chart and foresee future issues after a successful training session, but May and June passed with no progress on the conversion. Nothing had been done despite Lassiter's assurance to the Executive Committee that the project would be

finished by the end of March 2006. By the end of June, when Kovecki returned from a two-week vacation, Lassiter requested Wallingford to speak with them and to firmly push them to finish the project. We were approaching the seventh month of what should have been a straightforward three-month project, and Lassiter admitted that having to speak over Hedges' head concerned him a great deal. It's partially my responsibility since I didn't develop collaboration at the outset or make it clear early on what each participant's obligations were.

The Last Stage

Lassiter scheduled two days of employee training during the third week of August 2006 with Hedges' approval. Lassiter had received assurances from Kovecki that the system would be operational by the end of the training session, allowing the personnel to start using it right away. Kovecki set up training locations in two different conference rooms for the employees after Lassiter divided the instruction into key sections. A two-person team from UNITRAK was sent to serve as project managers and trainers. With the exception of the conference and seminar software portion, the training went well. The new software providing services in this area was criticized by customers for not being as functional and user-friendly as the current custom-written workstation software. Lassiter urged UNI-TRAK to work with the users to adjust the UNITRAK software to better suit their demands, despite his suspicion that a significant portion of the issue stemmed from the new program's simple differences. Ginder said: Given the fact that our software is still relatively new to the market, we are open to modifying and changing specific elements without completely rewriting the program. We believe there is a lot the MSCC can teach us that would improve the marketability of our product.

Lassiter requested Kovecki to migrate and integrate the data from the existing workstations to the new system on the last day of training. Lassiter was informed by Kovecki that he was experiencing some difficulties and would carry out the migration after work so that it would be ready in the morning. When asked the next morning by Lassiter why the system was down, Kovecki replied: "Last night when I performed the migration, less than 15% of the data rolled over into the right assignments." It will probably take me a week to fix the flaws since I don't have access to any documentation for the outdated program. Meanwhile, our present workstations' data seems to have been damaged and the new system isn't functioning. While some of the systems haven't had a backup in more than three months, I still have optimism that we can restore the most recent backup.

The remaining workstations at the MSCC were essentially unusable, despite the fact that one of the systems in the marketing section had just been backed up. List and mailing label requests were not able to be met. Word processing, posting of payments and invoices, changes, list management, and other functions weren't working or weren't working completely. Kovecki had neglected to place an order for a new phone connection that would have given UNITRAK specialists direct access to the system, making it impossible for UNITRAK to assist.

Lassiter was having a very tough time getting Kovecki to provide information on the state and progress of the system changeover. It seemed that Kovecki was making an effort to avoid the staff because he was annoyed by the difficulties he was experiencing and by their approaching him for help. Lassiter said: I made it clear to Kovecki that I wasn't trying to interrogate him for information, but rather that since the staff now regarded me as the project director, I needed information with which to make decisions affecting the staff's workflow and decide what kind of assistance we could ask of UNITRAK. Lassiter was irritated that there wasn't much he could do to manage the conversion, despite the fact that he was aware that the employees believed he was responsible for

the new system. Kovecki did not submit a report to Lassiter, and Hedges remained disinterested in the endeavor.

The upcoming

About 7:30 PM in late September 2006, Lassiter was in this circumstance while he sat in his office. On each of the previous Mondays, Kovecki had claimed that the new system will be accessible. The workforce experienced letdown every Monday, which made them even more angry. Lassiter was aware that the two days of instruction had been ineffective since nobody had remembered how to utilize the new system for a very long time. Also, he was aware that Kovecki was often away for interviews for new positions [6], [7].

CONCLUSION

Every commercial enterprise's total productivity and profitability are impacted by operations management. It accelerates the development of both individuals and businesses by measuring the effectiveness of managers and other employees. Operations management is the heart of the business, where wise choices and strategies are made. In order to create, plan, control, and improve operations, logistics, and supply chain management activities, operations management employs advanced methodologies. They are always being supported by new information technologies.

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CHAPTER 3

A BRIEF DISCUSSION ON COMPUTER SYSTEMS

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ABSTRACT:

A computer system is made up of a computer plus other hardware and software. A central processing unit (CPU), memory, input/output devices, and storage devices make up the majority of a computer system. To produce the intended result, each of these parts works in concert with the others as a single unit. In this chapter author is discusses the basic components of computer systems. Computer systems refer to the combination of hardware and software components that work together to perform various tasks and operations. A computer system typically consists of a central processing unit (CPU), memory, storage devices, input/output devices, and an operating system. With advances in technology, computer systems have become faster, smaller, and more efficient, allowing them to handle complex tasks with ease.

KEYWORDS:

Computer System, Information Technology, Industry, Network, Telecommunication.

INTRODUCTION

The first three sections of Part I concentrate on modern information technology after the crucial introduction, which establishes the context for the whole book. A broad vocabulary of technical terminology will be used, and many technical ideas will be explained. But, the purpose of chapters 2 through 4 was to clearly explain to all readers what managers need to know about IT and the data that technology manipulates. Many of this technical content may be already be recognizable to those of you who have a background in information systems, computer science, engineering, or one of the physical sciences. For those of you without this background, our goal is to provide you the terms and ideas you need to comprehend the management topics covered in the remaining chapters of this book and to interact with IS leaders and experts in the present and the future. These skills will also allow you to read IT articles in The Wall Street Journal, BusinessWeek, Fortune, and other media with confidence.

We start our IT overview by thinking about computer systems. 2 covers the fundamentals of both computer software, the collection of programs that govern how a computer system functions, and computer hardware, the actual components of a computer system. Current trends in the hardware and software industries are emphasized, along with recent technological advancements and significant suppliers in the IT sector. The spread of blade servers, the advent of smartphones, tablet PCs, and netbooks, as well as the continued dramatically faster supercomputers, are some of the most recent hardware innovations. The XML language's increasing importance, the creation of Web services, and the shift toward open source software are some of the more recent software advances. Whether you are dealing with microcomputer packages, business systems, or a Web browser as a computer user, your software is how you interact with the computer system. You will be engaged in the development and acquisition of applications software as a manager for your

company. This article provides an overview of the main categories of software that are now available, including database management systems, personal productivity suites, web applications, fourth generation languages, and object-oriented languages [1], [2].

Networking and telecommunications are the subjects of 3. Almost every computer, regardless of size, is capable of direct communication with other computers through a number of networks, including the global Internet. In actuality, "network-centric computing" is a feature of the modern computer business. 3 outlines the key components of networking and telecommunications, including network topology, kinds of networks, wireless communication, transmission medium, and network protocols. The Internet2 network, Voice over Internet Protocol telephony, and recent advancements in wireless networks are also highlighted, as well as online innovations like blogs, wikis, and social networking apps. The focuses on the need of networking for businesses, as inspired by the rapidly changing telecommunications sector. Explains problems with managing the data resource in the corporations of today. The emphasizes data modeling and data architecture, including fundamental data management concepts, the use of metadata, tools for managing data, packaged data models, and organizational data management procedures and policies. The successful management of this crucial organizational resource involves both IS and business managers significantly. A well-managed data resource can be profitable for the organization and is necessary to the efficient organizational use of IT.

The writers of the textbook have created seven instructional case studies about managing information technology assets, and they have been organized at the conclusion of Part I. The case study of the IMT Custom Machines Company examines the trade-offs between relying on a sizable mainframe-based computer system, switching to numerous powerful UNIX workstations, and making the leap to "cloud computing" using the Linux operating system. Two case studies concentrate on VoIP telephony, a significant new Internet technology. While "The VoIP Adoption at Butler University" case study in-depth discusses the selection and implementation challenges faced by a midsized organization, the VoIP2.biz case study deals with the product development challenges faced by a VoIP business.

The "Supporting Mobile Health Clinics" case study details the computer and communication requirements as well as the issues faced by clinicians working out of recreational vehicle-sized vans parked in front of homeless shelters and other community organizations to treat medically disadvantaged children. In the InsuraCorp case study, managers at a large insurance firm are debating who within the company should be in charge of continuing data quality and other data management concerns that occur after a corporate reorganization. This rapidly expanding chain of appliance stores' critical IT platform decision is thoroughly examined in the HH Gregg case study. HH Gregg must choose between switching to one of two commercial software systems that compete with one another and engaging outside help to help it move its current system to a UNIX environment. The selection and management of hardware and software for this organization is the subject of the Midsouth Chamber of Commerce case study, which concludes the saga started in Midsouth Chamber of Commerce following 1 of this book. It has prepared the ground for the in-depth analysis of information technology and your part in utilizing it. Now that we have a better understanding of the foundations of IT, we can examine how IT systems are created and maintained.

We use a wide definition of IT to include all technological processes related to data collection, manipulation, communication, presentation, and use. IT thus encompasses computers, peripherals connected to computers, communications devices and networks (clearly including the Internet),

photocopiers, facsimile machines, cellular telephones and related wireless devices, robots, video recorders and players, and even the microchips found inside of products like automobiles, airplanes, elevators, and home appliances. You must be aware of all of these IT manifestations, as well as their presence and possible applications in an organizational setting. Yet, the manager in a contemporary firm must be knowledgeable about two major IT categories: computer technology and communications technology. The form of the contemporary organization, how it does business, the range of its operations, and the positions and careers of its managers have all been significantly impacted by both of these technologies and continue to be so.

The separation between computer and communications technologies is arbitrary and maybe the first significant argument to be made in this. Previously, computer and communications technology existed separately, but during the last 30 years, they have developed in tandem. Every industry uses distributed systems, which connect computers together using telecommunications links. Systems that are offered over the Web, whether it be the Web itself or an intranet inside the enterprise, are becoming more and more common. Almost every manager, regardless of position, has a microcomputer on their desk. These computers are linked to the company's network and often the Internet. Nowadays, the computing and communication functions are often shared by the information systems organization. Computers are used to build up computer networks, including routers, gateways, and the switches used in telephone networks. Moreover, modern cellphones serve as both computers and communication tools. Although if it is still easier for us to talk about computer technology as separate from communications technology, the lines between the two are blending more and more. Actually, the computer/communications industry is responsible for the development and marketing of computer/communications technologies [2].

Consideration of computer hardware, as opposed to computer software, comes first in this discussion. The term "computer hardware" describes the tangible components of a computer system, such as a central processor unit, a printer, and a disk drive. In order to better comprehend how a computer system functions, we shall introduce the stored-program notion throughout the discussion of computer hardware. The second half of this article, which builds on the stored-program notion, is focused on computer software, which is the collection of programs that regulates how a computer system functions. Without software, computer hardware is essentially useless. Both are necessary for a computer system to serve as an effective tool for you and your business. This will illustrate how computer hardware and software work together in harmony.

DISCUSSION

Basic Components of Computer Systems

To be historically correct, we should note that there are really two separate types of computers: digital and analog. Digital computers, like people, are solely powered by digits or numbers. Analog computers change a comparable physical property, such voltage or shaft rotation speed, to represent the numbers utilized in the computation. Analog computers have been most useful in engineering and process control applications, but even here, digital machines have mostly replaced them. So, every subject we cover in this book involves digital computers.

Fundamental Organization

Modern computers come in a wide range of sizes, speeds, and technological features, from pocket microcomputers that cost approximately $100 to supercomputers that cost more than $50 million. Fortunately for us, every single one of these gadgets roughly follows the same logical framework.

All computers, from Dell microcomputers to IBM mainframes, are made up of the same set of six parts: input, output, memory, arithmetic/logical units, control units, and files. Our discussion of how computers work will focus mostly on these six fundamental parts and how they interact. Together with the actual blocks, there are two distinct kinds of arrows provided. The broad arrows represent the data flows through the computer system, while the thick arrows demonstrate how the control unit regulates each of the other components. A dashed line surrounds the control unit and the arithmetic/logical unit. These two components are together known as the processor, often known as the central processing unit, or CPU.

Input/Output

Before we can utilize a computer, we must find a means to enter data into it so that it can conduct computations. Input devices come in a wide variety; we will just cover the most common ones. While inputting data into a computer as a manager, you are most likely to utilize a mouse and keyboard. All of the components are present in microcomputers, although we shall discuss them in more depth later. In comparison to a personal computer, a terminal is a less complicated device since it just has input and output capabilities and doesn't have a CPU, at least not a general-purpose processor. A connection line of some kind connects the terminal to a computer. Most terminals contain a keyboard for inputting data and a monitor to display both the user's input and the output from the computer.

Clerical staff often use terminals to handle internet transactions. Specialized terminals are furthermore often employed as computer input devices. Point-of-sale terminals are used by the majority of retail businesses, whereas automated teller machines are common in the banking industry. Similar to the standard terminals discussed previously, these special-purpose devices serve as input and output devices and often have a small built-in printer to provide a hard-copy record of the transaction. The best packages only achieve identification accuracy in the 95 to 99 percent range, which is still far from ideal for speech recognition software. Yet, speech input to computers gives a different kind of input. With these numbers, speech recognition software is a productivity-enhancing tool for users who lack fine motor control, have physical restrictions, have repetitive stress injuries from overusing a computer keyboard, or who simply have no other option except to dictate [3], [4].

The original document may be read from a computer's memory using certain input methods. In the US, magnetic ink character recognition input technology is used for check processing. On checks, the account and bank numbers are preprinted at the bottom in an unusual font using magnetizable ink. The amount of the check is noted at the bottom of the check in magnetizable ink by the bank that cashed it. A computer input device known as a magnetic ink character reader magnetizes the ink, which then identifies the digits and delivers the data to the bank's computer system. Using an input method known as optical character recognition, text that has been typed, printed, or handwritten is immediately scanned. An apparatus known as an optical character reader scans and recognizes the characters, and after that, it transfers the data to the computer's memory or records it on a digital storage device. Imaging goes beyond OCR in scope. Any paper document may be scanned and turned into a digital version via imaging, allowing it to be stored in the computer system. This covers business documents including reports, charts, graphs, and pictures. In order to display the digital image stored in the computer system on a video display device, print it on paper, or transfer it to another computer, the process may then be reversed.

An increasingly important technique of entering data into a computer is the process of scanning a bar code label on a box, product, routing sheet, container, or vehicle. Bar code systems capture data far more quickly and precisely than systems where data is inputted. As a result, bar codes are often utilized for high volume transactions in checkout lines at supermarkets, department store sales, inventory management, time and attendance logs, and medical records. In fact, there are several distinct bar code symbologies. The supermarket industry's adoption of the Universal Product Code, or UPC, is perhaps the most well-known symbology.

Of course, if the data is already in a computer-readable format, such as on a compact disk or a digital video disk, it may be input into the computer using a CD drive or a DVD drive. These devices may also serve as output devices if the information is intended to be read back later into the same or a different computer. Just as we need a method of entering data into the computer, the computer must have a way of providing findings in an accessible format. In the past, we have discussed printing a paper using a small printer built into a specialized journal, displaying research on a video display, and burning output on a CD or DVD.

The most typical output format, however, is the printed report. Computer printers come in a wide range of sizes, speeds, and prices. The printers attached to computers typically employ a nonimpact technique and have a maximum print speed of 50 pages per minute. With larger PCs, impact or nonimpact printers can be used. The paper and ribbon are typically driven against the appropriate print characters by separate hammers in impact printers' typical impact printing mechanism. They have a line-by-line print speed of up to 2,000 lines per minute. While continuous-form printers can print up to 1,800 pages per minute, cut-sheet printers can only print up to 135 pages per minute. A printing method known as electrophotography is often used by nonimpact printers.

In part as a response to the flood of paper that threatens to overwhelm many businesses, microfilm has become a significant computer output medium. The output device is a computer output microfilm recorder that receives data from the memory and produces microfilm output at extremely high rates, either as a roll of microfilm or as a sheet of film known as a microfiche with multiple pages on each sheet. As a source of constrained, carefully crafted computer output, voice response systems are rising in popularity. In conclusion, various input and output devices will be connected to the computer depending on its intended use. Every computer system will have a minimum of one input device and one output device. On the computers you will be using as a manager, keyboards, mice, video display units, printers, and CD/DVD drives will be the most prevalent input/output devices.

Digital Memory

It referred to the main memory as the primary memory. Only in and out of memory does data flow. A special kind of data flows from memory to the control unit to tell the control unit what to do next. There are two-way data flows between files and memory, as well as between the arithmetic/logical unit and memory. Data from output devices always get their data from memory, while data from input devices always enter memory. There are various ways in which computer memory is analogous to human memory. Both humans and computers memorize information so that we can later recall or use it. However, there are significant differences between how information is retained in human memory and computer memory. Each memory cell in a computer is divided into a specific amount of data storage space. Moreover, every memory cell has an address, which is a constant identifying number. A very early microprocessor, for instance, would

contain 65,536 memory cells, each of which could store a single character. These cells have fixed addresses that start at 0 and end at 65,535, with the first cell having the lowest address.

A useful comparison for computer memory is a wall of post office boxes. The addresses linked with the memory cells in each box's upper-left corner match the sequential identification numbers written on the doors of each box. The contents of each box are changed as the mail is delivered or collected. A certain amount of data can be stored in each memory cell in a computer's memory up until a change is made. The letters MAY are stored in memory cell 0, 2012 are stored in memory cell 1, 700.00 is stored in memory cell 2, and so on. The letters in represent the data that is currently stored in memory; a nanosecond later, when the computer is operating, the data may be entirely different. The memory cells' contents will change as the computer runs even though their addresses are fixed. Computer memory really varies from post office boxes in a number of ways. First off, computers manage their memory according to the "destructive read-in, nondestructive read-out" principle. This suggests that whenever a specific piece of data is stored into a specific memory cell, regardless of whether it's received from an input device or as the consequence of a calculation in the arithmetic/logical unit, the computer deletes the data item that was previously present in the cell. When a data item is pulled from a cell, whether to print the item out or use it in a calculation, the contents of the cell are unaffected.

Another important distinction is the capacity of memory cells and post office boxes. Depending on the size of the pieces and the amount of effort postal employees put into stuffing the mail into the box, a post office box may hold a variety of amounts of mail. The fixed capacity of each memory cell varies depending on the computer model. A word is a memory cell that can store two or more characters of data, while a byte is a memory cell that can only store one character of data. It has become standard practice to describe memory capacity in terms of the corresponding number of bytes for comparison, despite the fact that the memory cells themselves are actually words.

Leaving our post office example aside, we may observe that there are a number of notable differences between the memory of one computer model and that of another. First, the capacity of each cell might differ. A microcomputer can only store one digit of a number in each cell, whereas a huge computer can store up to 14 digits in a single cell. Second, the number of memory cells can range from a few million to several trillion. Lastly, the time needed to transfer data from memory to another component varies by an order of magnitude across machines. Despite the fact that all memory is now constructed on very small integrated circuits on silicon chips, several technologies may have been employed to produce the memories.

Bit Systems and Coding Plans

A separate collection of circuits that can all be switched on or off make up each memory cell. As there are only two possible states in each circuit, 1 and 0, they are represented by the two possible values of a binary integer. Hence, each circuit stands for a binary number, or bit. To represent the decimal digits for processing by the computer, several of these bits must be concatenated to form a single character. A memory cell that stores one character is known as a byte, and on the majority of computers, one character is represented by eight bits. Because of this, eight bits typically equal one byte.

Consider the case below. Assume that the memory cells in the computer are each one byte in size. As a result, memory cell 327, for instance, will hold eight circuits or bits. If these circuits are configured to be on-on-on-on-off-on, the coding scheme may specify that this combination represents the decimal number 9. These bits may be changed to 1111 0001 to define the decimal

number 1. If these bits are set to 1100 0010, they may be interpreted as the letter B. We can continue in this way, giving each character we want to represent an eight-bit matching pattern. Nowadays, there are two coding methods that are extensively used. In the aforementioned situations, the Extended Binary Coded Decimal Interchange Code is used. IBM invented EBCDIC in the 1950s, and it is still in use today by IBM and other businesses. The second extensively used code is the American Standard Code for Information Exchange, which is utilized by microcomputers and in data transfer.

In essence, a coding system is used to represent data in memory and other computer components. Circuits in a specific memory cell are turned on and off in line with the coding scheme to save the data for later use.

It turns out that circuits are used to represent data in both the control and arithmetic/logical units. In the input, output, and files, the coding scheme is often represented by magnetic regions on some media, such a disk. Data transmission coding is frequently visualized as a series of electrical or light pulses. The coding system is crucial for enabling data storage, transport, and change, to sum up.

Mathematics and Logic Unit

Similar to memory, the arithmetic/logical unit is composed of very small integrated circuits on a silicon chip. In many respects, the arithmetic/logical unit is rather simple. It can do addition, subtraction, multiplication, and division as well as logical operations like comparing two numbers for equality or figuring out which number is greater. The broad arrows serve as a representation of the arithmetic/logical unit. The wide arrow from memory to it indicates that the necessary numbers are transferred from the appropriate memory cells to the arithmetic/logical unit. The procedure is then performed, with the length of time depends on the computer model. Several speeds are engaged, ranging from millions to billions of operations per second. As shown by the wide arrow from the arithmetic/logical unit to memory, the result of the operation is subsequently stored in the selected memory cell or cells [5]–[7].

CONCLUSION

A group of interconnected computers that share a storage system, as well as routers, printers, and other peripherals. Each system-connected computer can work alone, but they can also communicate with other computers and external gadgets. A computer system is an integrated set of devices that can input, output, process, and store data and information. Modern computers are built with at least one digital processor at their core. The five fundamental hardware components of a computer system are input, processing, storage, output, and communication devices. In its simplest form, a computer system is an electrical device that can be programmed to take input, store data, retrieve data, process data, and produce information.

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CHAPTER 4

A BRIEF STUDY ON COMPUTER FILES

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ABSTRACT:

A computer file is a resource used by computers to store data that is largely recognized by its file name. Data may be entered into a computer file in the same way that words can be entered onto paper. In this chapter author is discusses the stored-program concept. Computer files are a fundamental component of modern computing, serving as containers for digital data that can be accessed and manipulated by computer programs. Files can take many forms, including text documents, images, audio recordings, video files, and more. They are typically organized into directories and subdirectories, forming a hierarchical file system that enables users to organize and manage their data. Files can be stored locally on a computer's hard drive or on remote servers accessed over a network or the internet.

KEYWORDS:

Computer, Employee, File, Information Technology, Network.

INTRODUCTION

The information needed for the present calculations must be saved in the computer's memory as applications are processed. As memory has a limited storage capacity, it is not possible to maintain all of the data for all of the active applications in memory at once. Memory is also unstable; if the computer's power goes out, everything that was stored there is gone. File devices, also known as secondary memory or secondary storage devices, have been added to all but the smallest computer systems in order to maintain enormous amounts of data accessible inside the computer system on a nonvolatile medium and at prices more affordable than main memory. Magnetic tape drives, hard drives, detachable disk drives, flash drives, and CD or DVD drives are examples of file devices. All drives, with the exception of optical drives, record data by magnetically attracting certain regions of the media's surface. Broad arrows in either direction indicate how the data may be transported from specific memory cells to the file and returned from the file to specific memory cells. The drawback of files is that, compared to how quickly a computer can process information, the act of saving data in a file from memory or returning data from a file to memory is very sluggish. The store/retrieve time might range from a very tiny fraction of a second to more than a minute, depending on the kind of file. Nonetheless, we are prepared to put up with this drawback in order to store vast amounts of data at a reasonable cost per byte [1]–[3].

Files with Sequential Access: Computer file organization may be divided into two categories: sequential access and direct access. All of the records that make up sequential access files are kept in order according to the control key for the file. A payroll file, for instance, will include one entry for each employee. According to the employee identification number, these particular personnel records are kept in order. There are no addresses in the file, thus to locate a specific record, the file

device must begin reading the sequential file from the very first record and continue until it finds the one it is looking for. It is clear that using this approach to locate a single record might be time-consuming, especially if the sequential file is lengthy and the sought record is close to the finish. Because of this, using a sequential access file, we would seldom attempt to locate a single entry. Instead, we would gather a batch of transactions and carry out the batch processing all at once.

Magnetic tape is often used to store sequential access files. The file system that saves data on tape and retrieves it so it may be read back into memory is known as a magnetic tape unit or magnetic tape drive. Magnetic tape retrieval is often significantly slower than retrieval from direct access files, even with batch processing. Hence, sequential access files may not be appropriate if speed is crucial. Magnetic tapes, on the other hand, provide cost-effective data storage for huge amounts of information. For instance, a tape cartridge with a storage capacity of up to 500 billion bytes may be acquired for less than $160.

File Direct Access: A direct access file is one that is stored on a direct access storage device that allows the computer to access a record instantly, regardless of where the record is placed within the file. Direct access devices come in a variety of forms, such as hard drives, portable disk drives, CD and DVD drives, and flash drives. A typical computer hard drive is made out of a continually revolving disk that resembles a vintage phonograph record. To record on and read from the hundreds of concentric tracks on the disk surface, an access mechanism slides in and out on the disk. Microcomputer internal hard drives typically hold 160 billion to 2 trillion bytes and range in price from $50 to $200. Hard drive transfer rates can reach 375 million bytes per second, making it possible to read or write data from or to them very quickly.

Portable and desktop external hard drives that may be connected to a computer's USB connection have grown in popularity in recent years. Desktop external hard drives offer comparable capacities, prices, and data transfer speeds as internal hard drives. These external drives can significantly increase the capacity of the internal hard drive in addition to offering backup functionality. Portable drives generally have a lower maximum capacity and a slower data transfer rate than internal and desktop external hard drives. These portable drives allow users to back up extremely big data files and transfer these enormous data files from one computer system to another. They also include a "drop guard" function to avoid harm from drops. The Hopkinton, Massachusetts-based EMC Corporation has dominated the market for storage systems for big computers by finding a technique to connect a lot of cheap, compact hard drives together instead of the costly, massive disk drives that were previously employed. For instance, the Symmetrix DMX-4 950 model from EMC may be configured with up to 360 hard drives, each having a storage capacity of up to 1,000 gigabytes, for a total storage capacity of up to 360 terabytes. Direct access devices are also capable of using a detachable disk, in contrast to these fixed-disk file devices. For instance, a microcomputer's removable 3.5-inch high-density disk, which costs less than 50 cents and has a storage capacity of up to 1.44 million bytes. The price of the disk drive is about $20. These 3.5-inch disks were very popular in the 1980s and 1990s, but optical disks and flash drives which will be covered next largely replaced them in the twenty-first century [4]–[6].

The optical disk is a different kind of removable disk. It is formed of plastic and has a thin layer of a reflective alloy substance on it. By utilizing a binary coding system and a laser beam to burn small holes in the reflecting surface, data are stored on the disk. Compact disks and digital video disks, also known as digital versatile disks, are the two main types of optical disks in use today. Some CDs and DVDs are recordable, others are rewritable, and some are read-only media. The standard data capacity for a CD is 700 megabytes, but the standard data capacity for a dual-layer

DVD is 8.5 gigabytes. Iomega's Super DVD Writer, rated 22x and priced around $90, is one example of a DVD reader/writer for a microcomputer. The most recent and smallest portable DASD for PCs uses flash memory rather than a magnetizable disk, similar to that seen in digital cameras and portable music players. Other names for this flash drive include jump drive, small USB drive, and keychain drive. The term "keychain drive" may be the most apt given that the gadget is not much bigger than a typical automobile key it typically measures around 2 1/2 inches long. The prices and maximum storage capacities of these flash drives are decreasing over time; as an illustration, in 2010 a 32-gigabyte Cruzer USB flash drive from SanDisk was available for about $134. These flash drives have a maximum sustained data transfer rate of 40 megabytes per second and are made to fit into the standard USB port on a computer. The flash drive is a cost-effective and very practical means to store and move enormous quantities of data. The physical file is split into cells, each of which has an address, and this division is the key to how direct access files work. The cells resemble memory cells, but they are considerably bigger and may often hold many records in a single cell. It is feasible for the computer to save a record at a certain file address and then retrieve that record by remembering the address because of the presence of this address. Instead of reading through sequentially stored records until it finds the requested one, the computer may go straight to the file location of the desired record.

How does a computer determine which file to open to find a certain record? Consider the scenario where a computerized inventory management program wants to update the record for item 79032. For processing, the record must be fetched into memory from someplace in the DASD. However, where is it? What file address is this? The largest obstacle to adopting direct access files is the complexity of converting the identification number of a sought record into the associated file location. To manage this translation, quite complex software is needed, which will be covered further in this article. Both Web surfing and online processing need direct access to files. Airline reservation agents, department shop salesmen, office managers, and those browsing the Web from their home or work computers won't wait the few minutes that it could take to load and read the necessary magnetic tape. On the other hand, direct access files or sequential access files can both be used for batch processing.

Although if direct access files are increasingly being used in businesses, sequential access files won't completely disappear any time soon. Direct access file prices per byte continue to decline because to improvements in magnetic technology and production methods. The competitive world of today forces organizations to prioritize information processing speed, which necessitates a greater focus on direct access files.

Five of the six building blocks shown in 2.1 have been taken into account. At this point, if we stopped talking, we wouldn't have much. As of yet, there is no way for us to take use of the incredible speed and capacity we have mentioned or to govern these numerous components. The key lies in the control unit. It offers the control necessary for the computer to use the speed and power of its other parts. The control unit regulates each of the other five components, as shown by the thin arrows.

The control unit's ability to make decisions is how. Someone must create a detailed list of actions to be taken in order to instruct the control unit on what to do. This set of instructions, or program, is kept in the computer's memory much like data. From this list, one item is sent at a time from memory to the control unit, where it is interpreted and executed. Instead of waiting for the user to instruct it on what to do next, the control unit moves quickly through the whole list of tasks. The stored-program concept, which we just discussed, is the most crucial concept in all of computing.

DISCUSSION

The Stored-Program Concept

Some person must prepare a precise listing of exactly what the computer is to do. This listing must be in a form that the control unit of the computer has been built to under- stand. The complete listing of what is to be done for an application is called a program, and each individual step or operation in the program is called an instruction. The control unit carries out the program, one step or instruction at a time, at electronic speed. When a particular computer model is designed, the engineers build into the capability to carry out a certain set of operations. For example, a computer may be able to read an item of data keyed from a keyboard, print a line of output, add two num- bers, subtract one number from another, multiply two num- bers, divide one number by another, compare two numbers for equality, and perform several other operations. The com- puter's control unit is built to associate each of these opera- tions with a particular instruction type. Then the control unit is told which operations are to be done by means of a pro- gram consisting of these instructions. The form of the instructions is peculiar to a particular model of computer. Thus, each instruction in a program must be expressed in the precise form that the computer has been built to understand. This form of the program that the computer understands is called the machine language for the particular model of computer [7]–[9].

Processor Chips

At the heart of every computer today is one or more processor chips, such as the Intel Core i7 processor chip. It is important to note that the processor chip includes both the arithmetic/logic unit and the control unit. The Intel Core i7 processor chip, which is used in many of today's top-of-the-line microcomputers, contains hundreds of millions of transistors and has been described by Intel as the "fastest processor on the planet. It is also a quad-core processor which has four complete processors manufactured as part of a single chip. Intel is not the only processor chip maker, but it is the largest and the most important. Intel sup- plies over 80 percent of the microprocessor chips used to power microcomputers, with Advanced Micro Devices supplying most of the rest. Other manufacturers of processor chips include IBM and Sun Microsystems.1 As an interesting side note, IBM also provides the processor chips for all of the newest-generation game consoles.

Not only will the form of the instructions vary from one computer model to another but so will the number of different types of instructions. For example, a small computer may have only one add instruction, while a large one may have a different add instruction for each of several classes of numbers. Thus, the instruction set on some machines means the computer should add the number found in memory cell 470 to the number found in memory cell 500, storing the result back in memory cell 500. Therefore, if the value 32.10 is originally stored in cell 470 and the value 63.00 is originally stored in cell 500, the sum, 95.10, will be stored in cell 500 after the instruction is executed. Continuing our example, assume that the next instruction in the sequence is may contain as few as 20 types of instructions, while other machines may have more than 200 instruction types. In general, each machine language instruction consists of two parts: an operation code and one or more addresses.

The operation code is a symbol that tells the control unit what operation is to be performed. The addresses refer to the specific cells in memory whose contents will be involved in the operation. As an example, for a hypothetical computer the instruction. This instruction means move the contents of memory cell 500 to memory cell 200. Thus, 95.10 will be placed in cell 200, erasing

whatever was there before. The third instruction in our sequence. Our very short example contains only three instruc- tions and obviously represents only a small portion of a program, but these few instructions should provide the flavor of machine language programming. A complete program would consist of hundreds or thousands of instructions, all expressed in the machine language of the particular computer being used. The person preparing the program has to know each operation code and has to remember what data he or she has stored in every memory cell. Obviously, machine language programming is very difficult and time consuming.

Once the entire machine language program has been prepared, it must be entered into the computer, using one of the input methods already described, and stored in the computer's memory. This step of entering the program in memory is called loading the program. The control unit then is told where to find the first instruction in the program. The control unit fetches this first instruction and places it in special stor- age cells called registers within the control unit. Using built-in circuitry, the control unit interprets the instruction and causes it to be executed by the appropriate components of the computer. For example, the control unit would inter- pret the add instruction previously, cause the contents of memory cells 470 and 500 to be sent to the arithmetic/logical unit, cause the arithmetic/logical unit to add these two numbers, and then cause the answer to be sent back to memory cell 500. After the first instruction has been completed, the control unit fetches the second instruction from memory. The control unit then interprets this second instruction and executes it. The control unit then fetches and executes the third instruction. The control unit proceeds with this fetch–execute cycle until the program has been completed. Usually the instruction that is fetched is the next sequential one, but machine languages incorporate one or more branching instructions that, when executed, cause the con- trol unit to jump to a nonsequential instruction for the next fetch. The important point is that the control unit is fetch- ing and executing at electronic speed; it is doing exactly what the programmer told it to do, but at its own rate of speed.

One of the primary measures of the power of any computer model is the number of instructions that it can execute in a given period of time. In the 1980s the most commonly used speed rating was MIPS, or millions of in- structions per second executed by the control unit. However, it may take several instructions on one computer model to accomplish what one instruction can do on anoth- er computer model. Thus, the use of MIPS ratings has largely gone out of favor because of the "apples and or- anges" nature of the comparisons of MIPS ratings across classes of computers. Another speed rating used is MegaFLOPS or MFLOPS millions of floating point operations per sec- ond. These ratings are derived by running a particular set of programs in a particular language on the machines being investigated. The ratings are therefore more mean- ingful than a simple MIPS rating, but they still reflect only a single problem area. One publicly available set of MFLOPS ratings is the LINPACK ratings, in which the problem area considered is the solu- tion of dense systems of linear equations using the LIN- PACK software in a FORTRAN environment.

Published speed ratings can be useful as a very rough guide, but the only way to get a handle on how various machines would handle your computer workload is benchmarking. Benchmarking is quite difficult to do, but the idea is to collect a representative set of real jobs that you regularly run on your computer, and then for comparison actually run this set of jobs on various machines. The computer vendors involved will usually cooperate because they want to sell you a machine. To make benchmarking easier, software vendors have created ready-to-use computer benchmark packages, using everyday programs, which will measure the performance of various computers. For example, PC World magazine has created WorldBench 6, which is designed to test

microcomputers running the Windows 7 operating system. WorldBench 6 includes eight applications, such as Adobe Photoshop, Microsoft Office, and Roxio VideoWave Movie Creator. You can do your own bench- marking by buying a license to use WorldBench 6 on a single computer at a time for $249.

Again, processing speeds vary across machines, but all computers use the stored-program concept. On all com- puters, a machine language program is loaded in memory and executed by the control unit. There is a great deal more to the story of how we get the machine language program, but suffice it to say at this point that we let the computer do most of the work in creating the machine language pro- gram. Neither you nor programmers working for your organization will write in machine language; any programs will be written in a language much easier and more natural for humans to understand.

Types of Computer Systems

We have discussed the fundamental components of computers—the six parts that every computer is made up of—as well as the crucial stored-program notion. Now that we've looked at the similarities across computers, it's time to examine the contrasts between them. We will include the main applications for each kind of system in our discussion, along with the top suppliers. Our debate must start with a crucial disclaimer: There is some agreement on the terminology we shall use, but not on the criteria used to define each group or the computer models that fall under each kind. Generally speaking, the distinctions between categories are made using a mix of factors including cost, computational power, and the intended use of a machine, with the latter being the most important. The classifications we'll use are microcomputers, midrange systems, mainframes, and supercomputers, listed in order of generally increasing expense and power.

Moreover, keep in mind that MFLOPS is merely a very basic comparative indicator of power. Please be aware that the category lines are rather hazy. An arbitrary cutoff point of $4,000 has been established between microcomputers and midrange systems, however the technology used on both sides of this border is relatively comparable. On the other hand, as shown in the table, the types of work performed on these classes of machines are very different, so we have separated them. As we discuss midrange systems, it will become clear that this category originated from two separate subcategories, but due to their current cost, power, and application overlap, we have decided to group them all together into a single category that encompasses everything from microcomputers to the much larger mainframes and supercomputers. Moreover, some intermediate systems employ technology that is comparable to that of supercomputers; the only distinction may be the number of parallel processors. Low-end mainframes are far less powerful than high-end midrange systems, but they were designed to be used in as many different applications as feasible. While some sources refer to midrange systems as servers rather than midrange systems, we disagree with this terminology since a variety of machines, including microcomputers, midrange systems, mainframes, and supercomputers, May and do function as servers.

Microcomputers

Microcomputers range in price from $200 to $4,000. They are also known as micros, personal computers, or simply PCs. While there isn't much of a difference between them and midrange systems in terms of power, they often have less power. Microcomputers typically only have a single keyboard and video display unit, and they can typically be transported or carried by one person. The most well-known kind of PCs are desktop computers, but they are also available in smaller, briefcase-like laptop and notebook packages that weigh less than 10 pounds, as well as in

more recent, smaller portable or palmtop devices that weigh less than a pound. Smartphones are portable computers that simultaneously function as mobile phones. The tablet PC is an interesting variant of the notebook computer in which the user uses a digital pen to write on an electronic tablet. The netbook, a smaller, more affordable laptop that is stripped-down and priced between $300 and $500, is the most recent iteration of the PC. Netbooks are designed for Internet use and are being marketed by both computer vendors and wireless phone carriers who want to sell the user a wireless data device. PC refers to the IBM Personal Computer or any one of the compatible machines made by other vendors, such as Hewlett-Packard and Dell. However, netbooks rarely have a CD/DVD reader/writer or other extra features. Practically speaking, all microcomputers with the exception of those made by Apple fall under the PC umbrella. So, we shall discuss both PCs and Apples in this section. The IBM Personal Computer, which was based on microprocessor chips manufactured by Intel and the PC-DOS operating system developed by Microsoft, was the most widely used microcomputer for corporate usage by the second half of the 1980s.

The majority of corporate computers are still IBM-compatible PCs near the end of the first decade of the twenty-first century, but no new PCs are produced by IBM. IBM sold its entire PC division to the Chinese company Lenovo in 2005. IBM was not content with their profit margin on the PC business, and simply opted to abandon the market. Following the transaction, HP overtook IBM as the biggest IT company in the world, moving IBM to second place. At now, HP, Dell, and Acer 2 are competing for market leadership in the PC sector, but they attained their prime positions through various paths. Although HP rose to the top by purchasing Compaq Computer in 2002, Dell evolved as a direct-sale vendor, first by mail and telephone and now mostly via the World Wide Web. Due in part to its purchases of Gateway and Packard Bell, Acer, who was already a significant competitor, overtook Dell to take second position in 2009. Toshiba, Fujitsu, and Sony are other significant PC industry participants. As was already said, the majority of new PCs utilize the Microsoft Windows operating system, with over 80% of them utilizing Intel processor chips and the majority of the remaining PCs using AMD processors.

Apple is the only manufacturer of microcomputers that does not make an IBM-compatible PC and does not run Windows. At the beginning, the Apple Macintosh struggled to compete in the business sector against the established PCs, but in the late 1980s and early 1990s, its user-friendly graphical interface helped it win over many new users. After then, Macintosh sales peaked, and Apple struggled until releasing the iMac in 1998. The vibrant iMac gave the Apple product line some life and helped the company turn a profit once more. Since then, Apple has continued to develop innovative products like the MacBook, MacBook Pro, and MacBook Air laptops as well as the Mac Pro and Mac Mini desktop computers. The Mac computers run Apple's own Mac OS X Snow Leopard operating system and Intel microprocessor chips. Less than 10% of the American microcomputer market and possibly 5% of the global market are still held by Apple. However, Apple has created a lucrative and expanding niche for itself with its computers and other products like the hugely successful iPod music player, the iTunes music distribution service, and the well-known iPhone smartphone. The microcomputer market is fiercely competitive between Apple and the numerous PC OEMs and is likely to stay that way for the foreseeable future.

Microcomputers have a wide range of applications in homes, schools, and colleges. They function as terminals into bigger computers, as clients in client/server applications, as the point of entry into the Internet and the World Wide Web, as well as programs for word processing, spreadsheets, presentations, and tiny databases in the corporate sector. The days of standalone microcomputers in large organizations are over. In order to access data and applications wherever they may be,

managers require microcomputers connected to the corporate computer network. Even though they may run independently or on tiny local area networks, microcomputers are still crucial for small enterprises since they often have connection to the Internet [10]–[12].

CONCLUSION

A file system regulates how data on a storage device is kept, arranged, and accessed. A file is a logical informational unit that processes produce and the OS manages. File characteristics are settings and details related to files. A file is a computer object that houses data, details, preferences, or instructions utilized by a software. Application files, data files, and system files are the three different sorts of files found on computers. Compactness a small amount of space can hold data. Data Recovery Data retrieval from files is now more straightforward and effective because to computer-based systems' enhanced data retrieval algorithms. Editing all data kept in the form of files on computers may be simply altered.

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CHAPTER 5

A BRIEF DISCUSSION ON MIDRANGE SYSTEMS

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ABSTRACT:

A computer system which is more powerful than just a general-purpose personal computer but less powerful than just a full-size mainframe computer is referred to as a midrange system or midrange computer. In this chapter author is discusses key types of software. Midrange systems, also known as midrange computers, are computer systems that fall between the high-end mainframe computers and the low-end personal computers. These systems are often used in business settings for tasks such as database management, transaction processing, and enterprise resource planning (ERP).

KEYWORDS:

Computer, Corporate, Information Technology, Midrange System, Software.

INTRODUCTION

The widest category of computer systems is known as "midrange systems," and it includes everything from tiny microcomputers to enormous mainframes and supercomputers. This sort of computer system is characterized, rather arbitrarily, as having a price range of $4,000 to $1,000,000 and a power range of 2,500 to 250,000 MFLOPS. Workstations and minicomputers, two previous computer types that are no longer in existence, were the ancestors of today's midrange systems. In this context, the phrase "workstation" refers to a potent machine powered by a microprocessor that may or may not be utilized by a single person. Microprocessor chips, on which workstations are built, are often more powerful than those used in microcomputers. Workstations are really more capable, mature versions of microcomputers. Workstations were first employed for specialized programs that required a lot of processing power, high-resolution graphics, or both, but more recently they have been utilized as Web servers, in network administration, and as servers in client/server applications. Workstations also made inroads into the realms of conventional midrange systems and mainframes due to their extremely high price-performance characteristics compared to other kinds of computers. We have decided to combine these categories for our consideration because of how much workstations have impacted the midrange systems area [1]–[3].

The success of this class of machines, at least at its top end, is partly attributable to the creation of the computer chip with a restricted instruction set. You may remember from our previous talk that some computers have a large instruction set, but others have a significant difference in their instruction set. Instead of using the full instruction set found on mainframe circuits, the RISC chip designers worked with a condensed set of instructions. They were able to produce a smaller, quicker chip than had previously been achievable by working with a smaller instruction set. The majority of today's computers at the high end of the midrange systems category are powered by variations of these RISC CPUs. Now let's look at the second set of roots for the category of midrange systems. Up to the 1990s, these average systems were known as minicomputers. These

computers were formerly identical to the bigger main-frame machines, but for the fact that they were less costly and powerful. The bigger minicomputers were even briefly given the odd moniker of superminicomputers, which combines the prefixes "super" and "mini." These conventional midrange systems played a crucial role as departmental computers, managing certain activities such

The Most Compact PCs: Smartphones

The Apple iPhone and several BlackBerry devices are the market leaders for smartphones, which are here to stay. Smartphones combine the capabilities of traditional personal digital assistants (PDAs) with the capacity to make phone calls. With new applications being developed on a regular basis, these devices allow the user to perform a wide range of tasks, including making phone calls, picking up and sending e-mail, managing your calendar, keeping your to-do list and address book up to date, taking pictures, and being entertained with games, music, and video. The Apple iPhone and RIM's BlackBerry, in the words of Business Week's Stephen H. Wildstrom, are "the only genuine smartphones." He believes that the question "which one is better?" should be replaced with "which one is good for you?" He contends that the BlackBerry Storm is the clear victor for messaging activities because to its touch screen keyboard. On the other hand, if web surfing, social networking, gaming, and entertainment are more essential to you than texting on your smartphone, the iPhone comes out on top. The BlackBerry is made more for business, notably text and email, whereas the iPhone is made more for entertainment.

In terms of market share, the United States is dominated by BlackBerry and iPhone, with Nokia dominating the global market. BlackBerry and iPhone are next. The iPhone runs the iPhone OS, while the BlackBerry smartphones use the RIM operating system. Other significant participants in the smartphone industry include Palm, HTC, and Motorola. Google's Android, Palm OS, and Microsoft's Windows Mobile are among the operating systems in use. both serving as the server in a client/server architecture and office automation. Many midsized organizations handled their internal data processing using one or more of these platforms. Due to the competition from mainframe systems and powerful microcomputers and workstations, several experts predicted that these conventional midrange systems would vanish. Nevertheless, this was not the case. Workstations and minicomputers, on the other hand, have "morphed" into a more intricate, interconnected group that we have named intermediate systems. For client/server applications, Web serving, file and database serving, and network administration, these computers are typically used as servers. They range from quite tiny systems that cater to a single user or department up to enterprise-wide systems that have largely taken over the functions of mainframe computers [4], [5].

It might be helpful to split up the midrange systems of today into two groups. Machines at the low end are simply powerful PCs based around Intel Xeon or AMD Opteron CPUs, and often run Windows Server as the server operating system. For these Intel- or AMD-based servers, the UNIX or Linux operating systems are also an option, albeit this is less typical. 3 Hewlett-Packard, Dell, IBM, and Fujitsu are the leading market participants. Machines at the top of the market are either driven by RISC processors created by the manufacturer or by top-tier Intel or AMD microprocessors. These powerful computers typically use either the Linux operating system or a UNIX variant as their operating system. IBM, HP, and Sun Microsystems are the market leaders in this subsegment.

As an example, IBM Power Systems, which uses RISC CPUs created by IBM, is the company's offering in this UNIX/Linux market segment. The Power 520 Express with up to 4 processors and the top-of-the-line Power 595 server with up to 64 processors are two of the various variants of the Power server. The Power 595 may have a memory capacity of up to 4 terabytes, while the Power 520 Express can have up to 64 gigabytes. The Power 595 may cost upwards of $100,000, whereas the Power 520 Express has a starting price of less than $6,000. The POWER6 64-bit microprocessor4 chip from IBM, which was unveiled in 2007 and was the fastest processor chip in the world at the time, powers IBM Power servers. A dual-core CPU, the POWER6 chip has 790 million transistors. It's important to remember that a Power server's numerous processors may function as a symmetric multiprocessor, meaning that one processor can function independently of the others despite the fact that they are all identical. Consequently, many applications may run concurrently on each processor. The IBM I operating system may be used with the Power server, which typically runs Linux or IBM's version of UNIX. This is significant because it will enable System I customers to move all of their programs to Power servers once IBM's Power Systems and System I converge. More than a million Power Systems systems have been supplied to business and technical clients worldwide, together with its predecessors, the RS/6000 series and AS/400 series.

DISCUSSION

Mainframe Computers

For many, if not most, large enterprises and governmental organizations, mainframes serve as the brains of their computer infrastructure. The tale of the several versions of mainframe computers is the early history of computing. With MFLOPS ranging from 2,500 to 1,000,000 and price ranging from $500,000 to $20,000,000, the mainframe power and cost spectrum is vast. The diversity of the applications mainframes can handle including online and batch processing, common commercial applications, engineering and scientific applications, network management, systems development, Web serving, and more is one of their key strengths. In a client/server setup, mainframes can function as extremely big servers. A large range of applications and systems software have been created for mainframes due to their continued significance in business computing [6]–[8].

Because to its crucial position in computing, the main-frame market has always seen intense rivalry. From the late 1950s, IBM has been the leading vendor. The System z series of IBM mainframes is the most recent generation. The most recent versions are the System z10 computers, which were debuted in 2008 and range in complexity from a single CPU to 64 processors. These devices are all based on quad-core IBM processing chips and multi-chip modules. Being a symmetric multiprocessor computer, the System z10 can run many applications simultaneously on each processor. A modular multibook architecture that supports one to four books per machine is used in the construction of the high-end machines. An MCM, which houses the processing chips, storage management chips, and high-speed input/output interfaces, is included in each book.

The top-of-the-line, 64-processor System z10 Enterprise Class uses 4 of these MCMs and has a maximum main memory capacity of 1,520 GB. The System z10 Enterprise Class offers a 50–100% performance gain over its predecessor, which is even more astounding. According to IBM, the z10 can sustain hundreds of millions of users and is roughly equal to 1,500 Intel- or AMD-based servers. The System z10 offers better speed and capacity in addition to superior security features, improved availability, and greater administrative control over the usage of IT resources. Moreover,

a Parallel Sysplex, a multisystem environment that functions like a single system, may join several systems. A System z10 Parallel Sysplex may have up to 32 separate computers, each of which can have up to 64 processors thanks to a mix of hardware and software, mainly the z/OS operating system. IBM has maintained its leadership position in the mainframe market because to its high-quality technical offerings, comprehensive and great software, very dependable hardware, and unparalleled customer service.

Direct rivalry in the mainframe market isn't as intense as it once was. In 2000, Amdahl and Hitachi withdrew from the mainframe business. Hitachi exited the mainframe business to focus on other market areas after Fujitsu acquired Amdahl. Amdahl and Hitachi stand out as especially intriguing examples since they were able to compete with IBM for many years by creating machines that were almost similar to theirs but often had somewhat newer technology. They then sold these machines for less money. Only Fujitsu and Unisys remain as significant companies in the mainframe industry. Since Burroughs and Sperry merged to establish Unisys, the company has had a lengthy history in the mainframe industry. Yet, there is a lot of indirect rivalry in the mainframe market since companies like Hewlett-Packard and Sun Microsystems are attempting to convince clients to move their mainframe systems to top-tier servers.

The price-performance ratios of mainframes vs servers, the pace at which new machines are introduced, and the state of the economy all affect the demand for mainframe computers over time. The mainframe doesn't seem to be going away, despite what some experts keep predicting. Recently, Linux alternatives have been added to proprietary operating systems by IBM and other suppliers, and costs have been sharply reduced. The inclusion of Linux support has been crucial in the rebirth of the mainframe in the twenty-first century, as many businesses have discovered that running several virtual servers on a single mainframe is more cost-effective than running many Intel- or AMD-based servers. In one instance, an IBM client redeployed 800 servers onto 26 of a single z10 mainframe's 64 CPUs, resulting in a "tremendous reduction in software licensing fees, electricity, cooling, and space." As the twenty-first century progresses, the mainframe's function will change even more, with a focus on its responsibilities as the keeper of the company's data warehouse, server in sophisticated client/server applications, consolidator of smaller servers, potent Web server, and manager of global corporate networks.

Supercomputers

The real "number-crunchers" are supercomputers, which have MFLOPS ratings over 250,000 and cost $1 million to $100 million or more. The most common creators of numerically intense issues are research professionals like chemists, physicists, and meteorologists, who are the ones who use high-end supercomputers particularly built to tackle these problems. As a result, the majority of top-tier supercomputers are found at government research facilities or on the campuses of significant universities. Nonetheless, midrange supercomputers have a wide range of applications in big corporate organizations, most typically for research and development, enormous Web serving, data mining, and integrating a lot of smaller servers.

Cray Inc. had the title of industry leader for high-end supercomputers up until the mid-1990s. While Cray Inc. has Microsystems 8 each, 10 other suppliers with 4 machines or fewer, plus 3 additional machines that were constructed by a combination of vendors, IBM definitely occupies the top rank in terms of the number of huge supercomputers because to a determined effort it made in the 1990s and 2000s. These huge computers use one or more of the three high-performance computer architectures, parallel vector processing, massive parallel processing,5, and symmetric

multiprocessing, which all make use of a substantial number of processors. The IBM Blue Gene/P computer named JUGENE, located at the German research facility Forschungszentrum Juelich, incorporates 73,728 compute nodes, each of which contains 4 symmetric multiprocessors for a total of 294,912 processors, making JUGENE the fastest computer in Europe. This machine uses both massively parallel processing and symmetric multiprocessing. This configuration runs at speeds of up to 1 petaflop and contains 144 terabytes of main memory. In addition to the above stated suppliers, NEC, Hitachi, and Fujitsu are three more significant suppliers of midrange supercomputers. When Silicon Graphics, Inc. purchased Cray Research in 1996, the world's top high-performance computing business underwent an intriguing evolution in the supercomputer sector. Cray Research, which specializes in massively parallel supercomputers, has continued to run independently. The united firm was renamed Cray Inc. when Tera Computer Corporation acquired Cray Research from Silicon Graphics, Inc. in 2000. As SGI was set to declare bankruptcy in 2009, Rackable Systems bought it, and the company soon changed its name to Silicon Graphics International. It might be challenging to stay up with the players occasionally in the supercomputer arena as well as other fields!

Key types of Software

We have finished our review of computer hardware, and we will now talk about the many kinds of computers that are now in use, ranging from PCs and smartphones to supercomputers. Now let's talk about software, or the scripts that direct how computers function. When machine language programming was presented in the preceding part titled "The Stored-Program Idea," we started thinking about software. The stored-program notion is used by every computer; on every computer, a machine language program is loaded in memory and run by claiming the overall top slot. The top 100 computers were distributed as follows in the November 2009 ranking of the top 500 supercomputers in the world: Silicon Graphics International 12, Hewlett-Packard 12, IBM 33, Cray Inc. 14, and Sun A parallel processor is a multiprocessor setup created to distribute various portions of the same program to each processor so that work may be done on the sections simultaneously. The control section of a massively parallel CPU typically comprises over 1,000 parallel processors. Nevertheless, modern programmers don't write their programs in machine language anymore; instead, they write them in a number of different languages that are far simpler for people to use, such COBOL, C++, or Java, and the computer then translates them into machine language. We'll come back to these distinct programming languages in a moment, but first let's classify the many kinds of developed computer software and see how they interact.

Let's take a step back and consider the broad picture before we begin our examination of the essential components of computer software. Software may be divided into two main categories for convenience:

1. Software applications
2. Auxiliary software

The term "applications software" refers to any programs created to carry out specific functions for computer users. Payroll calculation software, inventory record-keeping software, word processing and spreadsheet software, a program to distribute advertising budgets, and a program that generates a streamlined report for senior management are examples of applications programs. Each of these apps generates the output users need to complete their tasks. Support software, in contrast, does not directly provide the results consumers need. Instead, support software creates a computing environment that makes it relatively simple and effective for people to work in, allows for the

execution of applications programs written in a range of languages, and makes sure that the hardware and software resources are used effectively. Typically, support software is purchased from computer manufacturers and software development firms. The software iceberg may help you better understand the link between applications software and support software. The piece of the iceberg that is above water is comparable to applications software in that both are quite noticeable. Applications software immediately creates the outcomes that are necessary for you to do your work as a manager. Nonetheless, the support software is vitally necessary for the applications software to provide the intended outcomes, much as the iceberg's undersea section maintains the top of the iceberg above water. The programs that are directly related to your job will be the main source of worry for you as a manager, but you must understand the functions of the main categories of support software to fully understand how the whole hardware/software system operates.

Software for Applications

The term "applications software" refers to any programs created to carry out specific functions for computer users. Examples of applications software include portfolio management systems, general ledger accounting programs, sales forecasting programs, material needs planning tools, and desktop publishing products. Every single one of you will use applications software in the course of your work, and many of you will be engaged in creating or acquiring these applications to fulfill the demands of your firm. It is difficult to classify applications software into a few clear categories, as we have done with support software, due to the diversity of these programs. Instead, we'll start by taking a quick look at where applications software comes from before giving an example of an accounting software package to illustrate the many kinds of commercial goods that may be bought. We will examine personal productivity tools for managing a variety of typical apps last.

From where can we get software? The majority of the time, support software is bought from a hardware or software provider. Yet, application software is sometimes created inside the company and other times it is acquired from a third party. Spreadsheets, database management systems, word processing, and other common application items are always acquired. Applications that are exclusive to the company are nearly always created inside the organization. Examples include a proprietary foreign currency trading software, a one-of-a-kind production control system, and a decision support system for accepting or rejecting a new product. Applications in the broad middle ground that are generally similar across organizations but may have certain characteristics unique to the specific company may either be acquired or created.

Accounts payable, accounts receivable, general ledger, inventory management, sales analysis, and personnel reporting are some of these middle-ground applications. The organization must make a determination here on the uniqueness of its needs. What are the expenses and advantages of creating a product internally vs buying one off the shelf? For practically any firm, the make-or-buy choice for applications software is a crucial one. This subject will be further discussed in 10. Let's highlight at this point that the trend toward more bought software and less in-house creation tends to be driven by the growing expenses of software development. An intriguing trend over the last two decades is that a large portion of internal software development is being carried out by users like you who are not part of the officially recognized IS organization, especially for smaller, personal, and departmental systems. This happened as a result of businesses hiring increasingly knowledgeable, computer-oriented workers who made use of powerful, reasonably priced desktop computers and relatively user-friendly software tools that allowed interested but non-expert individuals to complete considerable program development.

These tools include query languages used with database management systems and fourth generation languages, both of which will be discussed further on. In our opinion, this trend toward the creation of user applications will continue, with many of you being engaged in software development early in your careers. Of course, consumers shouldn't be involved in all internal software development. Large, complicated programs and applications that relate to several organizational domains are still being developed and maintained by IS organizations. The same tools that end users utilize are also used by the IS organizations, but they also have access to other tools. s 8 through 10 examine the different processes used in the creation or acquisition of applications systems.

An illustration of an application item

We will examine one commercial software program to manage the accounting needs of a smaller firm as we continue our examination of applications software. Of course, there are several other accounting items and business goods in a broad range of other areas that may be purchased. Peachtree by Sage Premium Accounting 2010, which has a selling price of $500 for a single-user edition, is our sample product. General ledger, accounts receivable, accounts payable, inventory, payroll, time and billing, task costing, fixed asset accounting, and analysis and reporting tools are all aspects that a small to midsized business would need. The Peachtree "Business Status Center" tab, seen in 2.9, gives the company a clear, integrated approach to evaluate important financial data. The "Business Status Center" website provides up-to-date data on a variety of topics, including suppliers with invoices to pay, top clients for the previous year, income so far this year, and account balances.

Creating and tracking sales orders and back orders, keeping an audit trail, tracking inventory items by specific attributes, creating departmentalized financial statements, and customizing forms, reports, and screens are just a few of the additional features that come standard with Peachtree Premium Accounting. To run the firm more effectively, the user may build multiple distinct budgets using the Comparative Budget Spreadsheet Maker. Customer Management Center, Transaction History, and Business Analytics are among the new features in Peachtree Premium Accounting 2010 that allow small businesses to compare their performance to that of other companies and preserve all client information in one location. Peachtree by Sage Premium Accounting is a solid option for a smaller company because of all these capabilities and a fair pricing [9], [10].

CONCLUSION

A computer system that is more powerful than a general-purpose personal computer but less powerful than a full-size mainframe computer is referred to as a "midrange computer" in a vague sense. Midrange systems are often constructed using components from a single manufacturer, and they run an operating system that is also offered by that vendor. Due to its relative stability, the platform has good availability and security. Knowing the number that is halfway between the data set's lowest and highest values is also helpful. The middle value is this number. Find the mean of the least and largest values, or alternatively, put the least and greatest values together, divide by two, to get the midpoint.

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CHAPTER 6

A BRIEF DISCUSSION ON PERSONAL PRODUCTIVITY SOFTWARE

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ABSTRACT:

By making people's duties easier, productivity software improves efficiency. Nevertheless, it may sometimes be expanded to cover any kind of software intended to assist individuals in doing their work, such as collaboration and communication tools. In this chapter author is discusses the database management system. Personal productivity software refers to applications designed to help individuals manage and organize their personal tasks and activities. These software programs can be used for managing to-do lists, calendars, emails, contacts, notes, and other personal information. They are typically designed to be user-friendly and intuitive, allowing users to easily input and organize their data. Personal productivity software can be standalone applications or part of a larger productivity suite, and may be available for desktop, mobile, or web-based platforms.

KEYWORDS:

Browser, Computer, Information Technology, Managers, Operating System.

INTRODUCTION

The group of software programs that we have named personal productivity software is perhaps the most significant from your own perspective as a manager. Word processing, spreadsheets, presentation graphics, electronic mail, desktop publishing, microcomputer-based database management systems, Web browsers, statistical products, and other comparable user-friendly and highly practical tools are the applications that you and your fellow managers will use on a regular basis. These items were created with a welcoming, cozy graphical user interface and are microcomputer-based. The world of personal productivity software is still seeing exciting developments. With the release of VisiCalc, the first computerized spreadsheet, this field really began in 1979. Microcomputers stopped being simply a play or a pastime and started becoming useful commercial tools thanks to VisiCalc. Several business-minded developers were persuaded by VisiCalc's commercial success that there was money to be gained in creating software that people and corporations would purchase and use. A flood of items started to surface within a short period of time and hasn't stopped since. The outcomes have been absolutely amazing for businesspeople that are open to trying new things and want to work harder. While the successful goods may anticipate reaping significant profits from their number of sales, the majority of microcomputer items are fairly affordably priced. Also, a lot of outstanding magazines have emerged that thoroughly examine the new items to help us choose the best ones. Almost every month brings news of an intriguing new product that may replace WordPerfect, Microsoft Excel, or VisiCalc [1]–[3].

Processing Words: the most common kind of personal productivity software may be word processing. Secretaries were often the first employees in a company to utilize word processing, but now managers and professionals alike generate their own papers at a computer keyboard.

WordStar was the first widely used word processor, and it was later replaced by WordPerfect in the 1980s and Microsoft Word in the 1990s.

Microsoft Word now has a market share of over 90%, dominating the word processing industry. Its many features include the ability to easily change fonts, margins, and columns, rewrite sentences to be grammatically correct with a click of the mouse, and convert Web files directly to Word format so they are ready to use. Microsoft Word also underlines words that may be misspelled so you can correct them as you type. Other top-notch word processing tools include the paid Corel WordPerfect and Sun's StarOffice Writer as well as some open-source ones like Google Docs and IBM Lotus Symphony Documents. Most of us have a tendency to favor the word processor we used most recently when selecting one. But more and more businesses are sticking with a conventional office suite, so we utilize the word processor that comes with it, often Microsoft Word.

Spreadsheets

Electronic spreadsheet tools, the most popular of which is Microsoft Excel, are the most popular after word processing. Corel Quattro Pro and Sun's StarOffice Calc are two more commercial spreadsheet programs; OpenOffice's Calc, IBM Lotus Symphony Spreadsheets, and Google Docs are free spreadsheet programs. With VisiCalc's initial popularity, Lotus 1-2-3 took over as the industry standard for spreadsheets in the early 1980s and maintained that position for more than ten years until Excel overtook it. The concept of an electronic spreadsheet is based on the traditional paper spreadsheet used by accountants to organize and show financial data. This paper spreadsheet is a huge sheet of paper with several columns and rows. The spreadsheet approach can be used for any application that fits into the rows and columns framework, such as budget summaries for multiple time periods, profit and loss statements for different business divisions, sales projections for the upcoming year, an instructor's gradebook, and computation of various statistics for a basketball team [4]–[6].

DISCUSSION

Database Management Systems

Microcomputer-based database management systems are the third most common type of personal productivity software after word processing and spreadsheets. Microsoft Access is the most extensively used program, while FileMaker Pro, Alpha Software's Alpha Five, and Corel Paradox are other very well-liked options. In the 1980s, dBase led the desktop DBMS market, however it is no longer around. These products are all built on the relational data model, which will be covered further in this article. While the PC DBMSs are often simpler to use, they share the same fundamental concepts as big machine DBMSs. On the basis of these DBMS systems, quite complex programs may be created with the help of macros and other programming tools.

Preasuring Graphics: Another important subcategory of personal productivity software is presentation graphics. The majority of spreadsheet packages have good graphics features, while presentation graphics products specifically offer considerably better features. The market leader in this space is Microsoft PowerPoint, which is followed by Corel Presentations and Sun's StarOffice Impress and is used to create presentations that are mostly text-based with embedded clip art, photos, graphs, and other media. Google Documents, OpenOffice Impress, and IBM Lotus Symphony Presentations are all free presentation graphics programs. The top options for more

intricate commercial graphics include CorelDRAW Graphics, Adobe Illustrator, and Microsoft Visio.

Groupware and Electronic Mail

Electronic mail and groupware certainly qualify as personal productivity software, but we'll save a thorough debate until 5 p.m. nowadays, managers in the majority of firms prefer to communicate through email. It is asynchronous, discrete, simple to use, and accurate. Groupware incorporates email but it does a lot more. Groupware, which incorporates creative methods of data exchange, aims to aid a group in being more productive.

Agency Suites

However, let's take a moment to discuss the crucial concept of office suites, which combine specific personal productivity software applications typically all or most of those categories we have already considered into integrated suites of applications for use in the office. There are still other significant categories of personal productivity software to consider. Microsoft enjoyed first-mover advantage when it debuted the Microsoft Office suite in 1990, building on the success of the Microsoft Windows operating system, and it has converted that advantage into the dominating entry in the market. It's also worth mentioning Sun StarOffice, which includes Writer, Calc, Impress, Base, and Draw, and Corel WordPerfect Office, which is comprised of WordPerfect, Quattro Pro, Presentations, and Paradox. Additionally, there are a number of free office suites available, including OpenOffice, which includes Writer, Calc, Impress, Base, and Draw, IBM Lotus Symphony, which includes Documents, Spreadsheets, and Presentations, and Google Docs, which combines word processing with spreadsheets and presentations and delivers them online.

Microsoft has been hard for the competition to match in the office suite market. Microsoft was the first to market, has control over the operating system, offers quality standalone goods, and has performed a better job than the competition at integrating the standalone items. Let's examine the industry leader, Microsoft Office, in more detail. Microsoft Office 2010 comes in three main boxed editions, as well as a new, free version called Office Web Apps, which offers online versions of Word, Excel, PowerPoint, and OneNote. Microsoft Office 2010's home and student version comes with Word, Excel, PowerPoint, and OneNote. Outlook is included in the home and business versions. The Professional Edition also includes Publisher and Access. The home and student edition costs $150, the home and business edition costs $280, and the professional version costs $500. The flexibility to transfer data across the many programs as required makes the office suite a concept that will endure [7], [8].

Global Web Browsers

The Web browser a person uses to access information on the World Wide Web is a crucial sort of personal productivity software. The program known as a web browser runs on the user's own computer and allows them to "browse" the Internet. Naturally, the user's computer must be connected to the Internet either directly via an Internet service provider or through a local area network that is itself connected to the Internet. To traverse the Internet, the Web browser relies on hypertext. An inventive method of connecting items is via hypertext. For instance, you may click The View from Yavapai Point to see a full-screen picture of that vista while reading a paper on the Grand Canyon or The Grand Canyon Suite to hear a few bars of that piece of music while reading a text about the Grand Canyon. It should come as no surprise that Microsoft's Internet Explorer is the most widely used web browser as we enter the 2010s. The Netscape browser, which had first-

mover advantage and dominated the market until the late 1990s, is no longer available. The open source Firefox browser from the Mozilla Foundation, Apple Computer's Safari browser, Google Chrome, and Opera browsers are among the other ones that are in use. Meaningful browser statistics are difficult to find, but according to one source, Firefox usage is likely overstated and Internet Explorer usage is likely understated; more accurate estimates are around 70% for Internet Explorer and 20% for Firefox. Several observers choose Firefox over Internet Explorer. For instance, Michael Muchmore of PC Magazine summarizes his evaluation of all five browsers with the following quote: "Firefox 3.5's speed, customizability, and support for future standards earn its status as our Editors' Choice Web browser. Check out Google Chrome if you're simply concerned with speed and not convenience. Stick with Firefox, though, if you want the best of both worlds: Its new private mode, enhanced performance, frugal memory use, and industry-leading customizability keep it on top.

The browser war is intriguing from the user's perspective since all of the products are free the deal is too good to pass up! The concept of pull technology is the foundation of web browsers. Before a Web page is sent to the desktop, the browser must first request it. The RSS reader6 software included in today's browsers and certain email applications is another example of pull technology. The time and effort required to frequently check websites for changes is reduced by these readers. When a user subscribes to an RSS feed from a certain website, the RSS reader receives syndicated Web material like Weblogs, podcasts, and news articles and checks for new content at user-specified intervals. Also crucial is push technology. Push technology involves sending data to the client without the customer's request. Email is the oldest and most popular push technology, and email spam is perhaps its most annoying kind. Push technology is frequently used by corporations and technology vendors to distribute software updates and patches, frequently over the course of an overnight period. Similar to this, many companies have sent sales updates and product news to their field service technicians all over the world.

Other Personal Productivity Products: A sales brochure, an annual report, an internal newspaper or magazine, and many other items may be designed and printed by using desktop publishing. Serif PagePlus, QuarkXPress, Microsoft Office Publisher, and Adobe InDesign are some of the more well-known desktop publishing programs. Norton Internet Security and ZoneAlarm Extreme Security are two essential security programs. Given that Firefox has 46% of the browser market compared to Internet Explorer's 37%, we shall think about computer security. Due of the survey's target audience, these findings ACT! by Sage, GoldMine, and Now Software's Up-to-date & Contact are some examples of contact management products to let the user track past and potential customers.

Microsoft Office Project, Project KickStart Pro, and Tenrox Online Project Management are a few examples of project scheduling software. Adobe Photoshop Elements, Corel Paint Shop Pro Picture, and Serif PhotoPlus are a few of the well-liked photo editing programs. The three software programs Adobe Premiere Elements, Corel Video Studio, and CyberLink PowerDirector are all excellent choices for video editing. Products like Roxio BackOnTrack Suite and Roxio Creator are useful utilities. While there is no doubt that the list of personal productivity software offered here might be expanded to include more categories and items, the list should nevertheless illustrate the breadth of the options available.

Support Software

Instead of immediately producing output of value for the user, support software has been created to support applications software from the background. Support software comes in a variety of forms. The several categories of support software will now be systematically examined, starting with the crucial operating system.

System of Operations

The operating system, which first appeared in the middle of the 1960s and is today an essential component of any computer system, is the most significant category of support software. The operating system is an extremely complicated piece of software that manages how the computer hardware operates and works with all the other programs to maximize productivity. Users communicate with the operating system, which in turn manages all of the computer system's hardware and software resources. How can a computer user communicate what he or she wants the operating system to do? To launch an application or access a data file on a PC or a Mac, the user locates and then clicks on the proper icon or label. On a bigger computer, the user must provide instructions written in the specific task control language that the operating system is capable of understanding. The kinds of instructions and the precise syntax of this task control language differ greatly across operating systems. JCL is used, for instance, to advise the operating system how to execute a payroll program by providing information such as the account number to be charged, the name of the program to run, the names of the data files required, and instructions for data output.

An operating system's primary goals are to increase the amount of work the computer system can do and to lighten the burden of computer users. By the employment of this complex software, the computer system's functioning has effectively been automated. All sorts of computers need an operating system, although possibly huge computers with several concurrently running applications and numerous peripheral devices require it more. With big computers, for example, the operating system chooses when to start a certain task out of all others waiting in the input queue by applying priority criteria set by the computer center management. According to priority guidelines once again, the operating system chooses which task to print next. The operating system on big machines also manages the flow of communications with the many terminals and microcomputers connected to its network. The operating system stores and retrieves data files on both big and small computers, keeping track of where each file is located. Similar to how it handles the software library, the operating system also keeps track of both support and application programs. The benefit of delegating all of the aforementioned duties to the operating system is that it can respond quickly to choose a job to do, choose the appropriate software from the library, and collect the necessary data files. By keeping the potent central processing unit as busy as possible, the system's throughput may be increased. Also, the operating system may design a computing environment that is reasonably simple to operate in terms of what computer users or operators see on their displays and what they need to do to communicate their needs to the operating system.

Future Concepts for Operational Systems

Multiprogramming and virtual memory are two crucial concepts that operating systems often use to boost the effectiveness of a computer's activities. Multiprogramming is a technique used on big computers to transition between programs that are kept in memory in order to overlap input and output activities with processing time. This effectively enables the computer to run many programs at once. On personal computers, the phrase Visit the companion website for this book at www.pearsonhighered.com/brown and search for the "Advanced Operating Systems Concepts" link for a more thorough explanation of the advanced operating systems concepts discussed in this

section. Essentially the same function as multiprogramming on bigger devices is described as multitasking. The main difference between multitasking and multithreading is that with multithreading, the operating system manages the switching between the several threads of the same application while they are all running practically concurrently. Multiprogramming, multitasking, and multithreading are all phrases used to describe how the operating system tries to use the CPU as much as possible.

Virtual memory is concerned with the management of main memory, whereas multiprogramming or multitasking is primarily focused on the management of CPU time. Individual applications may be far bigger than the actual number of memory cells since virtual memory gives the user the impression that there is infinite main memory accessible. Direct access storage devices (DASDs) are used creatively, with the operating system moving sections of applications between main memory and DASDs. The idea of virtual memory acknowledges that only a small portion of a huge program is being run at once, with the majority of the program being dormant. Because of this, while using virtual memory, only a small portion of the application is stored in main memory and the remainder is sent to a DASD. The operating system's immense complexity of jobs becomes clear when we mix the ideas of multiprogramming and virtual memory. Last but not least, multiprocessing describes the work that is processed when two or more CPUs are installed as a component of the same computer system. With all the CPUs controlled by a single operating system that keeps track of what each CPU is doing, each CPU works on its own task or collection of jobs. Complexity on top of complexity! It is clear that without the robust operating systems now in use and constantly being updated, the computer systems of today would be of much less utility to us.

Operating Systems' Sources: Operating systems are often purchased from the hardware vendor, however they may have been created by another business. For instance, Windows 7, an operating system from Microsoft, is often included when you purchase a new microcomputer from Dell or Hewlett-Packard. Numerous widely used operating systems are proprietary programs that were created specifically for a given computer system. Examples include Windows Vista and Windows 7, two more recent operating systems created by Microsoft for PCs, PC-DOS and MS-DOS, the same operating system created by Microsoft for IBM microcomputers and IBM compatibles, respectively, and z/OS and z/VM, two alternative mainframe operating systems provided by IBM.

The UNIX operating system and the steadily growing Linux operating system are open systems in contrast to these proprietary systems. Linux and UNIX are independent of any one manufacturer of hardware or computer system. Later versions of UNIX were developed by the University of California at Berkeley and a number of hardware manufacturers after being first produced by Bell Labs. As an example, Sun Microsystems and IBM both created their own UNIX variants, Solaris for Sun and AIX for IBM. UNIX is strong and adaptable, and it is portable in the sense that it can be used on almost any machine.

A young Finnish programmer named Linus Torvalds created Linux, a scaled-down version of UNIX, in 1991. Torvalds developed his new operating system lightweight and adaptable, and he chose to freely distribute Linux. The sole requirement for the free use of Linux is that programmers agree to share any changes or additions they create with the rest of the global Linux community. The ultimate decision on everything that gets into Linux is made by Torvalds. Linux may be downloaded for free and installed on a computer by a knowledgeable programmer, but most users want a little more assistance and must purchase a Linux "distribution" from a supplier like Red Hat or Novell. This distribution comes with the open-source Linux operating system along with

other programs, installation instructions, and supporting documentation. When several of the main IT industry giants, including IBM, Hewlett-Packard, Intel, and Dell, decided to promote the adoption of Linux, it gave Linux a huge boost. In fact, IBM has made Linux the core of its information technology strategy and currently provides Linux on all of its many computing platforms.

Only UNIX or Linux is used to operate many supercomputers and high-end midrange systems. Many IT experts want Linux or UNIX to replace Windows as the default operating system for all computers. While it seems doubtful, Linux will continue to gain popularity, at least for servers and other bigger equipment. Several businesses have decided to progressively migrate current programs to Linux while developing all new apps in a Linux environment. Linux keeps going to 8 UNIX and Linux are a component of the broader open source software movement, which also encompasses the Firefox web browser, OpenOffice productivity software, and the Apache web server. penetrate the mainframe market, where it is probably going to coexist alongside vendor operating systems like z/OS in significant business and governmental data processing facilities.

An application running on a server that manages network resources and regulates network operation is referred to as a server operating system, sometimes known as a network operating system. A server OS is an operating system that has been improved by the addition of networking functions, to put it another way. For instance, a server OS manages the server-side of client/server applications and enables computers on a network to share resources like disk drives and printers. Many UNIX variants, various Microsoft Windows Server variants, particularly Windows Server 2008, and Linux are major participants in the server OS industry. During the last several years, there has been a noticeable shift away from UNIX and toward Linux, with Windows Server also continuing to expand. One's headline, "The Windows-versus-Linux server face-off," says it all. Windows Server sales are predicted to increase from around $20 billion in 2008 to $22 billion in 2012, while Linux revenue will increase from $9 billion to $12 billion, according to IT research and consultancy company Gartner, Inc. These figures, however, cannot be compared since Linux is often given out for free. Microsoft Windows is considerably more prevalent at the microcomputer level, holding about 90% of the market. Mac OS accounts for over 6 percent of the remaining percentage, followed by Linux with over 4 percent. At the time of writing, Windows 7 is the de facto standard for microcomputers since it is preinstalled on the majority of new PCs.

During the future years, all of the commonly utilized operating systems in use now will continue to develop, each growing more sophisticated and potent. The trend toward Linux for bigger computers is likely to continue, while Windows seems likely to maintain its dominance of the microcomputer market—although Linux may make some gains here. The primary area of contention between Windows and Linux will be the server operating system market. The idea of an IT platform, which is described as the collection of hardware, software, communications, and standards that an organization utilizes to create its information systems, is one of the key concepts in the field of information technology. Now that we are in a position to say it, the operating system is often the most important element of the platform. As a result, talking about the z/OS platform, UNIX platform, Windows 7 platform, or Linux platform is frequent [9], [10].

CONCLUSION

Productive people are less stressed than less productive people. You need less surplus energy and resources to complete your responsibilities when you are more productive. Often, better time and energy management boosts your confidence in your ability to complete tasks on time and with

greater quality. Any application or platform that makes it simpler for you and your team to communicate or to create documents, spreadsheets, and presentations is referred to as productivity software. In the end, it encompasses every program or technology that helps you live a little bit (or a lot) more comfortably. When you can focus only on one thing without any distractions, you are in the best possible position to complete a job. Flow state is another name for this condition. You must get rid of interruptions and distractions in order to be truly productive.

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CHAPTER 7

A BRIEF DISCUSSION ON LANGUAGE TRANSLATORS

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ABSTRACT:

Language translators allow computer programmers to write sets of instructions in specific programming languages. These instructions are converted by the language translator into machine code. The computer system then reads these machine code instructions and executes them. In this chapter author is discusses the fourth-generation languages. Language translators are computer programs that are used to convert the programming code of one programming language to another. These programs can be used for a wide range of applications, including software development, data analysis, and web development. Language translators work by analyzing the syntax and structure of the source code and then converting it into an equivalent code in the target languages.

KEYWORDS:

Computer, Digital, Information System, Language, Translator.

INTRODUCTION

Machine language, which is unique to a particular computer type, was presented in the section previously in this document titled "The Stored-Program Idea." Machine language programs may be executed directly on the computer model they were created for, eliminating the need for translation. Computer programmers created easier-to-use human languages and the corresponding language translator programs to convert these easier-to-write programs to machine language because writing machine language programs is very laborious and demanding. The machine language program is then put into memory and run by the control unit when the translation process is finished. We want to focus on our second category of support software language translator programs for the time being [1], [2].

The first easier-to-use languages produced were assembly languages that allowed the computer itself to per- form many of the most arduous elements of programming, such as knowing the particular memory cell locations where data was placed. Although simpler than programming in machine language, assembly language programming still required the programmer to think like the computer in terms of the individual instructions. When the assembly language program is finished, the computer converts it into machine language so that it may be loaded into memory and executed by the control unit. This process is controlled by a specific stored program known as an assembler. The machine language for a particular computer is referred to as the first generation language, as well as the assembly language that came along later is called the second generation language. Even though object-oriented programming languages and third and fourth generation languages have mostly replaced assembly languages, they are still in use.

Languages of the Third Generation

The third and fourth generation languages reflect a rad- ical break from the preceding two generations. Programming in assembly language and machine language both require the

programmer to think in terms of the individual instructions as if they were computer commands. With 3 GLs and 4 GLs, the program- mer employs a language that is reasonably straightforward for humans to understand and use but has no direct link to the machine language into which it must finally be translated. Thus, the 3 GLs and 4 GLs are designed for humans, not comput- ers! Each 3GL or 4GL instruction is often translated into a number of machine language instructions. The 3 GLs and 4 GLs are also largely machine independent, despite the fact that each type of computer has its own special 2 GL. The ability to run a program created in a 3 GL or 4 GL on a variety of computers is a significant benefit. Since they convey a step-by-step process created by the programmer to complete the intended objective, third generation languages are often known as procedural languages. These procedure steps must, of course, be expressed using the specific statement types offered by the provided procedural language. The first procedural lan- guage was FORTRAN, which was created by IBM in the mid- 1950s. Other popular procedural languages include COBOL, BASIC, and C.

Before the computer can execute a source program written in any of these languages, the source program must be translated into an object program written in machine language. For 3 GLs, the language translator is called a compiler if the entire program is transcribed into machine language before any of the program is executed, or an interpreter if each source program statement is executed as shortly as that single statement is translated. The process of compiling and running a compiled procedural language program, such as COBOL. The important part is that the entire program is converted into an object program, which is then loaded and run. An interpreter only takes into account one statement from the source program at a time. This single statement is translated into machine language, and if no errors are encountered, it is executed immediately. The procedure is repeated, statement after statement. Although procedural languages no longer hold the near-total sway they did twenty years ago, many engineers, scientists, and computer professionals still prefer them. Some estimates suggest that at least half of the programs now in use were created in 3 GLs.

The 4 GLs, object-oriented languages, and other more recent languages have made progress against the 3 GLs, but they won't displace them anytime soon. The 3 GLs are entrenched, and new, more powerful variants of the 3 GLs continue to be created. Most importantly, literally millions of procedural language programs are already in use by businesses and other organizations, and in most cases, maintaining and updating these "legacy" programs is more environmentally friendly than rewriting them in newer languages. COBOL as an illustration of a procedural language, we'll use COBOL, which stands for Common Business-Oriented Language. A committee from the computer industry created COBOL to give business data processing procedures an industry-wide common language that closely resembled everyday English. Since its inception in 1960, COBOL has gained widespread accept- ance because it is standardized, has strong data manage- ment capabilities, and therefore is relatively easy to learn and use. COBOL is by far the most popular language for program- ming mainframe computers for business applications [3].

COBOL programs are divided into four distinct divi- sions. The first two divisions are usually fairly short. The Identification Division gives the program a name, and also the Environment Division describes the com- puter environment in which the program will be run. The Environment Division is also the component of the program that needs to be altered to move the program from one computer model to another. The Data Division, which is often quite lengthy, defines the file structures employed in the program. The Procedure Division corresponds most closely to other procedural language programs; it consists of a series of operations specified in a logical order to

accomplish the desired task. The combination of all these divisions, notably the Data Division, makes COBOL programs very lengthy compared with other procedural languages. It's accurate to say that COBOL is a verbose language.

Our example COBOL software is meant to calculate and print monthly sales commissions for the salespersons of a major organization. Each salesperson earns a 1 percent commission on the first $50,000 in sales during a month and a 2 percent commission on all sales in excess of $50,000. The data have already been entered in and are saved as a data file on a magnetic disk. One record has been prepared for each salesperson, containing the person's name and sales for the month. A printed line with each salesperson's name, monthly sales, and sales commission is to be the output. Additionally, after processing all of the salespersons' records, the program is to calculate and print the total commissions for all of the salespeople [4].

DISCUSSION

Other Procedural Languages

In addition to COBOL, there are several procedural languages, but we will just highlight three of the most significant ones. As noted earlier, the granddaddy of the procedural languages is FORTRAN. Since it was established in the mid-1950s, it soon became the standard for scientific and technical programming. Due in large part to the substantial effort made in the creation of FORTRAN scientific software, FORTRAN is still extensively used today. BASIC is the simplest of the widely used procedural languages. BASIC, which is an acronym for Beginner's All-purpose Symbolic Instruction Code, was developed in the early 1960s by John Kemeny and Thomas Kurtz at Dartmouth College. Their purpose was to create an easy- to-learn, interactive language for college students that would let the students concentrate on the thought processes involved in programming rather than the syntax.

The capabilities of the BASIC language have been significantly increased in more recent versions. C, which was designed by Dennis Ritchie and Brian Kernighan in the 1970s, is a highly essential language for scientific and technical programming. C is a highly strong language but hard to use since it is less English-like and closer to assembly language than the other procedural languages. C was originally developed for and implemented on the UNIX operating system, and its use grew as UNIX spread. In fact, C was used to create the UNIX operating system. C is a commonly used programming language for microcomputers and has become the standard language for many college computer science departments. On big research computers, it is not rare for C and FORTRAN to be the only languages ever utilized [5], [6].

DISCUSSION

Languages of the Fourth Generation

Third generation languages are already simple to use, but fourth generation languages also known as productivity languages and nonprocedural languages are even simpler. The programmer must create a step-by-step procedure to achieve the desired result and then express this procedure using 3 GL statements in order to use a 3 GL. With a 4 GL, the computer user only supplies a clear declaration of what he or she intends to do, not an explanation of how to execute it. The 4 GLs commonly utilize English-like syntax and because they are largely nonprocedural in nature the sequence in which instructions are presented in a 4 GL is usually inconsequential. In addition, 4 GLs do not require the user to manage memory locations in the program like 3 GLs, resulting in less complex programs.

The 4 GLs employ very-high-level instructions not present in 3 GLs, and thus 4 GL programs tend to require significantly fewer instructions than their 3 GL counterparts. This in turn indicates that 4 GL programs are shorter, simpler to develop, easier to change, easier to read and comprehend, and less error-prone than 3 GL programs. In contrast to the high-level third generation languages, fourth generation languages are occasionally referred to as very-high-level languages.

Some fourth generation languages use a compiler, while others use an interpreter to convert the source code into machine language. Please be aware that while the 3 GLs and 4 GLs are essentially the same across all computer models, the translation programs must be unique to each model. First, many of the 4 GLs are not general- purpose languages and cannot be used easily for many types of programs. Second, many programs are not written in 4 GLs due to various concern for efficient use of the computer resources of the organization. For the most part, 4 GL programs translate into longer machine language programs that take much longer to execute than the equivalent programs written in a 3 GL. The result of these arguments is many one-time programs or seldom used programs are written in 4 GLs, whereas most production programs are written in 3 GLs. In the case of infrequently used programs, human efficiency in writing the program is more important than workstation efficiency in running it; for production programs, the opposite is often the case. Fourth generation languages have their origins in the 1967 RAMIS introduction. FOCUS is another vintage entry that is still in use today. Initially, these products were primarily available on commercial time-sharing networks, but direct distribution of the goods to customers took off about 1980. By the mid-1980s, FOCUS was estimated to command about 20 percent of the market, with RAMIS following with 16 percent [7], [8].

In the late 1980s and early 1990s, the 4 GL market became even more splintered as new versions of the early 4 GLs were rolled out and a wide variety of new products entered the marketplace. The emphasis of the products appearing in the 1990s was on portability the ability of the 4 GL to work with different hardware platforms, oper- ating systems, and database management systems and over different types of networks. In the late 1990s and early 2000s, the 4 GLs changed again. Initially, the majority of 4 GLs incorporated a Web interface, enabling PC usage without the need for additional software. The 4 GL label essentially vanished as the focus of these products shifted to business intelligence, which is even more significant. Today's business intelligence software tools are designed to answer queries relating to the business by analyzing data , thereby providing "intelligence" to the business that will help it's become more competitive. Of all, this concentration on business intelligence is not that differ- ent from the focus of 4 GLs in the past; it truly is an evolution, not a major shift.

Some of the 4 GL products, like CA Ramis and FOCUS, are full-function, general-purpose languages with all the functionality required to handle any application program. Thus, they are direct competitors with the 3 GLs. Other 4 GLs were built to handle a certain type of applications, such as statistics, decision assistance, or financial modeling. For instance, SAS started off as a 4 GL with a narrow emphasis on modeling and decision assistance. SAS Business Intelligence has now expanded to an integrated suite of software for business intelligence in an enterprise, with extensive capabilities in data access, data management, data analysis, and data presentation. WebFOCUS, IBM Cognos 8 Business Intelligence, MicroStrategy 9, SAP BusinessObjects, Oracle Business Intelligence Enterprise Edition Plus, and Microsoft SQL Server 2008 Analysis Services and SQL Server 2008 Reporting Services are some of the more well-known business intelligence products available today. The fourth-generation languages are evolving more rapidly than those in the third generation, particularly with the addition of easy-to-use business intelligence options and

easy-to-interpret graphical output and colorful dis- plays. However, the 4 GL label is disappearing in favor of the business intelligence tag. Furthermore, with both the increasing capabilities of today's computers, the lack of effectiveness of execution of 4 GL programs vis-á-vis 3 GL programs is of less concern. For these reasons as well as the rising computer savvy of managers, the usage of 4 GLs will continue to expand. The strongest element of growth will come from end-user computing, but IS departments would also shift toward 4 GLs, especially for infrequently used applications.

Beyond The Fourth Generation Languages

Markup languages, object-oriented programming languages, and languages for creating Web applications are already available, so we'll move on to them next. Natural language development, in which users create their programs in everyday English, is another alternative. To program using a natural language, users will require little to no training; they just type what they want to achieve without concern for grammar or form. There are currently no real natural languages, although several limited natural language solutions that can be used with a number of database management systems and 4 GLs have been created. Yet, commercial advancements in the field of natural language processing have been slower than anticipated.

Scripting Languages

Markup languages, which are neither 3GLs, 4GLs, nor OOP languages, should be mentioned before moving on to object-oriented programming languages. Hypertext Markup Language is now the most well-known markup language. The unique codes needed to produce HTML, which is used to build World Wide Web pages, are introduced into the text to indicate where headers, bolded text, italicized text, graphics, and connections to other Web sites should be placed. Video may be embedded in HTML files using the upcoming HTML version 5 standard. The requirements for showing three-dimensional objects on the Web are provided by Virtual Reality Modeling Language, which is the 3-D version of HTML. HTML and the other markup languages are essentially codes that define the nature of the related data or the intended appearance of the finished result; they are not really programming languages in the sense that we have been using the word.

The importance of eXtensible Markup Language will surpass that of HTML. The usage of XML, which is basically a metalanguage standard for defining a document markup linguistic based on plain-text tags, helps data exchange across Web applications. The World Wide Web Consortium, whose mission is to provide open standards for the Web, produced XML. HTML and the Hypertext Transfer Protocol are other W3C standards. Standard Generalized Markup Language, which was created by the International Standards Organization in 1986, is a condensed form of XML. Another part of SGML that we are more used to is HTML. Plain-text tags are used in both HTML and XML to "markup" documents. The similarities between HTML and XML stop there, however. Although XML tags specify the kind of the related data, HTML tags instruct a web browser how to display different components on a web page. For instance, one XML tag may designate a customer's name as a customer name, a customer's address as an address, a number as a product number, and yet another may designate the amount sold as the quantity sold. For certain businesses and circumstances, whole sets of XML tags are being developed. For instance, the standard for publicly listed companies to submit financial information to the Securities and Exchange Commission is being established, and it is called eXtensible Business Reporting Language.

The fact that XML is a metalanguage is crucial. A collection of XML tags may be developed to identify the data items used in each business or particular circumstance. Data integration across

organizational boundaries may be accomplished via the comparatively simple identification and sharing of data made possible by XML. Since additional tags may be established as required, XML is "extensible," and it enables the separation of the data's appearance from its actual content. For instance, a business may utilize text tags to identify certain data points on a Web page and then extract the needed information for use in another application. As a result, XML offers a quick and efficient method for identifying and sharing data. The components of an XML standard are tags. XML tags, on the other hand, are meant to communicate the meaning of data, not the presentation manner.

Reusing code has long been a way to cut down on the time and expense of software development. Web services, however, provide a whole new method of code reuse. Let's compare code reuse to LEGO bricks as an example of an everyday toy. Companies have been able to save time and money by constructing systems quicker by designing programs as though they were little building blocks and allowing these programs to be stitched together. These construction elements wouldn't always fit with other building blocks until the recent development of Web services. It was like getting plastic blocks from two separate toy manufacturers. As we have observed for years, web services are reusable programs, and they are often written in the same languages. The difference is that we can now assemble all the "blocks" thanks to Web services. Before, programmers had to think about the kind of computer hardware and programming language that would be used by a certain "block." These elements become visible when using Web services, making them irrelevant while creating a system. Any computer hardware and any programming language that supports XML files may use the Web services "blocks." The success of Web services depends on XML.

Programming that is object-oriented

While object-oriented programming languages are not new, they have recently attracted more attention due to the improved GUIs that have been created for powerful workstations. OOP is a completely new paradigm for programming having roots in both the procedural 3 GLs and the nonprocedural 4 GLs. It is neither a 3 GL nor a 4 GL. Since the procedures are embedded in the objects, creating OOP objects is somewhat similar to 3 GL programming, however putting the objects together to build an application is much more similar to using a 4 GL. The core concepts of OOP include creating and programming different objects just once, then storing them to be reused in the present application or in future applications.

These objects may represent an entity inside the business, such as an Employee or a Factory, or they may be components used to build the user interface, such as a text box or a check box. The most well-known OOP languages today include Visual Basic.NET and C#, both created by Microsoft, Java, a platform-independent language created by Sun Microsystems, and C++, an object-oriented variant of the original C language. Each C program may also be written in C++, making it a superset of the C language. But C++ adds the capability of reusable objects, or classes. Java is a general-purpose programming language that is ideal for usage on the World Wide Web. Most companies and programmers all over the world have swiftly adopted Java. Applets, servlets, and standalone desktop apps are the three types of Java programs. Applets are programs that are downloaded from a Web server and run in your browser as opposed to standalone apps, which are programs that run on your desktop. Servlets, or applications that live on and operate on a Web server, are now the most widely used use of Java.

The object-oriented languages that are a component of Microsoft's.NET framework are other ones that are becoming more popular. The.NET framework, which was first released in 2002, enables

programmers to create applications in a number of OOP languages, such as Visual Basic.NET and C#. An OOP language requires the user to think in terms of objects. The first step for a programmer is to define the classes of things. The instructions or guidelines for generating an item are included in a class. We must create a class instance, also known as an object, in order to interact with the class. An object contains attributes, or properties, that may be changed by the programmer or, if the programmer so chooses, by the user while the program is running. An object also has methods, or previous acts the object has taken. Things may also react to things that happen to them or things that are done to them. The understanding of objects, attributes, methods, and events may all be challenging. An coalition of businesses headed by Sun Microsystems and Microsoft, respectively, have offered two rival frameworks, Java 2 Enterprise Edition and.NET, as platforms for the development of Web applications utilizing the object-oriented programming paradigm.

J2EE is based on the Java programming language, as the name would imply. J2EE is not the name of a product, in actuality. Instead, it consists of 13 different Java-based technologies combined in a certain way. Hence, it is theoretically conceivable to purchase each of these technologies from various providers and mix and match them as necessary. In reality, however, it is customary for a business to purchase a J2EE-compatible product from a single vendor. WebLogic from Oracle and WebSphere from IBM are two common options in this area. Since J2EE is entirely Java-based, it has a number of benefits, including the ability to execute its products across several platforms. Applications created for Microsoft's.NET framework, in contrast, are solely intended to operate on the Windows operating system. Nevertheless, unlike J2EE, where one is restricted to utilizing Java as the programming language, a programmer in.NET has a wide range of options to pick from, including VB.NET, C#, J#, and even C++. In reality, a programmer may decide, for instance, to write some of the software in C# and some of it in VB.NET inside a single application.

The Web application's complexity The J2EE framework offers the flexibility required to meet the necessary architectural and performance objectives for big systems with considerable scalability and security needs. degree of support for Web services required in terms of their support for Web services standards like XML, J2EE and.NET are relatively similar. The distinction is that the.NET framework has built-in XML support, but J2EE currently requires that XML support be "bolted on." at first, so let's pick an example that you may be able to relate to the family dog. To distinguish one dog from another, we may conceive of a dog and identify numerous attributes, or what programmers refer to as characteristics. Each dog has unique characteristics that may set it apart from other dogs, including height, weight, color, coat thickness, eye color, and snout form. So, each of these attributes has a value. Each dog performs a number of behaviors, regardless of its property values; programmers refer to these actions as methods. These techniques include eating, sleeping, running, and fetching. Dogs also react to various things that are done to them; these are known as occurrences. The dog may react to things like being called by name, being patted, or even being kicked. The Java source code for a sample class named Dog.

We said that in order to interact with a class, an object—an instance of the class—must be created. This action is known as instantiation. We may infer that a Dog has a number of attributes, methods, and events from our class definition. But, a family without a pet is left with little more than a categorization. The family now has an instance of the class, or a real dog, when they visit the animal shelter to save a furry buddy. Web-based apps may be as basic as those that only allow user registration or as complicated as those that allow business-to-business transactions, but they all have the following characteristics: An n-tier architecture serves as the foundation for all Web applications. User interface, Web or application server, and database server make up the three tiers

of a typical system. With web-based forms, the user communicates with the system. The server receives the data submitted on the forms, and a server application software processes it. A database may get some of these data thanks to this software.

An HTML form is the user interface that users run into the most often. It's possible for this form to be static or dynamic. The languages that were used to create the form may execute on the client side or the server side. Today's apps often employ AJAX to build dynamic applications so that the browser doesn't have to refresh the page when new data comes in from the server. You may be acquainted with two examples: Email and Google Maps. In order to generate dynamic Web pages, encode complicated business logic on the server side, and read from and write to a variety of database management systems, all Web application development tools or server-side programming environments function according to a similar concept. Microsoft's Active Server Pages, Adobe's ColdFusion, PHP, Java Servlets, and Java Server Pages are a few examples of server-side programming environments. Nowadays, ASP/ASP.NET and Java Servlets/JSP are the most popular technologies for creating complex e-business solutions. Developers choose the flexibility and simplicity of programming in languages like ColdFusion and PHP for small- and medium-sized applications [9].

CONCLUSION

By removing obstacles to communication and uniting people, translators play a crucial part in the global dissemination of knowledge and information. Translators transform the globe and enrich culture, whether they labor for a profit or an organization. Compared to other high-level languages, 4GLs are more similar to human language and are understandable by those without professional programming skills. They enable several common activities to be carried out using a single command submitted by the programmer. Computers of the fourth generation are based on microprocessor technology. VLSI circuits are used in computers of the fourth generation. Speed, precision, and dependability have all improved. Improvements to the current input/output devices.

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CHAPTER 8

A BRIEF DISCUSSION ON DATABASE MANAGEMENT SYSTEMS

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ABSTRACT:

Essentially, a database management system (or DBMS) is just a computerized data-keeping system. Users of the system are provided with the ability to carry out a variety of operations on such a system for the administration of the database structure itself or the modification of the data in the database. In this chapter author is discusses the communications interface software. Database management systems (DBMS) are software applications that help users manage large amounts of data by providing tools to store, organize, retrieve, and manipulate data. They have become essential in modern business and government environments where data is generated, collected, and analyzed to make informed decisions. DBMS can handle different types of data such as text, images, audio, and video, and they offer a range of functionalities such as data querying, data mining, and data analysis.

KEYWORDS:

Database, Information Technology, Management System, Program, Software.

INTRODUCTION

Our third kind of support software is a database management system, which is used to create, manage, and safeguard corporate data. The operating system and a database management system collaborate to store, edit, and make data available in a number of appropriate and approved methods. Significant data management capabilities are added by a DBMS to those offered by the operating system. The idea is to make it possible for a computer programmer to choose data from disk files by looking at the records' contents rather than their precise locations. Programming is now simpler, more effective, and less prone to mistakes. Also, this enables database designers and systems engineers to restructure the physical layout of data without altering the logic of programs, which drastically lowers the amount of maintenance required. Data independence is the general phrase used to describe these goals. The retrieval of a customer record, for instance, may be specified by a programmer using just their knowledge of the client's name or number in a DBMS, for example. A DBMS would also provide direct reference to any of the customer's associated order or shipping records once the customer record has been obtained. A DBMS enables access to data based on both association and content [1], [2].

A database is a common collection of information that is logically connected and set up to serve the requirements of an organization. A data warehouse is a similar phrase for a very big database or set of databases, which will be taken into consideration in 5. The program that controls a database is known as a DBMS. A DBMS is an extremely sophisticated and expensive piece of software; it may cost anywhere from $500 or less for a PC version to $200,000 or more for a version running on a huge mainframe computer. The structure and storage of the data in the

database are referred to as the database architecture. It is important to take into account the kinds of data to be kept as well as how they will be processed and utilized when choosing between database structures. The following are the five fundamental architectures: Hierarchical Data are organized according to a top-down organizational structure, which is a feature of the IBM product Information Management System. Network A prominent example is Computer Associates' Integrated Database Management System, which arranges data like the cities on a highway system, sometimes with several pathways from one piece of data to the next.

Relational There are several such solutions, including as Microsoft Access and SQL Server, IBM DB2, Oracle, MySQL, and Ingres, where data is organized into straightforward tables and records are connected by putting similar information in each of the linked tables. The most popular method for organizing data is the relational DBMS. It's an intriguing development that Ingres and MySQL are now open source software products. Users only have to pay for service and consulting; they may download and use them for free. Moreover, there are certain variants of relational DBMSs designed for extremely big databases that allow different types of analytical, rather than operational, data processing. Companies like Teradata, Oracle, Netezza, and Vertica provide these solutions. Object-oriented Versant Object Database, Progress ObjectStore, and Objectivity/DB are some of the more well-known products; data can be in the form of images, videos, and sounds in addition to simpler data types; attributes and methods are contained in object classes; and relationships between classes can be created by nesting one class inside another.

Object-relational This hybrid approach to data organization makes use of both the inherent simplicity of the relational data model and the capabilities of object-oriented databases to manage complex data types. The object-relational technique is more suitable for corporate applications, despite the fact that object-oriented data modeling often works well for engineering and scientific applications. Products that use object-relational databases include Oracle, IBM's DB2 and Cloudscape, and FFE Software's FirstSQL/J. Both procedural programs written in a 3 GL and special-purpose languages created for database processing may be used to specify data processing activities with databases. Languages like XML and Java have recently made it possible for websites to access databases. For a 3 GL application, the programming language's vocabulary is expanded with newer, stronger commands. For instance, adding a new order record to a customer and order database requires not only saving the order data itself but also updating the many links that connect the customer record with the related order records. In a typical 3 GL application, specific instructions would need to be given for writing new data to the customer record, its index, the order record, and its indexes. Programming is more efficient and less prone to mistakes thanks to the commands made possible by the DBMS's unique language innovations. With only one instruction, all the relevant indexes and records are immediately changed.

CONTROLLING THE DATA SOURCE Nowadays, data are acknowledged as a significant organizational resource that should be handled similarly to other assets like land, labor, and money. The data resource will take up the full number 4. Let's just mention for the moment that a DBMS is a crucial piece of software for managing the data resource. A data dictionary/directory, which is a common repository of data definitions, is another software tool for managing the data resource. When the meaning, storage format, integrity guidelines, security clearances, and physical placement of data need to be determined, the DBMS and system users consult such a central catalog. The DD/D is a database or data warehouse equivalent to an inventory accounting system for a components warehouse. DD/D functionality is often included into contemporary DBMSs.

Tools CASE

CASE tools, our fourth form of support software, were initially expected to have a significant influence on computer professionals, and that has been the case for certain professionals in some businesses. Albeit considerably slower than expected, the adoption of CASE tools has increased. The actual definition of computer-aided software engineering is a group of software tools that are used to assist in automating all stages of the software development life cycle. The occupations of systems analysts and programmers have undergone a significant transformation in those companies that have implemented CASE techniques. In particular, the analyst's or programmer's task requires additional upfront effort to precisely define the issue and articulate it using the specific CASE tool specifications. When it comes time to converting the specs into the desired output, such as a data flow diagram or a COBOL program, the tool helps with the back-end work.

The usage of CASE tools for object-oriented programming based on the Unified Modeling Language has increased recently. Large, object-oriented projects in particular may be specified and visualized using UML, a general-purpose notational language. Examples of such UML-based CASE tools are Borland Together, Sybase PowerDesigner, IBM Rational Software Architect for WebSphere, and IBM Rational Rhapsody. We'll save a more thorough discussion of CASE software for chapter 9, when we'll examine the use of CASE tools in the development of systems. For now, keep in mind that CASE is only starting to have an effect. CASE has the ability to increase productivity in a part of the business that needs it [3], [4].

DISCUSSION

Communications Interface Software

Our fifth category of support software, communications interface software, has grown in significance as the number of local and wide area networks, as well as the Internet and the World Wide Web, have grown in relevance. We've previously spoken about the Web browser, which is software that runs on the user's computer and enables the user to explore, or "browse," the Internet. It's possible that the Web browser is the most significant sort of communications interface software. Web server software is the name given to the server's communications interface software that "serves" the Web pages to the browser. The most widely used Web server program is Apache, an open source creation of the Apache Software Foundation. It may be used with a number of operating systems, including Linux, several UNIX variants, and Windows. More than 110 million websites in 2010 used Apache as their web server. File Transfer Protocol is an important communications interface product. The purpose of this product is to move files across computer systems. The user essentially enters into both computer systems simultaneously and transfers data from one to the other. It's possible that programs, text data, photos, and other types of files are being transported.

The incredible responsibility of controlling these workstations' communications with the main computer falls to communications software on big PCs with several linked workstations. The messages are gathered from the terminals by this program, which then processes them as necessary and sends the results back to the appropriate terminals. These items are often designed to integrate seamlessly with a certain operating system. For instance, IBM's CICS is a communications tool designed to function with the company's z/OS operating system. IBM has also developed versions of CICS that are compatible with Microsoft Windows Server, Sun's Solaris, Hewlett-HP-UX, Packard's and IBM's AIX UNIX operating system. As we discuss networking and communications in chapter three, we'll explain other sorts of communications interface software.

Utility Software

Our last category of support software is undoubtedly a catch-all one, but it's still significant. Utility software is used on big computers to load applications into memory, connect together relevant programs and subprograms, combine two data files, sort a data file into a particular sequence, and transfer files from one location to another. The user also has access to the software library via utility programs. Most of the time, the user interacts with these utility programs via job control language instructions. On a microcomputer, utility applications are used for a variety of activities, including zipping and unzipping huge files for easier transfer, reorganizing the hard drive to free up disk space, and scanning for malware and computer viruses.

Changing Software Characteristics

We have identified many of the significant trends in the software industry while researching the many types of computer software. Using our prior discussions as a foundation, we can specifically identify six significant patterns that are most directly relevant to you as a manager more attention paid to human productivity. For computer professionals and, where necessary, managers, software tools that increase human productivity will grow more popular. Examples include object-oriented languages, query languages, and CASE tools. Less support software is bought, and more apps. Managers will be able to install new applications more rapidly thanks to the trend toward more bought apps, but there is a risk that the purchased software won't be able to do tasks exactly as they are intended to be performed. Less support software may need to be bought in the future due to the growing accessibility and acceptance of open source support software, such as the Linux operating system. More object-oriented programming in many languages.

Visual Basic.NET, Java, and other object-oriented programming languages will become even more well-liked, in part due to the focus on graphical user interfaces. More attention should be placed on Internet- and intranet-based applications. Since it is simple and affordable to make these programs accessible to everyone who needs them, more businesses are developing or purchasing applications that operate on the Internet or their internal intranet. A greater focus on user development. With the aid of personal productivity tools, 4 GLs, and query languages that are simple to understand and use, managers and other professionals will take on more of the responsibility of software development themselves. Increased usage of personal productivity tools. Managers and other professionals will increasingly adopt personal productivity software, particularly Web browsers, spreadsheet programs, and database management systems.

The Industry of Information Technology

Several suppliers, as well as hardware and software items, have been discussed in this, but we don't have a framework for understanding the IT business. Let's begin with Hewlett-Packard and IBM, the two major participants in the worldwide IT sector. Both businesses have a significant influence in the software and computer services sectors despite having started out as predominantly hardware providers. Long the industry leader in printers, HP acquired Compaq Computer in 2002 to expand its PC and small-server product offerings. HP overtook IBM as the biggest IT firm in the world in 2005 when IBM sold its PC division to Lenovo. Both companies are major participants in the software market, with IBM coming in second worldwide in terms of software sales and HP coming in sixth. In terms of computer services, both are enormous, with IBM coming in top and HP jumping up to second after acquiring EDS for $13.9 billion in 2008.

The other significant participants in the hardware market have already been mentioned: in the microcomputer market, they include Dell, Acer, Lenovo, Apple, and the Japanese triad of Toshiba, Fujitsu, and Sony; in the midrange and larger markets, they are joined by Sun Microsystems. Oracle's acquisition of Sun in 2010 for $7.4 billion was an intriguing decision. Still speaking about hardware, AMD is second to Intel in terms of market share for microprocessor chips. IBM and HP are followed in the field of computer services by a number of independent consulting companies, including Accenture and Capgemini. With its 2009 acquisition of Perot Systems for $3.9 billion, Dell is attempting to enter this market, while the same year, Xerox paid $6 billion for computer services firm Affiliated Computer Services. A fascinating and competitive set of software firms exist in addition to the software offered by hardware vendors, despite being controlled by a single company. At Redmond, Washington, Microsoft is the biggest and most prominent software company. Bill Gates, who is thought to be the world's wealthiest man, led Microsoft from its founding in 1975 until 2000. Other significant software providers include Oracle, which started out as a mainframe DBMS specialist but has since expanded into other fields, including ERP systems and, most recently, hardware with its acquisition of Sun Microsystems; SAP, which leads the ERP market with its R/3 product; Symantec, which focuses on security tools and systems; and Computer Associates, which creates a variety of mainframe and PC-based software products. There are several medium-sized to small-sized software companies in addition to these large software houses. The success or failure of a single product has a tendency to cause many smaller companies to rise and fall quickly; thus, the most promising of these little companies are often acquired by the big vendors.

The majority of the big software suppliers have expanded via both increasing sales of internally generated products and the acquisition of other software companies, sometimes huge enterprises. In order to increase their market share, three of the top software companies acquired business intelligence software providers in 2007: IBM paid $5 billion for Canada's Cognos, Oracle paid $3.3 billion for Hyperion Solutions, and SAP paid $7 billion for France's BusinessObjects. Microsoft spent $6 billion in 2007 to acquire aQuantive, Inc., a significant participant in the internet advertising market, in order to better compete with Google and Yahoo. Since 2005, Oracle has acquired 55 software firms for more than $30 billion, which is a very active period for the company in the acquisition market. Oracle made its first foray into the hardware industry in 2010 when it acquired Sun Microsystems, which generates 80% of Sun's sales. Oracle joins the very competitive server industry where "IBM, HP, and Dell all rank well ahead of Sun in a business where size counts," therefore it is unclear if this acquisition will be as successful as its software firm acquisitions.

Telecommunications and Networking

This is the second of three articles on the fundamental components of information technology. Hardware and software have been discussed so far, but there are still two more essential building pieces to be addressed. The data resource is the emphasis of 4. Hardware and software need data to be processed in order to deliver usable results. Hardware, software, and data would be the only things that remained of computers if they were all standalone devices with no connections to other computers. In fact, it was the end of the narrative up until around 40 years ago. Now, however, almost all computers regardless of size communicate directly with one another across a staggering array of networks. Intraorganizational local area networks, backbone networks, wide area networks, as well as the global Internet are some examples of these networks for computers in organizations. The Internet is the most crucial network for home computers. Today's enterprises

rely largely on speech and visual communication in addition to computer communications. This article examines the rapidly growing subject of networking and telecommunications.

This article's objective is to discuss the networking and telecommunications technologies that company managers like you should be familiar with. You don't need to be an expert in every technical aspect; you only need to be aware of the responsibilities and broad capabilities of the different transmission mediums and networks. You must be familiar with the key terms and ideas in networking and telecommunications. The ability to exploit the entire range of information technology to boost productivity and organizational performance depends, above all else, on your understanding of how hardware, software, communications, and networking interact.

In the field of information technology, change is everywhere, but nowhere is it more pronounced and dramatic than in the area of networking and telecommunications. Every manager's work is being affected by a revolution in communications, which is mostly being driven by the Internet and World Wide Web. As American Telephone & Telegraph split up in 1984, there were several businesses competing to develop and sell telecommunications products and services. Innovation in the telecommunications and networking sector has been at an all-time high, in part because to this heightened rivalry. The transformation has been fueled by digital networks, fiber-optic cable, cellular phones, the ability to simultaneously transmit voice and data over the same lines, and wireless networks [5]–[7].

The majority of significant U.S. corporations have also undergone internal restructuring in order to streamline their internal middle management structures. In order to react to market possibilities and competitor activity more rapidly, they have also decentralized operations and formed cross-functional teams to carry out projects and enhance company operations. Overall, these internal shifts have made communication more crucial than ever for the remaining, often scattered managers. They need efficient, dependable voice and data communication with other departments inside the business as well as with suppliers and clients. More than ever, small companies need effective communication, and advancements like LANs, cellular phones, and improved operation of the public wired telephone network have helped meet this demand. The second half of the 20th century saw a revolution in communications that has continued into the new millennium due to a combination of internal requirements, foreign rivalry, and invention. This is intended to assist you in participating intelligently in the communications revolution.

Necessity of Networking

Let's be more specific when stating why networking between computers and equipment associated to computers, such as printers, is necessary. Why is a network connection required for managers or other professionals using microcomputers? Why are smaller computers often linked to bigger ones? Why are laser printers connected to LANs so frequently? Why is having an Internet connection essential for the majority of businesses? According to our assessment, networking is beneficial for five main reasons.

Technological Resource Sharing

Sharing essential technological resources among the numerous network users is made possible by networking. Users may share a range of resources, such as a fast color printer that is a part of the network, by connecting all the Computers in an office to a LAN, for instance. Software that is electronically kept on a file server may also be shared by the users. These gadgets are all wired up and have the ability to speak with one another thanks to a LAN software program called a server

operating system. A user's computer electronically sends a color brochure or a color transparency to the network printer when they wish to print them. Larger machines should share resources as well. Mainframes or midrange computers often share magnetic disk drives and very fast printers. Wide area networks also make it possible to share highly costly resources like supercomputers. Researchers from other institutions and research labs are able to use these massive computers by connecting via their local computer network to a national high-speed backbone network like Internet2, which has been financed by the National Science Foundation.

Sharing of Data the sharing of data is even more crucial than the sharing of technological resources. Users on the network may get data from other nodes, also known as points on the network, using either a LAN or a WAN. While creating spreadsheets to estimate future activity in their departments, managers must, for instance, be able to access global corporate sales projections from corporate databases. Automobile dealers need to be able to track down certain car makes, models, and colors with precise equipment fitted in order to satisfy consumers. A supply chain's managers require precise, current information on inventory levels and locations. Each of the company's divisional computer centers must be accessible to accountants at corporate headquarters in order to get summary information on sales and costs. The chief executive officer must be able to obtain current information on industry trends via the corporate network utilizing an executive information system. Data may sometimes be accessed from a commercial, public database that is not owned or operated by the company, such as LexisNexis and Dow Jones Newswires. Of course, the World Wide Web and the Internet are now the primary means of data exchange. According to conservative estimates, there are already at least 1.7 billion Web users worldwide, and this figure is continuously increasing. Each of these individuals gets quick access to a vast variety of knowledge on every subject. The user looks for the needed information by first utilizing a search engine like Google or a favorite reference website, and then they follow hypertext connections to find it. In summary, the Web has developed a fresh and intriguing method of data exchange [8]–[10].

CONCLUSION

There is little question that the computer was the most important technological advancement of the twentieth century, yet there is much more to IT than just the digital computer. The computer has captivated our imaginations more than any other recent breakthrough due to its remarkable influence on businesses and our daily lives. To sum up, the six essential building elements of a computer system are input, output, memory, arithmetic/logical unit, files, and control unit, in some combination. An in-memory stored program that is delivered into the control unit one instruction at a time, understood, and executed controls all of these components. Throughout time, the fundamental concept has been expanded in a number of ways, including the addition of various file storage devices and the use of several processors in a single computer system. No matter how the machine is set up, stored programs, or software, still operate the computer system. In a metaphorical sense, software is available in a range of dimensions. Applications software is made up of all programs created to carry out specific tasks for computer users; support software creates a computing environment that is comparatively simple to use, converts programs into machine language, and makes sure that hardware and software resources are utilized effectively. The operating system, which regulates hardware functionality and oversees all other software, is the most crucial component of support software. Language translators, communication interface software, database management systems, and utility applications are examples of additional support software. At the company, application software is often created utilizing 3 GL, 4 GL, and OOP languages. Before, the information systems organization's computer specialists handled

almost all internal software development; but, more recently, part of the work has been completed by end users utilizing 4 GLs and DBMS query languages. The increased availability and usage of personal productivity software, such as spreadsheets and database management systems, is a development that managers are particularly impacted by. An organization buys almost all of its support software and a growing amount of its application software from hardware and software companies. Ideally, you now have enough knowledge about computer systems to start understanding the current and possible effects that computers might have on your company and your career.

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CHAPTER 9

DISTRIBUTED DATA PROCESSING AND CLIENT/SERVER SYSTEMS

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ABSTRACT:

A job may be divided into functions that are then distributed over two or more linked processors in a technique known as distributed processing. An application is said to be distributed if its component application programs are split over two or more linked processors. In this chapter author is discusses the key elements of telecommunications and networking. Distributed Data Processing (DDP) and Client/Server Systems (C/S) are two important concepts in the field of computer science that have revolutionized the way data is processed and shared across different locations. DDP refers to the use of multiple computers that work together to perform a single task or set of tasks. This approach allows for faster processing of large amounts of data and also provides greater fault tolerance since if one computer fails, the others can continue to operate.

KEYWORDS:

Data Processing, Information Technology, Microcomputer, Network, Server.

INTRODUCTION

By the use of telecommunications cables, the many computers located at various locations are connected to one another in dispersed data processing. A kind of distributed system known as client/server systems divides the processing capacity between a major server system, such as a mainframe or midrange computer, and a number of client machines, often desktop microcomputers. Due to their dependence on more reasonably priced microcomputers and workstations, distributed and client/server systems have a tendency to lower computing expenses. There are several distributed system examples. One is the use of laptop computers by a company's sales staff, which transmits orders and sales data to the corporate computer center through the Internet. A client/server program that uses desktop microcomputers as the clients and a powerful workstation as the server is used for general ledger accounting is a second example. Most often, a LAN is used to deploy such a package in a single building or a collection of buildings. A commercial real estate database is created on a server in the main office of the real estate company in a third example, which similarly uses a client/server setup. The client computers are small computers that are housed at the branch offices or customer offices of the business. The client computers and server are connected through the Internet. In any instance, dispersed data processing is a practical and desirable configuration due to the presence of a communications network [1], [2].

Better Communications

Networks improve internal communications in a number of significant ways. Long-established internal and external communication channels inside corporations include the telephone network. The emergence of the Internet has increased the reach of these electronic mail systems globally.

During the last two decades, electronic mail through the corporate computer network has become a cornerstone of communication in the majority of significant organizations. Multiparty asynchronous communication on a huge range of subjects is made possible by electronic bulletin boards, blogs, and vast electronic mailing lists for individuals with similar interests. Through the Internet, instant messaging enables real-time text communication. Moreover, videoconferencing, in particular, offers a richer medium for visual communication, enabling more efficient communication.

Direct data communication linkages have been successfully employed by businesses to gain a competitive edge over their suppliers, consumers, or both. The SABRE airline reservation system is a prime example of a strategic information system that relies on network-based communication. Voice and data communications may now take place simultaneously over the same telecommunications connection thanks to recent advances that will be covered later in this article, such DSL and IP telephony. Networks have improved communication for people and companies, starting with "plain old telephone service" networks and progressing to modern LANs, WANs, and the Internet.

Marketing Initiatives

The Internet has developed into a significant marketing medium for a range of enterprises during the last 20 years. Of sure, marketing is a kind of communication, but it is a very specific one. The majority of midsized and bigger businesses have a significant online presence, with elaborate websites that provide details on their goods and services as well as, often, an online purchase option. A Yahoo! shop may be used by many smaller businesses as a marketing tool on the Web. 7 will take into account the full range of marketing operations carried out on the Internet.

Telecommunications and Networking Overview

For contemporary businesses, networking the electronic tethering of geographically separated devices is essential. Managers must have a basic understanding of the numerous telecommunications and networking alternatives accessible to their firms if they are to successfully engage in the continuing communications revolution. The word "tele-" is a prefix that simply indicates "at a distance." Telecommunications is hence long-distance communication. Data communications, datacom, teleprocessing, telecom, and networking are a few more words or abbreviations that are used virtually interchangeably with communications technology. As telecommunications is the most inclusive of these related concepts, we choose it. Voice and data communications are both a part of it. Teleprocessing, which clearly calls for telecommunications, refers to computer processing that occurs away from the source of the data. The electrical connecting necessary for telecommunications is known as networking.

Telecommunications may seem to merely need a cable or a wireless signal, but it is really much more complicated than that! Consider the main tasks carried out by a telecommunications network in order to start a full examination of communications. The transmission of speech or data—or both using the network and underlying medium is the most evident of these functions. The operation entails ensuring that a message or data packet arrives at its intended location without errors. Editorial, conversion, and routing are among of the subfunctions of processing.

When traveling from one device on the network to another, conversion entails making any required adjustments to the coding system or transmission speed. Editing entails looking for faults and putting the message into a standard format. Routing, or selecting the most effective way, is a crucial

issue in networks because several paths might connect a communication's source and destination. Network control, which involves monitoring the condition of different system components and, for certain kinds of networks, occasionally checking each workstation to determine whether it has a message to transmit, is closely tied to the processing function. The provision of an interface between the network and the user, which should make it simple and effective for a manager or any other network user to deliver a message, is a less evident but crucial role. The next significant section looks at the many ways that the functions.

DISCUSSION

Key Elements of Telecommunications and Networking

We think that in order for you to engage in the communications revolution as a company manager, you must comprehend a few essential concepts regarding networking and telecommunications in order to grasp your possibilities for the business systems you need. The variety of transmission media available, the topology of networks, the various types of networks, including LANs and WANs, and the network protocols used on these networks are some of the fundamental concepts that make up these key elements. They also include certain underlying basic ideas, such as analog versus digital signals and switched versus private lines. While there will be some technical content in this area, we will try to make it as clear as possible. We want you to bear in mind the overall picture of telecommunications above all the specifics [3], [4].

Digital and Analog Signals

The fact that the electrical signals conveyed via a network may either be analog or digital, depending on the kind of network, is perhaps the most fundamental concept in telecommunications. The telephone network has traditionally been an analog network, with voice messages being delivered through it by a physical amount that continually varies with time. Since speech transmission requires the substantial changes that an analog signal can give and is insensitive to tiny signal quality degradations, this analog signal performed well. The intended letters are represented by a string of binary numbers, or bits a string of zeros and ones in computer data. Analog transmission does not work well with the format of computer data. The data are particularly sensitive to degradations in signal quality, and only two different signals representing zeros and ones need to be delivered. The whole message might get jumbled if noise on the phone line causes a zero to be mistaken for a one or vice versa. Data cannot be transferred directly over the analog telephone network due to this noise issue. The issue of computer data transmission has two potential solutions. Before delivering the data through the analog telephone network, the original and still-current technique was to transform it from digital to analog form. A modulator/demodulator, often known as a modem, is the device that performs this conversion. At the opposite end of the transmission line, the data must be reconverted from analog to digital, which necessitates the use of a second modem. For many applications, using modems and the analog telephone network is a viable option for data transmission, but its speed and error-rate capabilities are severely constrained.

Creating digital networks particularly designed to transmit a digital signal made up of zeros and ones is the second, longer-term answer to the challenge of transferring computer data. Modems are no longer required since digital networks offer the promise for reduced error rates and faster transmission speeds. Due of these benefits, digital networks have been developed particularly for the purpose of connecting computers and other computer-related equipment. Moreover, the analog telephone network is being progressively replaced with a digital network. In many areas of the

United States, digital services like ISDN and DSL are now accessible to consumers looking for higher-speed Internet access over the public telephone network.

While the increased amount of data being communicated over the network has contributed to the conversion of the telephone network from analog to digital, there are also many benefits to sending voice signals through a digital network. Similar to how digital recording produces higher-fidelity music, digital voice transmission may result in higher-quality transmission—less noise on the line. As the majority of our telephone equipment is still analogue, the signal it sends to the closest switching center is also analog. Yet, the transformation of these telephone switches from analog to digital is happening quickly. The analog speech signal is changed from an analog to a digital voice signal at the digital switch so that it may be sent to another digital switch, which might be across town or across the nation. As a result, a growing amount of speech communication between switching centers is now digital. Our telephone equipment will someday be digital devices as well, making the whole telephone network digital.

Transmission Speed

Another fundamental issue is the transmission speed, which depends on whether the signal is digital or analog. Please be aware that when we talk about speed, we don't mean how quickly a signal moves—in terms of miles per hour, for example but rather how much data can be sent in a given amount of time. For describing transmission rates, terms like bandwidth, baud rate, and Hertz are sometimes used, although a more intuitive metric would be bits transferred per second. Fortunately, in many cases, the three concepts indicated above are almost equivalent to bits per second. In everyday language, bandwidth simply refers to circuit capacity. The difference between baud and hertz is the number of impulses transmitted each second. All of these phrases are equivalent if, as is often the case, each cycle transmits precisely one signal that carries one bit of data. We'll use bits per second in this to avoid any misunderstandings. Historically, baud was used in information technology journals for relatively moderate rates like 2,400 baud or 14,400 baud, whereas hertz was used for faster speeds like 500 megaHertz or 2 gigaHertz. Hertz is still often used in PC ads, even if the word baud has lately lost popularity.

We shall continue to refer to bps in this for clarification. For telecommunications, the idea of bandwidth, or capacity, is crucial. One page of data, for instance, needs around 50,000 bits to express it. It would take around nine seconds to send 10 pages using a 56,000 bps modem over an analog telephone line. Its bandwidth or capacity would be too sluggish to handle the transmission of a huge data file. On the other hand, it would take only 50 milliseconds to send the same 10 pages over a 1 million bps DSL connection. For one page of graphics, 1 million bits are needed. Ten pages of graphics would need a 56 kbps analog phone connection to transfer them in little under three minutes, whereas a 1 mbps DSL line would transfer them in only ten seconds. A 56-kbps analog telephone connection would take over five days to transmit an hour of high-definition video, which is clearly not something that will ever be done. With a 30-mbps fiber-to-the-premises line, the high-definition movie would download in 13 1/3 minutes, compared to 6 2/3 hours using a 1-mbps DSL line. What forms of communication, including speech, data, graphics, stop-frame video, full-motion video, and high-definition video, may realistically be conveyed via a given medium depends on the bandwidth.

Types of Transmission Lines

The difference between switched and private communication lines is another fundamental one. A switched-line system is, for instance, the public telephone network. The sender of any kind of

communication through the telephone network has no control over the message's path. In order to deliver the message via the lines they judge suitable, the telephone company's computers link switching centers. They do this based on variables including the length of the journey, the volume of traffic on the different routes, and the capacity of the various routes. For voice communications, this switched-line arrangement often works just well. Data communications, however, are more sensitive to local factors like electrical storms and variations in line quality along various routes. Since the communications were routed through various routes, a data message sent from Minneapolis to Atlanta via the telephone network at 11 A.M. may be correctly sent, while a different communication sent from Minneapolis to Atlanta 15 minutes later would be severely garbled. Private lines are one method to lower the mistake rate. The majority of private lines are leased, dedicated physical lines from common carriers like Verizon, Sprint Nextel, or AT&T. To guarantee the caliber of its data transfers, a business can decide to rent a line between Minneapolis and Atlanta. Private lines are also present on a campus or in a building. These are the organization's own lines that are used for internal voice and data communications. For example, private lines are often used for computer telecommunications within buildings or on campuses.

The distinction between simplex, half-duplex, and full-duplex transmission is the last fundamental concept we want to cover. Data may only be sent in one way with simplex transmission. Yet using this one-way communication from a monitoring equipment at a distant place back to a computer is uncommonly valuable. Data may go in both ways during half-duplex transmission, but not simultaneously. Full-duplex transmission enables simultaneous data transfer in both directions, increasing capacity; nevertheless, it is more expensive than half-duplex lines. A Citizen's Band radio offers half-duplex transmission, enabling just one side to broadcast at a time, in contrast to regular telephone service, which allows both parties to converse simultaneously [5], [6].

Media for Transmission

A physical channel that transmits communications makes up a telecommunications network. Twisted pair wires, coaxial cable, wireless, satellite, and fiber-optic cable are the five main media now in use.

Wrong Pair: A twisted pair of wires is the most typical transmission medium when all applications are taken into account. Two insulated copper wires with a typical thickness of 1 millimeter are twisted together to form a lengthy helix to form a twisted pair. To lessen electrical interference from neighboring twisted pairs that are identical, wires are twisted. The majority of telephones use twisted pair connections to connect to their neighborhood private branch exchange or local telephone company headquarters. Similar to this, several LANs have been established by connecting the different microcomputers and associated equipment using twisted pair cable. For many modern high-speed LANs, Category 5e cabling—which consists of four twisted pairs in a single cable jacket—is now employed.

Twisted pair transmission speeds may be achieved at a variety of different rates, depending on the cable's number of twisted pairs, its overall length, and the wire's thickness. Typical speeds on the analog voice telephone network range from 14,400 to 56,000 bps. A speed of 256,000 bps is typical when a digital service like DSL is utilized on the telephone network; outgoing DSL speeds may reach 896 kbps, while incoming DSL speeds can reach 12 million bps. Twisted pairs may be utilized in LANs to get much faster speeds. When utilized in a Fast Ethernet LAN, many twisted pairs in a single cable, such as Category 5e cabling, may provide speeds up to 100 mbps, or even up to 10 billion bps with Gigabit Ethernet.

Copper Cable: Another typical communication medium is coaxial cable. A thick copper wire in the middle of a coaxial cable is surrounded by insulating material. A cylindrical conductor, which is often a woven braided mesh, is positioned around the insulating material. The outer protective plastic covering is next placed over the cylindrical conductor. 3.2 describes how a coaxial cable is built.

Key: bps stands for bits per second, kbps for thousand bits per second, mbps for million bits per second, mega bps for billion bits per second, and giga bps for billion bits per second. Coaxial cable offers a reasonable compromise between reasonably fast transmission rates and little noise or interference thanks to its design. Broadband coax, which was first used for analog transmission but is now also used for digital transmission, and baseband coax, which is used for digital transmission, are the two types of coaxial cable that are most often used.

Baseband coax is easy to use, cheap to install, and reasonably cheap when it comes to the essential interfaces for microcomputers or other devices. Based largely on the distances involved, baseband provides a single digital transmission channel with data transmission speeds ranging from 10 mbps to maybe 150 mbps. Baseband coax was often used for LANs and long-distance telephone network transmission, but fiber-optic cable has mostly taken the place of this coax presently.

First deployed for the analog transmission of television signals, broadband coax which makes use of common cable television cabling now often utilizes digital transmission. A single cable may enable the simultaneous transmission of data, telephony, and video by splitting a single broadband wire into numerous channels. Similar to baseband coax, broadband data transfer rates allow for high transmission speeds over far greater distances than baseband coax can provide. Broadband coax has outlasted baseband due to its additional capacity and many channels. For cable television and large-scale local area networks (LANs), sometimes known as metropolitan area networks, broadband coax is still often employed. WIRELESS Wireless isn't technically a transmission medium. With wireless technology, radio waves are transmitted into the atmosphere. Many applications of wireless communication exist, including cordless telephones, mobile phones, wireless local area networks, and microwave transmission of speech and data.

A portable cordless telephone may be used up to 1,000 feet away from its wired telephone base unit. This enables the user to move the phone around a home's different rooms or take it outside onto a patio. A cellular phone, on the other hand, may be used anywhere as long as it is close to a cellular switching station approximately eight to ten miles away. Nowadays, all American metropolises and the majority of rural regions have access to these cellular switching stations. The switching stations are low-powered transmitter/receivers that are linked to a cellular telephone switching office using either microwave or traditional telephone lines. The computer-controlled switching office manages calls within its service area and connects the cellular system to the local and long-distance telephone network. Smartphones of today, like the BlackBerry or iPhone, combine a mobile phone with a portable computer. They may access the Internet through the so-called 2G or 3G networks run by cellular carriers. In comparison to 2G networks, which are often in the 20 kbps range, 3G networks provide substantially higher data transmission speeds, which vary commonly from 500 kbps to 2 mbps. There will soon be 4G networks with even faster data transfer rates.

The use of wireless LANs is expanding. They have the apparent benefit of being quite simple to install and design. If installing cables would be prohibitively costly or impracticable, such as in an ancient building, a wireless system enables networking. Users of mobile devices, such as portable

or laptop computers, are also able to connect to the LAN via a wireless LAN anytime they are in the vicinity of a wireless access point, such as at a coffee shop or airport terminal. A wireless LAN is less protected from interference and less secure than a cable LAN, which might lead to an increase in error rates and make the wireless LAN function at a lower data rate. Some of the more recent wireless LANs can reach rates of up to 300 mbps, although the majority of wireless LANs run in the 6 to 100 mbps range.

RFID Signals Growing Slowly

Radio frequency identification has been present since World War II, but it wasn't until 2003 that it came to the public's notice when Walmart said that its top 100 suppliers would need to start utilizing RFID for certain applications by January 2005. There was a belief that RFID would fundamentally alter retailing at the time, but that hasn't occurred. In fact, even Walmart has backed down from its initial directive. Walmart does not force its suppliers to utilize RFID, despite the fact that it still does it in its stores and distribution hubs. Of of Walmart's 20,000 suppliers, just roughly 600 have embraced RFID. Nonetheless, RFID has taken off outside of the retail industry, and sales of RFID tags, readers, software, and services have increased to $6 billion annually. Smart cards, such as passports, ID cards, and pre-paid transit cards, are where RFID is most often used. Governments are using RFID to identify cattle to help stem the spread of illnesses like mad cow disease, and the military uses it to monitor equipment and supplies.

RFID comes in both passive and active varieties. Both forms of RFID are centered around an RFID tag, a little piece of hardware often no larger than a postage stamp that utilizes radio waves to communicate a unique identification code to itself. An antenna and a small chip make up a passive RFID tag; there is no internal power source. Instead, a passive tag depends on the little electrical current that an incoming radio signal induces in the antenna. This electrical current gives the tag enough power to deliver a quick response, which is often merely an ID number. An active RFID tag has a built-in power source and may transmit data continually, when prompted, or according to a predefined schedule. Although the cost of passive tags has decreased to between $0.05 and $0.10, the cost of active tags is often above $1.00. Due of their cheaper price, passive RFID tags now account for the majority of RFID activity.

Smart cards and livestock, as well as a growing number of consumer goods, employ passive RFID tags. Cell phones, airplane transponders, and other specific uses like the monitoring of medical equipment all often include active RFID tags. While RFID isn't revolutionizing shopping, it is steadily growing in importance for identifying people, goods, machinery, and even cattle. For many years, long-distance wireless communication has been mostly accomplished via the microwave. As microwave is a line-of-sight technology, the transmitter and receiver must be in a clear, unobstructed line. As the earth is curved, it is necessary to construct microwave towers that are normally spaced 25 to 50 miles apart in order to relay signals from the initial transmitter to the destination receiver. While microwave transmission is costly due to the need for towers, transmitters, and receivers, it is still less expensive than laying fiber-optic cable in a very long trench, especially if the right of way for the trench has to be acquired. At transmission speeds of up to 1 gbps, microwave is often used for long-distance telephone communication and, to a lesser degree, for corporate voice and data networks.

There are more line-of-sight transmission technologies than microwave. Laser or infrared transmitters and receivers positioned on roofs are often a cheap and simple method to transfer data over short distances.

Satellite: In a unique variant of wireless transmission, signals are sent over extremely great distances via satellite communication. Simply said, a communications satellite is a large microwave repeater in the sky that houses one or more

It's Bluetooth Time!

Danish Viking King Harald Bluetooth ruled during the tenth century. His name is now attached to a wireless technology that enables communication between a wide range of devices, including mobile phones, desktop and notebook computers, palmtop computers, DVD players, and printers. This technology does away with cables and enables communication where it was previously impossible. Data may be delivered wirelessly at rates of up to 3 mbps with Bluetooth, a short-range radio technology integrated into a microchip, and ultimately up to 24 mbps with a Wi-Fi connection. Two of the top mobile phone manufacturers, Ericsson 1 and Nokia, two of the top manufacturers of laptop computers, IBM and Toshiba, and the top manufacturer of microprocessor chips, Intel, were the founding members of the Bluetooth Special Interest Group. Several other businesses, such as Motorola and Microsoft, have joined them as promoter members. Any business that wants to utilize the Bluetooth technology standards that the Bluetooth Special Interest Group has created may do so without paying any royalties.

Prior to being made available, Bluetooth-enabled products must pass compatibility testing. Many Bluetooth items of various types are now on the market, and operating systems like Microsoft Windows and Apple Computer's Mac OS have Bluetooth connectivity. The usage of Bluetooth has many applications. A business traveler may synchronize the data in a notebook computer and palmtop by adding Bluetooth cards to each of the devices and putting them in the same room. A desktop computer's mouse, keyboard, and printer may all be connected wirelessly over Bluetooth, doing away with the need for wires. The demand for Bluetooth-enabled mobile phones and hands-free headsets is rising as more states make it illegal to converse on a handheld phone while driving. A variety of Bluetooth-enabled home electronics, including a television, a stove, a thermostat, and a home computer, may be operated from a mobile device, all at the same time and from different locations, if desired. The microchips were created by the Bluetooth Special Interest Group with software controls and identification coding to make sure that only the devices pre-selected by their owners may interact.

For instance, UPS incorporates Bluetooth technology into the ring scanners that package loaders utilize. These ring scanners detect the barcode information on parcels and send it wirelessly to terminals worn around the waist. The information is then sent from the LAN through a landline to a worldwide scanning system at one of two UPS data centers, which houses all of the information on packages, utilizing wireless LAN access points installed across all of UPS's facilities. The Viking King is arrived, and Bluetooth is here! Unless where otherwise specified, the firms mentioned below are American-based transponders that listen to a certain region of the electromagnetic spectrum, amplify the received signals, and retransmit back to earth. Around 40 transponders, each capable of handling an 80 mbps data transmission, 1,250 digital voice channels at 64 kbps each, or different combinations of data channels and voice channels, may be found on a contemporary satellite. As satellite communication is still line-of-sight, it must be transmitted by many satellites in order to go halfway around the globe.

Due to the great distances required in broadcasting up to the satellite and then back down to earth, one intriguing but frustrating component of satellite transmission is the significant delay in receiving the signal. This is especially true for satellites in geostationary earth orbit, which are

placed 22,000 miles above the equator and look stationary with respect to the surface of the globe. Just under a third of a second is the absolute least delay for GEO satellites, which is a factor of ten greater than the minimum delay for fiber-optic links or earth-bound microwave over the same ground distance. Low earth orbit satellites, which orbit at a height of about 400 to 1,000 miles above the earth (as opposed to 22,000 miles for GEO satellites), attracted a lot of attention in the 1990s. A full system requires a lot of LEO satellites due to their quick motion, but because they are near to the earth, the ground stations need less power for communication, and the round-trip latency is significantly decreased. More than 10 times the 150 commercial satellites in orbit at the time, it was predicted 15 years ago that almost 1,700 LEO spacecraft will be deployed by 2006, but that did not materialize. See why, will we?

Iridium's launch of 66 satellites to provide mobile phone, paging, and data communication services was the first significant LEO project. Motorola oversaw the $5 billion Iridium project, which included Motorola, Lockheed Martin, and Sprint as investors. The Iridium system went operational in 1998 with two-page advertising splashed across prestigious publications like BusinessWeek. At that time, all of the satellites were in flight. Customers of Iridium would have a unique phone number that would follow them wherever they went on the planet, allowing them to make and receive calls from even the most distant regions of the world.

Iridium never gained popularity because the costs to utilize the service were too expensive. In 1999, Iridium declared bankruptcy, and it briefly seemed as if the satellites might be allowed to fall out of orbit. But Iridium was given another opportunity! The satellites and other assets of the original Iridium were purchased by a group of investors for $25 million, and satellite phone service was once again launched in 2001. To break even, the old Iridium required one million clients; the new Iridium merely required tens of thousands. The U.S. military, which signed a contract for unrestricted usage for up to 20,000 troops, made up a large portion of these consumers. Another client is the British military, as are several news media representatives. Marketing for the new Iridium focuses on marine, aviation, and mobile operations and is directed at businesses rather than at consumers. Iridium now serves over 300,000 users. While not quite as expensive as previously, the price of the revived Iridium is still significant: One example calling plan costs $250 per month for 150 included minutes, plus $1.40 per minute for extra minutes, while the phone, which weighs 9.4 ounces, costs roughly $1,500. A $100 activation charge and a much higher tariff apply when calling a phone connected to another satellite network. Globalstar, a rival LEO satellite system, has a checkered past as well. Globalstar offers service in more than 120 nations, however its 48 LEO satellites do not completely cover the earth. The Freedom 150 plan from Globalstar costs $65 a month for 150 minutes, plus $0.99 per minute for extra minutes. The Globalstar phone costs about $1,000.

In October 2002, Teledesic, a third planned LEO satellite system, was abandoned. To offer low-cost, high-speed Internet access, business networking, and desktop videoconferencing, the initial Teledesic proposal, which was funded by Craig McCaw, Bill Gates, and Boeing, called for the development of a 288-satellite network. Even that proposal, which called for 30 satellites with greater "footprints" on the planet, was abandoned in 2002, before any Teledesic satellites were ever deployed. At the time they were developed, all of these LEO satellite systems appeared like fantastic concepts, but the costs involved were enormous. Additionally, it took the LEO systems so long to develop from conception to deployment that, even before the satellites were deployed, competing, less costly technologies like mobile phones, DSL, and cable had made significant inroads into the prospective market [7].

CONCLUSION

To meet the organization's information demands, distributed data processing enables the deployment of application programs and data across networked locations. An organization may decide to centralize or decentralize its data processing systems depending on its needs. When a job can be divided into its component functions and then distributed among two or more networked processors, this is referred to as distributed processing. An application that uses several linked processors to distribute its component application applications is known as a distributed application. The idea behind a distributed database management system is to store data in several places.

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CHAPTER 10

A BRIEF DISCUSSION ON FIBER OPTICS

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ABSTRACT:

The technique that sends information as light pulses via a glass or plastic fiber is known as fiber optics, often known as optical fiber. These glass fibers may range in quantity from a few to several hundred in a fiber optic cable. The glass fiber core is encircled by yet another glass layer known as cladding. In this chapter author is discusses the computer telecommunications networks. Fiber optics is a technology that utilizes light to transmit data over long distances at high speeds. It involves the use of thin, flexible glass or plastic fibers to transmit signals in the form of light waves. These fibers are designed to carry data over vast distances, while minimizing signal loss and interference. Fiber optics is used in a wide range of applications, including telecommunications, internet connectivity, and cable television. It is also used in scientific research, medical equipment, and military applications.

KEYWORDS:

Cable, Fiber, Information Technology, Optics, Network.

INTRODUCTION

Fiber-optic cable, the most recent and most reliable transmission medium, is a real media and not a broadcast technology. Because to developments in optical technology, data may now be sent using light pulses that pass through a fine glass or fused silica fiber. Although the lack of a pulse indicates a 0 bit, a mild pulse may convey a bit. A fiber-optic cable, a light source either a light-emitting diode or a laser diode and a detector are necessary for an optical transmission system. When an electrical current is delivered to the light source, it releases pulses of light, and when light strikes the detector, it produces an electrical current. Due to the very thin fiber-optic cable, fiber optics are significantly quicker than other media and take up much less room. Since fiber-optic cables don't produce radiation and are thus exceedingly challenging to tap, they are more secure. Since they are unaffected by power-line surges, electromagnetic interference, or corrosive compounds in the air, they are also very dependable. Due to these advantages, telephone companies are switching to fiber optics for all new long-distance lines, connections linking central office locations, and the majority of new local lines from central office locations to termini in subdivisions. Except when used as a backbone to link several LANs and when extremely high speeds or high-security demands exist, this medium is unappealing for most LANs because to the high cost of the necessary equipment and the difficulties of dealing with the microscopic fibers. With small-diameter fiber, speeds may reach 3,200 gbps.

It may come as a surprise that the smaller-diameter fiber has a considerably greater capacity, but because light reflections are substantially less with a smaller fiber and the light ray bounces around less, faster transmission rates are possible. In contrast to the small-diameter fiber, which propagates

one light ray at a time virtually in a straight path without bouncing, the large-diameter fiber is multimode, which means that several light rays are crossing the fiber concurrently and bouncing off the fiber walls. However, single-mode fiber needs more expensive laser light sources and detectors than multimode fiber. With a recent advancement, it is now possible to divide a light beam traveling over a single-mode fiber into 80 or more distinct colors, each of which carries a separate stream of data. Prisms are employed in this procedure, known as dense wave division multiplexing, to convey these various colors along a single cable. For instance, part of the fiber that telephone companies are now installing is 8-micron single-mode fiber with an 800 gbps transmission speed when employing wave division multiplexing. This single-mode fiber has an extremely small outer diameter of about 125 microns, or roughly one-fiftieth of the outside diameter of a typical coaxial cable. Thus, fiber optics' advantages in terms of speed and size are important [1], [2].

DISCUSSION

Network Topology

Recognizing that all telecommunications networks use one or more of the transmission mediums previously covered is the first step in comprehending networks. But how are the networks set up, in terms of how the material and devices are arranged? The topology of the network is the technical word for this setup. There are an infinite amount of modifications and combinations of the five fundamental network topologies of bus, ring, star, hierarchical or tree, and mesh. BUS The linear or bus topology is the simplest kind of topology. All network devices share a single length of wire thanks to the bus. Typically, a file server with a large data storage capacity is one of the network devices. The wiring simplicity of the bus is obviously a benefit. Its single-point failure feature is a drawback. Nodes on either side of the failure point are unable to communicate with one another if the bus fails [3]–[5].

With large-diameter fiber, transmission rates may reach 1 billion bits per second. Since it resembles an extension of the star after some rearranging, a micron is one millionth of a meter or one thousandth of a millimeter. Most big and extremely large computer networks are set up like a tree, with the mainframe at the top linked to various controllers like a multiplexer3 and maybe lesser computers. Later, additional devices like terminals, microcomputers, and printers are linked to these controllers or smaller computers. As a result, the tree becomes "bushy" as one moves from top to bottom of it. The star and tree both have the same main drawback. The whole network collapses if the primary device malfunctions. The tree layout, however, offers a tremendous degree of versatility. If intermediary devices are used instead of connecting every device directly to the center, the cost disadvantage of the star may not become apparent as more devices are added to the network. Ring the two ends of the cable are linked in the ring topology, unlike the bus. In this instance, every network device, including a file server, is connected by a single cable. While the wiring for the ring is a little more intricate than for the bus, the ring is less prone to malfunction. Each network device can still communicate with every other device despite a single ring failure.

Star a mainframe or midrange computer, a file server, or a networking device is at the heart of the star architecture, and cables radiate outward to connect to every other network device. With every workstation and accessory connected to the single midrange computer, this system is typical of many small-to-medium computer setups. Since each item has its own connection and just has to be linked to the hub, installing each device is simple. The star is also less expensive for small networks with a few devices that are near to one another. The main drawback of the star is that if

the center component breaks, the whole network breaks. As the network expands, a cost disadvantage could also be seen for a distinct MESH. The majority of devices in a mesh topology are interconnected with two, three, or more additional devices in what seems to be an asymmetrical arrangement that resembles a woven net or a mesh. Every device would be linked to every other device in a full mesh, however this is seldom done due to the expense. A mesh topology is shown by the public telephone network and other networks that make up the Internet. The effects of a mesh failure rely on the alternate pathways or routes that are accessible in the area of the failure. A failure is likely to have minimal effect on a complicated mesh, like the telephone network, except from on the devices immediately affected.

Moderately Complex Networks: The interesting part now is that the first five network topologies may be joined and altered to create a dizzying array of networks. For instance, connecting several bus or ring LANs to the mainframe computer network is extremely typical. A high-speed backbone cable may be used to connect many bus and ring LANs, which effectively creates a bus network with the LANs acting as nodes. Because of the deliberate inclusion of a large degree of redundancy, national and international networks such as the telephone network and the Internet are significantly more complicated than those we have so far discussed. In this approach, even if numerous devices are adjacent to one another but distant from the central unit, one transmission line cable must be extended to each individual device. TREE the tree, or hierarchical, topology is the fourth fundamental kind. Sometimes this topology is referred to as a hierarchical star. A 3A multiplexer is a device that merges the data streams from numerous low-speed input devices, such as terminals and microcomputers, generally at a location far from the mainframe or central device, to make use of the whole transmission line's capacity to the central device. Almost every node or device on the network has a backup path when it is sent out. Later in this article, we'll look more closely at Internet2, a very fast national research network.

Types of Networks

We have so far focused on two essential components of telecommunications networks: the medium used to transmit messages and the configuration, or topology, of the networks. The division of networks into their fundamental forms, such as computer telecommunications networks, LANs, backbone networks, WANs, the Internet, and Internet2, is what we'll discuss next.

Networks for Computer Communications

This first form of network is nearly simpler to define by what it is not. It isn't a LAN, a WAN, a backbone network, or the Internet. The network that originates from a single medium-sized, big-sized, or very large computer or a collection of computers that are connected together is what we refer to as a computer telecommunications network. Coaxial cable and twisted pair are often used as the media in this form of network, which is typically set up as a tree. Up until the early 1980s, this was often the only kind of network run by a company that had operations in a single building or a cluster of related buildings. Even now, the computer telecommunications network still serves as the primary means of connection with the main computer in many enterprises. All other devices on the network function as "slaves" or subordinates under the direction of the central computer in this form of network. While LANs and other network types may now be connected to a mainframe or big computer, this sort of network formed the foundation of IBM's initial mainframe design.

While this is a good setup, the central computer must handle a lot of communication control. To offload the communications work from the central computer, it is extremely typical to add a front-end processor or communications controller to the network in between the central computer and

the rest of the network. Another computer called a front-end processor, sometimes known as a communications controller, has hardware and software that are specifically designed to handle all elements of communications, including error control, editing, regulating, routing, and speed and signal conversion [6], [7].

Area Local Networks: A local area network is first and foremost a local network; it is entirely controlled by a single company and typically covers an area with a radius of no more than two or three miles. LANs are high-speed data networks that often contain several million bits per second (bps) or more.

A LAN is different from a computer communications network in that a LAN is constructed around a number of intelligent devices that can process data as opposed to a single computer that handles all processing. LANs, therefore, are built on peer-to-peer relationships rather than master-subordinate ones. The Institute for Electrical and Electronic Engineers created standards for the five varieties of LANS that are now in use three types of wired LANs and two types of wireless LANs—and these standards have since been accepted by both national and international standards bodies. Officially known as IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11, including 802.11a, 802.11b, 802.11g, and 802.11n, and IEEE 802.16, including 802.16d and 802.16e, these five LAN standards are also known as Local Area Networks on the wire. Xerox invented the contention bus design, which was later adopted by Digital Equipment Corporation and a number of other manufacturers. Because of the original Xerox version of the concept, this architecture is often referred to as Ethernet. Obviously a bus architecture, the contention bus is often implemented using coaxial cable or twisted pair wire. In an Ethernet LAN, communication is often half-duplex, which means that it may happen in both directions but not simultaneously. All devices must compete for the utilization of the cable, which is an intriguing part of this design.

While using Ethernet, devices listen to the cable to identify messages meant for them specifically and to ascertain if the connection is congested. Any device may send a message when the cable is unplugged. Generally speaking, this works just well, but what happens if two devices begin to broadcast simultaneously? When there is a collision, the messages are muddled. When a collision occurs, the devices must be alerted, stop transmitting, wait a random amount of time, and then attempt again. The acronym CSMA/CD Protocol, which stands for Carrier Sense Multiple Access with Collision Detection, refers to this mode of operation. There is no upper limit on how long a device may wait before sending a message since collisions might theoretically continue to happen. As long as network traffic is modest to moderate, a contention bus architecture is easy to put into use and performs well. The original Ethernet architecture, now known as shared Ethernet, has a physical star arrangement but has a contention bus as its logical topology. A hub, which is a junction box with a number of ports for cables to be put into, is often used to create a shared Ethernet LAN by connecting the cables from all the devices on the LAN. There is a linear bus that connects all the ports embedded within the hub. Shared Ethernet functions as a physical star but a logical bus as a result.

A more recent version of Ethernet called switched Ethernet offers greater performance at a higher cost. While a switch is used in place of the common Ethernet hub and the LAN functions as both a logical and physical star, the idea is identical. The switch is smarter than a hub because it builds individual point-to-point connections with each device before forwarding communications solely to the relevant device. A hub simply passes communications through to all devices on the LAN. By giving each device a dedicated circuit of its own rather than having them all share a single circuit, this switching technique significantly boosts LAN performance. Of course, a changeover

costs more than a simple hub. The token bus architecture uses a coaxial cable or twisted pair bus topology, however it is not dependent on contention. A device can only transmit when it possesses a single token, which is handed around the bus to all devices in a certain sequence. A microcomputer must thus wait until it gets the token before sending a message; after sending the message, the device transmits the token to the next device. The device will get the token once again after a predetermined amount of deterministic time depending on messages delivered by other devices.

Star

The Manufacturing Automation Protocol, created by General Motors and used by many firms, is fundamentally based on the token bus concept. Robots and other machinery on the assembly line may be connected via a Network using the industrial automation protocol known as MAP. General Motors did not think it could depend on a contention-based LAN with a probabilistic message transmission delay time while constructing MAP. The speed of an automotive assembly line is predetermined, therefore it cannot be slowed down because a robot did not get the right information from the Network. As a result, a lot of firms, including General Motors, chose the deterministic token bus LAN architecture.

The token ring, which was first created by IBM, is the third LAN standard. It combines a ring topology with the usage of a token, similar to how the token bus works. Before sending a message, a device connected to the ring must capture the token and take it out of the ring; after the message has been sent, the device lets the token go back into the ring. As a result, collisions are impossible, and there is a deterministic maximum delay before any station may broadcast. A wire center is often used in the implementation of a token ring, into which wires from various devices are inserted to create a physical star but a logical ring. Nowadays, all three wired LAN design types are in use. In the industrial industry, token bus predominates, whereas Ethernet consistently outperforms token ring in office applications. Yet the wireless LAN, to which we shall now shift, is the most popular sort of LAN in the early twenty-first century.

Local area networks wireless. Whilst WiMAX networks are starting to develop, Wi-Fi wireless LANs still make up the majority of current wireless LAN deployments. Wi-Fi LANs are expanding quickly. For those who are always on the go and need Internet connection in public places like airports, restaurants, hotels, and college campuses, Wi-Fi technology is clearly advantageous. Moreover, Wi-Fi is becoming more popular as a home or neighborhood network that enables a variety of laptops and desktops to connect to the Internet via a single broadband access point. Wide-area wireless networks are likely to be based on different technologies, such as WiMAX and other 4G networks maintained by cellular carriers, rather of the several city-wide Wi-Fi networks that were built in the early 21st century. Moreover, wireless LANs have entered the corporate and commercial sector, particularly in older buildings and limited places where setting up a cable LAN would be difficult or impossible or where mobility is crucial. Even in more recent structures, wireless LANs are often used as overlay networks. In many situations, Wi-Fi is implemented together with wired LANs so that staff members may move their computers between offices with ease and access to the network in locations like lunchrooms, corridors, and patios.

One of the standards included in the IEEE 802.11 family of specifications is used by modern Wi-Fi LANs. All of these standards make use of the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) Protocol and the shared Ethernet architecture. Similar to the CSMA/CD used in conventional Ethernet, CSMA/CA goes farther to prevent collisions. Every computer

intending to transmit a message first submits a "request to transmit" to the wireless access point, according to one method of collision avoidance. The WAP replies by providing a "clear to transmit" signal to every computer on the wireless LAN, indicating the duration for which the network is set aside for the requesting computer. If no other computer is broadcasting. Each computer has to have a wireless network interface card installed in order to create a wireless LAN. A short-range radio transceiver, the wireless NIC can broadcast and receive radio signals. The wireless access point, a radio transceiver that serves the same purpose as a hub in a wired Ethernet LAN, is the brain of a wireless LAN. The WAP receives all signals from computers within its range, repeats them to make sure all other computers can hear them, and sends all messages to those who are not on this wireless LAN over the wired network.

There are now four Wi-Fi LAN standards in use, with the most recent one being ratified in 2009. The 5 GHz band is where the 802.11a Wi-Fi standard works, with data speeds of up to 54 mbps. The range of 802.11a is just approximately 150 feet, and only within about 50 feet of the WAP can the 54 mbps data throughput be successfully maintained. The 2.4 GHz band is where the 802.11b standard works, with data speeds ranging from 5.5 to 11 mbps. In comparison to 802.11a, 802.11b LANs generally have a range of 300 to 500 feet. The most popular Wi-Fi LAN protocol now in use is 802.11g, which employs a new kind of multiplexing in the 2.4 GHz band to reach the same range as 802.11b with data speeds up to 54 mbps. In order to boost its data throughput and range, the newly adopted 802.11n standard concurrently employs the 2.4 GHz and 5 GHz frequency bands. The 802.11n standard offers twice the range up to 1,000 feet and five times the speed of prior Wi-Fi standards up to 300 mbps. The good news is that the 802.11n standard is backward compatible with the older Wi-Fi protocols, allowing it to coexist with all of them and eventually replace them all. With its greater speed, coverage, and reliability, the 802.11n standard, according to many commentators, will quicken the trend toward a wireless office environment by replacing wired LANs.

WiMAX, a newer kind of wireless network that is based on the IEEE 802.16 family of standards, is now available. There were around 500,000 WiMAX subscribers in the United States in the beginning of 2010, but Clearwire, the top provider of WiMAX service, anticipates a significant increase in that number over the next several years. The Clearwire WiMAX service, also known as clear, was first made accessible in 27 areas throughout the United States, serving 34 million people. By the end of 2010, Clearwire anticipates that number to increase to 42 markets, serving 120 million people. Practically speaking, WiMAX will function quite similarly to Wi-Fi but across longer distances and with more users.

WiMAX: really comes in two flavors. In order to link a central access point to a collection of fixed networks, such as from a branch office to a central office a few miles distant, the IEEE 802.16d standard for fixed-point wireless access is employed. 802.16d offers a data rate of 40 mbps for up to 20 miles in ideal circumstances, although real data rates and distances are substantially lower. Connecting several Wi-Fi public access points to a main switch so that people may access the Internet is a significant use of 802.16d. The 802.16e standard is created to be direct competition for outdoor Wi-Fi networks by granting access to mobile users. In fact, an 802.16e network works at roughly 4 to 8 mbps, but theoretically, the network could supply up to 15 mbps of capacity and have an effective range of up to 6 miles with a line of sight to the access point or 2 miles without one. Greater-Speed Local Area Networks via Wire. As the twenty-first century goes on, LAN technology becomes better and better. Traditional Ethernet LANs have a peak speed of 10 mbps, while Fast Ethernet, which has a speed of 100 mbps, is presently the most popular kind of Ethernet

in new LANs. The wiring and CSMA/CD architecture of conventional Ethernet are also used by fast Ethernet. The two most often used implementations of Fast Ethernet are 100 Base-T and 100 Base-F, both of which operate at 100 mbps over Category 5 twisted-pair cable. While the Fast Ethernet cable may support full-duplex transmission, half-duplex is often utilized instead.

At speeds of 1 billion bps and higher, Gigabit Ethernet is even more recent and quicker than Fast Ethernet. In backbone networks, which will be covered in the following section, gigabit Ethernet is often utilized. Gigabit Ethernet is now available in two flavors: 1 gbps Ethernet, also known as 1 GbE, and 10 gbps Ethernet, also known as 10 GbE. 1000 Base-T, a 1 GbE operating over twisted-pair cables, uses a clever technique to deliver streams of data in parallel over a single Category 5e connection. When using fiber-optic cabling, there are two variants of 1 GbE available: 1000 Base-SX and 1000 Base-LX, which employ either multimode or single-mode fiber depending on the required distance. In certain backbone networks and in situations where very high data speeds are needed, 10 GbE is currently being implemented. Additionally, IEEE is now working on standards for 40-gbps Ethernet and 100-gbps Ethernet, which are also coming soon. Amazingly, while these ultrahigh speed networks were intended to run over fiber-optic cables, they can also operate on twisted-pair lines. Full-duplex communication is required for the majority of these Gigabit Ethernet networks. As long as Ethernet speeds keep increasing, it is likely to remain the favored networking technology for high-speed LANs and backbone networks.

Radius Networks: Backbone networks are the intermediary networks that link the LANs inside a single organization to one another, to the WAN of the business, and to the Internet. For instance, a major company's corporate headquarters may consist of many buildings spanning several city blocks. A big building could have a separate LAN for each level, or a LAN might span the whole smaller structure. To take use of networking's advantages, such as improved communications, resource and data sharing, and distributed data processing, all of these LANs must be linked. The LANs must also be linked to the WAN of the business and, in most circumstances, to the Internet. The foundation of internetworking is a backbone network. Backbone networks use technology that is substantially the same as that described for LANs, but at a higher level. The used medium, either fiber-optic cable or twisted-pair cabling, offers a high data transmission rate of at least 100 mbps and as much as 1 gbps. Typically, a bus topology is used. The only new vocabulary we need to introduce has to do with the hardware components that link the various components of the network together or link other networks to the backbone network.

The hub, the switch, and the WAP have previously been covered. As we all know, a hub is a straightforward device into which computer connections may be inserted; it can also be used to link one LAN segment to another. Whether or whether they are required to travel there, hubs send every message they receive to all connected devices or Network segments. The main component of a wireless LAN that links the LAN to other networks is a wireless access point. When two LANs utilize the same protocols, or set of rules, or LAN segments, a bridge joins them; a bridge is intelligent enough to only transfer communications that must be sent to the other LAN. A router, also known as a gateway, joins two or more local area networks (LANs) and forwards only the communications that need forwarding. It may also join LANs that adhere to various protocols. For instance, a gateway is used to link the Internet to a company's backbone network. More than two identically configured LANs, or LAN segments, are connected via a switch. Switches are very helpful for combining several slow LANs into a single 100 mbps backbone network. The switch functions very much like a multiplexer in this situation. Cisco Systems, Juniper Networks, 3Com, and Alcatel-Lucent are some of the leading manufacturers of these hardware components.

Area-Wide Networks: Wide area networks, often known as long-haul networks, are necessary for today's increasingly sophisticated, widely distributed enterprises to transmit voice and data throughout their remote activities. A WAN varies from a LAN in that it often belongs to many businesses and may reach considerably longer distances. A LAN utilizes a multiaccess channel, while a WAN uses point-to-point communication. While there are a few exceptions, WANs mostly depend on the public telephone network.

WATS and DDD: The most straightforward method for setting up a WAN is to use regular public telephone connection. For voice and data connections between any two locations covered by the telephone network, Direct Distance Dialing is offered by a telephone provider like AT&T, Sprint Nextel, or Verizon. It goes without saying that data transmission speeds are rather slow, data error rates are quite high, and hourly costs are extremely high. Wide Area Telephone Service is another option. With this service, an organization may use regular voice circuits to make and receive unlimited long-distance calls for a monthly charge. WATS has the same benefits and drawbacks as DDD. WATS does have a little lower cost per hour than DDD, but the client pays for it whether or not it is used, while DDD is only charged when it is. Whereas WATS is utilized for more nearly continuous, slightly larger amounts of data to be delivered at relatively slow rates, DDD is ideal for intermittent, limited-volume data transmission at relatively slow speeds. Rental lines leasing dedicated communications lines from AT&T or another provider is another, sometimes alluring, solution. It can make sense to lease lines to link each of the three facilities to headquarters if a manufacturing business has three locations that are geographically far from corporate headquarters. These leased lines often consist of extremely high capacity coaxial, microwave, or fiber-optic cables, and they are less prone to data mistakes than regular phone lines. The monthly cost of leased lines may be hundreds of dollars for short-distance connections up to tens of thousands of dollars for cross-country connections.

The most typical leased lines, also known as T-1 lines, have a data transfer rate of 1.544 mbps. Organizations must utilize multiplexers at either end of a T-1 line to mix a variety of data streams that, individually, are significantly slower than 1.544 mbps in order to leverage this high data transfer rate efficiently. There are additional leased lines available with capacity greater than T-1. T-2 trunks, which have a 6.312 mbps capacity when four T-1 lines are joined, have mostly been replaced by T-3 trunks, which have a data transmission capacity of over 45 mbps. There are T-3 connections connecting large cities, however they are substantially more expensive than T-1 lines. There are also T-4 trunks, which have a massive 274 mbps bandwidth. Fiber-optic transmission lines, or SONET lines, are the newest and greatest capacity leased lines. An American National Standards Institute-approved standard for linking fiber-optic transmission systems is called Synchronous Optical Network. Table 3.3 shows the data transmission rates for SONET lines. It should be noted that the T-3 rate of 45 mbps is faster than the slowest SONET transmission rate of roughly 52 mbps [8]–[10].

CONCLUSION

Many applications of optical fiber technology exist in the fields of engineering, medicine, photonics, and communications. Because to its performance, low loss, lack of interference, larger bandwidth, and inherent high data-carrying capacity, it has drawn the attention of several researchers. Internet services like Verizon Fios home internet employ fiber optics as a method to send information as light pulses over vast distances via strands of fiber composed of glass or plastic. Compared to other technologies, fiber optics can transfer more data at quicker rates across greater distances. Because of this, it is becoming the standard for contemporary data transfer and

is being utilized in networks for telecommunications companies, internet service providers, and business data centers.

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CHAPTER 11

A BRIEF DISCUSSION ON SATELLITE MICROWAVE COMMUNICATION

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ABSTRACT:

The signals are sent to these satellites in orbit, where they are located, and they retransmit the signal to the proper spot. As it just receives the signal and retransmits it, it serves as a repeater. In this chapter author is discusses the virtual private networks. Satellite microwave communication is a type of wireless communication that uses satellites orbiting the Earth to transmit and receive signals between two or more locations on the ground. It is an important technology for long distance communication, as it enables signals to be transmitted over vast distances without the need for physical cables or infrastructure. Satellite microwave communication relies on the use of high-frequency radio waves, which can be easily transmitted through the atmosphere and reflected by the Earth's surface.

KEYWORDS:

Information Technology, Microwave Communication, Network, Satellite, Signal.

INTRODUCTION

Several major corporations have built up their WANs using satellite microwave transmission. Owners of the satellite or satellites in question include Hughes Communications, Intelsat, Telesat, and SES; the user organization rents a part of the satellite's capacity. The user organization either supplies its own ground stations or rents time on a carrier's ground stations, together with communication links to and from those ground stations. Satellite transmission became quite popular for businesses with several distant sites thanks to the utilization of Ku-band transmission with reasonably affordable very small aperture terminal ground (VSAT) stations. Kmart, Walmart, Walgreens, CVS, Ford, and General Motors are just a few businesses that use VSAT networks. For instance, the FordStar VSAT network links the manufacturer with the thousands of Ford dealerships and is used to send and receive orders and sales as well as company-internal messages and service advisories. One Touch Systems created the one-way video, two-way audio setup that runs on the FordStar network, delivering more than 112 courses and broadcasting more than 70 hours of instruction per day. The FordStar network is also used to deliver interactive distance learning courses to Ford dealer-ship personnel [1]–[3].

ISDN. An Integrated Services Digital Network is a different approach to WAN implementation. An international set of standards known as ISDN enables the public telephone network to provide more telecommunications capabilities to phone consumers all around the globe. The same twisted pairs that are now used in the telephone network are also utilized by ISDN, which is accessible in many parts of the globe. ISDN capabilities are made feasible by technology and software that separate a single telephone line into two different kinds of communication channels at the local

telephone company office and on the organization's premises. A modem cannot carry voice or data at the 64 kbps speeds that the B, or bearer, channel can. Both packet-switched digital data and signal information necessary to regulate the B channels are sent via the D, or data, channel. There are two narrowband ISDN services available. For a single twisted pair, the basic rate provides two B channels and one 16-kbps D channel. Two voice devices and six data devices, any two of which may be in use at once, can be supported by a basic rate line. Across two twisted pairs, the main rate offers 23 B channels and one 64-kbps D channel. Broadband ISDN enables data transfer speeds of more than 150 mbps, while not being generally accessible. Thus, ISDN offers a substantial boost in capacity while continuing to use the public telephone network. The public telephone network is being digitally transformed via ISDN advancements. Yet since ISDN never really took off, other digital innovations like DSL and IP telephony now seem set to overtake it. Nowadays, ISDN service is accessible on a large number of telephone lines in the United States, although it is pricey when compared to DSL and other choices.

Networks with packet switching. Compared to the switched-circuit and dedicated-circuit networks previously discussed, packet-switched networks are quite different. A circuit is formed between the two computers that are interacting in switched- and dedicated-circuit networks, and no other devices are allowed to use that circuit while the connection is active. A packet-switched network, however, allows for numerous connections to coexist at once over a single physical circuit. A store-and-forward data transfer method is packet switching. Messages are transmitted via the common carrier network in packets that are typically 300 characters in length. This packet contains control information that is connected to the front and back and is transmitted across the communications line as a single bundle. As compared to standard voice and data connections, where the full end-to-end channel is occupied for the length of the session, packet switching is considerably different. The network can be utilized more effectively with packet switching since packets from different users may be mixed together. Each packet will be sent along the proper path by the computers in charge of the network.

In order to link the user organization's internal networks to the common carrier network, a packet assembly/disassembly device is used. Of course, using the common carrier network will cost the business money. In other instances, the user organization supplies the PADs and pays a set connection fee plus a price based on the quantity of packets transferred to connect to the common carrier network. In certain instances, the user organization may enter into a contract with a company that oversees and runs the complete WAN for the user organization, including the PADs required at each site. The phrase "value added network" used to refer to this contracting-out technique has mostly disappeared. Currently, a managed network is the typical name for a packet-switched wide area network. Managed network services are offered by AT&T, Sprint Nextel, Verizon, and other companies in the US. There are several packet-switched networks, such as business networks that cater to a specific audience and other networks like the Internet that are accessible to anybody or any organization that desires to purchase the networking service [4], [5].

DISCUSSION

Virtual Private Networks

The equivalent of a private packet-switched network utilizing the open Internet is a virtual private network. As compared to other options, VPN data transfer speeds range from a very low 56 kbps to a very high 40 gbps, however the network's dependability is poor. The user organization installs a VPN gateway on each Internet access circuit to create a VPN and provide its internal networks

access to it. Of course, the user organization is responsible for paying for the Internet service provider and access circuits. The VPN gateways make it possible to establish VPN tunnels over the Internet. These tunnels make sure that only permitted users may access the VPN by using encapsulation and encryption. Low cost and flexibility are two benefits of VPNs, whereas bad dependability is their main drawback. An enterprise has the option of building its own VPN or hiring a third party, like AT&T or Verizon, to manage and run it.

Internet: The omnipresent Internet will be considered last among the network kinds, but surely not least. While the Internet may be compared to a massive WAN, it is much more than that. With gateways to many more networks that do not utilize the TCP/IP protocol, the Internet is a network of TCP/IP-using networks. On the Internet, there were around 733 million hosts as of January 2010. According to Internet World Data, there were almost 253 million Internet users in North America as of September 2009. The Internet offers a great variety of resources, including data and services, and these resources are attracting more users, who are in turn attracting more resources, in what seems to be an endless loop [6], [7].

The U.S. Department of Defense established ARPANET4 in 1969 to connect a number of top research universities, and this event marked the beginning of the Internet. Early 1980s Ethernet LANs with TCP/IP networking appeared, and NSFNET was developed in ARPANET, which was developed by the US Department of Defense's Advanced Research Projects Agency. TCP/IP was first created as part of the ARPANET project in 1986 to connect five supercomputer centers in the United States. ARPANET is responsible for most of the groundbreaking work in networking. As several additional networks joined to NSFNET, it provided as the foundation for the developing Internet. Prior to the late 1980s and the opening of the floodgates in the early 1990s, commercial traffic on the Internet was not authorized. The National Science Foundation stopped supporting the Internet in 1995 and started sponsoring vBNS, an alternative extremely high-performance network that was, in some ways, a precursor of Internet2.

The US government or any other government is not directly connected to the Internet. The Internet Society, a membership-based organization, has the last say. The Internet Engineering Task Force and the Internet Architecture Board are two of the organizations that make up the society, which serves as its organizational home. Similar to how NSF funding has stopped, the government no longer provides assistance for the Internet. Their own portion of the Internet is purchased by users. To access the Internet locally by dialing a local number or using a broadband service like DSL or cable, a person often has to pay an ISP a monthly charge. To connect to the Internet backbone, which is a network of high capacity networks controlled by big ISPs like AT&T, Verizon, Sprint Nextel, Level 3 Communications, and Qwest, the smaller ISPs in turn must pay a price.

Electronic mail, remote login, discussion groups, and resource sharing are the four fundamental features of the Internet that are enumerated. Electronic mail was really the first "killer app" of the Internet the first program that attracted users' attention and convinced them to use it. A cheap, convenient, and asynchronous method of contact with other Internet users worldwide is offered through electronic mail. Instant messaging, a more recent kind of electronic mail, is a synchronous communication system that allows users to create private "chat rooms" with others in order to conduct real-time text-based discussion via the Internet. When someone on the user's private list is online, the IM system typically alerts the user, and the user may then start a chat session with that person. AOL, Yahoo!, Microsoft, and IBM Lotus are significant competitors in the IM business. By using a tool like Telnet or the more secure SSH, a user in, say, Phoenix may log onto a system on which she has an account in, say, Vienna. The Vienna machine will then function just

as if she were there. The World Wide Web, or the Web Hypertext-based tool, which enables users to navigate or surf the Internet by clicking on links contained in one document to move to another document, and so on, is what discussion groups are simply: online communities of Internet users. These documents may include video clips, recordings, photographs, and other images. internet search A software for information retrieval that enables users to search for material that adheres to certain criteria and returns a list of things that do so

Blog

A user-generated website where posts are produced in the form of journals; blogs often provide comments on a certain topic or act as an online diary for individuals.

Wiki

1. A wiki is a website that allows users to add, delete, or edit the site's content, often without the need for registration, making it a useful tool for large-scale collaborative publishing.
2. A social networking site
3. A program that enables users to share their own information and see other people's information

Twitter

Tweets are text-only messages of up to 140 characters that are put on the author's Twitter profile and sent to the author's subscribers, also known as followers. Tweets are a kind of microblogging and social networking that allows users to send and receive messages known as tweets. The most well-organized discussion groups are Usenet newsgroups, which are simply a collection of enormous electronic message boards where group members may read and publish messages. Usenet newsgroups may be accessed through the Web using Google Groups. A listserv is a mailing list that allows participants to send a single email to the whole group and have it sent. As long as users keep in mind whether they are sending a message to a specific group member or the whole group, this typically works out nicely. Use the reply option only if you want your answer to be sent to the whole listserv group when responding to a message!

One of the biggest uses of the Internet is the sharing of data resources. Users may transmit and receive files, including other applications, over the Internet by using the File Transfer Protocol. The account name and password of the distant computer must be known by the user in order to log onto it for standard FTP usage. Nonetheless, anonymous FTP sites have also been created, allowing any Internet user to sign in using the username "anonymous." Most anonymous FTP sites request the user to give an email address as the password out of politeness. The user may transfer any files found at that anonymous FTP server after logging in. While FTP is still widely used today, the World Wide Web, or simply the Web, is by far the most significant application for exchanging data resources. The Web is a hypertext-based platform that allows users to navigate or "surf" the Internet. Every document may connect to another document using hypertext. The referred document may be obtained by using the computer mouse to click on the link, regardless of where it is located: on your own computer, a computer down the hall, or a computer halfway across the globe. In addition, the Web offers a graphical user interface that enables the user to see pictures, photos, sound bites, and full motion video as part of documents on their screen. The user's PC receives all of this content over the Internet. The World Wide Web, the second "killer app" of the Internet, has sped up the already quickening revolution in telecommunications.

The user's computer must have a Web browser application installed in order to access the World Wide Web. This software package enables the computer to connect to a Web server through a dial-

up phone line, a cable or DSL internet connection, or a LAN connection. The most widely used browser is Microsoft's Internet Explorer, as mentioned in 2. A user connects to a "home" server at her ISP or own company when she first logs onto the Web. She can then navigate the Web by clicking on hypertext links or, if she already knows the URL (Universal Resource Locator) of the website she wants to visit, she may type it into her browser directly. She may also use a search engine application like Google, Microsoft Bing, Yahoo! Search, or AOL Search to look for information on a certain subject. She may store Web site addresses, or URLs, that she anticipates visiting often as "bookmarks" in her browser so that all she has to do to go there is click on the relevant bookmark. There was a lot of factual information available on the Web in its early years, but very little of it was of commercial interest. Nonetheless, all important corporations nowadays, as well as many smaller ones, have a sizable online presence. Businesses now have a new channel through which to educate consumers about their goods and services, promote, and interact with current and future clients and suppliers. Sales are increasingly being completed on the Web, especially for items like software that can be sent through the Internet and for items like books, CDs, and clothing that may be delivered by conventional mail or a parcel service. Organizations want to make sure that their sites provide the correct image, therefore designing engaging Web pages has evolved into an art form. See the websites of some of the top companies in any field!

Blogs, wikis, and other social networking apps are modern varieties of communication and debate tools made possible by the Web. A blog is a user-generated website with journal-style posts that are often presented in reverse chronological order. Blogs may cover any topic; sometimes they act as online personal diaries, and other times they provide comments on a specific topic like politics, the environment, or local news. Blogs often include text, photographs, and connections to other websites; sometimes, they also let users submit interactive comments. A wiki is a website that lets users add, delete, or change the material without often requiring registration. A wiki therefore becomes a useful tool for widespread collaborative production. Wikipedia, a free online encyclopedia that can be accessed at www.wikipedia.org, is a fantastic example of a wiki.

The very popular Facebook, MySpace, and Classmates, as well as the more business-oriented LinkedIn and Plaxo, are examples of social networking applications that have really taken off in the twenty-first century. Users can post information about themselves and view information posted by others on all of these platforms. Twitter, a microblogging service that allows users to post and read messages known as tweets, is another well-known social networking program. Tweets are text-only communications with a character limit of 140 that are published on a user's Twitter profile and sent to that user's followers. These more recent iterations of discussion boards and communication tools are collectively referred to as Web 2.0, a term used to describe a generation of Web-based services that place an emphasis on user sharing and collaboration online making use of the internet. How can a single person connect to the internet? The majority of users at work are linked to a LAN, which is subsequently linked to the organization's backbone network and finally to the Internet. There are numerous options, such as working from home or a tiny office. Up until around 15 years ago, connections were virtually invariably made using a 56 kbps dial-in modem. Currently, however, a growing number of customers are using one of the following five newer, higher-speed options: fiber to the house, wireless to the home, satellite connection, cable modem connection, or digital subscriber line. Broadband connections are the collective name for these five options.

A voice call and an Internet connection may both be active simultaneously over a single DSL line because DSL leverages the copper lines that are already established in homes and workplaces to

transmit data over them without interfering with speech traffic. DSL is a service provided by telephone companies. Since it is exclusively utilized for connections from a telephone switching station to a house or business and not for connections between switching stations, DSL is frequently referred to as a "last mile" technology. DSL offers exceptionally fast data transfer rates, ranging from 256 kbps to 20 mbps for Internet downloads to a home or office computer and from 256 kbps to 896 kbps for uploads from a home or office computer to the Internet. Since consumers normally do not transmit as much data to the Internet as they do get from it, the difference between upload and download speeds is typically not a concern. Moreover, since the DSL line is devoted to a single customer, these speeds are assured. An example of the fees is the $50 modem installation fee for Qwest 7 Mbps High-Speed Internet with Windows Live in a Phoenix home. This service offers download rates of up to 7 mbps and upload speeds of up to 896 kbps. If the customer has Qwest basic phone service, the monthly cost is $41.99, and this price includes a Wi-Fi network at home.

In terms of both cost and speed, a cable modem connection is quite comparable with DSL. The service in this instance is purchased via the cable television provider, and the data are sent using the same coaxial lines that are already in use for television. While these cables have far more capacity than twisted pair copper wires, they have historically only been used to transfer data from the cable television provider to the house. The cable television infrastructure has to be redesigned in order to support the two-way data flow needed for Internet connections. Nowadays, a cable modem can provide download rates of up to 28 mbps, but upload speeds are far slower. Nevertheless, due to users sharing the coaxial cable's capacity, cable modem speeds may be reduced. When more residents in a community connect to the Internet, connection speeds grow slower. One cost example is the $60 cable modem installation fee for Cox Communications Preferred cable modem service in Phoenix. This service offers download speeds of up to 13 mbps and upload rates of up to 1 mbps. Cable television service is not included in the $46.95 monthly cost. There is a one-time fee of $90 for up to four PCs for residential Wi-Fi networking.

A satellite connection, the third option, is often more costly than the first two, but for clients in remote locations, it can be the only option. There are two types of satellite broadband connections: one-way and two-way. In order to get one-way service, the user must sign a contract with a wired ISP to receive the uplink at dial-up rates, while the satellite offers downlink support at up to 10 mbps. The satellite uses a satellite dish at the customer's home or place of business to transfer data to the computer for the downlink. Although the upstream component of the broadband service requires a connection to a ground line, the two-way satellite service broadcasts and receives signals directly through the satellite. One example of a two-way satellite service is HughesNet Home, which charges $59.99 a month for download speeds up to 1 mbps and upload speeds up to 128 kbps. Another example is the HughesNet Elite service, which costs $119.99 per month and offers download and upload speeds of up to 2 mbps and 300 kbps, respectively. Every place in the United States with a clear view of the southern sky may access these services. These services come with a $300 installation charge and a 24-month commitment.

A city-wide or neighborhood Wi-Fi network, a WiMAX network, or a cellular 3G wireless connection may all offer WiFi to the house. These wireless solutions have a wide variety of prices and data transfer speeds, although monthly charges are typically between $30 and $60. A more recent option, fiber to the house, is only accessible in a small portion of the country. The biggest fiber-to-the-home service provider is Verizon Communications, which offers FiOS Internet Service. The Verizon fiber to the house service ranges in speed from a quick 15 mbps download/5

mbps upload service for $49.99 per month to a significantly faster 50 mbps download/20 mbps upload service for $139.95 per month, depending on availability. Two years are needed to commit to these initiatives. If the consumer accepts a packaged plan that includes Internet access, TV, and home phone, better pricing is possible.

Cable modem connections initially outperformed DSL in the race to provide high-speed Internet access in the US, but DSL battled back to overtake cable for a number of years. But, in 2009, cable once again took the lead, with 41% of broadband users selecting cable, 33% preferring DSL, and the other users choosing satellite, wireless, or fiber. The number of customers in each of the access categories continues to rise every year, despite the ongoing competition between cable and DSL for market share. Overall, 63 percent of adult Americans have access to broadband Internet at home, up 15% from a year ago. Yet with this rapid expansion, the US does not even rank among the top 10 countries in the percentage of households having broadband access, well behind many other developed countries. With 38.1 broadband customers per 100 residents in 2009, the Netherlands topped the globe, followed by Denmark, Norway, Switzerland, and Korea in the top five. The United States, on the other hand, came in fifteenth with 26.7 subscribers per 100 residents. Also, with an average connection speed of 4.2 mbps, the US ranked eighteenth, behind Korea and Japan which both had speeds of 11 mbps. However, compared to many other industrialized countries, the cost for 1 mbps of internet speed is substantially greater in the United States.

Why isn't the United States using broad-band technology? It partly reflects the reality that delivering a broadband connection is more challenging in sparsely populated areas of the United States. Around 20 percent of American homes lack access to broadband Internet service, and another 5 to 10 percent only have one option for television service: their local cable company. Consumer advocacy organizations think that the dominance of large telephone and cable providers like AT&T, Verizon Communications, Time Warner Cable, and Comcast in the market has reduced competition, which has hampered the growth of broadband in the US. The 2010 National Broadband Plan of the Federal Communications Commission could help steer the United States in the correct direction. If the United States is to catch up in the broadband space, it will undoubtedly take a concerted effort on the part of the government, private service providers, broadband content developers, and others. Intranets. The development of intranets within many large organizations is a significant result of the Internet's success. A TCP/IP-based internal network used by an organization is known as an intranet. An intranet typically consists of a backbone network that connects several local area networks, or LANs. The intranet cannot be accessed from outside the company due to the fact that the protocol is the same, but the organization may use the same Web browser and Web server software as it would on the Internet. People working for the company may or may not be able to access the Internet [8], [9].

CONCLUSION

Because they can penetrate the atmosphere, microwaves are used. This signal can be transmitted to a satellite and used for global communication (more than one satellite is required for this). An artificial satellite called a communication satellite establishes a channel between a transmitter and a receiver at various points on Earth in order to transmit a signal using a transponder. Satellite communications are used in telephone, radio, television, internet, and military applications. The global communications network is not possible without satellite communications. Around 2,000 artificial satellites orbiting the Earth transmit and receive voice, video, and data signals in analog and digital formats to and from a single or a network of locations worldwide.

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CHAPTER 12

INTERNET TELEPHONY GROWS STRONGER

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ABSTRACT:

As compared to conventional telephone, internet telephony has several benefits since it improves company communication by making it more intelligent, adaptable, cozy, and economical. Its ability to integrate different devices, including desk phones and cellphones, is one of its key advantages. In this chapter author is discusses the network protocols. This technology is particularly attractive for businesses that need to make a large number of long-distance calls, as it can save them a significant amount of money. In addition, VoIP systems offer features such as video conferencing and virtual faxing, which can further increase productivity and efficiency. As internet speeds continue to improve and more people have access to high-speed internet, it is likely that VoIP will become even more prevalent and continue to change the way people communicate. However, concerns about security and reliability remain, so it is important for businesses and individuals to choose reputable service providers and take necessary precautions to protect their data and communications.

KEYWORDS:

Internet Telephony, Information Technology, Telecommunication, Server, Web.

INTRODUCTION

Internet telephony, also known as Voice over Internet Protocol, is a significant component of telephone communications, particularly for businesses. The Internet is not simply for data. VoIP enables users to make voice calls through a broadband Internet connection as opposed to a traditional landline. VoIP has the benefit of drastically lowering telecommunications costs. VoIP requires a broadband Internet connection, which may be obtained either via a business network or another kind of broadband connection such as DSL, cable, or modem. To utilize VoIP, all you need to do is connect your current phone to an analog telephone adapter, or analog-to-digital signal converter, which is then connected to your DSL, cable modem, or LAN. These adapters are provided without charge together with the VoIP service by companies like Vonage and ViaTalk.

Another option is to purchase a specialist IP phone that connects directly to a LAN connection; this is a preferred choice for companies. The third option is to utilize your computer as a phone. To do this, you'll need software, a microphone, speakers, and a sound card in addition to a broadband Internet connection on your computer. With this choice, you may contact other computers locally and long distance with no additional cost and download the necessary software for free. But, you must use a VoIP service to connect to the public telephone network. There are several options offered, many of which are extremely affordable when compared to conventional telephone services. For instance, ViaTalk offers a comparable service for $16.95 per month, while

Vonage offers unlimited local and long-distance service in the United States for $25.99 a month. These and other VoIP companies can provide introductory deals with even lower costs [1], [2].

Businesses have jumped on the VoIP bandwagon more quickly than consumers because of the potential cost reductions involved. The two main methods for offering VoIP in enterprises are: In the first strategy, the company purchases the IP phones, Ethernet switches, and servers that power the call-control software and manage the VoIP network on their own. In the second strategy, the company purchases the IP phones but pays for a hosted VoIP service to manage the network. The main providers of VoIP hardware for the first strategy are Avaya, Cisco, Alcatel-Lucent, Siemens, and ShoreTel. With the second strategy, there are several hosted VoIP service providers, such as AT&T, Verizon Communications, and Sprint Nextel in addition to Vonage, Covad Communications, 88, and Avad Technologies, who are all large telecom companies. One estimate is that in 2009, Internet telephony accounted for over 70% of the corporate telephone market. While VoIP telephony is less common for small organizations, it is still an alternative that should be taken into account. Due in large part to customers purchasing bundled services from their cable provider or wired telephone provider, the residential VoIP industry is expanding. The Internet has been referred to as the "information superhighway" by some pundits. It is incorrect, as co-founder and former CEO of Microsoft Bill Gates noted in The Way Ahead, a book he wrote in 1995. The information superhighway has not yet been created; the Internet is only its forerunner. We want enormous improvements in bandwidth, more dependability and security, increased accessibility for the whole population, and more applications before we have a genuine information superhighway. The Internet and the rest of the information superhighway have many more uses than we now realize [3]–[5].

INTERNET2: Although it operates a cutting-edge, extremely high-bandwidth network, Internet2 is actually a non-profit consortium made up of over 200 U.S. universities that collaborates with over 70 top technology companies, 45 governmental agencies and laboratories, and more than 50 international partner organizations to develop and deploy cutting-edge network applications and technologies. The goal of Internet2 is to hasten the development of the real "information superhighway," the Internet of the future. To develop a cutting-edge network capability for the national research community is one of Internet2's three main objectives. allow ground-breaking Internet applications built on a far faster Internet than what we now have guarantee the quick dissemination of innovative network services and apps to the larger Internet community

The "leading-edge network for the national research community" on Internet2 was known as Abilene until 2007. Eventually, in 2007, Internet2 launched a new, even more performant network under the apt but still unclear moniker Internet2. All connections in 3.10 of the original Internet2 network operated at 100 gigabits per second (10 times faster than the Abilene network), making it a very high-performance digital optical network. The Internet2 network was then upgraded once more to include a number of strong, logically distinct, yet connected networks, each on its own overlaid infrastructure: a cutting-edge Internet Protocol network provided by Juniper Networks routers, a Virtual Circuit network provided by the switching capabilities of the Ciena CoreDirectors, and the Core optical network based on Infinera's optical networking platform. Other collaborators in the construction and management of the Internet2 network, in addition to Juniper Networks, Ciena, and Infinera, include Level 3 Communications, which developed and constructed the network, and the Indiana University Global Network Operations Center, which oversees the network. The Internet2 network, which is a backbone network utilized by the Internet2 institutions, effectively connects the regional networks that the Internet2 universities

have created. Any of the marked places on the map may be used to establish connections between these regional networks and the commercial Internet. The Internet2 network is mostly a ring topology, although it has been improved with cross-ring linkages between Salt Lake City and Sunnyvale, Denver and El Paso, Kansas City and Houston, Chicago and Atlanta, and Cleveland and Washington, D.C. The Internet of the future is foreshadowed by the Internet2 network and other Internet2 initiatives.

DISCUSSION

Network Protocols

Just one more significant component of our network puzzle remains. How exactly do the different components of these networks talk to one another? The solution is via the use of a network protocol, which is an accepted set of guidelines or norms that control communication between network components or, to be more accurate, between layers or tiers of a network. Two network nodes must use the same proto- col in order to communicate with one another. As a result, the protocol really makes it possible for network components to interact with one another. We have already come across various methods without really utilizing the term for them. For instance, the four generally used LAN protocols are wireless, contention bus, token bus, and token ring. The major issue with procedures in the past has been their overabundance. For instance, each of the main hardware suppliers, including IBM, developed their own sets of protocols. Systems Network Architecture is the aggregate name for IBM's collection of protocols.

Equipment from different manufacturers, such as Hewlett-Packard or IBM, cannot interact with one another unless they use the same protocols, whether they are IBM's, HP's, or maybe another set of "open-systems" protocols. Standardization so that everyone uses the same protocols is the main problem in integrating computers and other relevant equipment from many suppliers into a network. The standardization and adoption of a set of protocols have come a long way in the previous three decades, but we haven't yet arrived where most analysts had anticipated in the late 1980s. The International Organization for Standardization's Open Systems Interconnection Reference Model, which was created at the time, seemed destined to become the accepted set of protocols. Each of the seven tiers in the OSI model will have its own protocol. The OSI model is simply a skeleton, with some levels having specified protocols and others only having hazy concepts. It seemed like OSI was on its way when all of the major computer and telecommunications vendors including IBM announced their support for the OSI paradigm [5]–[7].

For better or worse, the growth of the Internet's importance and the development of multiple intranets inside significant enterprises in the 1990s ultimately put an end to the drive toward the OSI model. Transmission Control Protocol/Internet Protocol is the protocol used by the Internet and intranets. TCP/IP is a less extensive collection of protocols than OSI and does not form a part of the OSI reference model. It approximately corresponds to two of the seven OSI layers. TCP/IP and the OSI model are both significant for various reasons, thus we will examine both sets of protocols. The OSI model is a fantastic starting point since it offers a very helpful foundation for thinking about computer networks. We shall shift to TCP/IP after studying the OSI model since it is the de facto standard set of protocols for networking in the early twenty-first century, along with a few additional concepts. Reference model for OSI We will quickly cover how data travel between the levels in the OSI model and the function of each layer because of the significance of the OSI model and because it will provide us with a conceptual framework to comprehend how

communication occurs in networks. The OSI model must handle a wide variety of networks and communication methods, which makes it very complicated. Consider the movement of a communication over a network, such as an email message. Before being transmitted across the network, the communication starts at the application layer and progresses through the other six levels. A header is added to the communication before it is transmitted down to the next layer at each layer after the communication has been processed by the layer to fulfill the function for which the layer has been built. These headers include specific details about the communication and how it was handled, including how it was routed via the network. The message is relayed over the network after going through all seven tiers. The communication moves up via the seven levels until it reaches the receiving computer. Each layer processes the message in accordance with its own requirements before stripping out the header for that tier. By the time the message reaches the top layer, it has returned to its original form.

Applied Layer: The function of each of the seven levels will now be discussed. Many communications-oriented applications, such as electronic data exchange, file transfer, electronic mail, and manufacturing floor control, are handled by the topmost layer and are therefore immediately visible to the user. There will always be variances between multiple devices or systems, thus each application needs a protocol implemented in software to make the various devices look to the network to be the same. For instance, all of the devices being used by a group of users to interact through electronic mail must adhere to the same application layer/email protocol. The TCP/IP architecture at least tacitly includes SMTP, which has essentially supplanted the OSI electronic mail protocol, also known as MOTIS, which was used in certain regions of the globe. Prior to transferring the communication to the layer below it, the application layer adds a header, much as the layers underneath it.

Layer of Presentation: The communication is taken in by the presentation layer as it is internally coded by the transmitting device, and it is converted into the format required by the network. Also, if the information is very sensitive, it could be cryptographically encoded. The session layer. Users on various workstations may establish sessions with one another using the session layer. The session layer is not often utilized in apps, but it would enable users to log into distant machines and transfer files between them. Users may get a variety of services through the session layer, such as dialog control and synchronization.

Transmission Layer: The transport layer receives the communication from the session layer, breaks it up into smaller chunks if required, adds special header information indicating the network connection to be used, passes the packet to the network layer, and verifies that all packets made it to the intended destination successfully. The transport layer also manages multiplexing if the network connection needs it for effective utilization.

System Layer: A packet of data is received by the network layer from the transport layer, and it is given additional header information by the network layer to specify the path the packet will travel to reach its destination. The frame sent to the data connection layer is this enhanced packet. The routing of the packets is the network layer's first priority. For the purpose of creating billing information, the network layer often includes an accounting component as well.

Layer of Data Connection: Data frames of a few hundred bytes are used to transmit data to the data connection layer. Next, in order to distinguish between frames, the data link layer inserts specific header and trailer data at the start and end of each frame, respectively. The data link ensures that there are no transmission mistakes by sending the frames sequentially to the physical

layer for real transmission. It also processes the acknowledgement frames that are provided back by the data link layer of the receiving computer.

layer of matter:Bits are sent through a physical communication channel by the physical layer. At this level, electrical engineers are employed, and common design problems include inquiries like how many volts to utilize to represent a 1 and how many for a 0. The overall function of each layer should be clear from this concise explanation of the seven levels. The simplest way to conceptualize this whole process is that the user is completely unaware that the initial message passes through a tiered translation procedure independent of device or system.

The OSI reference model does not include TCP/IP Transmission Control Protocol/Internet Protocol, despite the fact that it closely correlates to the network and transport layers. Several non-Internet networks, including Internet2, the UNIX and Linux operating systems, and Microsoft Windows all make use of TCP/IP. The most significant factor is that TCP/IP is the protocol used on the global Internet and on the vast majority of intranets that are active inside enterprises. The worldwide de facto standard protocol for networking is TCP/IP, not OSI. TCP/IP is not a completely completed paradigm, but rather merely a series of partially built protocols. As a result, computer scientists and other IT experts have created an expanded TCP/IP paradigm. We will first discuss the TCP/IP protocols in isolation before moving on to the broader TCP/IP paradigm.

The seven-layer OSI model's network layer and transport layer are broadly equivalent to the IP and TCP portions of the TCP/IP protocol, respectively. Every message may be accepted by TCP/IP, which then divides it into parts of fewer than 64,000 bytes, delivers the individual pieces to the intended recipient, and ensures that they get there properly and in the proper sequence. TCP/IP anticipates that communication will be erratic since it does not know the precise route the pieces will travel. As a result, TCP/IP has extensive error-checking features built in to assure dependability. The original Internet designers had four levels total in mind for the networking protocol, with the application layer sitting on top and the hardware layer below the middle layers of networking and transit. Practically speaking, this four-layer worldview is not all that unlike from the OSI model: The OSI physical and data connection levels are both included in the hardware layer of the four-layer paradigm, whereas the OSI presentation and session layers are often not employed.

The application layer in this enhanced TCP/IP paradigm contains protocols like SMTP, HTTP, and FTP. TCP is used for transmission, whereas IP is used for networks. The hardware layer follows, and it comprises, among other things, DSL, ISDN, and other LAN protocols. In terms of the common collection of networking protocols at the start of the twenty-first century, this expanded TCP/IP model captures reality. The puzzle of the network is now complete. The ways through which different components of telecommunications networks may communicate with one another are provided by network protocols. So, networks are made up of physical media that are placed in a certain topology and that are part of a specific network type. Communication inside the network is made possible by the use of specific protocols.

Telecommunications and Networking's Expanding Role

We have previously emphasized the crucial importance of communications and networking several times, but to emphasize the point even more, we will talk about how this function is expanding rapidly in businesses right now. In fact, many experts think that the network is the most crucial and significant piece of information technology for the foreseeable future. We'll look at four

operational areas where telecommunications networks are crucial and becoming more important in response to this boom.

Online Activities

Nowadays, a network connects the main operations of many firms to a computer online. Teller terminals for banks and other financial organizations are completely online. When you cash a check or make a deposit, tellers immediately update your account. The bank doesn't care which branch you use since your account is always current, regardless of the city. Insurance businesses do the majority of their home office and branch office operations online, although less clearly. These actions are entered online to the insurance company network whenever an insurance claim is made, paid, a premium is paid, or a policy is changed. Without telecommunications networks, these and other financial institutions simply could not function as they do. Another essential use of online systems is the computerized reservation systems used by the major airlines. In actuality, the big airlines' primary marketing approach is on computerized reservation systems. The airlines and online travel firms advanced beyond the travel agencies in the 1990s by allowing customers to make their own bookings online, thus dodging travel agents completely. These reservation systems were initially intended to be used by travel agencies. Every major airline has a website where customers can book tickets, choose seats for upcoming flights, book hotels, and hire a vehicle. The websites of three main online travel agencies, Travelocity, Expedia, and Orbitz, provide these features in addition to the option to compare prices. These websites give information, handle ticket transactions for practically all airlines, and provide other travel services like booking hotels and rental cars [8], [9].

Connectivity

Major American and worldwide firms are particularly interested in connectivity. Every managerial and professional employee now receives a personal workstation from the majority of large and midsized organizations, and these workstations are connected to a network infrastructure so that each employee has access to every individual and every system with which he or she may need to interact. Connection to individuals and groups outside the company is also crucial. For instance, all of the major automakers have put in place systems that link their distributors to the business so that two-way data transfers can occur and sales variances may be rapidly identified. Also, in order to effectively modify orders, the automakers emphasize interaction with their suppliers. As a result, connection throughout the whole customer-manufacturer-supplier chain is essential.

Electronic Trade and Electronic Data Exchange

Electronic data exchange will be explored in more detail in Chapter 7, but it undoubtedly plays a part in the networking industry's expanding role. Business papers may be electronically exchanged between computers in different firms thanks to a set of standards, software, and hardware. The majority of the time, public networks like the Internet are used to transmit EDI documents. The usage of EDI in the industry of automobiles is perhaps the most sophisticated, but many other businesses and sectors have also embraced this technology. Every use of communications and networking for the purpose of doing business is included in the wide category of "electronic commerce." EDI is within the umbrella of electronic commerce, yet the World Wide Web is where business is booming right now. Online shopping, online ordering, online payments for goods and services, and sometimes online delivery of items are all examples of electronic commerce. On the Internet, there are many virtual shops and shopping centers with a huge selection of goods. There is no end in sight to the growth of electronic commerce via the Internet. For instance, the writers

of this book have ordered software, electronic books, registered for conferences online, booked hotels and flights, and ordered a variety of presents for offline delivery in addition to buying books, CDs, clothing, and other items online. For the majority of customers, online shopping has grown in importance. Electronic commerce is more significant for companies than for consumers, as you will discover in chapter 7.

Marketing

Telecommunications are utilized for several additional marketing-related purposes in addition to electronic commerce. All businesses offer goods and services, yet the distribution methods differ greatly. Sales personnel hired by the company or independent agents allied with the company often handle the sales role. Telecommunications are commonly utilized to help the sales staff in both scenarios. While a salesman is at an office, this assistance is often supplied by a networked desktop computer; when they are traveling, it is typically offered by a laptop computer that can connect wirelessly or through a wired network to the organization's wide area network (WAN) or the Internet. This computer-based sales assistance comprises an application that allows consumers to place orders and monitor the progress of their purchases. It also offers a digital communication channel so that customers may ask questions of others in the company and get responses in real time.

Moreover, online information explaining the availability of a product or service and its characteristics often serves as sales assistance. The sales representative or agent becomes more competitive thanks to this up-to-date information, which also boosts profitability for the company. For a Denver-based Edward Jones financial advisor speaking to a client who is considering buying a stock on the New York Stock Exchange, the significance of this real-time information is obvious. However, it is almost equally important for a parts clerk at an Oregon Honda dealership dealing with a disgruntled customer. The parts clerk may promptly make an order from the nearest warehouse that contains the desired component by using his networked computer to verify the availability of the part at Honda regional warehouses throughout the United States. Customer support is a subset of sales support. The consumer may sometimes have immediate access to online information outlining the features and availability of a product or service. Instant messaging has grown in importance as a tool for customer service in recent years, particularly for online shops and Wall Street stock and bond dealers [10]–[12].

CONCLUSION

As compared to conventional telephone, internet telephony has several benefits since it improves company communication by making it more intelligent, adaptable, cozy, and economical. Its ability to integrate different devices, including desk phones and cellphones, is one of its key advantages. There is no need for significant quantities of expensive gear or infrastructure installation since calls are made over current internet infrastructure. No new desk phones are required, and there is no need to extend cables throughout your office complex or property. According to the current licensing rules, internet-based PC-to-PC calling is not restricted in any way. It is prohibited to utilize equipment like Public Switched Telephone Network (PSTN)/PLMN in India for international internet telephony calls.

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CHAPTER 13

A BRIEF DISCUSSION ON TELECOMMUNICATIONS INDUSTRY

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ABSTRACT:

Businesses that provide telecommunications and services related to that activity are classified as belonging to the Telecommunications subsector. Examples of such businesses include those that offer telephony, including Voice over Internet Protocol (VoIP), cable and satellite television distribution services, Internet access, and telecommunications reselling services. In this chapter author is discusses the cloud computing. The industry includes a range of players, from traditional telecommunications companies to internet service providers and equipment manufacturers. It is also highly regulated, with governments playing a key role in setting policies and standards. The industry is poised for continued growth and innovation as it works to keep up with the increasing demands of consumers and businesses for faster, more reliable, and more secure communication services.

KEYWORDS:

Cloud Computing, Information Technology, Industry, Software, Signal.

INTRODUCTION

The telecommunications industry is divided into three main sectors: carriers, who own or rent the physical infrastructure and provide the service of sending communications from one place to another; equipment vendors, who produce and market a variety of telecommunications-related products, such as cellular phones, modems, routers, hubs, wireless access points, switches, multiplexers, and LAN software and hardware; and service providers, who run networks. The two largest carriers in the US are AT&T and Verizon, with Sprint Nextel, T-Mobile, and Qwest rounding out the top five. Alcatel-Lucent, Avaya, Cisco Systems, Ericsson, GENBAND, Juniper Networks, Motorola, and Nokia are some of the main equipment suppliers. AOL, Comcast, Google, MSN from Microsoft, Yahoo!, and a broad range of ISPs are among the service providers. As a significant historical footnote, the 1984 division of AT&T into the long-distance telephone and equipment-focused AT&T and the regional Bell operating businesses transformed the overall complexity of the telecommunications sector. There was no longer a single monolithic organization in charge of the majority of telecommunications in the United States, despite the fact that the many components that came forth as a consequence of the divestiture were still rather significant. Before to AT&T's split, long-haul communication technology advancements made it economically viable to build long-distance networks that could compete with AT&T's. MCI, Sprint, and other long-distance carriers grew as a result [1].

Significant managerial ramifications for the communications function in a user organization resulted from the AT&T sale in 1984. While working with AT&T for practically all of his or her telecommunications requirements prior to 1984, the telecommunications manager had a

reasonably simple job and received high-quality, dependable service for a set fee. The work became considerably more difficult after divestment. Today, in addition to dealing with a variety of carriers and equipment suppliers, the manager must ensure that all the different components work together. The emergence of new wireless telephone companies, sometimes independent and other times linked to AT&T or one or more of the RBOCs, transformed the scene in the 1990s as mobile telephony expanded. The reorganization of the RBOCs into bigger organizations also started in the 1990s, culminating in the 1999 merger of SBC and Ameritech and the 2000 formation of Verizon from GTE and Bell Atlantic. In the 1990s, several government-owned telephone providers across the globe changed to private ownership. The Telecommunications Reform Act of 1996 enhanced competition for phone service in the United States. The local telephone companies, long-distance telephone companies, and cable television operators may now enter one other's markets within the parameters outlined by the legislation.

The telecommunications sector is seeing even more changes as we go into the twenty-first century. In the United States, the number of mobile phones surpassed the number of conventional house phones in 2004. There were 170 million wired house phones and around 280 million mobile phones in the United States by the end of 2009. There were around 30 million cellphones in use, and that number was increasing quickly. Internet telephony has a significant influence, particularly on the corporate sector. The telephone industry's participants are also evolving. Verizon purchased long-distance provider MCI in 2005, while SBC scored a big victory by purchasing AT&T and renaming itself AT&T. Finally, in 2006, BellSouth, one of the only two RBOCs that had not yet been absorbed by Verizon or AT&T, was purchased by AT&T. Due to the fact that AT&T and BellSouth jointly controlled Cingular, the top cellular provider in the country at the time, the purchase of BellSouth by AT&T was particularly significant. In order to become a cellular provider even bigger than AT&T, Verizon Wireless acquired Alltel in 2008 for $28.1 billion. Despite this, the new AT&T is the second-largest cellular carrier, the leading provider of wired residential telephone service, and the dominating provider of telecommunications services to U.S. corporations. AT&T seems to have been completely rebuilt! Yet, there is a distinction: This time, there is still another large, multidimensional telecommunications company, Verizon, along with Sprint Nextel and T-Mobile, two additional formidable rivals in the cellular market, increasing rivalry from cable companies that provide telephone and internet services, and a number of other businesses. These are exciting times for businesses in the telecommunications sector and their clients, but they are also anxious times [2]–[4].

DISCUSSION

The Newest Buzzword: Cloud Computing

Cloud computing has recently gained popularity among IT suppliers and executives. What is the purpose of cloud computing? Using a network, often the Internet, to access IT services from an outside source is known as cloud computing. The term "cloud computing" refers to the process of procuring some form of IT capabilities from a vendor and delivering them to the client through the Internet. "The cloud" is a metaphor for the Internet. The consumer doesn't care where the real computing is happening from the perspective of the IT capabilities, which are provided by "the cloud." Web browser pioneer Marc Andreessen described the cloud as "a smart, complicated, powerful computer infrastructure in the sky that anybody can effortlessly tap into." There are three fundamental forms of cloud computing, however the specifics are continuously developing. Infrastructure as a Service, often known as utility computing, offers the processing power to supplement or take the place of a full-fledged internal data center. Traditional suppliers like IBM,

Hewlett-Packard, and Sun as well as businesses with significant computer power like Amazon provide these services. Platform as a Service offers virtualized servers that consumers may utilize to execute current apps or create new ones in a development environment as a service. The most well-known examples are Google App Engine, Microsoft Azure, and Force.com by Salesforce.com. The most well-known and often utilized kind of cloud computing is software as a service. Via a Web browser, SaaS distributes a single application to a number of consumers. Examples that most people are familiar with are Google Gmail and Apps, Vonage and Skype VoIP, and AOL, Yahoo!, and Google IM. These kinds of cloud computing, as well as the numerous varieties that exist, all have in common the fact that users are receiving some form of computing capability over a network, most often the Internet. While the name for cloud computing is relatively new, the fundamental ideas are nothing new. Utility computing has been available in some capacity for more than 20 years. In the 1990s, application service providers (ASPs) emerged, allowing customers to utilize "hosted" applications (running on the ASP's server) instead of buying the program and installing it on their own hardware. SaaS has existed since the 1990s as well. Cloud computing is becoming a much more appealing alternative for IT executives who need to be able to quickly increase capacity or add capabilities without investing in new infrastructure, personnel, or software due to the variety of services that are now available or at least currently under development in this space. In some form, cloud computing seems to be here to stay [5], [6].

The Resource for Data

This concludes the section of the book that deals with information technology in Part I. Computer systems, communications, and networking all essential information technology topics were covered in the preceding two sentences. The data that is processed by the hardware and software and transferred across the network both before and after processing is the fourth element of information technology, and it is just as crucial as the other three. In actuality, the other three components are worthless without the appropriate data being recorded, stored, and distributed. This focuses on the crucial data resource. The facts and data that an organization accumulates while doing business and in order to conduct business at all levels of the organization make up the data resource. The data resource's components include the metadata, which describes the data resource's technical and business properties, as well as the numerical, textual, audio, visual, and graphical data gathered from sources both within and outside the company. Data is now considered as a significant organizational resource that should be managed and developed similarly to other assets like infrastructure, labor, and capital due to the diversity and amount of data that is accessible to businesses. In reality, according to a large number of business trend watchers, businesses that manage data and organizational knowledge as strategic resources, recognize the value of data for business choices, and arrange data as well as they do other assets will succeed in the twenty-first century.

More data than ever before may now be gathered by businesses via routine operations, the recording of data transactions from point-of-sale terminals and RFID readers, and through websites for electronic commerce. Also, data is expanding at a tremendous pace. Every 18 months, it's not unusual for a company to double the amount of its data repository. All of this data can only be a benefit if it is accessible, clear when it is no longer necessary, and understood when it is, which can only happen if an organization actively organizes and manages its data. Only after a finance manager and other company managers have budgeted enough money to satisfy the related cash needs are financial resources available to develop a new facility or purchase raw materials. Only if engineers and people management have foreseen the requirement for certain talents in the

workforce can a new product be created. A company would never consider failing to plan and manage its facilities, workers, and capital. Same planning and management are required for data.

Every business manager is responsible for making an attempt to manage organizational data; however, some business managers, also known as data stewards, have specific tasks to manage certain types of data, such as customer, product, or personnel subject area data. Moreover, a unique management division often offers overall organizational leadership in the data management function. This unit is typically referred to as data or database administration. Also, some businesses have created knowledge management departments and hired a chief knowledge officer. Every manager in an organization is responsible for some aspect of the company's finances, staff, tools, and facilities. These controlled assets now now need to include data.

Control Data

The basis for all of these business inquiries is data management. Businesses succeed by acting quickly and wisely, yet they are unable to accomplish this without a reliable data source. See "Hurricane Windfall" in the box. Although the fact that managing data as a resource has many broad business implications, it is crucial for the efficient creation and maintenance of information systems. Inadequate data management is often the cause of poor systems development productivity, and some methods, such prototyping, are ineffective without a clear understanding of the data's origin and availability. Reusing data and programs when new applications are developed reduces the time it takes to construct a system. Data and the programs that collect and manage them cannot be reused unless they are cataloged, identified in standardized ways, protected yet available to those with a need to know, and maintained with high quality. About the data resource, there are management and technological challenges. The technical facets of maintaining the data resource that weren't previously discussed in section 2 are examined in the next part. It is a summary of the most popular data management and description tools used by database administrators and systems analysts. These issues become crucial to all managers when management of the data resource is delegated to the business units.

Technical Aspects of Data Resource Management

The Metadata and Data Model

A comprehensive map of company data, or data model, is a crucial component of efficient data management. A manufacturing corporation would never consider creating a new product without first creating a comprehensive design and, where applicable, utilizing pieces from already existing goods and common components. Data is the same way. Customers, orders, products, vendors, markets, and employees are examples of data entities that may be compared to the elements of a thorough product design. The link between the data entities is shown in the data model, just as it is in the comprehensive plan for a product. A data model displays the policies that govern an organization, including things like whether a salesman must be associated with a customer order, if an employee has to have a social security number, and how many direct reports are allowed for a supervisor.

An approach and a notation are both used in data modeling. The notation is a technique to display these results, often visually, and the methodology contains the processes that are followed to identify and define organizational data items. To ensure that the data you need is planned for inclusion in corporate databases and that the data recorded and saved have the necessary business significance, managers must be actively engaged in these approaches. The next paragraphs present

a number of potential approaches, although the reader is directed to literature on database administration for a thorough treatment of data modeling notations. The most widely used notation for expressing the data requirements in an organization is the entity-relationship diagram. Entities, or the items about which data is gathered, characteristics, or the actual data components to be collected, and connections, or the pertinent linkages between organizational entities, make up this structure. To represent the information that would be gathered about each client, the model may comprise properties for the customer's last name, first name, street, city, and so forth. The ERD is a very helpful tool for easing communication between database designers and developers who will establish and manage the database and end users who require the data because of its nontechnical nature.

An ERD, however, is insufficient to describe data requirements. Just a small portion of the metadata data about data necessary to accurately characterize data for the organization is an ERD. All the business rules that apply to data are documented in metadata. For instance, some meta-data regarding a customer name attribute would define the term, state its properties such as maximum length and the type of data that a value of this attribute might have, whether or not every customer must have a name in order to be stored in the database, whether the name can change in value over time, whether there can be multiple instances of the name, and who has the rights to enter and change the name. Business managers are often the source of the information to design these rules since these metadata rules are inherent to the corporation. To handle the hundreds of thousands of metadata components that are normally present in an organization, you may buy business rules and metadata repository software packages.

Often, business rule software includes more rules than only those pertaining to data. Although producing and maintaining high-quality metadata requires commitment, we cannot guarantee high-quality data without such information. For instance, unless everyone in the company is in agreement on what the characteristic employee wage means, various individuals may interpret its values in different ways. One of the writers of this book formerly had a position in a company where the word "customer" had 17 distinct meanings, each of which was pertinent to a different area of the business. While there were legitimate business justifications for having 17 distinct definitions, it was confusing when individuals believed they were using the same definition but really weren't. This organization requires 17 unique but connected entities. In the end, the company decided to actively manage the metadata for each business topic area by adopting the data steward idea. This made it possible to identify and accept minute variations in client data and to correctly record that data. Customers were overcharged, product markets were misunderstood, and many staff lost time attempting to clear up misconceptions before this was done.

A data model

Data modeling plays a crucial component in the planning of IS. Two distinct strategies—one top-down, known as enterprise modeling, and the other bottom-up, known as view integration—are used in practice. Since they are complimentary techniques that place varying emphasis on various parts of data and, as a result, check and balance each other, many organizations choose to employ both. Independent of specific reports, screens, or in-depth explanations of data processing needs, the enterprise modeling technique entails characterizing the company and its data requirements at a very high level. The organization's activity is first separated into its main functions. Each of these functions is then further broken down into processes, and each process is further broken down into activities. A somewhat high level description of an activity is typical. This company is broken down into three levels.

A list of data items is then allocated to each activity after having a general grasp of it. For instance, the entities product, customer order history, and work center may be connected to the quarterly forecasting activity. The lists of entities are then examined to make sure that each entity's definition is explicit and that consistent names are being utilized. Eventually, linkages between the entities are identified, and a corporate data model is created based on basic company norms and standards of operation. The corporate data model's areas that need the most improvement are prioritized, and more specific task assignments are developed to better explain these areas and update databases in accordance with them.

The benefit of enterprise modeling is that it is not influenced by a lot of specifics, present databases and files, or how the firm really functions right now. It should pinpoint a thorough list of general data needs and be future-focused. On the other side, it could leave out some crucial information, making it incomplete or erroneous. The view integration strategy might be useful here.

Each report, computer screen, form, document, and other output from organizational databases is recognized in view integration. A user view is the term for each of them. Each user view's data pieces are recognized and placed into a fundamental framework known as a normal form. The process of normalization, which reduces complex data structures to simpler ones, follows a set of criteria that produces a data structure that is very reliable and practical for a variety of purposes. In truth, normalization is a technique used to remove problematic abnormalities brought on by the insertion, deletion, and updating of data. When the data structure is optimized, the database may develop with comparatively little modifications to the produced and populated portions. Each user perspective is standardized before being integrated into a single detailed description. This combined collection of entities from normalization should ideally correspond to those from enterprise modeling. Due to the two techniques' dissimilar foci, this is often not the case in reality. As a result, a final data model is created by reconciling the enterprise and view-integrated data models. An alternate method for data modeling that gets around the challenges of beginning from scratch is to start outside of the company and use a general data model created for circumstances like your own. The creation of so-called universal, logical, or packaged data models is the result of years of experience working in many sectors of the economy. Prepackaged data models may be customized to your organization's lingo and operational guidelines. These beginning points for your company data model are offered by consultants and database software providers. One to two senior database analysts' annual salaries are about equivalent to the cost of such a bundled data model. Such prefabricated business data models offer the following important benefits, among others:

1. Data models may be created utilizing tested components that have developed through time. When new types of data are identified in an industry, the supplier keeps these data models up to date.
2. Due to the fact that the fundamental elements and structures are already established, projects take less time to complete and are less expensive.

Prepackaged data models are created using best practices, making it simpler for your data model to change when new data needs are discovered for the specific circumstance. Prepackaged data models are created utilizing hundreds of business queries and performance metrics, so you don't overlook any crucial parts. The majority of the time, if you adapt a data model from your DBMS provider, your data model will be simple to integrate with other applications from this vendor or their software partners. Unspoken needs may be revealed by beginning with a preconfigured data model when posing requirements queries. Prepackaged data models make use of organizational

structures that support broad, flexible views of data rather than specific, inflexible ones, so supporting data management as an organizational resource. It could be simpler to transfer data for interorganizational systems if several businesses in the same sector utilize the same universal data model as the foundation for their organizational databases.

Data modeling techniques are neither easy nor cheap to carry out. They need a significant amount of time, organizational commitment, and the hiring of highly skilled managers and data professionals. Many recommendations have been created to address these worries:

Objective: A clear overriding necessity, such as the coordination of operational data processing, data access flexibility, or the efficiency of data systems, must be used to justify the modeling effort. The likelihood of failure increases as the aim becomes less apparent.

Scope: A data model's coverage has to be carefully and thoroughly thought out. Generally speaking, a project's management is more challenging the wider its scope. There are many options for scope, including division, corporate-wide, areas with specific high-impact demands, and a very significant or willing business function.Outcome A topic area database definition, the identification of shared data capture systems by several departments, managerial and strategic databases and access services to meet various levels of management's information demands, and a more hazy architecture for future databases are all options. The likelihood of success decreases as the degree of uncertainty increases.

Timing: Few businesses have the ability to stop all system development while a full data model is created. For instance, it is feasible to create merely a high-level data model and then add specifics when significant systems initiatives are performed. While the evolutionary method may be more useful, it must be implemented within the framework of a first overall, generic corporate data model. Whatever the method, data modeling constitutes a major departure from the more conventional method of making quick modifications to systems. Business managers often don't care about waiting for a complete data model to be established; they just want access to the data they need. Yet, the consistency and high expenses of improperly handled data will destroy the integrity and sustainability of the data resource unless a comprehensive strategy to data management is followed. It should be obvious that the question of centralized vs decentralized control has nothing to do with data modeling. In reality, the data administration method places a strong emphasis on giving individuals with the most in-depth data understanding the ability to make decisions. Nonetheless, some managers may balk at data planning and modeling because they fear losing power.

CONCLUSION

While computer technology and software have been around for a lot longer than telecommunications and networking, the three fields have combined in recent years to make telecoms more important than ever. The networking period spans the last decade of the 1990s and the first decade of the 2000s. Organizations and people may communicate more effectively thanks to networks, which also make it possible to share resources and data. They are also necessary to construct client/server and distributed data processing systems. Online operations and electronic commerce are only two organizational activities where telecommunications and networking are playing an increasingly important role. There is a strong desire to use ubiquitous connection to enhance corporate communications. Networking, namely the Internet, is at the center of the current communications revolution. Even more so than computer hardware and software, telecommunications and networking technology is exceedingly sophisticated. We have created an

understanding of networks at the management level by focusing on a few important components. Analog or digital communication signals are both acceptable. Data can be sent more easily digitally, and there is now a determined trend away from analog transmission. Networks use a range of transmission mediums and may have different topologies. The Internet, WANs for long-distance communication, LANs for high-speed communication inside a constrained region, backbone networks to link LANs together and to connect to WANs, and computer telecommunications networks are among the primary kinds of networks. For the last 15 years, as the globe has gotten connected, the Internet, and particularly the World Wide Web, have become front-page news. Facilities owned and run by telephone companies and other carriers are crucial to the operation of WANs and the Internet. Protocols must be agreed upon in order for the devices connected to any form of network to communicate with one another. TCP/IP is now accepted as the de facto networking protocol due to the Internet's success.

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CHAPTER 14

A BRIEF DISCUSSION ON DATABASE PROGRAMMING

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ABSTRACT:

If the frontend is about appearance, the backend is about performance. This is determined by the type of database queries written. Database languages, commonly referred to as query languages, are a type of programming language that programmers use to define and access data. In this chapter author is discusses the managerial issues in managing data. The importance of database programming lies in its ability to create efficient and reliable systems that can manage large amounts of data. Database programming is widely used in various industries such as finance, healthcare, retail, and e-commerce, where data management and analysis are critical to the success of the business. With the increasing demand for data-driven decision making, the demand for skilled database programmers is also increasing.

KEYWORDS:

Database, Information Technology, Network, Program, Software.

INTRODUCTION

Both procedural programs written in a 3GL and special-purpose languages created for database processing may be used to specify data processing activities with databases. For a 3 GL application, the programming language's vocabulary is expanded with newer, stronger commands. For instance, adding a new order record to a customer and order database requires not only saving the order data itself but also updating the many links that connect the customer record with the related order records. In a typical 3 GL application, specific instructions would need to be given for writing new data to the customer record, its indexes, the order record, and its indexes. Programming becomes more efficient and less prone to mistakes thanks to the commands made accessible by the unique language extensions the DBMS has supplied. With only one instruction, all the relevant indexes and records are changed immediately [1], [2].

Nowadays, the usage of two special-purpose languages alone or in conjunction with three general-purpose languages is more prevalent. A query language is one of these 4 GL, nonprocedural special-purpose languages used for asking questions of the database. The International Organization for Standardization has standardized SQL as the most popular database for 4GL. Using such a global standard for database query language ensures that programs you build will need little to no modification even if you switch DBMSs. The availability of programming expertise, the prevalence of best practices, and your likelihood of avoiding vendor lock-in increase when you choose a nonproprietary language that is not exclusive to just one vendor. Consider a

scenario in which you need access to the order ID, customer ID, name, and order date for each client order placed since April 12, 2011. An example SQL query to get this result is as follows:

There might be 10 or more process division instructions needed in the corresponding COBOL application. By typing one query at a time and receiving a return for each one, SQL may be utilized interactively. It can also be used in 3 GL applications. SQL may be incorporated into languages like COBOL, Java, C++, and.NET with the aid of the proper tools to process the SQL. When software on both computers understands SQL, middleware will enable SQL in applications on one computer to access data on another computer, even if the SQL processors on the various systems originate from other software manufacturers. Some software keeps SQL a secret. For instance, to access the data required, say, to calculate a sales forecast, fairly complicated SQL code is actually generated by statistical analysis software like SAS and business intelligence tools like MicroStrategy. Since SQL cannot be used to transfer queries and data across computers, XML is often utilized as a data interchange language.

Data interchange between computer applications uses XML to identify and define the data's structure. Since neither system has to be aware of the other's database technology, XML has virtually become a standard for e-commerce data interchange. Data may be transmitted as long as the various companies agree on a data structure and the labels to use for the various types of data.

Web services, a system for exchanging applications and data over the Internet, are built on the foundation of XML. For instance, let's say your corporation, a manufacturer, is a member of a sector where businesses are required to use a standard data format. Let's assume that you enable online ordering for your clients. Your company creates applications, let's say in Java and Microsoft's ASP, to handle orders placed via Web sites. Your order entry software analyzes inventories when a client puts an order to determine whether it can be completed immediately. You would want to be able to verify inventory at one of your suppliers when your warehouse is out of stock. With XML, you can send a document over the Internet to a Web Service on your supplier's computer systems with the product identifier that is being ordered; that Web Service will respond with the description of the item, its inventory level, and any fees related to filling from the supplier's inventory. Your e-commerce site programs may decide what to show to your consumer using this data. In this instance, XML is utilized to specify what data are being sent using labels or tags that are understood by both parties. Nevertheless, neither company is required to be familiar with the other's software, hardware, or database management systems.

DISCUSSION

Managerial Issues in Managing Data

After examining the main technological challenges related to managing data, let's move on to management concerns.

The business manager must understand how to prepare for data, control data integrity, protect access to and use of data, and make data available. As with any corporate resource, reliable sources for data must be found and the data collected; sufficient storage space must be accessible; outdated material must be located, eliminated, or archived; consumption of the data must be tracked; and, if necessary, fines should be levied against those who use it. The business manager should have the tools necessary to handle these problems as well; they are not only concerns for the IS organization.

Guidelines for Handling Data

Understanding a few essential rules is necessary for effective data resource management. The need to manage data Whether they are other companies, individual consumers, or patients, permanent organizations all have customers or clients. There are suppliers, suppliers, orders, reservations, goods, services, and workers regardless of whether a firm manufactures to stock or to order. Moreover, information on customers, suppliers, orders, goods, and staff will remain exist regardless of how accounting, selling, billing, or any other management activity is carried out. A corporation will always have customers, products, workers, and other entities about which it has to preserve current data, even if data values may change, new customers may be added, items may be withdrawn, and people may be recruited and retired. While data existence is enduring and competent data management is always needed, data occurrences are erratic. Both information systems and business processes must adapt to change. Programs will need to be rewritten if the corporation chooses to alter a sales forecasting technique, although customer, order, and general economic situation data are still required. In reality, when a company chooses to alter the way it does business, many of the databases would stay mostly intact provided they are adequately handled. Programs that analyze, process, and report information may also undergo significant changes at the same time. Data are therefore fundamental to business. Data must be handled throughout time since they persist over time [3], [4].

Data May Exist on Many Levels

While the company keeps a ton of data, there may only be a few core classifications of data on which to base the majority of the information. The data pyramid is one method of data organization. While new data might enter this pyramid at any level, the majority of new data are captured in operational databases at the base of the pyramid. The histories of client orders, supplier purchases, internal work orders, general ledger adjustments, staff transfers, and other regular company operations are stored in these databases. Strategic and managerial control databases are often subsets, aggregates, or summaries of operational databases that also include important external data. In a database for sales forecasting, for instance, historical monthly sales totals by product family or region produced from client orders and product data may be included. To develop the sales forecasts required for production planning and scheduling, this data may be augmented by outside economic indicators and sales force assessments.

There may be considerable discrepancies when management databases are built from sources other than internal, common operational databases. For instance, before sending client orders to order entry, the sales organization may monitor them in a local database. They may not take into account canceled orders, orders rejected owing to insufficient credit, returned items, or sales that aren't reached due to insufficient manufacturing capacity if they use these data to anticipate final sales. Since they enter the company at different points of interaction with the consumer, these informational components could not be taken into account. To create an effective sales forecasting system, a well-run firm must take into account all the transactions that determine sales level.

The key to managing the data resource is to have an awareness of the connections between the data in different databases. Instead of being gathered separately, aggregate data should ideally be produced from operational data, and data should be shared across databases from a single source. Later in this article, the systems that fill these databases, transport data, and produce reports are discussed. There are additional separate systems for interpreting levels of data in addition to the concentration on management levels. One such plan, based on the following, focuses on the range

of influence for data: Local Local data are those that are relevant to only one user or a select number of group members inside an organization. Local data often don't need strict supervision or to adhere to corporate norms. It is allowed for local data to be copied across the organization since local data may have a finite lifespan and usage. Shared as shared data are those that are traded between several user groups, there must be agreements among those who share the data as to its definition, format, and time for exchange. Because of a reliance between many organizational units or functions, shared data is present. Core Core data are those that need to be defined and sourced throughout the whole company. Core data may only exist in one copy, but if several copies are made, their production is carefully planned out and maintained. The third level of data classification we examine is based on the distinctions between data and metadata, which are as follows:

Physical: Databases and other file systems store actual data. Computer accessibility, integrity, security, and performance are crucial factors for physical data.

Logical: The vision or comprehension of data required to utilize data is known as logical data. Users are shown logical data through query languages and programs. Logic-based data presentation encourages usability and accurate data interpretation.

Semantic: The metadata that describe organizational data are known as semantic data. Clarity, consistency, and shareability are crucial concerns for semantic data.

These and other data level consideration approaches are beneficial because they let us concentrate on certain data elements without having to take them all into account at once. Yet, if the scheme being utilized and the level being addressed are not apparent, talks regarding data might be unclear or confusing.

Application Software Should Be Separate From

In this, the transformation of data into information is compared to the transformation of resources for raw and component materials into finished goods in a manufacturing organization. Raw data are recorded or received, quality-checked, and then kept in the operational, or raw material, warehouse. Any permitted information product is produced using data that is in storage. As contrast to raw materials, which are consumed when utilized, data are downloaded from the warehouse as required. Operational data are updated with fresh data when they become dated. In a slightly different way than in our manufacturing scenario, snapshots of data are regularly transmitted to a long-term data warehouse in order to analyze trends and patterns.

The long-term data warehouse enables previous transactions to be understood not only in the context of the present situation but also in the context of the characteristics of customers, goods, facilities, and the like at the time of the transactions. When permitted, information is moved from operational and historical sources to other areas of the business or to outside organizations. Similar to the entrance of things into completed goods storage, information is added to the warehouse when data are processed into it. The raw material warehouse is used by all operations and work centers to develop information products, although each work center may have its own inventory of data that is still in use and may receive certain types of data that are not shared with other applications. As a result, data are organized, controlled, and, hypothetically, stored centrally, where they may be maintained secure and clean for usage by the whole company [5].

Software for applications must be controlled separately. Data are not trapped within apps, where their structure and significance are obscured from other programs that need them, when they are handled independently.

Application Software Can Be Classified by How

They Handling Data: According to the idea of application independence, there are three categories into which diverse data processing applications may be divided: data collection, data transmission, and data analysis and display.

The following phases are involved in the transformation of data into information usable for transaction management or higher-level decision making:

data gathering Applications for data capture collect information and fill databases. In the data pyramid, they manage and store data. Each data should ideally be recorded just once and thoroughly checked for correctness and completeness. The organization may share responsibility for guaranteeing the caliber of data collecting systems. Applications for localized data collection are created when there is just one purpose for the data or when cooperation between units is not necessary. An inventory of data items must be kept for all database contents since localized data may eventually be helpful elsewhere in the organization. Data exchange Applications for data transfer and integration transport data from one database to another or otherwise combine data from several databases to satisfy a processing requirement. Due to the fact that they link similar databases, these programs are often referred to as bridges or interfaces. After raw data has been collected, it may be retrieved, modified for new uses, and then imported into other databases where it is kept for certain uses.

For instance, information on client orders may be kept in a number of topic or target area databases that support customer service, invoicing, and production scheduling. Moreover, this kind of application distributes copies of the original data in addition to extracting and summarizing data. Ideally, this transfer would be event-triggered, meaning that whenever new or modified basic data are gathered, messages are sent as required to any other databases that rely on those data to inform them of the changes. Data presentation and analysis Applications for data analysis and presentation deliver information and data to authorized individuals. Data may be reformed into graphs, summarized, compared to historical data, or placed into word processor-generated publications. A decision support system or executive information system may accept data as input. Applications for data analysis and presentation may access any and all data that the business manager who is viewing the presentation is permitted to see. Data and how it is presented should be treated independently, and those who choose the format for display shouldn't necessarily be in charge of where and how it is captured and stored.

Application Software Must Be Taken into Account

Disposable: The development of disposable apps is an important outcome of application independence. Since applications and data are so integrated in many firms, outdated systems cannot be readily replaced. An inefficient system may need to be maintained alive just for its data access capabilities when the presentation capabilities of an application system become outmoded but the application also stores data that are crucial to the company. Because of application independence, a business may individually change the capture, transfer, and presentation software components as needed. Presentation systems provide management with commercial value even though they are often the most unpredictable forms of applications. In addition, company managers

may tailor their own presentation and analysis tools to suit specific demands using contemporary programming languages and system generators.

Once Data Should Be Captured

The concept that data should be collected from a single source and, even when not shared from a single common database, synced across separate databases is another consequence of the separation of data from applications. To capture the same data several times and reconcile variances across apps would be just too expensive for a business. For instance, a university recently found that 12 separate systems had recorded a student's home address when it reviewed its application systems. It was calculated that duplicate data handling would cost several hundred thousand dollars annually. The management of the data resource is therefore made possible by an IT architecture based on application independence, which is one way to look at the data architecture. An organization's data architecture need to include a list of all the ways that data is used by the various business divisions. To meet the analysis and presentation requirements of diverse user groups, the design should also incorporate a strategy for data distribution to multiple databases. Since that is the most effective architecture for delivering data to consumers, the same data may be kept in several databases. Key business data should be collected just once, and then transmitted across databases as necessary, to guarantee that the data are up to date, accurate, and synchronized throughout the company.

Tight Data Standards Must Exist

Data must be properly recognized and specified in order for all users to understand what data they are editing since the same and comparable data are utilized in a variety of application software. Moreover, the contents of shared databases and data transmission systems must be clearly specified and explained. The development of a clear and practical method for uniquely identifying each instance of data and for giving all data a clear business significance is the main task in managing the data resource. A company must, for instance, be able to distinguish between data about one consumer and data about another. Also, the meaning of information like the product description and specification must be precise and unambiguous. the five categories of data standards that must be defined for a business: use rights, identifiers, names, and definitions. Business managers, not IT managers, have the expertise needed to establish these standards, thus they should take an active role in the process. This involvement often takes place via the position of data steward, which is held by a business manager in charge of the data quality in a certain topic or process area.

Identifier An attribute of a business object or event known as the identifier differentiates one instance of this entity from all other instances. A unique bill-of-lading number, for instance, clearly distinguishes each shipment, and employee numbers are distinguishing characteristics of each employee. Applications in several departments of a company often use various IDs for the same object. There is no issue as long as all of the systems' identifier values exactly match one another, however this is not always the case. An identity that is guaranteed to be distinct and stable over a lengthy period of time is desirable. For instance, a hospital could want to identify a patient using their social security number. Also, since they are unstable, meaningful data identities are often not preferred. For instance, if a client relocates or changes principal companies, a customer identification number based on geographic area and standard industrial classification code will no longer be acceptable. So, it makes sense to utilize a meaningless, sequentially issued number as the identifier and additional descriptive data like location and SIC code.

Naming Each kind of data stored in organizational databases must have unique names that have some significance. The meaning of two data components with the same name will be unclear to users. Business managers will believe that these are independent bits of data if the same data element is referred to by multiple names that are never related. Many businesses create a naming strategy or template that they use to create all of the names for their data, using standard phrases for the various components. An employee-monthly-pay data name, for instance, identifies the entity, the time period, and the kind of data. Each of the three parts of this data name would have a limited vocabulary; for instance, the time period may contain values like daily and weekly and be denoted by one of many acronyms. Standard names let users quickly identify the data on a report or in a particular database and make naming new data pieces easier. Definition There is an explanation provided for each data object and element that explains what it means. The definition need to be applicable to all business users and situations. Surprisingly, words like "client," "employee," and "product" may not have the same meaning in every context. For instance, does the term "customer" relate to someone who has made a purchase from you or to a future customer? Definitions must be created via examination by a wide variety of organizational units since over time, several business units may have formed their own meaning of such words.

Integrity is king.

Each data element's acceptable range or set of values must be obvious. The meaning of the data that is communicated by data definitions and names is enhanced by these integrity constraints. For instance, a data field called region is likely constrained to a range of acceptable values based on sales territories or some other fictitious concept. Also, individuals who are creating all data collection apps may utilize a single, centralized standard for correct numbers to find errors. The integrity rules may also describe who may approve deviations or under what conditions values outside of the valid set can be approved since exceptions may be permitted.

Right to use

These standards specify what may be done with each kind of data when and by whom. These security guidelines outline the authorized usage of each category of data. For instance, a company manager could only be permitted to see the employee-monthly-pay data element about herself and those under her direct supervision, during normal work hours, from an approved device. These data standards need to be kept in a standards repository, often known as a data dictionary or directory. Users may learn more about organizational databases thanks to this unified library of info about data. The DD/D should be used by database management systems to access and approve the usage of data.

Master Data Should Be Compliant: Almost all databases and information systems make use of common data topic areas and often supplement that common data with local data that is exclusive to that application or database. The same values must be used consistently throughout all apps that utilize this shared data, including those for customers, products, employees, invoices, and facilities, otherwise various elements of the company cannot communicate with one another without becoming confused. The disciplines, technologies, and procedures used to guarantee the relevance, accuracy, and quality of reference data both inside and across different topic areas are referred to as master data management. MDM makes sure that everyone is aware of the most recent information on a product's description, an employee's pay, and a customer's billing address. Sharing transactional data, such as client purchases, is not addressed by MDM. In most cases, no one source system has the "golden record" of all pertinent details about a data topic. For instance,

client master data from customer relationship management, billing, ERP, and bought data sources could be connected. MDM chooses the most reliable source for each individual piece of data and ensures that every application uses the same virtual "golden record." For master data management, the identity registry, integration hub, and persistent approach are the three most often used designs. The master data stay in their original systems when using the registry technique, and apps consult the registry to find the agreed-upon source of a given piece of data. The registry aids each system in finding related master records in other source systems that match its own master record. As a result, a database may need to let additional apps to access it, and each application may need to visit many databases to obtain all the data it requires. The integration hub strategy involves broadcasting data updates to all subscribing databases through a single service. Each application does not have to gather and keep all the data it needs; redundant data are preserved, but methods exist to assure consistency. One consolidated record is kept as part of the persistent method, and all apps use that one real "golden record" to access the shared data. As a result, it takes a lot of effort to both go to the persistent record whenever any system requires common data and to transfer all data collected in each application to the persistent record so that it always has the most current values. All data uses, from operational to business intelligence, are supported by MDM. With an effective MDM, there is never a delay in any application learning any master data information. A company must have a solid data governance framework, often including data stew- ards, for MDM to be effective. Later, we'll talk about data governance [6], [7].

MDM necessitates data management discipline.

But does MDM provide results. The main advantage is that there is only one true version of important organizational data that the whole company may use. With only intended redundancy, there are fewer mistakes, misunderstandings, and wasted efforts when attempting to resolve disagreements across business divisions and with stakeholders. Moreover, when master data are not adequately handled, changes to important data values or even data models may have a significant effect. Moreover, MDM makes it much easier to meet the data quality criteria of numerous laws, including Sarbanes-Oxley, HIPAA, and Basel II. This is an illustration of the reasoning behind customer master data management and a robust data governance program: Consistent data drive better data matching, better matching drives better customer identification and model construction, better identification and modeling drive better customer inter- actions and campaigns, better interactions and campaigns yield higher hit ratio, and higher hit ratios result in more revenues. MDM serves as the chain's hub [8], [9].

CONCLUSION

As comparison to spreadsheets, databases are a far more effective way to store and organize data since they provide a single location that can be immediately shared among many users and readily amended. Database software is used to build, modify, and manage database files and records, making it simpler to create, enter, edit, update, and report on files and records. Data storage, backup, reporting, multi-access control, and security are other functions handled by the program. To learn full stack or backend development, database programming is a prerequisite. Understanding how the data is stored might be helpful for front end programmers as well.

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CHAPTER 15

A BRIEF DISCUSSION ON DATA MANAGEMENT PROCESS

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ABSTRACT:

Data collection, processing, validation, and archiving. combining various data kinds, both structured and unstructured, from many sources. ensuring catastrophe recovery and high data availability. regulating how individuals and applications access and utilize data. In this chapter author is discusses the data management policies. Data management is the process of acquiring, storing, organizing, maintaining, retrieving, and using data in a secure and efficient manner. It involves various techniques, tools, and procedures to manage data throughout its lifecycle. The process starts with data acquisition, which involves collecting data from various sources, such as sensors, databases, or third-party services. After that, the data is stored in a database or a data warehouse. Data organization involves structuring and classifying data to make it more manageable and accessible.

KEYWORDS:

Database, Decision, Information Technology, Resource, Signal.

INTRODUCTION

A manager of real estate, people, or cash is knowledgeable about the fundamental yet crucial tasks required to manage such resources successfully. The general functions for managing any company resource. Each of these tasks is examined in the context of data management in this section. It's crucial to remember that, just as with other resources, every business manager should participate in some capacity in each of these roles for data. Data linkages between business units and functions are mapped out via data resource planning. There will, as with other plans, be a macro-level data plan, sometimes referred to as an enterprise data model, to identify data entities and relationships among the entities and more specific plans to set timetables for the deployment of databases for various elements of this blueprint. The strategy specifies the types of data that are needed, how they will be utilized, where they will be used within the company, and how much data is anticipated. After that, this strategy must be communicated to all business departments engaged in data resource management. For instance, this timetable, together with data and processing volumes, must be sent to system capacity planning so that sufficient computer and network technologies may be set up to run and access these databases [1]–[3].

For each necessary data piece, decisions must be taken on the quickest and highest-quality source. Should client sales information, for instance, be gathered at the point of sale or entered later? This decision will be influenced by worries about mistake rates, frequency of updates, the possibility of lost paper documents, technology costs, training requirements, and a variety of other issues. When acquiring data from sources outside the company, it is important to take their reliability, cost, and timeliness into account. For instance, many market research companies may gather competition

sales information from retail locations or telephone polls. The original source, the accuracy of the data, the timing of when the data are required and when they were gathered, the precision and detail obtained, and other aspects should be examined when choosing an external data source. Choosing data sources is often influenced by a master data management program. Data capture systems must be designed to obtain and retain this data after the best sources for the data have been identified and chosen. Any databases that hold the updated data must be notified of the change. Consumers of the data must be aware of when the data are updated and potentially be alerted automatically when unusual circumstances arise. To monitor data capture and transmission, the proper application systems must be constructed. Assume, for instance, that telemarketing suppliers receive electronic files containing client list data for a promotional campaign and send back results via the Internet. To ensure that all files were delivered and received, that every client on the list was contacted, and that a status was obtained for each, a system is required.

Define/Describe and Inventory Determining what is being managed is a fundamental stage in managing any resource. Each property must be specified for a real estate management, standards and scales must be established to specify the dimensions and geometries of each structure or piece of land, and terminology must be established to refer to various parts of each building. A format for storing and reporting must be specified, each data object, element, and relationship must be defined, and the structure of the data must be detailed so users can access the data. As previously noted, it is necessary to maintain a metadata inventory catalog, often utilizing a DD/D, where all data definitions and descriptions, volume statistics on data, and other data on data are saved. To learn what data are available and what they imply, all users may visit the metadata repository and data dictionary. Databases must be organized and made accessible in order for data to be effectively accessed, reported, and presented in the manner demanded by business management. Data should be organized and kept to make it simple to create information. While the majority of the job is relatively technical, business managers are best suited to carry out this duty since it requires a clear understanding of how the data may be used. What data are needed and how the data are to be picked are the two components of data consumption that are important for appropriate organization. For instance, database designers need to know if consumer data will be chosen based on markets, regions, items purchased, sales representatives hired, or any other factors. When the data organization is well-tuned to the processing needs, orders of magnitude faster processing may be obtained. Of course, making sensible database design decisions may also significantly lower the cost of data processing and maintenance.

The data warehouse is one very common approach for making data available to many individuals in an organization for decision-making and business intelligence. 4.7 describes the recent implementation of a data warehouse by a sizable division of a furniture company. The business had a number of legacy software systems before the data warehouse was built, and each one included data that was challenging to extract but was required by other business divisions. Likewise, it was challenging to examine the data included in these application systems due to the manner the data were arranged. A data warehouse was established, from which specific data from each installed system as well as data from newly constructed systems were routinely taken and added to the operational store. The data were transmitted to the data warehouse after being cleaned up and structured at this facility for analytical applications. As a result, analysts have access to historical data from every factory and for all product lines. The furniture company is starting to utilize data mining methods now that it has a data warehouse in place to help with tasks like analysis and forecasting. In the long run, it is anticipated that the establishment of this data

warehouse would increase forecasting efficiency and decrease wasted analyst time, yielding a 31 percent return on investment. See the section on data warehousing called "Birth of a Legend."

Control Quality and Integrity The data resource must be subject to quality and integrity controls, much as with staff certification, financial record audits, and examinations for dangerous chemicals or structural flaws in structures. Application independence indicates that these restrictions must be implemented during data collection and maintenance and kept as a component of the data definitions. As part of the audit of financial records, databases should also be checked on a regular basis. These audits for data quality, like other quality assurance duties, should be given to a company that is not directly in charge of storing and maintaining the data.

When data are seen as a company asset, data quality is an extremely important problem. The data should be cleaner the more they are utilized to support organizational processes. Data quality issues, for instance, might result in improperly managed relationships and missed revenues when the data are combined with a customer relationship management tool. CRM, data warehousing, and enterprise resource planning systems all depend on data. The caliber of the procedures carried out by these systems is directly correlated with the caliber of the data. Initiatives to improve data quality, such as master data management, may be challenging to explain. These applications seem to be overhead. Hence, where are the advantages? Benefits often result from increased trust in the information. Faster decision-making is a result of more confidence. Less time spent reconciling data, more customer satisfaction, and eventually lower expenses and higher profits are some other advantages. The rights each manager has to each kind of data must be established in order to protect and secure it. Definition, retrieval, insertion, deletion, update, and retrieval of the datum alone or in conjunction with other values are only a few examples of privileges for using data. For instance, a company manager could have access to everyone's salary in his department but not be able to link earnings to individuals. Programs, databases, files, specific records or data items, terminals, and workstations may all be given privileges. The hours of the day and the days of the week may have an impact on how you may use other tools, data, and software. The choice of who has the authority to do what with data requires striking a careful balance between the requirement to safeguard its integrity and quality by preventing loss or theft of a priceless asset and the right of people to have simple access to the data they need for their employment. Since security is so crucial and may become dysfunctional if handled incorrectly, it should be taken into account when databases and application systems are first established, rather than as an afterthought [4], [5].

DISCUSSION

Account for Use

Due to the high cost of data collection, maintenance, and reporting, these expenses must be determined and a system of accounting developed to record them. Also, a company may decide to divide the expenditures across the proper responsibility areas. Compared to other information resources, accounting for the use of data is particularly challenging due to two factors. First off, it often happens that the principal consumer of the data is not the organizational unit in charge of collecting it. Second, since data are not consumed during consumption, utilization is shared. The operating system and database management systems are able to record the precise expenses of computer processing time and disk storage. The main challenge is creating a fair payment structure that encourages proper data management without preventing useful usage. The linking of easily observable expenses to value is challenging because the value of data is so elusive. It is possible to at least estimate the expenses associated with data processing and storage, as well as who

consumes particular data. Of course, how to set prices to pay these expenses is a different and more challenging problem.

Upgrade, Recover, and Restore

An asset is often refurbished and put back into use when it becomes dated or damaged. When new technology or methods render an employee's abilities outdated, the person is trained for the new environment. The same methodology applies to organizational data. Procedures must be in place to restore the database to a clean and uncontaminated state when it is damaged due to a hardware or software problem. In order to facilitate speedy restoration, frequent backup copies of the database are often generated, and an electronic history of database modifications is maintained. When a database is briefly unavailable due to a recovery or upgrade, the business manager must plan ahead for what needs to be done in the organization. The business manager must also be able to identify any incorrect actions or choices that may have been made as a result of the flawed data and remedy them before they result in excessive expenses or other issues for the company.

An inventory control manager should promptly assess if work, purchase, or accelerated orders should be recalled if, for instance, an inventory file has been incorrectly updated and inventory replenishment orders have been made. This is because a lot of data history must be maintained. Although certain information must be preserved in live databases, some information may be archived and utilized only as required. Data should eventually be condensed, removed, and/or sent to the data warehouse. In addition to being expensive in terms of storage space, keeping data for too long might skew projections and other studies. With the rise of data warehousing, a new method of storing data to support organizational decision-making has emerged. For instance, since the late 1980s, Walmart has been keeping data in its data warehouse. Walmart is in the advantageous position of being able to evaluate and anticipate from more than a decade's worth of purchasing habits, even if this may not be ideal for many firms. Every firm need to establish a data retention policy that is consistent with its data usage and strategy.

Training and Advice for Successful

Data may not be utilized wisely just because they are available. Business managers who could utilize the data need to understand what data are kept in databases, what they signify, what presentation systems convey this data, and how they can be accessed in ad hoc methods. This training might include a study of the corporate data dictionary's contents with a focus on a specific user group, or it could focus on using a statistical package to access a database for decision assistance.

Data Governance Guidelines

Each business has a unique way of putting these data management principles and procedures into practice. Nonetheless, guidelines for data management and ownership should be created. Typically, the development of these regulations comes through a procedure known as data governance. Data stewardship, or the process of establishing strategy, goals, and rules for corporate data, falls within the purview of data governance. This includes supervising local data stewards who are in charge of carrying out comparable tasks for certain data topic areas or business units. IT governance, which will be examined, is a subset of data governance. With cooperation and a shared objective, data governance aims to establish and sustain an enterprise perspective of data. Daily data management efforts are subject to high-level control under data governance. A data governance council, made up of representatives from IT and other important business domains, including data

stewards, often oversees data governance. This council meets frequently it does not convene on the fly to discuss important matters. The council establishes guidelines by which choices may be made on a daily basis on metadata, data ownership and access rights, data infrastructure and architecture, and other topics. The council informs executive management of opportunities and difficulties. Senior executives who see the benefit of managing the data asset give the council its mission. Moreover, the council notifies project managers, administrations, data stewards, and other internal information system stakeholders of its choices. In order to assess if new rules should be formed, current policies should be better communicated, or policy violators should be dealt with, the council may also audit that the policies and procedures it develops are being followed and may evaluate monthly reports concerning data quality.

In the modern world, a data governance council may be in charge of making sure that the rules governing the caliber of financial reporting are backed by reliable data quality management techniques. To guarantee accurate and trustworthy information, policies must, among other things, be transparent, have a clear set of enforcement guidelines, and be continuously implemented. Such laws place a lot of emphasis on internal controls. In order to ensure that changes to data and metadata are correctly handled and that fraud and security breaches are prevented, the data governance councils monitor that adequate data integrity controls are set up on databases and metadata repositories. Essentially, it is exceedingly difficult to demonstrate compliance with financial reporting laws if suitable controls are not applied to data. Let's now go through two of the most important data governance policy areas: data ownership and data administration.

Data Ownership: For both professional and personal reasons, such as the following, company managers may become too possessive of data. the need for maintaining privacy protecting trade secrets as a need the demand that only those who need to know be permitted to see confidential business or product blueprints the desire to encourage intra-company rivalry and to defend the utilization of limited resources the desire to demonstrate dedication to one's employment and ownership of the information required to do one's job the ambition to obtain political advantage via the exploitation of information

Both good and terrible come from this protectiveness. To get the most out of managing the data resource, a commitment to high-quality data, cost-effective data administration, and the use of data for strategic advantage are crucial. On the other side, being too possessive of data might prevent data exchange, which can restrict access to data and raise overall company data processing expenses. Data resource management requires that the data culture be controlled. Data ownership management is based on a corporate information policy. 4.8 includes a data access policy statement created in late 2000 for a significant Midwest truck component company. This policy was devised by the president and the chief information officer when it became apparent that many managers were not disseminating data that might benefit other employees. All managers were informed of the new policy via a number of printed announcements and employee meetings. According to this strategy, each manager is in charge of handling data as a resource for the benefit of the whole company, not just his own department. While the tendency is to make all data organizational, certain regulations will establish distinctions between different kinds of data, such as personal, departmental, and organizational data.

Data management may be significantly impacted by questions of foreign rules, norms, and cultures pertaining to data ownership as enterprises and the markets they service grow increasingly global. In the subject of data ownership, one particular issue—the control of data flow across international borders—is pertinent. Transborder data flows are electronic data transfers that take place across

national borders in order to process, store, or retrieve data in another country. Data are governed by exporting nation's legislation. Transborder data flow regulation legislation varies greatly from nation to nation. These laws are justified by the alleged need to stop economic and cultural imperialism, which includes stopping social values from changing and stopping multinational headquarters from usurping local authority. They also serve to protect domestic industry, including the local computer hardware, software, and services industry, as well as individual citizens' privacy by shielding them from the storage of private information about their health, employment, and other matters. Tariffs, the creation and implementation of regulations by the ministries of commerce and communications, and formal application procedures for carrying out data processing operations domestically are all examples of control mechanisms for transborder data flows. There is often no one administrative entity with broad jurisdiction, and there is limited overlap across national systems. While many practical issues are reduced by international standards groups for electronics, computer languages, and data communications, policy issues must still be resolved, often independently with each country.

Data Administration: In order to manage data more effectively, several corporations have established a unit to oversee their activities. This group is often referred to as data administration, however other labels could be used. While alternative organizational models are available, this group often reports to the IS director as a staff unit. The business should, in any event, have a data governance policy that specifies the responsibilities of the data administration group and business managers with regard to data administration.

The most effective rules are those that provide the data administration group both operational and restricted planning responsibilities. Data administration aids in database architecture to make it effective for processing needs. Here, the team collaborates with systems analysts, designers, and users to pinpoint the needs for next databases and database technology. Operational databases, data warehouses, databases used for e-commerce, and mobile apps may all be handled by different data administration professionals. Both technical and managerial professionals, typically with great experience and with high regard within the company and within IS management, should be included in the data administration group [6], [7]. To determine or coordinate data management from policy to execution, the data administration group should be a high-level function. A strictly technical team that is simply focused on database structure optimization may not be able to handle the variety of problems in data management.

The following should be among the data administration group's primary responsibilities:

encourage and regulate data exchange. All business divisions should be encouraged to define data and enhance the usage of shared data sources for various application systems. The group should attempt to establish the proper ownership for each kind of data and the duties that each data owner should be responsible for. Data sharing and privacy may need to be traded off by an organization. Examine the effects of application system modifications when data definitions change. As the application independence notion is often not completely implemented, programming changes may be necessary as databases evolve and change. The demands of all database users must be taken into account when developing a timetable of which systems need to be modified. preserve metadata.

Data administration must update already-existing data definitions and create definitions where none exist when a metadata repository and data dictionary are launched. The dictionary has to be updated when new information is provided, when ambiguous definitions or inadequate formats are

discovered, or both. Minimize processing and data duplication. The group should promote deleting unused copies of data and the programs that keep them, syncing ostensibly redundant copies, and managing data distributed throughout the organization's numerous computer systems. Boost system development productivity and lower system maintenance expenses. Data administration should strive to provide user-friendly database organizations, use database technology that requires less programming, and educate database analysts and programmers on the most recent techniques. These initiatives need to enhance the creation and upkeep of application systems.

Boost data security and quality. The group should assume a leadership role in this matter, assisting business managers and the data governance council in developing data quality standards, establishing security clearances, and putting these regulations into practice by working with data center operations. The integrity of the data. Databases must be regularly reviewed by data administration to ensure that data integrity has not been jeopardized. The fear of data corruption has increased due to the rise in Internet-based hacking, making routine inspection essential. The database administrator is the key person in charge of managing computer databases within the broader data administration role. He or she can be assigned to the technical department that supports different hardware and software for systems.

The following factors are important to the DBA: database management system tweakingchoosing, assessing, and learning database technologies design of a physical database invention of techniques to repair databases after damage placing databases physically on certain computers and storage devices the connection between databases and other technologies like telephony

Data Protection and Privacy

Organizations nowadays are finding it necessary to have privacy policies. Companies that gather data globally over the Internet must take care of the privacy of such data due to legislation being implemented in the European Union and the United States. The rapidly expanding crime of identity theft, in which private information is often acquired through hacking business systems, has led to the creation of several of these laws. Large-scale data center breaches have also led to the enactment of several new regulations.

Data accuracy, security, and purpose restriction are often mandated under data privacy laws. This is extended by legislation passed in California in July 2003. According to California Senate Bill 1386, firms that suffer a security breach must tell Californians if there is a possibility that private information was improperly accessed. While only California is now covered by this statute, additional states and maybe the UK are likely to follow. Every international business with clients in California is required to abide with this regulation. Due to the recent implementation of data privacy regulations, many firms lack data privacy policies and are thus subject to legal action. Companies must be aware of who is permitted access to the data in order to appropriately manage data privacy.

Finding authorized users on the Internet may be a difficult undertaking. Also, businesses must be able to track access to the data by keeping track of who is seeing it and denying access to anybody who shouldn't be able to. To solve this serious issue, software development is only getting started. Yet there are data breaches. Records of employees, health insurance claims, student academic and loan information, and customer data have reportedly been taken through misplaced laptops and through computer system hacking. More than 160 severe data thefts were reported by US businesses and government organizations between January and August of 2006. In these situations,

it could be required for the company whose data was stolen to pay potentially high prices for identification and credit monitoring services for the impacted parties [8], [9].

CONCLUSION

The design, development, and management of the data resource's technological and managerial challenges have been highlighted. In today's enterprises, the data resource must be treated as an asset. To profit from this crucial asset, the worth of the data must first be acknowledged. After that, the data must be organized and structured. In order to clearly describe organizational data, the data model was established. The database designer and the business management can communicate more easily thanks to the data model. With the help of this kind of graphical model, it is possible to describe personal, departmental, and organizational data. Corporate leaders should make sure that their organization has a model like this. Moreover, comprehensive metadata must be maintained to define corporate data and the laws governing it. Three different categories of data management systems—those that acquire, transport, or show data—have been distinguished in key ways.

The advantages of wider data sharing include increased flexibility, the ability to simply dispose of certain systems and extend the life of others thanks to the separation of data management tasks. Eventually, policies pertaining to the data resource are created via data governance techniques. Particular emphasis should be placed on issues relating to access, backup and recovery, privacy, and data quality. The obligations for data security and privacy must be balanced with the demands of business management to utilize the data. In order to safeguard the data resource and increase the potential rewards to be gained from it, careful attention to these regulations is necessary.

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CHAPTER 16

IMT CUSTOM MACHINE COMPANY: SELECTION OF AN INFORMATION TECHNOLOGY PLATFORM

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ABSTRACT:

One aspect of the company's overall technology strategy is the choice of technology. This process entails examining the business case and selecting the technology or technological stack that will best address the issue. In this chapter author is discusses the data flow and functional responsibilities. They specialize in creating machines that are unique to the specific needs of their clients, and they have a team of experienced engineers who work closely with customers to develop and build machines that meet their exact requirements. IMT Custom Machine Company offers a wide range of services, including design and engineering, prototyping, fabrication, assembly, installation, and commissioning of machines.

KEYWORDS:

Data Flow, Information Technology, Machine, Signal, Tool.

INTRODUCTION

From her executive office on the second floor, June Page saw a thunderstorm approaching from the west in October. She also considered the ominous cloud looming over her information systems department as she turned to a mounting pile of papers. There has to be action taken. Committee after committee has examined critical systems issues and suggested gradual fixes. And Page often gave the suggestions her approval because she had trust in her employees. Yet soon another "glitch" always appeared to appear, necessitating the appointment of another committee. She saw that "something vital was lacking." "We don't know where we want to go or how to get there for IS; we don't have a strategic orientation. We need to finally understand where we want to go with our information systems. Page worked as the division manager for a subsidiary of the International Machine and Tool USA Corporation and was a vice president of the company. Large, highly customized manufacturing machines costing millions of dollars were produced by the IMT Client Machine Company.

These devices were used in the production of many pieces for huge objects like vehicles. As division leader, Page oversaw three factories: two that produced around 150 machines annually, and a third that produced smaller machined components for the two factories. Within the division, a service and spare parts department supported the repair and maintenance business for any bespoke equipment, even those produced by IMT's rivals. The biggest bespoke machine manufacturer in North America was located in the Fort Wayne, Indiana, facility where Page worked. Early in September, Page made the decision to hire a seasoned engineer to learn about the IS operations, look into every problem, and come up with a recommendation or at the very least, some options for her to consider in order to get IS back on track. Charles Browning was the ideal candidate for the job, she knew, even if she had adopted an unconventional method. Browning was

a staff engineer who completed his MBA at a prestigious Midwestern institution. He had a strong foundation in scientific computers. In the Fort Wayne facility, he reported to the manager of development engineering [1], [2].

On September 3, 2002, Page had charged Browning at a meeting:

I need you to evaluate the whole IS situation and provide me with three or four fundamental directional alternatives that will meet our IS demands for the next years. After six weeks, you must provide a report on your results. Prepare to tell me the truth. I'll go through the results with you before incorporating one of the solutions into my 2003 business plan. There shouldn't be any restrictions on the kinds of suggestions you make, Charlie. Page sought to bypass any managerial layers that could have been excluding the underlying causes of IMT's IS issues by employing Browning. She thought Browning had his report done when she received a knock at her office door. The Sector of Custom Machines The increase in production capacity for American manufacturers of bespoke manufacturing machinery is outlined in Exhibit 2. There has been a definite rising trend in production capacity expansions up to the middle of the 1970s. But, when industrial output in wealthy nations slowed, the rise in the machines' global demand started to drop.

The need for American-made bespoke machines rapidly decreased as the market share of domestic industrial production enterprises fell. All of a sudden, excess manufacturing capacity was a reality. Plans for several additional facilities and extensions were scrapped, and underused plants started to be targeted for closure. After 1975, annual capacity additions decreased. Annual capacity increases have decreased below the early 1960s level by the mid-1990s. When the 2000 numbers were made public, analysts predicted that capacity expansions would be almost nonexistent. Williamson Machines and Engineering Corporation, which held about 30% of the U.S. market, closed its "medium horizontal"-type machine factory in Cleveland, Ohio, in 1983 as a result of the industry slowdown. It then transferred its medium horizontal production capability to its lone remaining custom machine factory in Fort Wayne, Indiana.

The Fort Wayne factory was built in the early 1970s expressly to produce a "big vertical," a sort of specialized machine that is comparable but technically distinct. General Engineering, Inc., which had previously been a direct competitor of WILMEC in the industry, stopped producing bespoke machines in 1988 after shutting its Detroit, Michigan, facility. General Engineering transferred its manufacturing machinery to WILMEC's Fort Wayne facility after selling its technology to the latter. A third, quite distinct technology known as "big horizontal" also began being produced at Fort Wayne as a consequence of WILMEC's technology purchase from GE. Assembling one-third of its medium horizontal machines was now handled by WILMEC's Chicago-based specialized machine reconditioning department, which had also grown at this time. All three special machine types large horizontal, big vertical, and medium horizontal—were being produced at the Fort Wayne site by 1990.

Beginning in late 1993, WILMEC shifted the emphasis of its strategy from the machine manufacturing sector to a number of service sectors. In the middle of 1995, WILMEC sold International Machine and Tool of Bonn, Germany, all of its bespoke machine engineering, production, and sales activities. International Machines of Germany and Tools of Commerce of Italy, two of Europe's leading machine manufacturers, merged in 1987 to become IMT. Throughout the late 1980s and early 1990s, there were several factory closures and mergers that affected both the US and Europe. By 1995, the U.S. market's custom manufacturing machine production capacity had basically stabilized at 95% of the amount of demand. A considerable rise in demand

would result in capacity issues and delay delivery, as was true for the majority of cyclical businesses. In fact, according to some industry watchers, the bespoke machine business may resume a significant construction program by 2005 [3].

DISCUSSION

International Machine and Tool

In many aspects of its business, International Machine and Tool followed the organizational design of other large, multinational corporations with European headquarters. IMT's chairman, Dr. Wilhelm Schlein, described the group as "a federation of national companies with a global coordination center a distributed organization with many homes." Schlein's approach to creating a decentralized, multidomestic enterprise was essential to realizing IMT's motto of "think global, act local." IMT has a country-based matrix structure on one side. Financial objectives for all of IMT's firms in a given nation were the responsibility of each country manager. Presidents of the countries managed links between IMT operations there. They were also in charge of maintaining connections with representatives of the national administration. The business group, a distinct international technology management group, reported via the second side of IMT's matrix, which was technology-based.

Each BG's goal was to enable shared operations and expertise across several international manufacturers operating in the same sector. BG executives acted as business strategists who established international "rules of the game" and then delegated execution control to local managers. Two of the eight worldwide custom machine factories owned by IMT in 2002 were situated in the US. Almost half of IMT's worldwide capacity is produced in the U.S. The Chicago and Fort Wayne facilities' combined capacity was far more than that of any other country. The U.S. country manager and a Custom Machine BG manager, who sometimes had competing objectives, were Page's two matrix managers. She had to boost return on assets to help the U.S. country manager, but the BG head also pushed her to keep her position as the company's IT leader. Like other bespoke machine firms, Page's division gave the BG a portion of revenues in exchange for funding international R&D initiatives.

R. June Page

Page was well-known and well-respected in the custom machine sector and had more than 18 years of expertise in custom machine engineering. At WILMEC, Page had progressed through a number of engineering and production management roles earlier in her career. She has always been involved in the business, serving as chair and member of many professional organisations' technical committees. Page did not, however, actively participate in IMT's usage of its information systems. She only used a computer for personal usage to create brief papers, keep a calendar, create and evaluate reports, send emails at work, and browse the web from home. She believed that using the personal computer at her workplace for more than 50 minutes a day was difficult due to her demanding schedule. IMT Custom Machines Company, Inc., the IMT subsidiary in the United States, named Page vice president in 1999. The IMT-USA holding company in New York, which in turn reported to the IMT international headquarters in Bonn, served as CMCI's reporting channel on the "country side" of the matrix. The business group's main office was in Milan, Italy, and Page answered to the managing director of the Custom Machine BG on the BG side of the matrix. Soon after beginning their new positions, Page and the other division managers collaborated with the president of IMT-USA to create statements of the company's purpose, values, and vision that could

be applied everywhere. The IMT-USA President released the final version of the document after extensive debate and several amendments.

The Plant in Fort Wayne

Throughout the previous 25 years, the work climate at the Fort Wayne facility was, to put it mildly, lively. During that time, the facility went from being a bustling single-product manufacturer to a stagnating business that was on the verge of going out of business owing to a lack of orders. A facility that supported three technically distinct products each coming from a different business and having a separate engineering design system evolved from it a short time later. IMT's Fort Wayne operation had roughly 1,200 workers and was operating at or close to capacity in 2002. Cleveland, Ohio served as the headquarters for all engineering and marketing activities for the Fort Wayne and Chicago factories until the mid-1990s. IMT shut down its Cleveland location in 1995 and relocated its technical and marketing team to either Fort Wayne or Chicago.

In order to address everyday problems, a variety of informal processes formed as the Fort Wayne factory expanded to service several product lines. Notwithstanding the incompatibilities between the three various machine technologies, these undocumented processes which used three different drawing systems as well as exclusive manufacturing processes performed well enough. During the final several years of WILMEC's ownership, very little money had been spent on modernizing the operations. In reality, a significant capital improvement wasn't even contemplated until IMT had finished buying WILMEC. Significant renovations were never possible due to low margins and severe capital budget restrictions.

The informal procedures thus remained under IMT control as business executives concentrated on making the transaction profitable. The facility was restructured at the beginning of 1996 into three "machine-type" product lines, each of which functioned as a distinct product line and profit center. The mission statement for CMCI was finished in June 1997 by Edward Fortesque, the company's quality assurance manager. The company's restructure was finally taking shape.

Information Systems at CMCI

Soon after receiving his accusation from June Page, Charles Browning started his investigation. He had discovered a lot of information on the information systems in Fort Wayne and Chicago by the middle of September 2002. Engineering systems and management information systems groups were formed to provide support for Fort Wayne's information systems. Eight of the 25 individuals that answered to Dr. Michael C. King, the Development Engineering Manager for Fort Wayne, made up the ES group. Engineer-trained, Dr. King was regarded as a leading industry authority on the creation of automated fabrication techniques.

Bill Gears, who in turn reported to Joe O'Neil, the division MIS manager, received direct reports from twenty members of the MIS support team. A single-person MIS "group" was in place in Chicago, and it answered to O'Neil. O'Neil received his reports from the division controller's team. O'Neil was a former IBM employee with substantial mainframe and IBM AS/400 platform experience. In the years before moving to Fort Wayne in 1998, he served as the MIS manager at another IMT location. On July 30, 2002, O'Neil sent a note outlining his goals for the Fort Wayne MIS group to the senior division and plant managers. "I do not have a specific purpose for the MIS group, but basically I am aiming to offer an adequate, responsive, and affordable network structure of data processing support for all locations within the division," O'Neil said to Browning later.

Browning discovered that the division was supported by a number of Computational Tools

Everyone in the division was free to utilize the division's IBM mainframe, which was situated in Fort Wayne. The division's overhead included the whole cost of the mainframe's leasing and ongoing maintenance. New engineers and other professionals were given a mainframe user account, a PC with a board allowing it to interact with the mainframe, and several PC software programs for local work when they joined the business. Under a 5-year lease, the mainframe was delivered in March 1999. The requirement for faster reaction times for computer-aided design and an increase in user volume led to a mainframe upgrade in 2001. Between 1999 and 2001, the manufacturing and front offices connected 65 additional users to the mainframe.

A second IBM AS/400 belonged to CMCI and was a gift from General Engineering. Data transfer between the two mainframes was tried as soon as the acquisition was made, but the process proved challenging. The majority of transactions included "drawing" data from one system into another. While a method to "push" data to the other system was present, its purpose remained unclear. The receiver's data file may be modified without the user's awareness, which was another deterrent to using AMSERV. As a consequence, concerns about data security made it more difficult for the two systems to share data. Similar data files were required on each system in sequential applications where data were produced on one system and consumed on another. Staff members who work in drawing and engineering have used the mainframe the most often since 2001. On the mainframe, IMT Fort Wayne used an IBM CAD program. The 65 percent of mainframe utilization is for the CAD application and other drawing and engineering applications. The 54 percent of the mainframe's CPU capacity was reported to have been used overall in August 2002.

Also, the section made extensive use of personal computers. Anybody who need a PC could get one at Fort Wayne, according to company policy. There was no need for a financial explanation since Computers were seen as tools. The typical PC setup in Fort Wayne consisted of an inkjet printer linked to the most recent Intel processor running the most recent version of Microsoft Windows, the Microsoft Office program suite, and a number of other well-known applications. PCs were bought from a local source on a three-year lease. Many customers believed that the adoption of PCs had somewhat made up for the MIS group's inadequate mainframe software support and the long systems development time. For instance, important work centers in the manufacturing used spreadsheets on Computers to schedule production. Nevertheless, a lot of PCs were primarily used as a "dumb" interface to the mainframe for database queries or email sending. Moreover, engineers and secretaries often utilize PC word processing to make documents. Around 210 of the 300 users on the mainframe in Fort Wayne were using PCs to access it. CAD users made up the remaining users.

Also, the section featured strong individual workstations for technological work. Six IBM workstations were in use by the development engineering team in Fort Wayne as of 2002 for special projects. With a local area network, they were linked. Also, throughout the previous year, a number of Sun workstations were connected to the Network. For routine manufacturing tasks, employees at the Chicago location employed 18 IBM CAD workstations. Moreover, 25 Sun and IBM workstations were available in Fort Wayne for the creation of drawings. Fort Wayne's mainframe was used to store drawings created on workstations in Chicago. These drawings were uploaded and downloaded through a high-speed dedicated telephone connection. Tom Goodman, the MIS support guy in Chicago, told Browning, "I feel like we are the beta site for bringing sites together. Chicago's designers enjoyed their CAD stations, but they were having difficulty with the connection between the mainframe and the Chicago LAN.

Functional Duties and Data Flow

The generalized data flow between the Fort Wayne operation's key functional units. Only the human resources department of the seven functions was disconnected from the primary information flow. The following six organizational divisions took part in a continuous flow of information in consecutive order. The exchange of company information began with the customer-marketing relationship. When a technical description or specification for a new machine was given to IMT, the information came directly from the client. The specification might range in size from five to several hundred pages. After reading the specification, a marketing engineer would input it into a mainframe negotiating program based on how they understood it. The negotiating software, which was inherited from WILMEC, was developed in COBOL and needed the entry of data from roughly fifty computer displays. Marketing utilized PowerPoint and Excel on their computers for presentations. A marketing engineer would contact a design engineer or another regional authority if they had a query regarding a specification. The majority of estimations have to be completed in 10 working days. Negotiations were sometimes highly frantic due to the sheer number of requests and the fact that there were only two engineers on duty, covering the whole United States. A marketing engineer named Mike Truelove said to Browning, "We do our hardest, but sometimes we miss certain things. After obtaining the business, we almost always return and bargain with the client over what we overlooked.

A query system using data from the negotiating program was another widely used mainframe application. Data from active talks as well as contracts that had already been won or lost were analyzed using this method. The majority of the business support systems were housed inside the administration and finance department. Applications that were used by buying, receiving, and other groups included the purchase order, accounts payable, and accounts receivable systems. The General Engineering MIS department had designed each of the three systems from scratch on the AS/400. While wages and salaries were kept on the local level, payroll was handled by an outside data service provider. Human resources exclusively utilized standalone computers as of 2002. In order to manage HR functions, such as benefits and pension/investment plans, HR planned to establish a LAN that ran specialized corporate applications. Due to security concerns for the private personnel data kept on HR's computers, there were no plans to link the LAN with Fort Wayne's mainframe [4]–[6].

Conditions for Production

Every machine the business produced was electrically and mechanically specifically constructed to meet a customer's precise requirements. When combined with the complexity of the technical and economic constraints, customization needs necessitated the use of advanced computer tools for modeling and design work. For each of the three different kinds of bespoke machinery, Fort Wayne has a distinct design system in 2002. Each product line's design engineers were specialists in their respective software.

Receiving the data that had previously been put into the negotiation software electronically was the first stage in design engineering. The operation included obtaining the information records from the negotiating database. The design engineer went through the customer's specification again and chose which new information should be included in the design program's input files. The engineer then carefully evaluated and often updated the design that the software had developed. The electronic computer file and a paper folder with completed project forms were forwarded to a drawing supervisor for completion after the engineer approved the design.

All of Fort Wayne's design systems were created by the ES group. A relative indicator of system size and complexity was the total number of procedures employed by each of the three systems. There were around 500 routines in the big vertical, 400 in the medium horizontal, and 2,400 in the large horizontal. In Fort Wayne and Chicago, all drafting was performed using a CAD application system. The CAD software operated on the local IBM workstations in Chicago and the IBM mainframe in Fort Wayne. There were 18 CAD "seats" in Chicago and 85 CAD "seats" in Fort Wayne. Further software has been created during the previous five years to automatically accept output from design applications and produce drawings of common components in CAD or references to drawings. This method was used to develop around 60% of the drawings for the typical 4,000 components per machine. A draftsman had to use the design parameters to construct the last 40% of the drawings. Before being sent to the manufacturer, all tasks were reduced to drawings.

The material specification was included on a typical component design. The bill of materials was included in assembly work orders. The creation of the automated drawing programs was very straightforward since CAD and the design applications were on the same platform. There are things we have been able to accomplish with this architecture that would be impossible if the duties were divided between two distinct systems, development group engineer Jennifer Velan told Browning. The BOM was manually entered into the DBOMP BOM database system after all of the designs for a bespoke machine were finished.

To manage bills of material for the vertical type machines, Fort Wayne significantly changed DBOMP, which was initially created by IBM. DBOMP's limitations forced many "work-arounds" when the production of the medium and large horizontal machines was moved to Fort Wayne, for instance when the General Engineering large horizontal technology was moved there, it was found that DBOMP could not handle the longer General Engineering drawing numbers. Moreover, nobody in Fort Wayne had sufficient knowledge of the DBOMP code to alter the program. The Fort Wayne shop floor's work-in-process inventory management system was very constrained and only functioned for products needed for the main aisle assembly area. It could not handle stock goods; it could only handle custom components. In order to have items delivered, a main aisle supervisor would request a "pull" from the storeroom. Each feeder aisle had its own tracking system, which was either manually maintained or maintained on a spreadsheet. The data were manually fed from the DBOMP onto the mainframe that housed the WIP main aisle tracking system.

With the exception of the fact that it functioned for all stocked inventory items for the main and all feeder aisles, the components inventory system was relatively constrained and comparable to the tracking system. It followed the same procedure as the WIP system. In order to support the quick changes taking place in the Fort Wayne facility, the MIS department was behind schedule. During emergencies, most system improvements took 3 weeks, whereas non-emergencies took 6 to 9 months. Paper systems were developed to satisfy the information demands when a computerized system was unable to offer necessary capabilities.

All bespoke machines were thoroughly tested in Fort Wayne or Chicago, and the testing was seen by an employee or representative of the client organization because each custom machine required a large expenditure of between $2 million and $8 million. Every machine was confirmed to have complied with the customer's test requirements stated in the specification by the test department and the witness. The test department received a hand-delivered schedule and other test-related material. On a form that was translated from or copied directly from the client specification in

marketing and engineering, test information was recorded. The marketing department sometimes failed to correctly interpret the customer's test requirement specification, which was the test department's main grievance. IMT might be forced to pay well over $100,000 for a test that was either unneeded or unsuccessful because the customer's request was misunderstood. Many personal computers linked to a Network were present in the test department. While the mainframe was also linked to every PC in the test department, this connectivity was seldom utilized. The quality assurance department at Fort Wayne, which was in charge of the data and production of the test reports sent to clients, included the test department in its purview. However, only the LAN of the testing department retained electronic test result data. The test division looked after its own LAN programs.

Staffing Problems

About the company's information systems staff, Browning discovered some new data. The programmers at MIS had strong experience in RPG for the AS/400 and COBOL. Nevertheless, none of them had any familiarity with the UNIX operating system or the associated programming languages. Four of the 14 programmers had more than 25 years of Fort Wayne experience, two had about 12 years, and the other eight had only three years or less. Four of the engineers in the development group who supported the engineering system had some UNIX experience. They all had extensive backgrounds in scientific computing. Every engineer has worked for the firm for more than 10 years. One of the engineering systems group's newly hired programmers was well familiar with UNIX. During his investigation, Browning overheard a number of remarks that seemed to imply that Fort Wayne's MIS and engineering systems employees always managed to make the systems function despite the frequent modifications.

In 2001, Fort Wayne turned a profit for the first time in a number of years thanks to the use of informal systems, workarounds, and an amazing amount of human effort, according to Browning. In Fort Wayne, things were starting to stabilize slowly as the unofficial processes were being improved and codified.

The division of the business into three product lines has made it easier to define the goals and objectives of the operational systems and processes. Essentially, the fact that each product line was given autonomous power and responsibility was the main reason many staff members observed success. Support for computer systems, however, remained a problem. The MIS group supported everything else, whereas the engineering systems group supported engineering and drawing. Since the corporate MIS division in New York backed the HR organization's applications, it was not thought of as a local problem. The PCs and other computer gear for all the functional groups throughout the plant were maintained by a small staff in MIS [7].

CONCLUSION

The objective of recruiting is to build a big pool of people who are accessible and eager to work, while the objective of selection is to separate out or exclude those deemed unqualified to satisfy the job and organizational criteria. The term "system selection" refers to the process of choosing computer hardware, software, system software, internet access, and a network based on how a business needs to handle information. One aspect of the company's overall technology strategy is the choice of technology. It is an approach that entails examining the business case and selecting the technology or technological stack that would most effectively address the issue.

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CHAPTER 17

SUPPORT FOR ENGINEERING AND DRAFTING SYSTEMS

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ABSTRACT:

Drafting is the process of creating a sketch or other visual representation of a machine, building, or other structure in order to plan how it should be built. The design and manufacture stages both require drafting. In this chapter author is discusses the new marketing and negotiation system. In addition to software, organizations require hardware that is optimized for engineering and drafting applications, including high-performance workstations and servers. Support for engineering and drafting systems includes providing technical support, training, and consulting services to ensure that organizations can maximize the benefits of their software and hardware investments. This support is essential for ensuring that organizations can remain competitive in today's fast-paced business environment.

KEYWORDS:

Drafting, Feedback, Information Technology, Machine, Program.

INTRODUCTION

Browning also came across a heated argument over where to put the engineering and drafting systems' IT support. On a legal pad at his desk, Browning listed the three options that came up during the discussion: In the engineering support systems group: There were compelling arguments in favor of keeping support for engineering and drafting within the development engineering line of responsibility. For each of the three product line technologies, models were created using design and drawing software. These design systems were primarily supported by three engineers with strong computer backgrounds. Two of the three had engineering master's degrees. Support for these programs needed a delicate balancing act between programming, inventiveness, and expertise in specialized machine construction. The ES engineers were able to update the systems quickly by cooperating closely with the user engineers in the product line. The MIS programmers' lack of knowledge of the underlying design technologies alarmed the engineers. According to certain engineers, the MIS staff may make code modifications that "would cost millions to fix after a design was committed and the components were built."

The fact that product line engineers had in-depth first-hand knowledge of how the system was utilized was one justification for product line support of engineering systems. Feedback on issues would thus be clearer to people who backed the scheme. Additionally, it may be claimed that each profit center should have ultimate authority over the program. Depending on their own plan, they should be able to choose how much computer help they get. A programmer would need to be moved from the engineering support systems group to each of the product lines if the engineering systems support duties were divided among the product lines [1]–[3]. A common accountability point for all computer support and integrated applications was provided by the alignment of all computer-related functions in one functional group, according to the MIS group's arguments for

MIS-based support of engineering and drawing systems. Product line and development engineers would need to submit more well detailed change requests. Assistance from MIS would ensure better documentation of code modifications. The MIS community argued that if product line engineers were in charge of support, the end result might be "spaghetti code," which only the original programmer could understand.

Browning learned that Page had been given the mandate to require her subsidiary to utilize a newly developed set of German bespoke machine design programs as early as 2002. The BG management team decided that it was appropriate to implement a standard procedure for bespoke machine design at each factory. The German applications were ported onto a UNIX workstation platform as part of the BG strategy, which included global distribution and support. Nevertheless, none of the applications were compatible with UNIX when it was announced that the German programs would be utilized. Also, the German developers had a maximum of a few years of expertise working in the UNIX environment [4]–[6].

DISCUSSION

A New Marketing and Negotiation System

Browning discovered that the current negotiating program was wasteful and unsuccessful in the eyes of marketing and engineering. After researching for two years how the IMT division could interact with its clients, the marketing team proposed a redesigned "front-end information" system. All client suggestions, including text, may be optically scanned into the system as it is being offered. This would enable faster analysis and processing of customer specifications. The planned system was initially estimated to cost more than USD 2.5 million. The marketing division, which had two staff engineers and had engaged a separate outside consultant to serve as its own IS specialist, was where the system's first concept was conceived. MIS had just lately been engaged in the system's planning. The project was isolated from engineering and division MIS input since it was being managed by the division strategic planning manager. The system was supposed to be finished and functioning by the end of 2003, and hardware procurement were supposed to start in November 2002.

The Field Sales Interface for CMCI

Browning learned that IMT's field sales team had been considering adopting the Salesforce.com service to roll out a new customer relationship management tool. Vice President of Sales Russ Nelson said that there was no need for a capital outlay to implement this web-based solution. To convey order data to the factories, this new CRM system would need to be improved. In late 2003, it was intended for the new SPEC system, which transfers order information to the manufacturers, to go online. Each plant was required to have high-speed Internet connectivity installed by the middle of 2003 in order to utilize Salesforce.com. To accommodate the data acquired from field sales representatives, they would need to create system connection. As of September 2002, SPEC was experiencing difficulties as a result of staff members' inability to agree on the precise data that should be sent to each factory and the establishment of the required system interfaces.

Novel Tools for Software Design

Browning discovered that payments from Fort Wayne and Chicago amounted for 25% of the cash utilized for the BG's R&D development budget after asking some inquiries at the controller's office. The MIS team at CMCI estimated that around 30% of their expenditure resulted in viable information technology, with the other 70% going toward production hardware upgrades. With

regards to further expenditures in UNIX application tools, the BG was unquestionably committed. The precise software and the number of seats that would be rented or bought had not been decided as of the end of September 2002, although a variety of software engineering and applications development tools had been suggested.

Replacement Bill of Materials for the System

The DBOMP system, which was almost 15 years old, was unable to handle the new German-developed design system, which was to replace the three older systems, according to the production scheduling staff, who also informed Browning of this. A new BOM system would be necessary to support the new design system and its consequent BOM structure. The systems department at Fort Wayne had found a system that would work with the IBM mainframe and could be obtained for free. The PUFR software was free because IMT-corporate USA's MIS team was getting ready to get rid of it. The sole prerequisite was that PUFR assistance be provided by Fort Wayne MIS personnel. By September 2002, Fort Wayne MIS employees had spent over 4,000 staff hours working to get PUFR up and running. According to projections, PUFR needed around 10% more work to be done in order to enter a test phase. The Fort Wayne MIS team had already invested in extra modules that were not initially included in the free IMT corporate edition of PUFR in order to reach this far. Also, some of the 400 or so auxiliary applications that still utilized the outdated DBOMP format had to be converted as part of the process. In the hallways, there were sometimes conversations of replacing PUFR "in a few years."

Browning and Page's Meeting

The results of Browning's six-week investigation were summarized as follows in a meeting with Page in October 2002: "The best way to characterize the current Fort Wayne information systems situation is as a lot of manual points where data are transferred between a patchwork of old, semiautomatic, and outdated processes. The end effect is that checking and rechecking are required to assure integrity since each location where information is moved has a chance of introducing a new mistake. Moreover, since the obsolete procedures need ongoing adjustments and workarounds, the more recent processes are never improved. To make judgments today that will prepare us for tomorrow, we actually need a clear vision.

The first alternative is to transition to a centralized computer environment, perhaps one run by IBM. In the case of this choice, we would pledge to continue using the mainframe for all crucial applications, forgo the AS/400, discourage the adoption of Sun and IBM workstations, and maybe even permit the usage of Linux on the mainframe. The year after we purchased our system, IBM introduced the eServer iSeries to replace the AS/400. This new platform can run AIX and Linux in addition to our present operating system, OS/400. This strategy would make the most of the mainframe's lower-cost, energy-efficient capabilities.

"We would have to make a long-term commitment to the mainframe. A systematic method would be needed to keep up with a large central mainframe, purchase new applications, and provide complete access to all users. To ensure centralized use, maintenance, and management, the strategy calls for transferring all of the important AS/400 programs to the eServer iSeries mainframe. It would be decided which major mainframe packages could be upgraded to meet Fort Wayne's current capacity and needs. During the next five years, Fort Wayne will phase out older packages. Spreadsheet and word processing would be done on PCs linked by LANs to the mainframe, but practically all computational work would be done on the mainframe.

Alright, Page commented. "Even though a lot of people would be outraged, I can see how it would be possible. Our engineers are used to having unlimited access to the Sun and IBM workstations. Browning referred to option two as "workstation computing." "In this case, we would use a method that gradually phases out the mainframe. At the same time, we would spend heavily in PCs, large UNIX servers, LANs, and UNIX-based workstations from Sun and IBM. We could let workstations to run Linux. An architecture like this would make it possible to transition to a complete client/server setup. "All programs would be migrated to the new environment as part of our long-term plans to switch to a distributed UNIX environment. The installation of a high-speed network would connect every computer. According to functional areas and profit centers, data and application servers would be dispersed. Seats for CAD would gradually move from the mainframe to designated workstations. The mainframe would be networked and accessible from all workstations throughout the transitional phase.

“The whole UNIX network system would be served by a single relational database server cluster, although local databases might also exist as needed. PCs would be connected by LANs, and a wide area network would be set up to act as a network bridge. It would be downsized to a more compact, compatible midrange mainframe as CAD and other important applications were moved off the mainframe. Before all of Fort Wayne's programs were transferred to UNIX workstations, it would likely take around 10 years and two main-frame downgrades. Well, Page said, but wouldn't this one cost much more and provide a kind of "disintegrated" computing environment? Other businesses that have taken this approach have had to retake central authority after a while, according to what I've heard. The potential is there, according to Browning. "And you're correct; given what's happened to mainframe prices over the last several years, it'll probably cost more than the mainframe option.

"Let me explain option three before you assess each choice. It's even riskier with this one. We would hire a data center hosting business to set up and operate "virtual machines" for us while we outsourced the operation of our servers to them. We may act as if we had an almost infinite number of servers. We would just need to pay for what we need on a monthly basis, eliminating the need for any further computer hardware investments. In this scenario, we would chose to abandon the mainframe while switching the whole computing platform over to a Linux-based setup. UNIX and Linux are both operating systems, however Linux is significantly more adaptable. Companies including Red Hat, Corel, IBM, and HP provide Linux-based solutions. In the years after 2002, this idea became known as "cloud computing" in fact, one of many applications of cloud computing. Some significant corporations have chosen this environment for their computer requirements.

Given the variety of needs we have across the organization, the Linux solution might also offer more than enough flexibility. Linux solutions might be used for everything from tracking quality control to controlling machines and monitoring production, using services offered by a reputable supplier like IBM, speciality Linux firms, or the in-house programming team. Moreover, some data center hosting firms using Linux-based servers offer a 99.7 percent uptime guarantee or higher. I learned that Ford and DaimlerChrysler have used Linux for car simulations. Moreover, Amerada Hess and other oil firms' exploratory efforts have shown the platform's robustness. The present conservative milieu in IMT is a far cry from this, however. Our main computers would be run by someone else.

To be whole, only one," Browning said. "We may think about simply waiting and carefully monitoring. This choice advises waiting to take any important action right now. We watch to see

what happens. Only when forced to make choices by circumstances would we decide on particular system adjustments. If you choose to "watch closely," every choice you make will be in reaction to current circumstances. We could introduce Linux and allow certain individuals play with it as part of this strategy. If Linux is the future, as some suggest, it may be wise to put off making a decision right now. Whether Linux is prepared for prime time is unclear. But, it can take a few years of testing to see whether it really is a long-term answer for the business.

IMT IS's Decision and Future Direction

Fine, Page said. "Having choices is incredibly beneficial. I value the time you invested in the project. Let me consider my alternatives and then decide. Once Browning left the office, Page started to consider the possibilities he had offered. It was going to hurt to change. Despite the fact that Browning had recorded the main strategy possibilities, there were still a number of factors to take into account before choosing which option to pursue. The information systems of CMCI have finally caught up after years of neglect, reorganization, and an expanding organization. Page also understood that changes to the division's IS architecture may need organizational adjustments. It was urgent that a choice be made. Or was it? The only issue left was deciding what to do.

Choosing the VoIP Provider's Following Steps

Lawrence R. Milkowski recognized he faced a challenging task as the president and chief executive officer of VoIP2.biz, Inc., an Indianapolis-based start-up that provides Voice over Internet Protocol telephony to the small and medium business sector. He had until Friday, June 23, 2006 to draft his recommendations for the board of directors' meeting on Tuesday, June 27, 2006, about the future steps for his startup firm. Although Larry firmly believed in the company's course, he was aware that the board was eager to decide the company's destiny given the slower-than-expected success in bringing the cash flow to break even.

The Business

In 2006, VoIP2.biz saw itself as a systems integrator that assisted corporate clients in switching their phone communications from analogue to VoIP. By engaging in these operations, VoIP2.biz would take over the role of the customers' phone provider and generate recurring income. In order to establish first mover status in the markets they serviced, management's strategy called for expanding the company's operations outside of Indiana, opening more sales offices throughout the Midwest, and maintaining supremacy in the Indianapolis market. The management thought that if this plan was successful, they would be a desirable acquisition target in the years 2009 to 2010.

The management of VoIP2.biz believed that the possibility for its company arose from the realization of five key market realities encountered by business clients with less than 400 voice telephone lines: These companies often made separate investments in phone networks, data networks, and Internet access technology, resulting in two different and independent monthly expense streams—a network for voice and one for data. Moreover, the voice network was often underused and overcontended. However, the price of dedicated circuits for carrying voice conversations is often higher and, in some cases, double that of a comparable data circuit.

The majority of voice communication devices, also known as private branch exchanges or key telephone systems, were specialized equipment with exclusive hardware and software. They cost $1,000 to $2,000 per user to purchase, $1,000 to $2,000 to maintain, and lacked the adaptability to quickly meet unique user requirements. Once deployed, they often had a high maintenance cost since relocating, adding, or altering end-user stations usually needed specialist expertise [7]–[9].

Business customers realized that by managing their customer communications effectively, client relationships could be improved and more sales could be generated. The price of purchasing and implementing the necessary automated call distributors and interactive voice response systems was just too high for many businesses to justify. The conventional phone providers provided extremely poor service to business clients, especially those with between one and one hundred workers or several hundred scattered over numerous sites. Customers often encountered under-trained account managers who lacked business and technological expertise, making it difficult for them to get the answers to their concerns or care for their unique requirements. In addition to lacking a strong data processing workforce with any expertise in speech processing, many customers lacked competent networking personnel to assist them in making telephone judgments.

In order to supply these market demands, VoIP2.biz offered the following systems: Given the financial advantages of combining the phone and data networks into one single network rather than two, included all of the sophisticated capabilities offered by any standard telephone carrier, low-cost long distance, E911, and call origination and termination services in place of traditional phone company services. They replaced proprietary telephone systems with an open-source call processing platform that ran on common hardware, saving 10–20% of the cost of an alternative technology. They were also marketed, designed, installed, and maintained by a skilled team of data and voice networking specialists.

The idea for VoIP2.biz was inspired by some experimentation conducted by employees of the Harley Services Company in the early months of 2004. Beginning in 1995, HSC started offering telecom carriers throughout the US outsourced engineering, installation, and marketing services. By leveraging HSC's services, carriers were able to outsource central office engineering and equipment assembly, speed up the rollout of new client services like DSL, and save expenses. HSC was in a unique position to comprehend and evaluate new telecommunications technology before it was generally available since it served the carriers as a service provider. Engineers at HSC began looking on broadband applications, such as audio and video over internet protocol, in 2003.

In 2004, Milkowski and other HSC employees researched the VoIP industry and assessed a number of then-current VoIP service providers. The HSC project team developed a method to give a cost-competitive IP PBX solution for integrating VoIP using an open source software platform as a consequence of these investigations. They chose an open source solution because it had the benefits of being implemented on a commercially accessible commodity PC server, having high-quality application code as a result of ongoing user community evaluation, and not requiring any licensing costs. Due to its sophisticated call processing capabilities and much cheaper monthly telecoms expenditure, Milkowski thought that the open source approach provided the greatest technology foundation for smaller business clients.

Starting in October 2005, Milkowski, HSC, and numerous outside investors acquired VoIP2.biz as a distinct entity that had been split off from HSC. 70% of the equity in VoIP2.biz was kept by HSC. Milkowski then created what was internally referred to as the "Phase I Plan," which required the business's infrastructure, people, and some kind of market presence to be completed. Employees at VoIP2.biz expanded the open-source IP PBX's capability in late 2005 and the first half of 2006 while also establishing various reseller connections with carriers and equipment suppliers. Due to these efforts, VoIP2.biz is now able to provide business clients with a full end-to-end VoIP solution. Also, Milkowski and his group of five engineers and salespeople marketed the VoIP2.biz solution to a number of clients. To assist promote the service to the business sector, VoIP2.biz inked arrangements with four approved distributors in Central Indiana. Through internal labor and

relationships with other sources, the team also created a number of features for their platform. Management became convinced through the company's business operations to date that the open source solution provided by VoIP2.biz offered a small to midsize business customer a complete telephone system solution for 10 to 30 percent of the price of a new proprietary solution from traditional vendors. See Exhibit 1 for a thorough breakdown of VoIP2.biz's services.

VoIP2.biz was close to finishing the Phase 1 Plan by June 2006. The business had acquired several clients, worked out a number of tricky technological problems, and finished employing a small group of engineers and sales/customer support representatives. The business had not yet achieved a profit or cash flow break-even threshold, however. Despite only earning $88,000 in revenue from October through December of 2005, a net loss of $86,000 was incurred. Financial performance were anticipated to be somewhat better from January through June 2006, with revenue anticipated to be close to $150,000 and profitability before taxes anticipated to be minus $66,000. By June 30, 2006, a number of the board of directors believed that the business should be turning a profit or at the very least be at breakeven.

The Shifting Landscape of Telecommunications

Several analysts anticipated that the Internet will transform corporate communication by June 2006. Nonetheless, voice communication often continued to be done through Plain Old Telephone Service even while the implications were significantly transforming data communications in small and medium businesses. Voice communications were still significant to company in the marketplace and continued to be 10–20 times larger than Internet communication. Businesses continue to spend a lot of money each month on outdated telecommunication systems. Despite the fact that the Internet has not yet significantly changed corporate phone communication, some studies predicted that businesses were only starting the next stage of using the Internet to further cut expenses. The next significant development in voice communications was predicted to be VoIP. Several industry observers expected that by the end of 2005, Internet technology will be used to supply the majority, if not all, of the voice traffic produced by businesses. There are two main reasons why this alteration might occur:

Companies may combine phone and Internet connectivity into one converged network that would transport speech, data, and video, lowering monthly communications costs and boosting the capacity of the Internet. The unused voice network capacity might be leveraged to expand the data network capacity by merging all Internet-based communications. Customers would use less of their network capacity for voice since VoIP required less than half the network capacity of a traditional POTS phone call.

VoIP2.biz Products

The client is given a VoIP solution for their business through the VoIP2.biz V2B System 1 IP PBXSM. VoIP2.biz's V2B Network ServicesSM connects customers to the telephone network for call origination. The VoIP2.biz Hosted Voice Services, which gives the user a telephone system capability similar to a Centrex, comprising network services, call initiation and termination, and Internet connection

V2B System 1 IP PBX from VoIP2.biz

The V2B System 1 IP PBX is an Internet Protocol-based telephone system that can manage voice communication for a client company by initiating, routing, delivering, and receiving calls.

Employees of VoIP2.biz install the IP PBX on an HP or IBM server running Linux at the customer's location. The solution is included into the client's data network by VoIP2.biz.

In most cases, these requirements include setting up specialized call handling and applications like voice mail, auto attendants, interactive voice response, and an automated call distributor. Through VoIP2.biz's implementation process, the company defines the customer's unique call handling requirements and implements them in the V2B System 1 IP PBX. VoIP2.biz offers and installs a graphical user interface that runs on top of the Asterisk application and significantly streamlines the administrative interface; these apps are included in the V2B System 1 IP PBX. As part of the system deployment, VoIP2.biz staff either buys and installs new digital telephone sets, conducts a mix of the two, or interfaces the V2B System 1 IP PBX to the client's existing PBX or KTS so that the present analog phones may still be utilized. The staff at VoIP2.biz often suggests a migration strategy to its clients. According to this plan, the voice network will be switched over to the V2B System 1 IP PBX first, with IP trunking replacing POTS circuits, followed by the voice mail and call processing. Finally, all of the phones will be moved over, and the old system and voice network will be shut down. This migration technique minimizes the client's perceived risk while accelerating the beginning of network savings [10]–[12].

CONCLUSION

System integration does away with the necessity for data management and storage. It offers a centralized system built on a safe and scalable architectural foundation. Your business may obtain operational and financial efficiency thanks to the enhanced data collecting and retrieval procedure and other advantages. Conclusion: CAD/CAM tools are crucial for manufacturing technology because they automate the production process, which reduces time, energy, and cost while increasing flexibility. Experts can provide more precise design representations thanks to CAD. By replacing manual design drafting with CAD, design development, modification, and optimization were made possible. Engineers can create more accurate designs and alter them digitally thanks to CAD. CAD software computes the relationships between various materials.

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CHAPTER 18

A BRIEF DISCUSSION ON VOIP V2B NETWORK SERVICES

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ABSTRACT:

By utilizing a broadband Internet connection rather than an ordinary (or analog) phone line, Voice over Internet Protocol (VoIP) technology enables you to make voice calls. In this chapter author discusses the market for VOIP services, VoIP V2B Network Services is a business-focused Voice over Internet Protocol (VoIP) service that offers advanced communication features such as high-definition voice quality, call routing, and online faxing. The service is provided by a leading cloud-based communications provider, and it is designed to help businesses of all sizes streamline their communication needs while reducing costs.

KEYWORDS:

Internet Protocol, Network, Signal, Service, Telephone, Voice.

INTRODUCTION

While the V2B System 1 IP PBX may be built and used with an existing POTS telephone network, the operational benefits of VoIP outside of the savings from the IP PBX itself—are best achieved by combining the customer's voice and data network expenses into a single network. For the consumer, switching from voice telephone lines or trucks from the ILEC to data circuits from VoIP2.biz may result in considerable monthly savings. Along with call origination and termination services, these additional data circuits enable the V2B System 1 IP PBX to initiate and finish conversations via the IP network [1], [2]. In conclusion, VoIP2.biz offers the following services via its **V2B Network Services:**

Internet access and a high-speed telephone trunking service the making and ending of calls, including long distance and E911 Portability of local and toll-free numbers the list of V2B Network Services includes:

Internet connectivity: In order to guarantee service quality, VoIP2.biz offers high-speed data connections with access to the Internet. The customer's current Internet connection may be supplemented or replaced by these lines.

Dial Tone: Using the V2B System 1 IP PBX or a facility supplied by VoIP2.biz, dial tone is sent to the desktop.

Phone Number Porting: At the client's request, VoIP2.biz staff may, in most circumstances, transfer the customer's current direct inbound dial phone numbers into the VoIP2.biz service, allowing the customer to continue receiving incoming calls on those numbers.

Call Origination: Users of the VoIP2.biz service may make and receive local and international calls.

Delivery of Calls: As instructed by the client, calls will be transmitted across the VoIP2.biz network to other callers on the network, local destinations, long-distance destinations, or other carrier facilities. Other Services, such as operator services, 411 or Directory Help, 911, and E911.

Services for VoIP2.biz V2B Hosted Voice

The same feature capability that is offered in the V2B System 1 IP PBX packaged with the communications capabilities of the V2B Network Services Schedule is delivered by V2B Hosted Voice Services, a hosted Internet Protocol-based voice service. With this packed solution, the client may take use of VoIP2.biz's features and benefit from VoIP cost reductions while just paying a minimal start-up price and a set monthly rate per user. This solution combines the essential network services with the V2B System 1 IP PBX features into a convenient package. The V2B Hosted Voice Services Schedule include the following:

Internet connectivity: In order to guarantee service quality, VoIP2.biz offers high-speed data connections with access to the Internet. The customer's current Internet connection may be supplemented or replaced by these lines.

Dial Tone: With the feature offered by VoIP2.biz, dial tone is sent to the desktop or remote user.

Phone number porting allows customers to transfer their current direct inbound dial phone numbers into the VoIP2.biz service at their discretion. Customers will continue to receive incoming calls on these numbers as they have in the past.

Call Origination: Users of the VoIP2.biz service may make and receive local and international calls.

Delivery of Calls: As instructed by the client, calls will be transmitted across the VoIP2.biz network to other callers on the network, local destinations, long-distance destinations, or other carrier facilities.

Voice Mail: An integrated voice mail system with voice mail to email conversion is part of VoIP2.biz's phone services.

A commoditized program that runs on regular PC hardware would be able to provide dial tone to the desktop and handle voice conversations, doing away with the requirement for expensive, specialized devices like conventional PBXs and KTSs that need proprietary hardware and software.

VoIP, according to some experts, would also make it possible to integrate all of an organization's locations, including distant employees, into a single communications network. By merging voice and data into one network and delivering sophisticated capabilities not now accessible to the majority of small and midsize company customers, VoIP would also lower communications costs and enhance functionality.

Businesses would need to upgrade or replace their current telecommunications equipment and replace their POTS telephone circuits with Internet connections in order to benefit from these cost reductions and functional improvements. Management at VoIP2.biz projected that a company

might achieve a four to six month return on the necessary expenditure using open source voice apps and commodity Internet lines [3], [4].

DISCUSSION

The Market for VoIP Services

In response to the deregulation of the American telephone system, technology companies provided PBX systems for controlling voice communication and maximizing the use of carrier services, hence lowering a company's monthly expenditure. The next step was to produce smaller variations of these systems, called KTSs, so that smaller businesses could benefit from these reductions. Each PBX and KTS manufacturer distinguished its products by including call processing elements such as automated attendants and voice mail in their systems. A unique architecture of hardware, software, and telephone handsets was eventually developed by each vendor for the market. In order to satisfy future telecommunications needs, employing components from Nortel, for example, was out of the question after adopting Avaya as a business telephone system. Businesses gradually implemented more network services for Internet connection as the Internet grew and became a corporate need, extending e-mail and Internet access to every desktop. These deployments, which often included separate cabling systems and face plates, were created completely independent of the existing voice communication infrastructure.

TCP/IP and other protocols like them were made feasible by the creation of "open systems" standards, which fundamentally refer to a specified interface for transmitting data across proprietary systems. Together with accelerating the creation of relational databases and application software, these open systems standards enabled access to applications via common web browsers like Internet Explorer, significantly lowering the cost of deploying and maintaining web-based information services. Over time, conventional voice communication was redesigned by engineers who were conversant with Internet technologies. Inside their own networks, carriers started employing Internet Protocol communication for voice traffic, which resulted in substantial cost savings. Traditional PBX manufacturers accepted Internet-based standard protocols for communication inside a network as a result of the widespread acceptance of the necessity to embrace "open" standards, allowing commodity cost components to be utilized with previously closed systems [5]–[7].

By 2006, several of the makers of proprietary PBX and KTS systems had redesigned their systems to include IP technology. They did, however, typically continue to use a proprietary system that did not provide much cost savings and had limited usefulness for their customers. The client needed to reengineer their network in addition to the VoIP equipment that was provided to them in order to benefit from the cost reductions offered by IP networks. The POTS network required to be replaced with an IP network in order to realize savings. The client would then need to invest in pricey gateways that converted the new IP communication network back into POTS communication, which the old PBXs could handle, or the existing PBXs would need to be replaced. In summary, many smaller organizations considered it impossible to realize considerable cost reductions through network integration utilizing the modified PBX or KTS systems. As an alternative, businesses like Digium, the makers of Asterisk, and Pingtel created application software that had all the features of a PBX but operated on standard PC hardware and Linux. These systems offered almost all of the functionality of a commercial PBX as well as direct support for IP trunking for as low as 10% of the price of a PBX from a typical vendor. They were also freely accessible and distributed as "open source" software.

In conclusion, as of June 2006, vendors marketing voice communications solutions to small- and medium-sized businesses were offering:

Replacing long distance services with hosted VoIP solutions for both residential and business clients; proprietary telephone systems with internal operations based on IP technologies; and by addressing the complete company communications infrastructure with system integration solutions like VoIP2.biz's, call handling is significantly improved, and monthly expenses are reduced.

The table on page 133 summarizes the options for the small and midsize company client. Hosted VoIP companies marketed long distance service, offered an extra phone number, and connected to the current Public Switched Telephone Network to carry calls. The telephone handsets might be supplied by either the supplier or the provider. The client was responsible for integrating the provider's products and services with the rest of the company's telecommunications infrastructure. Even more functions were left up to the client by system VoIP providers. Since they provide the client with a single point of contact and responsibility for the whole telecommunications infrastructure, management regarded VoIP2.biz's solutions as unique.

The number of POTS lines that could be converted to VoIP service was often used to gauge the size of the VoIP market. Small businesses in the US deployed roughly 50 million POTS lines that could be converted to VoIP in 2005. This market was predicted to have 1 million POTS lines in Indiana and 8.8 million POTS lines across the Midwest. Less than 2% of these POTS lines were thought to have become VoIP-enabled as of 2005.

Distinct Benefit of VoIP2.biz

These are some justifications given by Milkowski in a presentation he gave to a local venture capital firm in May 2006 as to why VoIP2.biz will succeed: "VoIP2.biz solely caters to corporate customers. The major rivals are mostly focusing on the residential sector; "VoIP2.biz concentrates on the small and medium company sector, which is mostly untapped by rivals. We mainly target the 20 to 100 line market, but we will expand to 400 lines if the chance presents itself;

"We are aware that providing VoIP services to corporate clients is not about reducing long distance costs. Usually, just 5 to 10 percent of their communications expenditure goes for long distance. The main goal of VoIP for corporate clients is to consolidate their networks and use widely available technologies to significantly lower their total telecoms expenses. "We think we are the first business in the greater Indianapolis area to provide an open-source VoIP IP PBX service. We want to lead the Midwest in excellence. The only rivals with a product similar to ours are based in California, New York, and Atlanta. "VoIP2.biz's solutions are distinctive in that the business takes care of its customers' whole communications system requirements, from phones to network connections. "We think that by using an open-source platform rather than reselling a proprietary PBX manufacturer's product, the client will save money on the expenses of both the initial purchase of the technology and the continuing maintenance of an IP PBX. "Finally, as this chart shows, our cost structure enables us to deploy a new PBX solution at a lower cost than our rivals. It is evident from looking at the charts for a number of rivals that VoIP2.biz provides a solid offering in our target market. Our total cost of operation per user at list price is far lower than all known rivals, for both small and bigger systems. This holds true for both the original investment and subsequent maintenance expenses.

The Contest

Management examined the competing voice communication options made available to company clients in the early months of 2006. A report to the board of directors in April 2006 condensed the findings of this investigation as follows:

Nationwide Hosted VoIP Solution Providers: Beginning with companies like Vonage, these commercial entities employ a national IP transport network to provide low-cost long-distance service to corporate clients. Similar to cellular phone service, these implementations are not part of the company's current communications infrastructure. Some companies are having trouble handling consumer complaints due to their channel partners' lack of data expertise, according to information gathered by management. www. is one of the representative businesses in this group. www.broadband.com, www.vonage.com, www.packet8.com, and www.broadvoice.com. These systems typically cost between $29.95 and $40.00 per line, each month, including installation costs. Several market players sell phone handsets while also offering Internet connection.

The conventional voice communications sector has long been controlled by Indiana. Depending on the size of the business, they sell network services through a variety of channels. IP-enabled PBXs from suppliers like Nortel, Avaya, and Cisco are sold by ILECs. ILECs often sell equipment, sometimes known as customer premises equipment, to support network sales and have an account presence. They charge "right-to-use" fees for new software applications and often offer proprietary VoIP systems that cost between $1,500 and $2,000 per station. ILECs charge less for T1s utilized for Internet connectivity than for phone transmission.

Competitive Local Exchange Carriers: These companies provide businesses with competitive Internet access or point-to-point dedicated data connection in fractional and full T1s. While none serve the Indianapolis region, several CLECs use a Cisco platform to develop a hosted VoIP service. Others are reselling the services provided by the above mentioned national suppliers. In general, it is said that most CLECs cannot afford the infrastructure needed to install a VoIP solution utilizing Cisco, and we have learnt that the margin available for reselling the national hosted products was also unattractive. Moreover, because most CLECs are data providers, they are not at ease marketing and supporting voice solutions. In the greater Indianapolis area, hosted VoIP solutions have been offered by both eGix and Ultimate Medium. Management is aware that certain services have been discontinued by Ultimate Medium. Instead of being an efficient straight competitor, management thinks Ultimate Medium offers VoIP2.biz a compelling chance for collaboration.

Cable Companies: The firms are getting ready to provide residential VoIP service as their first offering. By the end of 2005, BrightHouse introduced a residential product. They want to provide a business service in the future, but as the majority of companies are not cabled and connected to the current cable network, either the cable provider or the client would have to pay a substantial capital expenditure for cable to be a practical substitute. Internet service providers (ISPs) consider VoIP services to be a desirable service addition, especially for residential users. It seems obvious that residential VoIP services should soon be offered by AOL, MSN, and other major national ISPs. ISPs that provide services to corporate clients have long looked for a value-added service they could provide on top of Internet access. VoIP offers an ISP the opportunity to expand their business. Few regional ISPs focused on local businesses have adopted a VoIP business plan to yet. The management anticipates that wireless ISPs will be eager to introduce VoIP services.

Interconnects and PBX VARs: Historically, VARs and interconnects have offered smaller businesses a competitive alternative to the ILECs, often at a lower price point. Several of these companies provide systems from well-known PBX producers including Nortel, Avaya, and Siemens. Seldom have they had the data know-how necessary to promote and set up a Cisco solution. Many companies, including Mitel, NEC, Toshiba, and ShoreTel, have begun providing less expensive PBXs, according to market discussions. These companies can end up being effective channel partners for VoIP2.biz. Their rivals in the Indianapolis market were MVD Communications and VanAusdell & Farrar. Suppliers of data networking solutions: Historically, these businesses have sold, installed, and maintained data networking infrastructure. They are well-positioned to expand their consumer base by offering VoIP products and services. Companies like Fusion Alliance and Advanced Micro have stated a dislike for management while working on voice communications solutions and a desire to engage with knowledgeable companies like VoIP2.biz.

Sales and Marketing

The firm prepared a three-pronged channel approach, including direct marketing to prospective business clients, indirect channel sales, and turnkey VoIP "telco-in-the-box" sales to network providers. By collaborating with knowledgeable solution providers, the company's franchise concept would enable penetration into smaller geographic regions. These collaborations would make advantage of VoIP2.biz's technology and business procedures as well as the partner's sales and installation capabilities.

The firm intended to leverage direct sales efforts by selling to small and medium business owners, financial officers, and information technology professionals in these businesses in addition to utilizing approved distributors to reach the market. In this attempt, cold calling and direct mail were also planned. In the past, these advertisements have received positive feedback since companies are typically aware that VoIP is a subject that might help them save money and that they should take the time to learn more about it. Milkowski realized that the Phase II Plan needed to address the issue of a low closure rate even while business workers had great success getting interviews with the customer and getting approval to develop a proposal for switching their voice communications network to VoIP. Even if the majority of customers did not object, it usually took six to nine months to get a "yes." Milkowski sought to create a "telco-in-the-box" solution that gave smaller telecoms carriers and ISPs the flexibility to add voice services to their current data networking services in addition to selling directly to companies and via authorized distributors. Management was negotiating with its first carrier client for these services in June 2006, and it had discussions with a number of other carriers as well.

In order to expand the firm, Milkowski envisioned that VoIP2.biz would use an advertising and marketing strategy that highlighted the advantages of VoIP and an open source platform as it entered new markets. Also, they intended to establish reference accounts in each regional market. As Milkowski entered each area, he intended to start a big local advertising campaign. Management intended to start pushing VoIP via neighborhood business associations, local business media, and securing drive-time "sponsorships" on the neighborhood NPR station. Exhibit 2 is an illustration of a June 2006 Indianapolis Business Journal advertisement. Like before, VoIP2.biz provided solutions with a choice of two price models: hosted and system sales. These hosted solutions would cost $25 to $30 per user each month under the Phase II Plan, plus the monthly cost of Internet connection. They anticipated that these agreements would typically last for three years. The business intended to charge for non-recurring services, which would have included a

$1,000 installation fee in addition to the price of any additional phone handsets, optional data networking equipment, and related services the client could need. The cost of a system would include recurring fees for network, direct inbound dial phone numbers, long-distance telecom, and software support as well as nonrecurring fees for installation, hardware, and software placed on the client site, phone handsets, and one-time network fees.

According to the Phase II Plan, these systems were to be costed at a 50 percent gross margin for the original installation plus yearly software maintenance costs. Moreover, the client was charged a monthly cost for the network connection as well as the call origination and termination service. The monthly call origination and termination service could be priced very profitably at a margin of 80 to 90 percent whereas the monthly networking price was quoted at very low margins, 20 to 30 percent, because T-1 pricing was widely advertised in the market and was a generalized way to measure competition. The goal margins for various system sizes up to 128 stations are shown in the example below. During late 2005, management had also been successful in gaining speaking opportunities to explain VoIP at corporate gatherings. Open source solutions and expanding their data networking to incorporate speech processing capabilities were of interest to leaders in information technology. Asterisk was well-known, and a few people had even used it for R&D. In general, people were eager to find out more. Several presentations in each market at the beginning of the market entrance process were required under the Phase II Plan.

Operations Milkowski believed that VoIP2.biz implemented complicated voice and data networking solutions and conducted business like a conventional professional services organization. As a result, he appropriately arranged the sales support and operations tasks in the Phase II Plan. VoIP2.biz sales representatives intended to evaluate the prospect's existing phone and data infrastructure, including looking over its telecoms bills, throughout the presales process. During this process, VoIP2.biz staff learned about potential communication requirements, such as those associated with a new office opening, a significant increase in employee numbers, or a deliberate move of the company. With this knowledge, the engineers at VoIP2.biz would create a first statement of work before presenting a potential proposal. The strategy called for sales representatives to install a demonstration phone at the customer location since Milkowski knew the prospect would want to witness a demonstration and use VoIP2.biz's service. The plan called for VoIP2.biz engineers to adhere to a structured implementation process to complete station reviews, specify a dial plan and voice processing applications, build the appropriate IP network, and more after the business deal is closed.

1. PBX system software, procure and set up the required hardware, finish customer onboarding, and switch over to the new system.
2. The plan specified that billing activities would be initiated both when network infrastructure is installed and when a system is installed.
3. Through its technical support center, which had been outsourced to HSC's technical support center team, VoIP2.biz intended to offer post-installation support. Its own network operations center was run by VoIP2.biz.

A member of the operations team should:

Set up a second colocation site to provide backup connection, a second network, and call processing capabilities. This facility was slated to open in downtown Indianapolis in the third quarter of 2006. By the fourth quarter of 2006, a Web-based tool's graphical user interface for end user administration will have been fully implemented. By the fourth quarter of 2006, implement

the Asterisk extensions that were recently made available and allowed for user interaction with Microsoft Outlook. By the fourth quarter of 2006, put in place a billing system that automates the charging of customers for end-user long-distance minutes.

It would be required of the business development team to:

For company expansion in Indianapolis during the third quarter of 2006, add more sales staff. Beginning six months after entering a market, close at least eight new business contracts each month. A year after entering a market, close at least 12 new commercial contracts per month. By August 2006, choose the relevant markets and start hiring for the growth into new geographic regions. During the fourth quarter of 2006, begin focused sales activity targeting Midwest contact centers and smaller carrier prospects. During the fourth quarter of 2006, the development of the franchise business strategy for smaller geographic regions will be finished, and franchise partner recruitment will start. The Amount Needed Management at VoIP2.biz intended to seek an additional investment of $3 million in order to implement the Phase II Plan. Since the business had already acquired and successfully implemented a number of clients in the larger Indianapolis region and was prepared to expand into a number of other Midwestern cities, Milkowski thought his idea was a sensible investment. The Phase II Plan would need major marketing and working capital investments to be implemented successfully. This market growth would be funded primarily with the $3 million investment, which would also be utilized to meet basic business and operational requirements. Exhibit 3 provides a thorough description of anticipated cash flows resulting from the application of the strategy. Milkowski understood that outside funding would be required for this venture. Although HSC and a few angel investors had up to this point given finance for VoIP2.biz, HSC management had decided they would only be investing internally for the next two years. No present investor was ready to put up the whole $3 million, even if some of the other investors could be able to provide some investment funds.

Milkowski was aware that he would need to demonstrate how he and his team planned to boost technological acceptability at a much quicker rate without incurring significant costs if the board of directors was to approve the option of conducting Phase II. The board had said at their most recent meeting that if a workable strategy could be created, they would only commit an additional $500,000 until the end of 2006. Indeed, there were alternatives to sticking with the Phase II Plan. Milkowski was aware that given the previous history of the most well-known VoIP company—Vonage—at least some board members were worried about the future of VoIP as a successful business endeavor. Since the IPO, their stock's performance hasn't exactly been great. VoIP was allegedly just a few years ahead of its time, according to some. They saw that Vonage catered mostly to the residential market, therefore VoIP2.biz targeted the small- and medium-sized business sector. They were still worried. They didn't think the company could be sold for very much since it didn't have a positive cash flow. These board members believed that the company deserved to be shut down. Milkowski was aware that discontinuing service would have a significant negative impact on his 22 clients. He did not like this alternative either since it would result in job losses for his employees. Although there were plenty of opportunities for qualified engineers, he was aware that his more senior colleagues would have a harder time finding employment since each of them had a sizable mortgage and other continuing costs. These individuals had each taken a significant pay reduction when they joined the company during the previous year.

Thirdly, Milkowski was aware that the business may be acquired by another corporation. Two companies that had affiliated businesses in the Indianapolis region had been in touch with him.

Milkowski was aware that he would need to create and defend a suggested selling price in order to endorse this course of action. He understood that the price need to be determined by the anticipated future revenues. He was also aware that previous investors wanted to at least get their money back. Lastly, he realized he needed to take into account the 22 contracts' fairly guaranteed cash flow for the duration of the contracts when determining the firm's pricing. He was positive that most of those contracts, if not all of them, would be simple to transfer to the firm that would survive. Jim O'Neil, his vice president of sales and service, entered the office while he was considering which recommendation to make. Remember that big contact center we've been trying to get, Jim remarked to Larry? Apparently, it worked because they said they would sign the contract, which is for 100 seats initially and would increase to 300 seats in three places over the course of the next year. On Monday, we will meet to collect the completed contract [8], [9].

CONCLUSION

VoIP is a fantastic option for both small and big enterprises. It can easily integrate into our digital life since it makes use of the internet's capabilities. It includes integrations and enhanced calling options that enable a unified communications strategy. VoIP has benefits over conventional phone systems due to its ability to support multiple party calls. Both big and small businesses often need a separate conference call service that allows multiple participants to join the same session. A mobile VoIP system can help you communicate more quickly and run your business more effectively. offering you a competitive edge as a result. Professionals may conduct business conversations and conferences much more easily thanks to mobile VoIP.

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CHAPTER 19

A BRIEF DISCUSSION ON VOIP ADOPTION AT BUTLER UNIVERSITY

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ABSTRACT:

Voice over IP (VoIP) investment is prevalent and increasing, but some businesses are having trouble accurately assessing their total cost of ownership. This report looks at VoIP adoption trends, including information on how many businesses already have the technology in place, how many are putting it into use, and how many are extending their use of it. In this chapter author is discusses the request for proposal to the selected vendors.

KEYWORDS:

Information Technology, Network, Signal, Telephone, VoIP.

INTRODUCTION

Looking back over the previous 12 months, Butler University's CIO Kincaid was proud of how the university had advanced with a network capacity fit for the twenty-first century: the convergence of its data and voice networks. Yet the decisions that had been made in the previous year were not for the "faint of heart": at a time when network security issues were a top worry, his IT group had taken on a lot more in-house responsibility for voice communications than in the past. This also meant that the telephone staff members, who were now co-working with their data network colleagues for the first time, had 24/7 visibility.

Butler University's IT

Indianapolis, Indiana's Butler University is a private liberal arts university. The university, founded in 1855 by lawyer Ovid Butler, had 4,400 students enrolled in it in 2005, the year it celebrated its 150th anniversary. It was made up of five colleges, 20 buildings, and 290 acres. In addition to residing on campus, more than half of the registered students also used the university's network and phone services. Butler University's Information Resources department, which employs 40 people, provides technological support not just for its students but also for its roughly 900 professors and staff employees. Scott Kincaid, the CIO, who was formerly the CIO of a significant financial services company, answers to the university president. Kincaid was Butler's first IT executive to get the CIO title. Four directors, including Network and Systems, Administrative Computing, Web Applications Development, and Instructional Technology, answer to Kincaid and are in charge of the university's IT services.

All four of these positions are filled by part-time student employees, with the help desk and instructional lab support services relying heavily on them. The IT department was in charge of maintaining more than 125 servers, 1,400 university-owned workstations, and over 7,000 network connections throughout the whole campus. Human Resources, Finance, Campus Solutions, and Enterprise Portal PeopleSoft1 ERP modules have been a part of the university's administration systems since 2001. Butler formerly used SBC's2 Centrex service to set up 3,000 phone stations, with the majority of academics and staff using simple single-line analog phones. Butler paid the

local telephone carrier on a monthly basis to handle all call switching for the Centrex system, which was an outsourced alternative to a university-owned system. The SBC Centrex system had been quite dependable during the previous ten years, but it lacked more contemporary features like intelligent call queuing. Students had to share their phone number and voice mail box with their roommates since voice mail was delivered through a Centigram 640 system that gave a single voice mailbox to each dorm room.

The university was able to save money on ownership expenses and day-to-day operation of the communications equipment thanks to the outsourcing agreement instead of implementing its own private branch exchange. While very dependable, the Centrex system was not readily adaptable and was built on characteristics that were more than ten years old. As a result, it was now preventing the implementation of functionality for customer contact centers, such sophisticated call routing. Moving phones and phone lines was a labor-intensive operation as departments expanded and staff changed. The telecom coordinator at Butler had to constantly reconcile SBC's outdated, error-prone invoicing system. Butler's demands were only partly being met by Centrex, therefore Information Resources started looking into the telecommunications market in early 2004. An internal PBX would be more economical than the outsourced Centrex system for telephone services, according to numerous vendors and trade publications. Butler might buy and manage its own system, which would then be modified as necessary. Much more fascinating was a more recent option that would integrate voice conversations with PeopleSoft when Oracle purchased it in January 2005. Ameritech, Southwestern Bell, and Pacific Telesis combined to become 2SBC. In 2005, SBC acquired AT&T Corp and changed its name to AT&T Inc. In 2006, they combined forces with Bellsouth and acquired Cingular, all under the AT&T brand. VoIP3 network solution: network as data communications. A VoIP solution appeared to be neither easy nor inexpensive, like the other options [1]–[3].

With its Automatic Call Distribution feature, a new internal PBX would treat callers better by placing them in a queue if all staff members were busy. To enhance telecommunications services throughout the institution and provide staff members faster access, multiline telephone sets, an online caller directory capability, and enhanced management reports are recommended. Private voice mailboxes may be set up for pupils, and each one could have their own phone number. Many businesses own and operate an internal PBX system that uses conventional phone circuits, but the communications sector saw an intriguing trend with newer VoIP alternatives. Butler's technology division was interested in the potential cost reductions from moving voice traffic to the data network through VoIP. Just twelve to thirteen percent of the market had VoIP installed in 2004 due to the fact that it was a relatively new technology and there wasn't yet a "clear route to success" for such a market solution. Even if there was a growing tendency toward more IP lines in the telecommunications industry, the data at the time were so sobering that we questioned whether this was the right course to follow. Naturally, we were intrigued.

DISCUSSION

Butler had other concerns to take into account in addition to the low adoption rates. The dependability of the voice services on campus would probably be worse as a result of the convergence of traditional data networks and voice networks, since VoIP phone sets would be dependent on network activities that weren't utilized by conventional analog phones. The Butler data network was known to sometimes have outages as a result of hardware malfunction, occasionally inadequate capacity, or strange behavior from student-owned computers. Concerns regarding the possible voice quality of IP-based telephony were raised by a number of

stakeholders. Ironically, Butler's Information Resources department gained official clearance in January 2004 to start a three-year program to modernize all of the network switches, routers, and hubs, a significant undertaking. The money for the network improvement would come from two different places: two thirds from university contributions and the last third from the yearly IR operations budget over a three-year period. Butler was thus working to enhance the network, although it was not yet operational.

A genuine source of concern was the idea that a data network would be able to support high-quality, business-class phone conversations. This meant that delivering a less tested technology to its consumers and getting their buy-in to this new solution was likely the largest risk that a VoIP PBX solution faced. To get buy-in, you would have to agree to embrace a new communication strategy and take on new performance risks. Virus assaults, which often targeted data networks but not conventional phone lines, also caused concern among everyone [4]–[6]. They were worried that we would make our speech systems inferior to data networks in terms of quality. But our objective was to match the voice network's quality with the data network. Aligning Butler's Requirements to the Available Network Options the Telephony Assessment Team was established in March 2004 to examine the options. Director of network and systems at IR, Joe Indiano, served as the team's leader. The crew also comprised the university's facilities management telecom technician, a data network engineer, and the CIO, Scott Kincaid.

Joe Indiano suggested hiring a seasoned consulting company to do a formal requirements analysis that includes end-user surveys since this study was new to Butler but had already been completed by several other businesses. Butler used the knowledge of a specialized trade association of which it was a member to discover a qualified outside business without spending months of investigation on that alone. They sought peer suggestions for consultants who have assisted other organizations like theirs with telephone system reviews through the ACUTA listserv. Two potential candidates were soon identified, and Butler phoned and spoke with each of them. In order to ascertain if investing in a new phone system may enhance communication and further Butler's purpose, Butler made the decision to retain Dietrich Lockard Group, an independent telecommunications consulting company situated in St. Louis, Missouri. In order to include the university community in the investigation of the telephone requirements, a formal User Advisory Committee was established to collaborate with the consultancy company. Administrative employees were among the end users of the phone system represented on this committee. Voice over Internet Protocol enables voice traffic to be sent over a public or private Internet protocol network.

After their return to campus, consultants from the Dietrich Lockard Group conducted focus groups, interviews, and surveys with staff, professors, and students. While they praised the communication system's great dependability, the team discovered that many administrative users were dissatisfied with the outdated Centrex and Centigram capabilities. For instance, all the offices with high call volumes lacked management reporting and only had rudimentary calling trees to assist route calls; analog phones could only take one call at a time. Current phones needed to be physically moved, added to, and changed by a technician. Butler University, like many others, lacked any way to reach the whole campus in the event that urgent emergency information needed to be sent.

According to the student polls, about 92 percent of those living on campus had a mobile phone, however almost the same amount also utilized their normal room phone. One-third of the students still preferred a traditional telephone, despite roughly two-thirds of the pupils preferring mobile phones. Moreover, 73 percent of the students said they valued the voice mail service offered by the university, and they made it plain that they want a private voice mail box. Given the obvious

prevalence of mobile phones on campus, these findings caught the Telephony Assessment Team and the User Advisory Group by surprise. It implied that mobile phones, with their meager minute plans and sometimes patchy service, did not completely satisfy the requirements of the average residential student. Traditional landline phones are not considered significant in the era of cellular technology, according to conventional thinking. Yet sometimes facts don't agree with intuition. It was a no-brainer to continue offering regular phone service in dorm rooms once we learned that our rival universities were also doing so. That was a huge surprise to me since I would have bet money that the phones could have been taken out.

There was a huge list of requirements and prospective possibilities that had been highlighted from all of the needs analysis conversations. A list of significant requirements for a new system was prepared in June 2004 based on the analysis of the data gathered, with three priority groupings: must haves, extremely important, and nice-to-haves. Five strategic objectives were formulated by Joe Indiano and Dorothy Lockard using the findings of the requirements study to assist identify the greatest opportunities within the framework of Butler's strategic plan:

1. Enhance contact with students and among students, notably by providing private voicemail boxes.
2. Enhance how callers are handled in campus call centers with high call traffic.
3. Improve training and make use of emerging services like multiline, self-labeling phone devices, and online directories.
4. Provide greater direct access to particular Butler staff members
5. Maintain a high standard of services compared to similar institutions, especially those that affect students and their families.

Cost projections for several alternative telecommunication systems were made as part of the business case. Based on assumptions of what each choice would cost given market research on price and the work it would take to support each option continuously, these cost estimates included investments in hardware, software, phone equipment, and continuing costs. The findings of Butler's needs study were delivered to the university vice presidents in July 2004. Butler management then authorized the team to get vendor quotes, although they were wary of the prospective expenditure.

Proposal Request to the Selected Ven

The Telephony Assessment Team and the consultants created a thorough call for proposals based on the strategic objectives and the key criteria set by the User Advisory Group. Dietrich Lockard Group located suppliers who seemed to be in line with Butler's requirements. The six suppliers were approached by Dietrich Lockard Group, which also chose the most qualified regional implementation partners for each manufacturer. Via the neighborhood resellers, four of the merchants filed bids. SBC offered Butler three options: either keep the Centrex service as it is now, add equipment to the service, or switch to an in-house PBX utilizing Nortel hardware. In order to conduct an apples-to-apples comparison of the various proposals, the User Advisory Group and the Telephony Evaluation Team set out on a journey that involved attending vendor presentations, speaking with vendor representatives, evaluating all of the features, visiting a few chosen vendor customers, and visiting vendors. There were several characteristics and considerations taken into account, and the RFP included 400 distinct data points. In order to guarantee that the chosen option would best solve Butler's essential challenges, the criteria were weighted according to a three-level priority framework [7]–[9].

Most vendors were able to satisfy Butler's requirements, which included satisfying the demands outlined in the RFP and the overall cost. Yet, problems surfaced as significant differentiators throughout the comparison investigation. Butler was learning how important local assistance from a knowledgeable reseller was if it wanted to transfer all of its telephony in-house. It would also be essential to have experience integrating new VoIP systems and other corporate technologies. Butler University also desired a system that provided comparable functionality, such video conferencing capabilities, for both Mac and PC users since 25% of the professors at Butler use Macintosh computers. Other significant differences reflecting their increased priorities in a post-9/11, Internet-era, were an efficient and adaptable integrated emergency notification system that allowed for a simultaneous broadcast of text and audio to all campus phones, as well as other data network security concerns.

Also, the firms' planned R&D expenditures were taken into account. The majority of telephony vendors presently sell both traditional analog and IP-based PBX systems, with some of them emphasizing the ability to link the two. The Telephony Assessment Team, however, was able to confirm that the manufacturers were investing all of their R&D funds on IP-based systems during last-minute trips to many of their corporate offices. The Telephony Assessment Team realized that although VoIP was undoubtedly the riskier option, if they invested in a new analog PBX, they may wind up with a system that had a short lifespan. Suddenly, continuing to use the SBC Centrex service for a few more years seemed to be a viable choice.

Vendor Picking

Butler selected five primary candidates from a list of nine prospective candidates that was provided.

The following were among the final options:

1. Maintain the present Centrex service provided by SBC
2. Continue to use SBC's Centrex service, but upgrade to a Nortel IP system with 50 seats.
3. The University of Michigan Regents created and freely released 5Lightweight Directory Access Protocol, an online, fully-indexed phone directory service.
4. Install a new system to support internal VoIP PBX.
5. Cisco
6. Mitel
7. Nortel
8. The vendor solutions for each significant problem were compared side by side, along with the extra capital expenditures and/or ongoing support expenses necessary to meet these criteria.

The Telephony Evaluation Team, in collaboration with the User Advisory Group, evaluated this range of options and scored them before selecting Option 3: to purchase its own internal system and a Cisco IPT system, with products and implementation services provided by Midwest Cisco partner Berbee Information Networks. After careful thought, Joe Indiano and Scott Kincaid submitted this to the Butler top management and received approval to go forward. The day before the start of the Christmas holidays, Butler notified Berbee and Cisco that they had won the offer.

The team's study did not support the notion that an internal IP-based system would be less expensive than the outdated Centrex technology, despite what was reported in the media. The majority of the demands mentioned by staff, instructors, and students could, however, be met with just a little cost increase. For instance, Automatic Call Distribution capabilities would now be

available for any high-volume call region on the telephone. The new IP-based phones would enable Butler to send out campus-wide emergency notifications. Every student who had previously shared a line in a dorm room would now now have their own special phone number and private voice mailbox, which also went with them when they changed rooms from year to year. Students would also get an email informing them the voicemail when it was left for them. Supporting IR's aim of offering quality services and fostering collaboration between students and professors was the strategic goal. The voice communication requirements were met by Cisco's system, but Butler had more concerns than simply the technical specifications and price.

Vendors often make lofty promises of all kinds of significant advancements and results throughout the sales cycle. Nevertheless, the legal contracts they provide only commit them to delivering certain hardware and software with very little in the way of guarantees, and clients often spend the majority of their time haggling over pricing. We were able to effectively negotiate the inclusion of the initial RFP and the vendor's proposal to Butler in the final contract for this project. Instead of merely concentrating on the hardware, this helped keep everyone on track and held the vendor responsible for the promises they made in their bid.

Butler was finally building an integrated set of IP network-operated software applications, not merely a "black box" phone system. Understanding the IP protocol and how Butler would use it came in second place to figuring out how the system's many parts would interact in a safe and reliable way. For this application system, it was also critical to determine who inside Butler controlled each component, how the data would travel from point to point, and where data was being duplicated. One of the benefits of the more recent software-based systems was the ability to seamlessly integrate with other systems, such as PeopleSoft, the housing system, and Butler's LDAP directory. In essence, there were several interfaces to current systems, additional possibilities, and a wide range of choices for how all of these features were going to function together. The implementation help offered by a Cisco partner was thus crucial when picking the main vendor.

After careful consideration, the IR team decided against leasing the new phone system and instead decided to fund it internally by using the Centrex solution's monthly costs instead. Butler used a three-year financing plan as its business strategy for its first data network replacement expenditure. If Butler had continued with the three-year deployment schedule for the data network, there would have been several hazards given the switch from an external telephone solution to an internal one that relied on the data network. Butler, on the other hand, made the decision to shorten the project's implementation period by deciding to turn its three-year network replacement project into one that would last only one year.

After the selection of the new telephone system, Butler had to choose a supplier of local voice circuits. A new RFP had to be launched for the circuits, and Time Warner Telecom was chosen as the new voice carrier. In order to divide the new telephone servers across two campus sites, which is not achievable with conventional PBX systems, Berbee worked with the university to negotiate the establishment of two separate communication lines to the campus. To offer backup and disaster recovery capabilities, a total of 17 Windows servers, including Call Managers, E911 Emergency Responders, and Call Accounting Database servers, were installed between the two physical sites. The Berbee InformaCast software would enable instantaneous, zone-by-zone, university-wide notifications to be sent in voice and/or text to all IP phones.

Deploying a single network that would continue to provide dependable phone communication as well as more dependable services for conventional computer applications became the new goal. Butler already had the required fiber backbone in place, but some of the outdated cabling needed to be replaced with brand-new Ethernet cable. By upgrading outdated wire and adding an uninterruptible power supply to every network closet, the new converged network would now handle both the new telephone system and the conventional data network services. After the winter break, contract work started, and the agreements were signed in the middle of January 2005. The department has also advanced the network replacement project's timeline and started installing new routers and switches around campus. The new network architecture incorporated greater segmentation, safeguards including intrusion detection, and quality of service standards to reduce the reliability risks of the new system. The Butler network would be able to conceptually isolate traffic on the converged network using Butler-exclusive features like QoS levels to safeguard voice transmissions from other traffic, including criminal behavior. Additionally, new monitoring tools would be added to the VoIP system to track call routing and quality metrics as well as call origin and destination locations. This would assist the IR team in identifying the source of issues and assisting them in network management so that voice communications could be delivered at a standard comparable to that offered by conventional analog phone lines [10], [11].

CONCLUSION

Another benefit of VoIP is portability, particularly for remote, hybrid, or highly mobile teams. VoIP is perfect for companies with employees spread across time zones and regions since it functions online and users may use their phone systems from anywhere with a functional Internet connection. VoIP is a technology that allows voice conversations to be sent across IP-based networks, such as the Internet. Instead of using specialized conventional circuit-switched voice transmission lines, voice is now transferred across a general-purpose packet-switched network. VoIP is a technology that allows voice conversations to be sent across IP-based networks, such as the Internet. Rather of using specific conventional circuit-switched voice transmission lines, voice is carried across a general-purpose packet-switched network.

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CHAPTER 20

A BRIEF DISCUSSION ON IMPLEMENTING THE VOIP SYSTEM

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ABSTRACT:

Instead of being restricted to a single physical phone line, a VoIP phone system enables you to make and receive calls from any location with an internet connection. As a result, both you and your staff will be able to work remotely. In this chapter author is discusses the cutover to the new system. This may involve the installation of new servers, routers, switches, and other networking equipment, as well as the configuration of the VoIP software and network settings. Testing and fine-tuning of the system are also critical steps to ensure smooth and reliable communication. Ongoing maintenance and support are necessary to keep the VoIP system running smoothly and to address any issues that may arise. With proper planning and execution, implementing a VoIP system can bring significant benefits, including cost savings, increased flexibility, and improved communication efficiency.

KEYWORDS:

Information Technology, Program, Network, Signal, VoIP.

INTRODUCTION

The number of persons officially associated with the project started to grow quite fast. In January 2005, Berbee gave the Butler project a full-time project manager. Joseph Indiano, the director of network and systems, would oversee integration with other current systems and act as the project coordinator for Butler. The CIO would act as the project sponsor and have the responsibility to remove organizational barriers to communication between important university stakeholders, including the deans and other vice presidents. Also, the CIO would have to explain the project's strategic goal and respond to any queries from staff, teacher, and student users about the new system [1]–[3].

Other crucial IR employees were also a part of the newly established IP Implementation Team, including telephone workers, network engineers, and PeopleSoft developers, help desk staff, and Butler's Facilities Management team to assist with the logistics of the installation. The Berbee Information Networks, the implementation partner, provided the bulk of the IP Implementation Team members, with assistance from Cisco personnel as required. In order to guarantee that the new network architecture would let data and voice traffic to coexist while having telephony servers secured from student PCs and external security risks, Berbee Information Networks' security practice was also enlisted. It was also agreed to retain the Dietrich Lockard Group consultant on the team, which was unexpected at the beginning of the project, to make sure Berbee and Cisco constructed a system with all the components specified under the RFP and vendor contracts. Last but not least, around 18 students assisted with testing and implementation. By this deployment, the former data and telecoms professionals who had previously worked in separate units merged

in addition to the data and voice network technology. You must bear in mind that within the project, convergence refers not only to the integration of processes and people but also to the convergence of technology. When voice and data traffic combine, the corresponding employees do too. Those who work in data have a distinct methodology and lingo than those who work in telephony. Thus, controlling this blending of the employees and disciplines was crucial. There were several persons to coordinate in addition to the size of the implementation team in order to do this.

The "Infinitely Intimate" Communication Strategy of Butler

In order to develop the message the university would deliver to every user to assist assure acceptance of the new system, a communications coordinator was hired to the team. Butler's consumers had previously suffered data network outages, thus managing their anxiety over a significant system redesign was seen as crucial. One method used for this was to This set the tone for the teams to concentrate on the ways the network improvements were allowing individuals to speak more freely, not on the fact that the calls were being delivered over IP data packets, and to redefine "IP" to stand for "infinitely personal." Users were given vital system information in person by departmental workers, and management was reminded to attend training sessions. Although though e-mail was used for most communication, printed materials that were placed around the school and all-campus voice mails were also used. The university community was informed about the new system's purpose, the location and time of training, how to switch from the older voice mail to the newer one, who to contact in case of issues, the date and time of cutover, and instructions on how to return old phones once users started using their new equipment.

A pilot project

Before the new VoIP phones were widely used, a pilot program was put in place to try out features and get customer input. 40 phones were sent to high-volume phone users, including department coordinators and high-level secretarial employees, in April 2005, around six weeks before the system was scheduled to "go live." The users contributed to the testing of the new system's features over the course of around three weeks and helped to improve any other elements that pilot users had identified. The pilot program's main objective was to win over the user community. Pilot users should ideally become department coordinators and trainers in addition to spreading their excitement for the new system among their peers. The folks who would be utilizing phones the most were the ones that IR wanted feedback from. Because of our high phone volume, they needed someone from admission to be engaged. It seemed reasonable for me to volunteer to be a phone coordinator because I oversee the group that manages incoming calls.

Admission

A series of training sessions were held in three laboratories as part of the pilot program after an information session, which Berbee had hired with a company to administer. To support information exchange and early training, Dietrich Lockard and Berbee consultants and members of the implementation team were present. Pilot users were given the chance to experiment with the new phone's features and engage with the new functionalities via role-playing. They made training enjoyable. They welcomed inquiries and conversation from the outset and provided gift bags and prizes. A PowerPoint presentation outlining the terms, advantages, and ways the new technology will assist our departments came first. The IR team sent out material often, including worksheets to complete after testing out different capabilities available on the new phones, cards with contacts, and pamphlets with timelines, making the training sessions much more interesting. We

experimented with newly discovered capabilities, such as "parking" calls, forwarding calls, and setting up conference calls, and we filled out phone feedback forms.

Several users had "phone envy" as a result of the pilot program; they got to witness how IP phones were used and developed an interest in the new capabilities of the technology. As a result of bringing technology closer to the consumers, the idea of being "infinitely intimate" was also emphasized. Although many customers were enthusiastic about the new phones and its features, others were wary of the shift since they were unsure of how the IP phone would truly function: Although it was an easy adjustment for me, many individuals had trouble understanding the idea of using a computer connection rather than a telephone hook to use the phone.

Operations

The capability of the new system provided for thorough reporting, and department managers could use it to assess and benchmark their contact center staff. Managers of high call volume offices were aware that these capabilities would dramatically enhance their department's call center procedures. Nevertheless, some of these features were actually frightening some users, who felt they would be watched since we would be able to gauge call volume and duration. This led to increased consumer worries. Several people believed "Big Brother" would be watching because of it [4], [5].

DISCUSSION

The Cutover to the New System

The implementation team was confident in their ability to continue through with the full roll-out scheduled for June 2005 when the pilot was completed. Butler avoided having to do a standard cutover, in which the old phones are removed and the new ones are installed simultaneously, by switching from traditional telephony to an IP-based system. Instead, the old analog phones were kept accessible while the new IP-based phones were provided to all users in the weeks leading up to the switchover and all academics and staff were required to attend training sessions. Even users at the new call centers could make and receive internal calls on their new IP phones while all outgoing calls were handled by the old Centrex phones before the switchover. The roll-out strategy, however, was in danger of failing due to a number of technical issues, which eventually came to be described as a "Week from Hell":

Due to a software problem, the new IP-based phones' apparently straightforward "plug and play" setup did not work, and all multiline phones unexpectedly had to be manually registered one by one using their specific machine address code. The vendor chose to replace and rebuild each and every one of the new telephone servers since they were randomly restarting. 2,000 more phone numbers that Butler required to give private numbers and voicemail boxes were discovered to be missing after a two-month effort, and SBC said it would take 45 days to fix the problem. It was discovered that none of the offices for the campus-based independent non-Butler businesses, Food Service nor the Bookstore, had any Ethernet cabling. The SBC service representative Butler had relied on for the previous four years abruptly left, and the spouse of the IR telecom coordinator was robbed while being tied and gagged with duct tape! Our terrible week was a major setback. Yet neither the team members nor myself wanted this project to be delayed. One of the choices Butler had under the Berbee contract was to change the implementation schedule to permit a split roll-out, with phase one of the roll-out taking place in the summer to ensure everything went as planned and phase two users being introduced during the Thanksgiving holiday. The team took the

choice to continue forward and not allow the unanticipated obstacles do more harm than required, therefore the cutover date was postponed by only two weeks.

As everyone was determined to complete the roll-out at once, we opted against splitting it apart. We didn't want to put that spirit to death. Moreover, we believed that adding extra work around the Thanksgiving holiday would strain our team members and the suppliers even more.

Butler's phone numbers were given to Time Warner Telecom, who forwarded all incoming calls to the new system and switched off Centrex. The new call center software controlled the calls and ensured that calls reached the appropriate parties. Just a few lines and functionalities were overlooked, demonstrating the value of the planning, testing, and roll-out. Yet none of the departmental burglar alarms were functional. The Cisco analog-to-VoIP gateway was used to connect the alarm panels, which formerly connected to the campus police department through analog phone lines. Nevertheless, Butler had obviously not tested the devices before deployment since the alarm panels, which were based on 1970s technology, would not even function with the analog-to-VoIP gateway. Butler then utilized several spare Centrex lines to rejoin the alarms using conventional analog circuitry. The internal voice and data system, which had just been converged, was otherwise completely operational. There were no complaints about the voice quality. As I have participated in a number of significant system changes in the past, I have seen my fair share of "blips" and general catastrophes, thus I was pleasantly surprised that I have not yet seen any such problems from this move.

Realities after Implementation

The whole new system, which cost roughly $1.5 million, took about a year to complete from the beginning of design to the end of implementation. A set of interconnected servers connected to PeopleSoft, LDAP, and the network provided Butler with a powerful "soft-PBX" capacity under the new system. Six fully functional contact centers were also created as a consequence, providing students and outside callers with greater support for issues including student accounts, admissions, financial assistance, and box office tickets. Departments could simply take their IP phone with them when they changed offices, and the number would be immediately reassigned without the need for IR involvement. The PeopleSoft system also provided academics and staff with daily updates to a list of campus phone numbers.

The new IP system, however, was not less costly; in fact, it was somewhat more expensive since IR needed to hire a full-time employee to handle the new system. Compared to the outsourced Centrex system, the new system included a lot more components. Moreover, Butler's IR team is now in charge of managing phone networks in addition to data networks. Once the original implementation's exhilaration subsided, CIO Kincaid began to question, "Did we make the correct decisions?"With the present security concerns to computer networks, should Butler have accepted the burden of administering an integrated voice and data network in their desire to enhance communications?

The Fund for Children's Health

The Children's Health Fund creates and supports a nationwide network of 22 programs, two affiliates, and the District of Columbia in 15 to 17 states. From birth through age 24, the CHF's objective is to offer comprehensive medical care to the nation's most medically underprivileged children. Teams of doctors, nurses, dentists, psychologists, social workers, and nutritionists

provide in-person primary healthcare, mental health, and oral health services at more than 200 service locations nationwide in collaboration with pediatric departments and specialists in affiliated academic medical centers or Federally Qualified Health Centers.

In line with the idea of an "improved medical home," which ensures continuity of treatment via coordination across various healthcare providers and specializations, the CHF's integrated approach to healthcare is a good example of how to do this. In order to guarantee a high level of care while simultaneously attempting to boost efficiency and lower the cost of acute care, the Medical Home idea is being embraced in the United States. This kind of integrated health care delivery is made possible by health information technology, including communications networks in addition to computer software. Dr. Irwin Redlener, co-founder and president of the CHF, has a medical degree. In 1969 from the University of Miami. Dr. Redlener's quest to become part of the solution started with providing medical care in Lee County, Arkansas, then working on earthquake relief in Guatemala, then serving as medical director for the Children's Hospital of Denver. However, it is said that his life mission for providing medical care to underserved children began when he was a medical resident in pediatrics at the Children's Hospital of Denver and saw a poster for VISTA with the words: "If you're not part of the solution, you're

The Children's Health Fund offers mobile medical clinics.

The 36- to 44-foot long blue vans that contain CHF's mobile medical clinics are created to provide a complete spectrum of pediatric primary health care, including preventive care, acute and chronic illness diagnosis and treatment, mental health, dental care, and health education services. In addition to treatment given in mobile clinics, regular health clinics as well as fixed clinical locations housed in shelters, schools, and community centers also provide care. MMCs have also been deployed to provide medical services in response to public health crises or emergency situations, including the 9/11 attacks on the World Trade Center, hurricanes Rita and Katrina in 2005, and the 2010 Gulf of Mexico oil spill. The mobile clinics routinely visit low-income neighborhoods and homeless and domestic violence shelters to provide medical services [6]–[8].

The design of the MMCs is based on two key CHF principles:

1. To offer children in medically disadvantaged communities with high-quality primary care, as well as dental, mental health, and social services.
2. To collaborate with a top-notch neighborhood medical facility, such an academic medical center or FQHC, in order to provide the community with coordinated healthcare and access to additional medical specialists as required.

For people living in poverty at government-sponsored locales as well as places where there are few health care providers, referred to as HPSAs, access to dependable, inexpensive transportation is a significant challenge. GlaxoSmithKlein offered a $2.3 million grant to provide transportation funds in 2004 to help alleviate this restriction for low-income and homeless persons in New York and four other significant areas: $35,000 on taxi fares and The Dallas Children's Health Project spent $20,000 on adult bus fares the year before. This Referral Management Project had striking effects in New York, as expert appointment compliance increased from 5 to roughly 70%.

The foundation of the medical home concept is the idea that a returning patient would be supported by a dependable healthcare team who are familiar with them and have access to their medical records.

The blue vans' sides are decorated with graphics that make it obvious that they are CHF units with trained medical experts inside. The MMCs are scheduled to be at the same place with the same medical staff aboard on a certain day and a specific time each week. We don't merely materialize in ice-cream man form, fire a shot, and then go. According to the routine, the doctor is present every Tuesday from X to Y hour.

Although offering high-quality primary care from a mobile clinic does provide certain special difficulties for assisting those providing the medical treatment, these include:

1. Creating a space that supports regular medical office and clinic procedures and is consistent with them. This entails providing the space and medical tools necessary to enable the high-quality delivery of primary care, including enough reliable electrical power.
2. According to governmental regulations and regulatory norms, such as those outlined by JCAHO.
3. Supporting a movable unit that works in many, mostly metropolitan locations, each with a special set of environmental requirements.
4. Offering stable and dependable computer and communications technologies inside the MMC, as well as remote access to technical help.

The entire cost of each mobile clinic, which includes the initial investment for a cutting-edge MMC as well as ongoing operational expenses, is an additional crucial factor. Each MMC's about $500,000 capital budget is mostly used to purchase the necessary medical equipment and related vehicles. When children get vaccines, preventive care provided by a medical home should, of course, result in long-term cost savings for state and federal payers. The certification agency for healthcare organizations. The HIPAA Security Rule establishes security standards for protected health information maintained or transmitted in electronic form, as well as for routine health examinations that can prevent expensive trips to hospital emergency rooms, though these are challenging to measure. The HIPAA Privacy Rule regulates all protected health information. As a result of CHF's affiliation with a large medical center, MMC may be included in medical residents' official training rotations, often in pediatrics or community medicine, as a member of the medical staff, given the national scarcity of primary care doctors.

Healthcare Information Systems to Support Primary Care Nowadays, paper-based record keeping in medical practices is still common in the United States. The software packages created and maintained by vendors with expertise in the healthcare sector provide two different sorts of functionalities: The data included in practice management systems, which support administrative duties like patient workflow and the revenue cycle, includes information on patient contracts, appointment scheduling, and patient insurance plans.Electronic medical record systems provide clinicians with data that includes patient demo-graphics, family history information, allergies, medication information, clinical documentation of diagnoses, treatments, and outcomes for prior visits and specialty referrals, as well as patient diagnosis, treatment, and physician orders.Just 4% of ambulatory doctors had completely functioning EMRs by 2008; 13% had moderately functional EMRs; however, 50% of those working in bigger practices had partial or full EMR assistance.

Several companies provide bundled solutions that include PMS and EMR modules built for data sharing. Nevertheless, speciality practices in particular may have acquired software from several suppliers as some of the clinical programs are created to especially serve certain kinds of care, such as pediatrics, OB/GYN, cardiac care, and so on. Moreover, software that facilitates electronic prescription transfers to pharmacies and insurers has lately gained widespread use as a requirement

for government and other insurer payments. Due to financial incentives provided by Medicaid and Medicare to qualified physicians who have implemented certified electronic health record systems and reported specific metrics for Meaningful Use beginning in 2011, investments in software packages to support clinical processes in small practices in particular will be made at a much faster rate during the second decade of this century. The CHF was among the first organizations to identify the benefits of employing computerized health information systems. In order to spearhead the initiatives to provide cutting-edge support for the MMCs, Jeb Weisman, the current CIO, originally joined the company in the late 1980s before the introduction of the first MMC. Originally, a system developed and maintained at home was used.

It was crucial that you have a true background because of how the transitional housing system for the homeless operated at the time there were forced transfers every three weeks and other things of that kind. By the time they were 6 or 7 years old, some of these children had had six doses of the measles vaccine since it is better to vaccinate them than not in case an infection develops. As a result, there was an equal amount of medical over- and under-neglect occurring. Records are really crucial. In an effort to provide specific technology for the MMC environment, CHF teamed up with a now-defunct vendor in 1999. Weisman's team added a similar data collection capability for use with the commercial software package in light of the CHF's early investment in custom software that supported the data collection of detailed clinical data specifically for pediatric care. This system was then phased out in 2007 when CHF partnered with another top electronic health record software vendor, eClinicalWorks. In addition to providing the information required for referrals, having this comprehensive information in a uniform format allows for high-quality patient-physician interactions at both the first and follow-up visits. Lead blood levels, asthma, and other chronic illnesses are more prevalent in medically disadvantaged populations.10 The integration of laboratory and imaging data with the rest of a patient's medical record is one of the issues in record keeping that all physician practices encounter.

The Office of the National Coordinator for HIT in the United States is in charge of implementing the HITECH Act, a piece of legislation that was included in the American Recovery and Reinvestment Act and was signed into law by President Obama in February 2009. Health and Human Services Department. An EHR is comparable to an EMR, with the exception that it is designed to share data with other healthcare systems other than the one owned by the healthcare provider. In a paper-based system, the testing facilities normally fax the test results to the requesting physician, who then files the paper copies and film with other hard-copy records in the patient's folder. When test results are not obtained promptly, a nurse or other staff member usually calls the employees of the testing institution and may quickly get the missing data. The most advanced healthcare information system systems of today combine electronic test reports with the patient's record, giving the doctor easy access to all pertinent information via the same patient record interface.

Yet, it is more difficult to preserve an accurate medical history for a patient who lives in poverty and could be staying in a shelter for the homeless or another kind of temporary accommodation than it is for patients who have a more permanent address. In cities and towns with CHF clinics, a patient seen by a certain clinic in a particular Bronx area this month can live in a different shelter in a different borough the next month and see an MMC or permanent clinic in a different part of NYC. It could be necessary to contact and have fax capabilities in order to get a record from another clinic. In order to allow patient referrals to other doctors, especially specialists, and to confer with other medical professionals, it is essential that both telephone and fax capabilities be

available. Having the patient data previously gathered for the same patient accessible in organized electronic form would be the perfect approach, particularly when the same software program is being utilized at several clinics [9]–[11].

CONCLUSION

VoIP helps businesses provide better customer service by facilitating efficient call routing and expanding access to front-line staff. Customers may rapidly reach the appropriate person or department by using an automated attendant, either as their main or backup choice. VoIP has fundamentally changed how we use telephone, with significant ramifications for product developers, service providers, and end users. This technology may significantly reduce telephone and long-distance expenditures for both organizations and individuals. VoIP lowers monthly communication expenses by establishing and placing calls across IP networks.

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CHAPTER 21

A BRIEF DISCUSSION ON CELLULAR WIRELESS NETWORKS

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ABSTRACT:

A cellular network, also known as a mobile network, is a kind of telecommunications network that uses wireless links to connect end nodes and is spread out across cells of land that are each serviced by at least one fixed-location transceiver typically three cell sites or base transceiver stations. In this chapter author is discusses the asynchronous multi-master database replication. Cellular networks consist of a complex architecture of components, including base stations, mobile devices, switching centers, and backhaul links. The design and optimization of these components play a crucial role in providing high-quality and reliable mobile communication services to users.

KEYWORDS:

Broadband, Cellular, Data Security, Satellite, Wireless Network.

INTRODUCTION

Therefore, in order for clinicians to provide high-quality healthcare via a mobile clinic, there are two main communications requirements: access to patient data that was previously collected at another medical facility but isn't yet available in the clinic's patient record system, and access to personnel at another medical facility for either an emergency consult or referral or a more routine referral. All of the network requirements for a mobile clinic environment listed below would be met in a perfect world. But, MMC service contexts provide some particular difficulties. Availability and dependability of the network. The availability of remote access to data and people is the most important networking need. Yet, the majority of MMC deployments take place in crowded metropolitan areas and sometimes in poorly populated rural areas—where there may be network availability issues or unreliable access to voice and data networks. Data protection. The minimal standards for data security must be in compliance with HIPAA. At the database server level, user data must be secured, and "network tunneling" and extra encryption are required to safeguard patient data at the network level.

Simple to use with no on-site assistance. The MMCs' networking technologies facilitate the provision of pediatric primary care at a high level. The network operating solution must be "push-button" technology with little in-field maintenance and provisioning since the highly educated and trained medical professionals may not be sophisticated in their understanding of networking technology and equipment maintenance. Cheap to install and maintain. The price of an MMC shouldn't be significantly increased by the added networking hardware. Also, the network solutions should be simple to find, buy, and install in the MMC. Latency and throughput on a network. The data rate must permit the transmission of files with text content. High-density medical picture transmission presents a unique difficulty since it calls for substantially greater throughput rates.

Network latency must be kept to a minimum in order to maximize efficiency and prevent misunderstanding on the part of the MMC employees [1]–[3].

Options for Connectivity: What Has Worked and What Has Not Many networking strategies have been explored since the introduction of the first MMC in 1987, and more recent technologies have become accessible and cheap. With varying degrees of success, two distinct wireless network options were tested.

Using Satellites to Access

A handful of MMCs have rooftop-mounted satellite antenna installations in 2005. Tunneling is a networking technology that encrypts user data for safe delivery over the open Internet. These antenna systems are equipped with a setup feature that automatically unfolds the antenna and lifts the antenna from a horizontal position. The antenna is pointed upward. After a scanning operation to find the strongest satellite signal, the antenna starts building a communications connection with the satellite. The antenna unfolds back into its horizontal position when the system is turned off. These devices proved to be mechanically problematic while being pricey and built for mobile use. These structural constraints on the system exist. It fluctuates daily, but unlike mom-and-pop casual usage, we are dealing with really important health care conversations and information. Inevitably, a gear will peel, a connection will fail, or a circuit will fry in the mechanical system. Doctors and nurses have scaled the roof to manually lower the antenna system, which consists of expensive, complicated equipment. That's not ideal, to say the least, since it makes people distrustful of technology.

Moreover, they caused structural issues for the MMCs. Due to the nature and architecture of satellite communication systems, the satellite communications sometimes also have unacceptably high latency. The way expectations are handled in these sorts of settings is intriguing. In an ideal environment, the majority of the data you move is straightforward, organized textual data, which has a high throughput or capacity. Hence, you really require a very little amount of bandwidth with extremely low latency. On a standard Ethernet-based system, a megabit satellite connection is quite different from 1.5-megabit connections via a wired line, even in Wimax, or whatever the flavor of the month is. The latency is the worst. The end user is duped because they don't trust it even when the throughput is sufficient to move the picture down or the data up since it takes longer to refresh than they are used to in their daily lives at home or at work. While caring for the patient, do they take a break and hope their data is refreshed, or do they stand there for twice as long and wait for anything to happen? We are here, in a box in the middle of nowhere, and we simply have to manually write it down and deal with it afterwards, which is very frequently how wireless communication at the satellite level may make things worse than just going with the flow [4], [5].'

DISCUSSION

Cellular Wireless Networks and Wireless Modem Solution

The MMC was fitted with a Sierra Wireless AirLink PinPoint X wireless modem that offered Third Generation wireless service with a "fall-back" capability to 2.5G wireless service in regions where 3G service was not available. It was first trialled in 2004 and officially put into operation in 2007. The benefit of using this particular wireless modem was that it supported both of the 3G technologies that are extensively used in the United States: cdma2000 and Universal Mobile Telecommunications Service. This wireless approach gave the MMC a high data rate to and from the Internet since 3G rates had a range of several Mbps. The transmission of patient data, however,

requires "mission-critical" or "professional" levels of cellular coverage and dependability, while today's general-purpose wireless networks are intended at "consumer" levels. This method can only be used to support MMC communications that are not mission important if the wireless coverage is not dependable or available. More important than getting faster data rates is providing the clinicians operating in mobile clinics with stable and predictable wireless access to the Internet. There is enough speed available on 3G and the upcoming 4G networks to transmit anything other than text-based data. What these networks do not provide, however, is dependable coverage at the necessary level. Delaying data transfer from the MMC until the van has access to a wired internet option, such as at a community center or school, has been tested as a hybrid alternative.

Broadband Wired Access with Delay

The MMC functions as a "store-and-forward" device in this mode of operation, keeping patient data, medical referrals, and digital photos on a server until wired broadband Internet connectivity is available. In a typical configuration, a wireless LAN connection from the MMC to the broadband access point inside the other facility would be made via a wireless router. The wireless LAN link's security and the latency in accessing and transferring information are two clear drawbacks of this strategy. In addition, owing to regional limitations on access to its wired internet connection or HIPAA security concerns, the MMC is not always able to utilize a neighboring third-connected party's network. Many of these businesses or institutions, especially those located in cities, won't let you install your own telecom equipment inside of their structures. So, we are able to visit shelters even if they often have network- or Internet-based infrastructure and forbid us from connecting to it. The HIPAA laws are also increasing significantly—becoming much more stringent, much better prescribed and laid out, and much more severe if you break them. These issues make it impossible for us to just go via any old network. So, we must ensure that we can tunnel while considering the options [6], [7].

Replication of Asynchronous Multi-Master Databases

The integration of patient record data gathered at various sites has been made possible thanks to a more manual solution, which was adopted in the absence of a dependable, high-speed networking solution to enable patient data transfers from the MMCs to the central server at the New York CHP headquarters in the Bronx. Yet, it also calls for the MMC servers to be physically close to the CHP offices. Banks discovered many years ago that installing a teller machine in a town in Montana would result in increased use and increased revenue from each transaction. But do you believe that town had access to telecommunications? No, there wasn't. So, how did it function? AMMR. When rates were low in the middle of the night, the cash machine might eventually phone up and relay the information to Wells Fargo. After merging everything, business rules were applied, and inserts were then sent back down to the database. Without real-time high bandwidth communication, it knows what it needs to know and survives another day.

To link X number of what we refer to as laptop servers to the master or main server, all the servers from the vans are physically hauled in to a single location. When we hit the button, a type of round-robin process begins in which the data is moved from each one to the master, business rules are applied, the data is aggregated, and then the exact same data set is copied to each and every one of them. That is a really effective approach because we accomplish it via inserts rather than physically transferring 10 gigabytes of data down to each one. After you're done, each of those gadgets will be a precise functional clone of the whole collection of data. It's a sophisticated response to a crude issue.

Additional Support Issues and Responses

The mobile unit's IT infrastructure consists of a server made from a Panasonic ToughBook laptop and many client PCs, which are ToughBooks with lesser workloads. Despite the fact that they enable wireless Ethernet, the suggested MMC option is wired because to its higher speed and reliability: These generators, which range in power from 5 to 20 kilowatts, are located below the mobile units and emit electromagnetic radiation. When you have 20 kilowatt generators supporting your weight, you don't get much wifi connection.

You are 20 feet from the server in a 36 foot van, yet you are unable to establish a stable wireless connection because the electricity is too contaminated. Even the best-regulated generator will eventually generate filthy electricity with plenty of harmonics and brownouts. Brownouts pose a threat. The object melts and erupts in a spike. Just purchase a new one. Nevertheless, the electronics in sophisticated medical equipment steadily deteriorate during a brownout. It starts producing incorrect data or fails unexpectedly before you realize it is dead. Moreover, the transportable unit has air conditioners and air filtering systems, both of which need significant starting power. Since the UPS is often not designed to handle this kind of filthy power, you must add at least a real-time UPS in front of these devices, preferable something like a line conditioner voltage regulator that pre-cleans the power before delivering it to the UPS.

Weisman, Jeb

Moreover, laser printers cannot often be utilized with a UPS that works in the mobile environment, therefore inkjet printers must be used instead. However, an inkjet printer has a greater operational expense. The initial on-site IT setup, training, and continuous remote help desk assistance are all provided by the CHF's NYC office for new MMC initiatives. By the first week, the majority of the MMC teams sponsored by CHF had fully implemented computerized record-keeping for all of their patients. One of the factors contributing to the quick start-up is the addition of a clinician with experience using the EMR to the training team: Normally, our training team consists of me, another employee who serves as sort of an application specialist, and either a medical director or a high-level clinical provider from one of our projects within the network who has been using eClinicalWorks in the field. It truly has a significant impact. Members of the training team are always there to provide help on-site in the clinic. Typically, they are present the first afternoon that patients use the system in real life as well as the following morning. In order to cover as many places as possible in case there are any technical or clinic procedure issues, we aim to divide it up in this manner. One of the best things about our training is that we don't separate out according to role throughout the training: we don't teach the registrar or the nurses alone, or train all of our providers in a room by themselves. They are learning about one other's occupations and how to assist one another while also building built-in tech support. The training replicates how a clinic really operates.

Mobile clinics for health care as a Crisis Response

In 2003, Dr. Redlener was appointed the inaugural head of Columbia University's Mailman School of Public Health's National Center for Disaster Preparation. One of the objectives of this institution is to handle the aftermath of significant catastrophes and evaluate how they affect communities and high-risk, vulnerable children. Before that time, CHF had previously sent its MMCs to New York City to assist with disasters connected to Hurricane Andrew and the 9/11 World Trade Center assault. After a natural catastrophe, the optimal communications technology option will depend greatly on the crisis circumstances. The region's previously existing commercially accessible

cellular network may be used if cell towers and base stations have not been destroyed. Nevertheless, since this is the same network used for public mobile phone service, there may be network congestion after a catastrophe as a result of a rise in call volume from the general population. The majority of cellular service providers do not use call prioritization, therefore calls from the general public will often compete with a mobile clinic's use of the network. In worst-case circumstances, the emergency relief location could not have access to a cellphone network. The same might be stated for other types of public disturbances, such blackouts. A sizable area of the United States had power outages in 2003. When uninterruptible power supply batteries ran low and generators malfunctioned or were too small for the scope of the outage, practically all mobile phone connections in New York City stopped working within hours. Of course, using the MMC vans with their own generators and satellite antennae is a potential substitute.

Redlener personally accompanied two mobile healthcare units with a team of doctor's only days after Hurricane Katrina struck New Orleans in 2005 in order to provide vaccinations and treat illnesses throughout the Gulf coast. They had cared for more than 7,000 patients in the first few weeks whose physicians' offices had been destroyed either swept away or flooded. A study conducted by the center the following year revealed that one in three kids living in trailers funded by the Federal Emergency Management Agency had at least one chronic condition, and that kids living in trailers in the Baton Rouge region were twice as likely to be anemic than kids living in homeless shelters in New York City. It was obvious that children needed more continuous healthcare, therefore CHF assisted in establishing and funding additional mobile clinics at the Gulf port, as well as in New Orleans and Baton Rouge, Louisiana.

The upcoming

Early in 2009, Dr. Redlener set out on a new mission: to raise awareness about the long-term health effects that economic recessions have on children. His "Kids Can't Wait" campaign underlined the negative long-term effects of skipping vaccines and early health screenings. The demand for mobile clinics was even greater in the United States by the middle of 2010, and the televised coverage of the Haitian earthquake disaster in 2009 had significantly raised public awareness of the urgent need for such solutions. The personnel at the NYC-based CHF were now well-versed in installing technology on a new MMC, educating the staff on-site, and provide remote assistance for the first several weeks of operation. CIO Weisman, though, wonders how the mobile clinics may be supported even better and what additional support difficulties are in store. Should we try any newer, more economical network communication solutions? Would the HITECH stimulus monies and Meaningful Use guidelines from the federal government result in improved software integration solutions? Would it be increasingly difficult for him to keep his personnel if more medical offices embrace software? What set of circumstances can manifest that would make the mobile medical clinic paradigm obsolete?

Information Management at InsuraCorp

Individual insurance policies like term life, universal life, and whole life policies; retirement services like 401(k) and 403(b) plans; and group insurance policies like group life and disability insurance, as well as long-term care insurance, are among the financial products, services, and support offered by InsuraCorp's various business units. Up until recently, the business divisions of InsuraCorp continued to function independently while the company expanded via acquisitions. Moreover, little effort was made in the past to advertise goods to clients across business divisions.

Nevertheless, under the current CEO, there has been a shift in emphasis on creating business unit synergies via cross-marketing product offers. In order to assist InsuraCorp in achieving its new synergy objectives, the business's first CMO was appointed in 2005. Under his leadership, a new branding effort was launched by the corporation. A single point of contact for consumers will be created as a consequence of the branding campaign, along with an integrated website that enables salespeople and customers access to all of the company's product and service offerings. In the past, if you had an individual insurance policy, retirement services, and a group policy, you would go to three different Web sites and you would have three different passwords. All of that is being consolidated. The CMO was well aware of the issues with the silos that had developed over time. We are entirely redesigning the foundation of our websites so that they all have the same appearance and feel. We are also eliminating several Web pages and consolidating them into a single focal point where customers can visit and view all of their personal data displayed.

The marketing VPs, who previously exclusively reported to the leaders of their respective business units, now now have a dotted-line connection to the CMO in order to enable this strategy. This dual reporting arrangement suggests that the line headsets the overall direction for the marketing team, but that all marketing leaders must also collaborate with the CMO to create and implement marketing strategies at the corporate level. The marketing leaders have benefited from the dotted-line connection by learning about what other business units are up to and how their own objectives align with corporate-level goals. The ability to see sales agents1 and consumers "holistically" is necessary for achieving synergies across product offers and creating a consistent brand image. The same agent may be selling items from several business units within InsuraCorp. Yet, it is quite challenging to record the fact that a company or individual consumer is dealing with the same agent under its old systems. It's critical to comprehend both the items that clients now own and those that they may acquire from InsuraCorp. Due to "life chang- ing events," such as having children, purchasing a house, or sending children to college, the CMO is aware of the need of being able to identify cross-sales possibilities for various InsuraCorp business units for individual clients. Many customers just purchase one product, not knowing that InsuraCorp offers a wide selection of other items. So, in order to capture and ease access to integrated enterprise-level data, the InsuraCorp branding strategy also necessitates investment in enterprise-level IT activities.

InsuraCorp's IT

Each business unit had its own IT chief and employees up until recently. The company's data integration objectives, such as the ability to cross-market items from other business units under the new InsuraCorp brand, were hampered by the fragmented IT organization structure's inefficient processing and redundant IT resources. Almost all IT resources were gathered at company headquarters under a newly declared unified structure for the IT organization that was introduced in the early months of 2006. The previous business unit IT 1A sales agent may now work for InsuraCorp as a career agent or as an independent agent who is authorized to do business in a certain state and is assigned to sell goods on behalf of InsuraCorp under the centralized structure. The CIO receives a solid-line report from executives, and the business unit they serve receives a dotted-line report. The VPs of Corporate Applications, Enterprise Architecture, Planning and Finance, and Systems Operations are the CIO's other four direct reports. Over 300 IT professionals work for the new consolidated IT organization. There are another 25 or so IT employees working at different locations. Also, InsuraCorp uses outsourcing for IT services like 401 statement printing and spam prevention and often hires IT contractors for on-site work when the organization lacks the necessary skill set for a certain IT effort.

In response to the need to design a new IT architecture to enable enterprise-level infrastructure services, the post of vice president of enterprise architecture was created in early 2006 and filled with an outside appointment. The creation of 11 IT working groups to concentrate on certain facets of IT architecture, such as desktop computing, networks, security, IT storage, and so on, was one of this VP's early efforts. Each group was tasked with creating standards and coming up with concepts for IT initiatives that would be required to meet the new integration and standardization goals of the organization. A handful of the working group heads and the VP of Enterprise Architecture make up the Enterprise Architecture Development Committee, which oversees the operations of the IT working groups. In order to assess, authorize, and prioritize IT projects, new procedures and committees had to be formed as a result of the transition to a centralized IT organization. Requests for IT work are originally approved by a new standing committee that consists of a member from the corporate planning division of InsuraCorp. The company's Executive Committee then receives approved IT project proposals for final approval and prioritizing. The creation of a set of IT principles to clarify the function of IT and explain the uniform IT practices to be used throughout InsuraCorp was another endeavor under the current CIO. For each concept, the members of the IT Committee, often known as the ITC, created a thorough justification and a list of ramifications. The CIO was aware of the value and need of the corporate IT principles: We hear business folks remark, "yes, we purchase versus construct," and we do. It's astonishing to me how widespread those IT principles have gotten after they are developed. It has been more effective than I anticipated.

CIO

All business and IT managers as well as other staff members who are engaged in making IT decisions follow these IT principles. For instance, Principles 1 and 9 highlight the significance of providing technology tools that business users find simple to access and use, and identify the primary IT job at InsuraCorp as providing "uninterrupted" support for business activities. The "working model" for purchasing and implementing IT solutions favors integrated over stand-alone solutions supported by a "master source" of company data and using standard industry solutions. It also favors purchase over build decisions based on alignment criteria. The company's commitment to developing internal IT workers via proactive training and mentorship is outlined in Principle 15.

These guiding principles express InsuraCorp's shift toward enterprise-level solutions that make use of readily available mainstream IT technologies. In order to meet the corporation's aims for data integration, they also indicate that the firm would adapt its business procedures to match the requirements of the bought software as required. An initiative that is clearly in line with the company's recently adopted IT principles is the recent choice of Salesforce.com to provide a common IT platform for sales and customer service across InsuraCorp's dispersed internal workforce. Customized solutions at the business unit level are being sacrificed in favor of a common, user-friendly, Web-based "self-service" approach [8]–[10].

CONCLUSION

In comparison to previous options, cellular networks provide customers improved advantages including greater capacity, low battery consumption, a wider geographic coverage area, and less signal interference. Many communication hurdles that may be the fault of the sender or recipient may cause communication to break down. Consequently, understanding the hurdles is necessary for efficient communication. Computers are linked together wirelessly instead of using network

wires. Radio communications are used by computers to transfer data between one another. Direct communication with other wireless computers is possible, or you may use a wireless AP to join an existing network.

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CHAPTER 22

DATA INTEGRATION INITIATIVES AND CHALLENGES

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ABSTRACT:

The process of merging data from several sources into a single, cohesive perspective is known as data integration. Integration involves procedures like cleaning, ETL mapping, and transformation and starts with the ingestion process. In this chapter author is discusses the planning the new information technology system. Data integration is a critical process for organizations that need to combine and consolidate data from multiple sources. While data integration can bring numerous benefits, including streamlined operations and better decision-making capabilities, it also presents a range of challenges.

KEYWORDS:

Data Integration, Enterprise, Information Technology, Network, Signal.

INTRODUCTION

A corporate data repository initiative was launched in 2006 with the CMO as the sponsor. The goal of this project was to create an enterprise-level data warehouse for all business units' customer and product data for the first time. At the business unit or function level, all product and customer data used to be stored in separate antiquated systems. Having a single source of data for the whole organization is the aim of the EDR initiative. An enterprise source for monitoring and reporting on marketing efforts will be made available by the EDR. Moreover, it will serve as the repository for a comprehensive list of the goods that InsuraCorp offers, enabling sales representatives to cross-sell items from other business units to clients. EDR will assist in "connecting the dots," as one of the IT architects put it: They are aware of the sources of income. They can't connect the dots, even though they are aware of how much money is leaving and what they are paying the agents. They are aware that they are doing these conferences and email campaigns, but once again they are unable to connect the dots.

Manager of Data

The EDR project was entirely handled internally. Building data models and data-flow diagrams were the main early priorities. The EDR, which contained more than 300 data items throughout the company, was prepared to be filled with data nine months into the project. In order to map the data fields of those trustworthy sources, the business analysts on the project team first identified the "trusted" electronic data sources inside InsuraCorp. They then spoke with the subject matter experts and data stewards in the relevant business domains. The EDR was then attached to the source file for data transmission once the data fields were mapped to the EDR. The business analysts then revisit the data for evaluation. The project team has found and fixed discrepancies both inside and across the source files using this multi-step method. The business analysts are in charge of checking the data for correctness once it has been transmitted to the EDR. Other products

for business intelligence reporting by either business or IT professionals were also being evaluated under the direction of the EDR project manager [1]–[3].

Bringing together data that was previously isolated in several administrative systems managed by distinct business divisions, however, also revealed a number of data management difficulties. They used to be more dispersed merely inside those divisions, so all they concentrated on was their own small corner of the globe. Today, however, they are being encouraged to go beyond that. They included worries about the "trustworthiness" of data from various older systems as well as challenges with data quality. For instance, the lack of information on product descriptions was one of the data quality problems that came to light. For instance, marketing department computer users are unable to utilize products without a related description. Moreover, incorrect product categorizations have been found. Moreover, it may be challenging to distinguish between two or more administration systems that relate to the same customer since the same client may have distinct addresses in legacy systems maintained by several business units. While there are resources that can validate data as it is input, InsuraCorp management are aware that data quality cannot be fully automated and does not come for free.

It has been challenging for InsuraCorp to predict the veracity of data because of the many source systems and resource-intensive human procedures required to integrate such data. The systems used to oversee and distribute remuneration to sales agents are also hard-coded into the apps, which makes it more difficult to discern if the data is reliable. The fields include some data that is known to be inaccurate, and some of the fields are empty. We produce exception reports as we extract that data and transfer it into the data warehouse [4], [5].

DISCUSSION

Project Manager

The IT executives at InsuraCorp understood that creating an EDR would not entirely address all of their data management problems: new data management strategies and choices about data governance would be needed to maintain an enterprise-wide perspective of the company's data. For instance, how would data quality be assessed and who in the company should be in charge of it? Who should be the data owners inside the company? Who should be in charge of deciding who has access to what data and who should be in charge of implementing data access rules to guarantee the appropriate degree of data security? Who should make the decisions on whether data should be stored and how long it should be kept?

A New Information Technology Platform is Chosen

It was 7 o'clock. Steve Nelson, the newly hired Chief Information Officer at Gregg's Appliances, Inc., was up against a deadline on the Friday before the Labor Day weekend in 2006. Technically, he had two deadlines to meet.

The operating system, proprietary database management system, and line of HP 3000 mainframe processors which Gregg's relied upon for its transaction processing and inventory management applications had all been chosen to be retired by Hewlett-Packard, the company's primary information technology vendor. The last date of support was December31, 2006. Second, Steve's strategies for handling this concerning development were sought for by Gregg's senior leadership team as well as the Board of Directors. In reality, Gregg's Chief Financial Officer had just walked out of Steve's doorway, telling him that he needed Steve's PowerPoint presentations for the next "board book" on Tuesday [6], [7].

Resolving an Information Systems Mistake

Sage Niele, the recently appointed Vice President of Operations and Chief Financial Officer for the Midsouth Chamber of Commerce, remembered how thrilled she had been when she first began in this role as she went over to the microwave in her office. Just a few weeks ago, Sage was the owner/operator of a lucrative information systems and financial consulting company, spending an average of 80 hours a week in the office or on the road. Sage made the decision to start working for another company since she had a family and aspired to live a calmer life there. It didn't seem that anything had changed in her life as of late. She continued to put in 80 hours a week of work, and her life remained busy. Yet Sage believed she could make out a glimmer of optimism. A few days after Sage started working there, MSCC President Leon Lassiter assigned her the difficult duty of overseeing the organization's information systems. This position would be difficult in most companies, but the MSCC was particularly difficult because of its past.

The MSCC had been receiving what it believed to be inaccurate invoices from Data Management Associates, its software provider and consultant, during the previous several months. The relational database system and bespoke report-writing software that the MSCC had acquired about a year earlier had faults in them or were implemented incorrectly, and DMA had been billing the MSCC for labor relating to these issues. Now it was evident that the MSCC's information systems had a lengthy history of making bad operational judgments, adding this event to that list. Sage was tasked with resolving the issue and creating a plan for the future. Sage saw that she just had two days left until Lassiter needed to get her 100-day action plan, which was due on December 24.

Her list of "to-dos" included figuring out the shortcomings of the present information systems, figuring out the MSCC's future information system requirements, and looking into alternatives in case the MSCC had to abandon the DMA system. Beyond that, however, there were several issues that needed to be resolved right now, such as the worsening relationship with DMA and the rollout of the new software. Even though she was aware that she didn't yet have all the answers, her 100-day plan had to specify how they would be obtained. Sage believed the best place to start was to look into the rocky past of the MSCC's information systems to help identify the clues needed to prevent catastrophe in the future. Sage has consulting expertise. Very ironic, she said. "When I press the start button, the situation at the MSCC has the same potential to blow up like the popcorn."

The Middle States Business Chamber

In Case Study 1, Midsouth Chamber of Commerce, the MSCC's history, and computer technologies are covered in greater detail. The Midsouth Chamber of Commerce was founded in the early 20th century, but the organization's experience with information technology started in 1989 when Ed Wilson, the vice president of public affairs, brought personal workstations and a collection of software for the first time. Several employees were hesitant to adopt this strategy and were dubious about the automation attempt. Wilson, however, was able to obtain the tools and employ a programmer to create unique software for each functional division the marketing division, the operations division, and the human resources division with the aid of Jon Philips, a small company consultant.

The usage of these systems increased substantially throughout the 1990s. To examine the organization's information systems requirements and choose the hardware and software solutions the MSCC needed, Wilson hired another outside consultant, Nolan Vassici, in 1998. Vassici proposed additional personal workstations after conducting a thorough analysis. A year later,

Vassici modified and changed the division-specific proprietary software. To improve the MSCC's computing capabilities, Wilson recruited Simon Kovecki, a fresh computer science graduate, as a systems analyst in June 2003. Wilson continued to oversee the IT infrastructure and, with Kovecki's assistance, changed the hardware and software virtually annually. Kovecki kept a close check on the systems, which were quite dependable.

It's Time for Change

Lassiter began to worry in 2005 about the MSCC's absence of a comprehensive information systems strategy that would provide the organization the type of continuing assistance it required. Despite the stability of the systems, the MSCC's data was spread among a number of workstations. Lassiter believed that the field of information systems required greater focus and integration. He took it upon himself to issue information requests to many businesses that provided software to businesses like the MSCC. When Lassiter visited a national association conference in August 2005, he learned about a little company named UNITRAK during a discussion on management software. Based on his 2004 evaluation of the MSCC's present and future divisional requirements, Lassiter believed the MSCC should take into consideration a software solution that UNITRAK had just developed.

Planning the New Information Technology System

In order to make the MSCC more effective, Lassiter had highlighted advantages offered by the UNITRAK program, such as speedier access to account information, the use of a centralized database of information, and enhanced quantitative analysis of activities. "The UNITRAK system not only fulfills our demands now, but this user-friendly package is also powerful enough to give the MSCC with the capacity to develop over the next five years," Lassiter said in a note to the management group. Greg Ginder, CEO of UNITRAK Software Company, was asked by Lassiter to provide a brief overview of the system's capabilities in October 2005. I'll back it if you want it, Wilson said Lassiter after seeing roughly 30 minutes of the three-hour demonstration. Kovecki's comments were different. "That will work for my initiative in public relations." The program has its advantages and disadvantages, and I think it might help me save some time. But, I object to the notion of giving the workers unrestricted access to so much information. Lassiter was successful in getting the MSCC's Executive Committee to sanction the purchase of the UNITRAK system, which included a tiny IBM server and the UNITRAK software. It is unclear what they will do with it, however.

The System's Implementation

The new system's implementation took a lot longer than expected despite Lassiter's interest and encouragement. The time it took to get the system up and running increased due to delays in issuing the purchase order and testing the software. Finally, training began in August 2006. The training went well, but data transfer developed into a significant issue. Lassiter instructed Kovecki to transfer the information from the old workstation systems to the new system on the last day of training. Less than 15% of the data rolled over into the correct assignments, which caused Kovecki a lot of trouble. It took him till the end of 2006 to have the data transferred to the new system since there was no documentation on the outdated program to refer to. The majority of the MSCC workstations were virtually dysfunctional in the meantime. List and mailing label requests were not able to be met. Also, it was exceedingly difficult to parse words, make payments and invoices, alter data, and maintain lists at this time. Also, Lassiter was having a very difficult time getting Kovecki to provide information on the development and status of the system conversion. It seemed

that Kovecki was making an effort to avoid staff members because he was frustrated with the issues he was experiencing and resentful of their approaching him for help.

At the end of the year, the system was operational thanks to UNITRAK, and at no extra expense to the MSCC. Nonetheless, issues persisted since it quickly became apparent that the system had significant limitations, most notably the absence of a relational database management system. Nonetheless, the MSCC survived with the UNITRAK application until 2007. Later, in February 2008, an even worse issue surfaced: UNITRAK had dire financial issues and had filed for bankruptcy. Shortly after, UNITRAK's existing support team disbanded, leaving the MSCC without any technical assistance. Lassiter recruited Zen Consulting, an independent consultant, to design programs, provide new reports, and help with software maintenance and support in order to solve this issue.

Leaving the UNITRAK Implementation Behind

Kovecki started to worry about his future at the MSCC in September 2008. He decided to leave as a consequence and accept a job with a nearby legal office that used a comparable hardware platform. Kovecki was replaced in late October 2008 by Dick Gramen, a former staff computer trainer for a nearby insurance firm. Gramen was a former Hewlett-Packard employee who set up and managed a large HP server as well as a local area network. But, Gramen had no prior experience with IBM servers. Moreover, Gramen had no prior knowledge of trade organizations or the UNITRAK program. As soon as he came, Gramen struggled with even the most fundamental system administration chores, which made him understand that learning this new environment would be exceedingly challenging. He began to question why the MSCC's requirements could not be met by a workstation network and HP server hardware as a result of these challenges.

Gramen spoke with his college roommate John Harter about the best method for the MSCC to have in place since he was determined to support his ideas. Harter was now working as a consultant for the neighborhood HP value-added reseller. Naturally, Dick, I'm going to advise you to get the HP system, Harter stated. HP offers the ideal system for your sort of business, and I have no doubt that UNITRAK will use it. And maintaining it should be easier for you. But I have to be open with you. Your board will be difficult to persuade. There are less expensive solutions available that might satisfy your demands. But if you do purchase the HP system, our organization might help you if you ran into issues. Gramen was certain that he could manage the maintenance and support and succeed at the MSCC with the aid of Harter and by bypassing the learning curve on the outdated hardware system. All that remained for him to accomplish was persuade the MSCC's management to switch to the HP system. Gramen started explaining to Lassiter, the vice president of marketing at the time, one month into his employment, The MSCC can no longer afford to continue using the same set of computer gear.

The IBM computer just is unable to satisfy your demands, neither now nor future. I simply cannot support the newly emergent political activity program without additional hardware since the present online legislative information services system is at capacity. If we don't deal with this problem right now. This collection of factors ultimately convinced Lassiter to back Gramen's broad hardware approach. Lassiter was thrilled that the IS representative was finally making an effort. He was certain that the information systems at MSCC were essential for preserving Midsouth's leadership among business trade organizations, and as a result, for the organization's financial success. Lassiter was also concerned that, without reform, the MSCC would not be able to provide its members with significant value in the area of legislative monitoring. Lassiter instructed Gramen

to covertly seek purchase cost estimates as a consequence. Gramen understood, however, that he would need the association's president, Jack Wallingford, to assist him if he were to successfully transfer the MSCC on the new hardware. Yet, Gramen was unprepared by the reception when he reached Wallingford:

Dick, I agree that we could need whole new hardware, but we cannot experience the issues we had with our last purchase of an information system. We made some fairly big mistakes when we bought the UNITRAK system, and we can't let it happen again. Also, there is no one on our board of directors who can negotiate a favorable pricing for us with HP. Moreover, I don't see how you can decide now. You haven't had enough time to learn about the technology, software, data structure, or even the activities that the MSCC is involved in and how the business is run that we now use. Gramen promised to schedule multiple meetings with top management during the first quarter of 2009 in order to discuss the organization's IT requirements and the overall operations of the MSCC in order to allay some of Wallingford's worries.

Using HP Hardware

Ed Wilson made the decision to assist Gramen after hearing Gramen describe the seriousness of the situation. Wilson went to Lassiter and Wallingford separately to convince them to endorse the HP method. Nonetheless, due to his position of power on the Executive Committee and the fact that his division was the biggest user of information technology, Lassiter's backing was of the utmost significance. Lassiter, however, was furious when Wilson visited him:

I instructed Gramen to get purchase cost estimates covertly so that we could be ready for action when the time came. Evidently, he disregarded my suggestion. I won't support bringing this before the Executive Committee until we are certain of what is required since I'm not ready to go into this blindly. We can't simply make a buy right now. Wilson was nevertheless certain that something needed to be done right now, regardless of Lassiter's backing, even if Lassiter's reasoning was correct. Wilson and Gramen then presented their idea to the Executive Committee, even though they were aware that doing so would make Lassiter uncomfortable. Wilson started,

Gentlemen and gentlemen, we need to decide quickly on this matter. Our already limited resources are being drained by the expensive expense of hiring a consultant to support and maintain the UNITRAK software on inadequate hardware. Also, we must move swiftly to continue providing our members with excellent service since there are upcoming demands in the area of legislative services. Our suggestion is the ideal response to the current dilemma. From a technological perspective, HP technology is cutting edge with flawless stability and dependability. The fact that HP has assured us that, once a transaction is completed, it would propose a software provider that can fulfill our demands is just as significant. With this suggestion, we have the best of both worlds.

Unusually, Lassiter sat at the rear of the space and listened in quiet. He was certain that the Executive Committee, which was made up of the CEOs of twenty of the state's major enterprises, would reject this idea even in the absence of his involvement. Lassiter believed that the constraints of the UNITRAK software system and the 2008 economic crisis were to blame for the MSCC's income growth being much slower than its spending growth. The MSCC's cash reserves had been swiftly reduced by half, too little over $1 million, making an unauthorized purchase difficult to defend.

Lassiter, however, had underestimated the strength of the crisis argument, as the Executive Committee gave Wilson and Gramen instructions to look into the cost of purchasing the HP

equipment, with the one caveat that they exercise "due diligence" in creating the whole information systems solution. The MSCC must employ an independent consultant to do a full requirements analysis, define a long-term vision, and set IS objectives before any choices are taken, Lassiter said in a message to Wallingford and Wilson after realizing that the MSCC was heading down a dangerous road. Also, we need to be aware of and take note of the errors our initial system had. Decisions on hardware and software cannot be made separately.

now introduce Data Management Associates

Gramen called the HP representative for advice on a suitable provider as soon as the Executive Committee meeting was over. The HP salesperson offered without hesitation the name of a nearby value-added reseller who, in addition to selling and installing HP hardware, would also look for software solutions that would meet the demands of the MSCC and the indicated hardware platform. This seemed the best option given Gramen's weak grasp of these issues. Gramen believed that this strategy was appropriate since his buddy John Harter worked for the neighborhood VAR.

However, it turned out that this arrangement was far from optimal. The VAR contacted Data Management Associates on the MSCC's behalf without ever having visited the MSCC and based primarily on Gramen's assessment of the MSCC's operational and information system requirements. DMA, which employed 54 people and was run by Stanford University alumni and computer science Ph.D. Dittier Rankin, was 61 miles away from the MSCC's headquarters. DMA has changed its direction and started creating bespoke software for regional chambers of commerce and small trade associations around the nation. Even still, the VAR had faith in DMA's skills despite her lack of extensive experience. Gramen and DMA spoke over the phone numerous times before making plans for DMA to show off its skills at the DMA headquarters in May 2009.

Despite the short 45-minute meeting, Wilson and Gramen were quite pleased. Gramen was prepared to present this idea to the Executive Committee, and she did so with the aid of screen photos, examples of reports, and specification papers. Yet in the interval, a fresh circumstance had emerged. Lassiter was contacted by John Hilborn, one of his closest friends and a member of the MSCC Executive Committee, who questioned him about his absence from the previous meeting. What Hilborn heard did not delight him. As a consequence, during Gramen's presentation at the next Executive Committee meeting, Hilborn requested Lassiter's opinion on the plan. Lassiter only said one thing after that cue: "Friends, if the offered solution turns out to be great for the MSCC it would be pure chance, since the software selec- tion procedure has not been thorough." Then he sat down.

Gramen felt uneasy after hearing those few remarks, as did a few other Executive Committee members. The idea was immediately put on hold for one month until further data was received from and regarding DMA. Gramen arranged for the president of DMA and two other members of DMA's management to visit the MSCC's headquarters and carry out an IS requirements analysis since his proposal and maybe his job were on the line. The people stopped by for two days. They spent the first day's morning giving a thorough introduction to DMA and showcasing the possibilities of the software packages they supplied using a laptop. The personnel of the MSCC was interviewed for the remaining day and a half about their work responsibilities, how they utilized the current system, and any unmet requirements they could find. In addition, Lassiter gave DMA a very thorough analysis of the IS requirements for his division as well as his own personal vision for the information system that the MSCC required. Lassiter also provided DMA with a ton of information in an attempt to describe the MSCC's capabilities and stress upon DMA the variety

and complexity of its activities. They contained explanations of the purpose and significance of the data in each of the reports as well as illustrations of every report and kind of document that the current system was capable of producing. He also provided DMA with an operations manual outlining the duties of each marketing division employee as well as a comprehensive report on the data that was presently stored in the database but was unable to be accessed and printed in a manner that could be used as a report. In all, there was a two-foot-deep stack of documents and information. Lassiter also refused to let DMA go until he had a thorough thesis on DMA's capabilities and software architecture.

Rankin stated that DMA had examined the data acquired during its fact-finding mission and had effectively assessed the IS requirements of the MSCC within two weeks, in time for the June 2009 Executive Committee meeting. DMA came to the conclusion that the HP platform and the MSCC's requirements were well suited to its Association Plus software throughout this process. Lassiter was unfazed, however, and continued to advocate for the granting of travel money to enable someone to visit at least one DMA client in order to see the program in use. Due to Lassiter's influence and the fact that his division used the existing information system the most extensively, the Executive Committee decided to postpone making a decision and allocate funding to send him and Gramen to the Lake Erie Chamber of Commerce, one of DMA's most recent customers.

Additional stops and interviews

While DMA had voluntarily divulged the identity of the Lake Erie Chamber of Commerce, this turned out to be a poor decision for DMA. Gramen and Lassiter met with LECC President George Franks after an hour of their visit. We were really satisfied with DMA when we conducted our due diligence, Mr. Franks said. They displayed to us information and screenshots that made us all feel that this was the solution. But guys, from the time of execution, we have had serious and ongoing data conversion issues. And I'm still unsure about whether this method will ever be useful.

Lassiter informed the Executive Committee of his conclusions after gathering this data. Gramen kept insisting that time was of the importance, but the Executive Committee wanted further guarantees. In order to learn more about DMA's capabilities and to observe an operating version of DMA's software, they dispatched Lassiter and Gramen to the DMA headquarters. As soon as I got to the DMA headquarters, the top employees at DMA gave Lassiter and Gramen a tour and introduced them to them. In a conference room, they were given a thorough presentation of what looked to be a fully functional version of DMA's software shortly after that. DMA had, however, prepared sample reports and images using the data and reports from the MSCC in order to provide the impression that the software system was fully functional. According to what a former DMA worker subsequently revealed to Sage Niele,

They produced representative screens and reports using the sample reports and other information provided by Lassiter. DMA thought that if they could simply secure this contract, they could develop the software and remain one step ahead of the MSCC in the trade association industry with a huge client like the MSCC. The short version is that they offered "vaporware" for sale. Lassiter and Gramen frequently requested and got assurances from DMA that it could create the software and convert the UNITRAK database to generate the exhibited reports and lists for the MSCC during the demos with "quite small and reasonably doable modifi- cations." Every concern and inquiry was answered by DMA with the assurance that the development would go well and that, in addition, the MSCC would obtain the source code if it bought the program.

Lassiter and Gramen went home after being satisfied with what they had witnessed. The Executive Committee meeting in August 2009 heard a report stating that this system was suitable for purchase. The Executive Committee took note of this and gave Gramen the go-ahead to seek design specifications and precise pricing estimates for this software system. The HP server would be loaded with DMA's Progress relational database management system under the new configuration. DMA was supposed to transform existing data into the new system. Moreover, DMA was to utilize its Association Plus software to empower the employees of the MSCC to generate the required reports, lists, and other documents using Results, a user-friendly report-writer software program. During the Executive Committee meeting in September 2009, the design specifications and cost projections were presented and accepted. There was a $277,000 total cost. Gramen immediately got in touch with DMA and requested the business to draft a contract proposal.

The DMA Agreement

For the purchase of the Progress relational database management system, the Association Plus bespoke software module, and many packaged software components, DMA issued its usual contract to Gramen in late September. Gramen sent the proposed contract to Wallingford with the note, "It looks fine," after realizing he lacked the knowledge and the authority to review it. Wallingford signed the contract, and the following day it was on its way back to DMA without being reviewed by any other members of staff, the corporate counsel, or any outside expert. But, if someone with more legal knowledge had looked through the document, they would have seen right away that it was very one-sided and lacked any of the guarantees that Lassiter and Gramen had been offered during their visit. It did not give any clear or quantitative performance requirements for the services that were to be rendered, to put it simply. The agreement also limited DMA's financial and performance responsibilities while allowing DMA to decide whether to raise the cost of the goods and services delivered [8], [9].

CONCLUSION

Data integration's function is to connect and integrate data from many sources. To provide you a better grasp of what various sources are telling you, data integration was created. Systems may improve their overall performance when they have access to real-time, integrated data. Not only will gathering data and transforming it into its final, useable state be quicker, but they will also provide real-time intelligence, agility, and actionable insights. Data integration is a crucial stage of the procedure. Integration facilitates a data-driven organization by streamlining the data lifecycle. Moving the data closer to the actionable point.

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CHAPTER 23

TROUBLES IN IMPLEMENTING THE DMA SOFTWARE

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ABSTRACT:

Certain computer bus designs provide the Direct Memory Access (DMA) feature, which enables data to be transmitted directly from an associated device (such a disk drive) to the motherboard's memory. In this chapter author is discusses the enterprise systems. The implementation of new software can be challenging and may lead to unforeseen problems. This paper focuses on the difficulties faced by an organization while implementing a DMA (Data Management and Analysis) software solution. The challenges faced by the organization include technical issues related to hardware and software, as well as user adoption and training issues.

KEYWORDS:

Direct Memory Access, Enterprise System, Information Technology, Network Signal.

INTRODUCTION

Nonetheless, enthusiasm was palpable at the MSCC for the first time in a while since it seemed as if a new computing age had dawned. The MSCC conducted a launch ceremony on November 11, 2009, and DMA management was asked to participate. Yet, the meetings held in conjunction with this event were as significant. By estimating the complexity of the different customization components, the time required to develop the customized software, and the activities that the MSCC needed to do in order to aid the conversion, DMA tried to establish the project's implementation timetable during these meetings. By the conclusion of the day, a general timeline for its execution had been made down, with the first week of July 2010 being its intended completion date [1].

A DMA consultant named Stacey Porter visited at the MSCC headquarters two weeks after the first discussions to install the first iteration of the telemarketing module and to provide training on the constituents, territory management, and committees modules. The staff's first exposure to the program was during this training. Nevertheless, the area managers were unimpressed with the design or functionality of the software since it sometimes required them to go through more than twenty screens in order to do relatively straightforward activities. Lassiter required a large rewrite of the territorial management module as a consequence, and by March 2010, the PAC, accounting, meetings, and legislative modules had also experienced delays of this kind.

Gramen and Wallingford made the decision to keep using the outdated system until all of the staff members were familiar with the new one since the planned conversion to the DMA program was rapidly approaching and delays were becoming the norm. Because the DMA software was still not completely functional, the MSCC abandoned this order after three months because it had simply become too costly to continue paying the consultancy expenses to keep UNITRAK running. DMA started having significant issues transferring the member-ship database from UNITRAK into the DMA bespoke software package as development dragged on into late July. Lassiter called Porter

and Gramen into his office as the software installation came to a standstill. The MSCC and DMA's working relationship further deteriorated at this meeting as Porter was forewarned by Gramen, "I believe we've been quite patient with you so far, but that is going to change. I've heard of cases going to court that were far less dire. And I'm sure you realize that you are responsible for everything.

The First Sign of New Issues

Several billing problems have made this partnership even more difficult. DMA encountered a wide range of issues when implementing the system, and fixes to one issue sometimes created new issues in another. At least five MSCC employees were regularly communicating with DMA by the middle of July 2010 to report issues and ask for help. As a consequence, DMA swiftly used up the development hours allotted in the agreement and began paying the MSCC for the work done in excess of the free hours promised. Lassiter got more and more engaged in the day-to-day implementation issues as the issues became worse. Lassiter went to Wallingford and argued that he ought to be given the job of directing the whole project since he felt that he was the only one who could right the ship. Lassiter asked, and Wallingford readily granted his request.

Lassiter set up a conference call right away with Porter, Gramen, and himself to discuss the several things that were over their due dates. We are in our eleventh month and we still cannot utilize your software to close our books each month, Lassiter highlighted on the call. This is absolutely inappropriate. The system documentation you promised would at least help us shorten our own learning curve. Yet it makes sense that you can't finish the more difficult modules. For some reason, despite my repeated demands, you have refused to comply. One more thing: When our talks started, we were promised access to the source code, but now one of your team members has informed me that this would cost us $20,000. What kind of dishonest business do you run? This is really inappropriate, and I'm losing tolerance with it. If nothing changes in this circumstance. Conflicts over the things that were and were not promised as part of the system installation became to be a major source of tension in the conversations between DMA and MSCC. Considering the nature of the connection, Lassiter ordered Gramen to thoroughly analyze all DMA billings for erroneous charges. Lassiter also requested the chance to examine the DMA contract.

An initial ray of optimism could be seen in the contract, which stated that about half the price of the software system was required as a down payment and the remaining amount was payable upon Gramen signing acceptance certificates after the successful installation of each individual module. Nevertheless, after speaking with Gramen, Lassiter discovered that the whole system had been paid for even though none of the acceptance certificates had been signed. Lassiter found it hard to accept that they had handed away one of the MSCC's most significant sources of power. Lassiter made the snap judgment that it was time to consult Wallingford once again.

We have two issues, Jack," Lassiter remarked. "First, it should go without saying that the software and DMA's ability to maintain and deliver it are both seriously flawed. The fact that Gramen does not seem to have the necessary skills to monitor or resolve issues with the software implementation and is truly of little use in terms of maintaining and supporting the hardware platform is equally critical. So, the success or failure of this project entirely depends on DMA. I believe it's time for us to change course. I concur, Wallingford said in his response. In these situations, I have faith in your judgment. Nevertheless, I want to tell you something before we continue. By the end of the year, I intend to retire. The Executive Committee will form a search committee this week and start

considering applications from potential candidates. I truly hope you'll think about applying for this job.

Lassiter was at a loss for words, but he no longer wanted to stick with the MSCC at this time. He believed that he had accomplished the maximum amount of marketing at the MSCC, particularly in light of the limits of the information system. Lassiter was prepared to accept the lucrative offer he had previously received to serve as the chief operating officer of a nearby investment management firm. Lassiter wasn't alone, however, since Ed Wilson had just finished a final interview with a brand-new think tank on government policy. Yet, Wilson did so since his last outside interview did not go well, but Lassiter did not bring up his name. While Wilson was close to retiring, the search committee was well aware that he would only be a short-term solution; Lassiter was their preferred candidate. Due to this, after looking over the other candidates once more, two members of the search committee called Lassiter and encouraged him to submit. Following two drawn-out discussions, during which the two members hinted that they would not accept a refusal, Lassiter gave up and consented to have his name put forward for the president. Two weeks later, at the August 2010 meeting, the Board of Directors approved that choice [2].

DISCUSSION

A Lack of Progress

The MSCC's issues had not, however, been resolved by the President search. Porter was tasked by Lassiter with estimating the number of hours it would take to fix the issues on an updated list of software issues that had been created by the MSCC team at the end of August 2010. DMA returned the time estimates and a number of work orders with cost estimates three weeks later. In that email, DMA said that the work would begin as soon as the MSCC signed and returned the orders. Lassiter declined to sign the work orders and alerted DMA that DMA was in violation of the contract since he believed the work to be a part of the original installation.

Ed Wilson announced his impending retirement on December 1 soon after Lassiter assumed effective control of the company as president on October 1. Lassiter made the choice to divide his responsibilities among the current staff members rather than replacing him. Lassiter started looking for a candidate with a strong information system and financial management background to oversee the MSCC's information systems and to serve as chief financial officer after realizing that he had to delegate some of his IS development duties and that he could no longer afford to leave Gramen as the only person responsible for the MSCC's information systems. He retained temporary control of the ever-tense relationship with DMA while having Gramen directly answer to him in the meantime.

DMA seemed to be causing more issues than it was resolving at the same time. The new software was losing favor, and paper systems started to multiply since some modules weren't installed and others weren't even functional. The personnel often had to work on the weekends and after hours due to the sluggish response time, which further lowered morale. The integrity and dependability of the membership database have also come under scrutiny due to the system's overall unreliability and data conversion issues. At the end of October, DMA representatives Rankin and Porter met with top management and personnel at the MSCC for a full day. Each section described the issues and disappointments it had with the program. Lassiter was furious at the conclusion of the day's meetings: "We have to halt the first installation! It is now time for your business to provide the system for which we have a contract. Missed deadlines, unanswered phone calls, and incomplete solutions are getting on my nerves.

I recognize your annoyance, Mr. Lassiter," Rankin remarked. But, I'd want to reaffirm our wish to have you as a client. We will work harder to complete the installation, and I will personally write you a letter stating the deadlines for solving the lingering issues. The differences between the anticipated and actual delivery dates were again discussed on a conference call that Gramen and Porter had two days later. They also sought and were given a list of DMA's customers in accordance with Lassiter's instructions. To find out how satisfied these companies are with DMA, Lassiter gave Gramen the go-ahead to call each of them. This phone study showed, much to Lassiter's dismay, that there was a great deal of discontent with DMA's goods and services. Due to contract nonperformance, the Lake Erie and Great Lakes Chambers of Commerce were already involved in legal proceedings with DMA, and many of DMA's other customers were advocating for a multiparty case. On November 4, Lassiter sent Rankin a second letter explaining the issues that remained unresolved and urging him to act quickly. Rankin gave Porter the go-ahead to call Lassiter and deliver a stern message in response. “Mr. I simply wanted to let you know, Lassiter," Porter said, "that DMA has already expended $250,000 in expenditures that it has not charged you in an effort to address your concerns. Nonetheless, DMA has made the decision to stop providing program assistance to the MSCC until the Chamber pays its unpaid fees.

Here comes Sage Niele

Ed Wilson resigned on December 1, 2010, however he was kept on as a part-time consultant and given the position of Executive Director of the political action committee. Sage Niele then took over as Vice President of Operations and Chief Financial Officer. Niele worked as a systems manager for a large pharmaceutical business in the Midsouth region. She received her MBA from the Wharton School of Management. She has most recently run her own information technology and financial consulting firm. She had opted to seek something less demanding and time-consuming than having her own company since she had two young children at home, but it quickly became apparent to her that this job would not meet that description.

After just a few days on the job, Lassiter encountered Niele in his office:

It's great to have you on board, Sage. In order to determine the shortcomings of the present information system, the requirements of the MSCC, and the alternatives that could be available should the MSCC need to abandon the DMA system and start again, I need you to start a planning and evaluation process. You are to serve as the only point of contact between the MSCC and DMA going forward. I've started the search for a capable, excellent alternative for Gramen, which will advance your cause. We must fire him, but I'll allow him two months to find a new work. The next week, Lassiter, Niele, and Gramen met with a lawyer with experience in computer software contracts who was also a former MSCC Chairman and a current member of the Executive Committee. While Lassiter had anticipated her appraisal, it turned out to be far worse than Lassiter had anticipated. She said, "According to how I interpret this contract, the MSCC has few, if any, remedies. I wish you had gotten in touch with me before the agreement was finalized.

The only practical remedy in the absence of performance requirements is payment avoidance. You have already provided tacit agreement to the software system since you have already made full payment. As I spoke with Leon earlier, I know that your objective is to either get your money back or get a new system from DMA, or you want to get reimbursed and the source code so you can pay a consultant to make the program useable. These results are improbable. In my view, you should be more diplomatic with DMA and try to make as much more progress with them as you can till you make a decision. Pay what you believe you owe if DMA does really consider

terminating its support, and we'll pursue them for specific performance. Taking that advice to heart, a number of more letters were produced internally and delivered to DMA in a more subdued tone. Niele continued to submit DMA payments, but only for the things that the MSCC considered to be chargeable. Each time, she prayed that DMA would not cut the power. Niele identified a list of eight software programs that would operate on an HP hardware platform, that were created for use in a trade association context, and that seemed to be deserving of further examination with the assistance of the MSCC librarian. She started interviewing MSCC employees at the same time to compile a list of the system's shortcomings both now and in the future. One outcome of her work was the foundation of an interim committee on information systems, which she utilized to accelerate her understanding of the MSCC and its present information systems.

Niele also discussed Lassiter's and important board members' perspectives on the MSCC's operational future. In order to help her evaluate system options, Niele also made arrangements for six CEOs from the Executive Committee to have their IT managers or other important IT staff members participate on a steering committee. In addition to providing her with new perspectives, she thought that doing so would make it simpler for her to persuade the Executive Committee to accept her final recommendation. Sadly, Niele was also aware that the Executive Committee would not find her appraisal of the existing situation and the potential solutions appealing. The modules will likely never be operational, DMA is unwilling to commit the resources required to finish the job, the DMA relationship is still rapidly deteriorating, any costs already itemized are probably sunk due to poor con- tracting, it will be expensive to start over from scratch, and doing nothing is equally expensive, she wrote on a legal pad in her office. Where to proceed from here was the key issue at this point. Sage pondered which issues she would be solving via her suggestions and which issues she would be causing by implementing new changes as the microwave beeped to indicate that her popcorn was ready.

Information technology use

This three s are designed to raise knowledge and comprehension of certain IT applications utilized by today's companies. The sorts of applications that are available, the IT platforms and networks that enable them, and the rapid changes in business circumstances and management techniques all provide businesses new chances to employ IT in novel ways in order to survive and expand. s 5 through 7 provide a thorough overview of the capabilities of a broad variety of IT applications that business and IT managers may take into consideration for adoption. This will aid readers with some business expertise in categorizing and evaluating the characteristics and capabilities of systems they may already be familiar with.

Enterprise systems: Systems that support the whole company or significant sections of it and managerial support systems—systems created to offer assistance for one or more managers are the first two s in Part II that concentrate on IT applications utilized inside an organization's borders. The following ideas are introduced at the beginning of Chapter 5: batch vs online processing, client/server systems, virtualization, service-oriented design, and Web services. These ideas are crucial to understanding IT applications in general. When we talk about transaction processing systems, then we talk about ERP, data warehousing, CRM, office automation, groupware, intranets, factory automation, and supply chain management software. Decision support and group support systems, as well as data mining, geographic information systems, business intelligence systems, knowledge management systems, expert systems, neural networks, and virtual reality applications, are some of the managerial support systems.

E-business systems: Applications created to communicate with clients, suppliers, and other business partners are the main topic of 7. A short history of the Internet, technological advancements, the legal and regulatory framework in the United States, and early e-business potential are covered in the first section of the document. Afterwards, examples of business-to-business transactions are given. Six B2C retailing firms that have advanced their e-business skills are discussed after a basic examination of the advantages of B2C. These companies include successful dot-com examples, conventional catalog merchants, and conventional store retailers. The discussion moves on to successful dot-com intermediate examples like eBay, Google, and Facebook. The concludes with suggestions on what makes a good website for users and what makes a successful social media platform for companies to engage with customers directly.

A collection of six unique educational case studies finishes Part II. "Vendor-Managed Inventory at NIBCO" describes a supply chain management initiative that builds on an enterprise system capability. The Continental Airlines case study demonstrates how an organization invested in data warehousing and business intelligence applications to transform a struggling business into an industry leader. The 15-year journey Norfolk Southern took to establish a mature business intelligence capacity is detailed in the case study for Norfolk Southern Railway, which was coauthored by the organization's vice president of information technology.

The fourth case study, "Mining Data to Raise State Tax Revenues in California," discusses the technical and nontechnical challenges of identifying citizens who could have underreported their taxable income to the state of California using data gathered from various government sources. The last two case studies concern little businesses. The Cliptomania Online Shop case study details the adjustments a B2C firm took in order to maintain its position as a leading online retailer. The Rock Island Chocolate Company case study concludes by describing the managerial challenges that come up when a midsized company decides whether or not to begin using social media tools and social networking platforms [3], [4].

Business Systems

Information technology is a critical enabler for businesses, both public and commercial, of all sizes. Companies and other organizations are not what they were ten or twenty years ago. Companies tend to provide more tailored goods and services, are becoming more global in scope, are more complicated yet have fewer levels of management, and rely significantly on the correct and timely flow of information. Yet rather than slowing down, this shift in organizations is increasing. You need to understand IT and how it could affect your work, your career, and your company if you're a manager now or in the future. You cannot afford to put IT decisions entirely in the hands of information systems experts. If you and your company are to succeed, you must play a number of crucial roles as a business manager. These roles include conceptualizing ways that IT can be used to improve performance, acting as a consultant to the IS specialists who are creating or implementing applications for your company, managing the organizational change that comes with new IT applications, utilizing and enhancing technology applications, and facilitating the successful implementation of new IT applications.

How can we begin preparing you for your new roles? We begin by becoming aware of the many ways in which businesses are using Technology. The process of raising awareness of IT applications has already started in the first four chapters of this book. A systematic introduction to a broad range of IT applications will be provided by this and the two that follow. We believe the variety of ways IT is being used to improve organizational effectiveness and efficiency will

astound you. We are hoping that these three s will get you to start considering possible applications for your current or prospective organization. The majority of the obvious uses are already in place. A computer is used by practically every business to manage payroll, maintain inventory records, and process accounts receivable and payable. A telephone system and fax machines are also almost universally used. Yet there are still a lot more applications to be found, most likely by managers like you.

Application Areas

Some kind of framework is required to think about a subject as big as IT applications. Applications that are interorganizational systems and those that are intraorganizational systems have been separated. Electronic data exchange systems and other e-business or e-commerce applications are clear instances of interorganizational systems, or systems that cross organizational boundaries. The expansion of the Internet has increased the significance of apps that connect companies with their final customers, other companies' customers, or suppliers.

Nowadays, understanding e-business applications is crucial, thus we spend the whole seven to it. To give some structure to the wide range of intraorganizational systems, we have separated these applications into two main categories: managerial support systems, designed to support a single manager or a small group of managers, and enterprise systems, designed to support the entire enterprise or large portions of it. This encompasses client/server architecture and service-oriented architecture as well as corporate solutions like groupware and transaction processing systems.

The topic of system assistance for managers, especially decision support systems and expert systems, is covered in chapter 6.

For our examination of intraorganizational IT applications in this and the following, this serves as the main foundation. Please be aware that the list of applications is not exclusive nor complete. For instance, certain particular applications may be classified under two or more application categories. Therefore, one might easily argue that a software category like groupware is both an enterprise system and a management support system. We have chosen to discuss group support systems as a management support system whilst also discussing the broader category of groupware as an enterprise system.

Group support systems are an important subset of groupware that are concerned with sup- porting the activities of a small group in a specific task or a specific meeting. Notwithstanding these restrictions, however, the before we go on to concrete illustrations of the different application fields, we must take into account a number of crucial ideas that are present in all applications. Understanding these ideas is necessary in order to comprehend the applications [5].

CONCLUSION

DMA enables peripheral devices to send data directly to or from memory without requiring the CPU to process each individual byte. Consequently, DMA makes it possible to utilize interrupts more effectively, boosts data throughput, and may even lower hardware costs by doing away with the requirement for peripheral-specific FIFO buffers. It is often used to transport data between input and output devices. It is necessary to use a different DMA controller to manage the transfer. By enabling external devices to send data straight to or from the PC's memory without utilizing the CPU, it enhances system performance.

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CHAPTER 24

BATCH PROCESSING VERSUS ONLINE PROCESSING

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ABSTRACT:

Computers employ batch processing to regularly finish high-volume, repetitive data processes. When performed on individual data transactions, several data processing operations, such as backups, filtering, and sorting, may be computationally demanding and wasteful. In this chapter author is discusses the functional information systems. Batch processing and online processing are two different approaches to processing data in information systems. Batch processing is a method of processing a large volume of data in a single operation. The data is collected, processed, and outputted as a batch. In contrast, online processing is a real-time method of processing data. The data is processed immediately as it is entered into the system.

KEYWORDS:

Computer, Functional Information Systems, Information Technology, Online Processing, Network.

INTRODUCTION

Online vs batch processing is one of the key differences between computer applications. All processing was batch-processed in the early days of computers. The company gathered a batch of transactions, which were then all processed at once. For instance, throughout the day, all inventory transactions were written down on paper. The transactions were entered onto a form of computer-readable media, such magnetic tape, after the business day's closure. The medium was then transported physically to the computer center, where the master inventory file was processed against the daily batch to update the complete inventory. The master inventory file was fully updated and the correct inventory reports were issued before the start of the next work day. A condensed version of this batch processing strategy [1], [2].

The time lag before the master file is changed is the main issue with batch processing. For instance, the master inventory file won't be current until the start of the business day. The corporation may not always accurately know how many of each product it has on hand. Online processing was created when technology advanced to eliminate batch processing's time delay. With a fully functional online system, each transaction is immediately entered into the computer. For instance, in an online inventory system, a shipping or sales clerk enters the purchase or sale of a product into a workstation linked to the server computer, which houses the inventory master file, through a telecommunications connection. Within a nanosecond of the entry being finished, the computer changes the master file. As a result, the corporation is constantly aware of the quantity of each product that is in stock.

Since the user interacts with the computer directly, a fully functional online system is sometimes referred to as an interactive system. The user will often get a response from the computer in less than a second. Yet, not all online platforms are interactive. Online data input is offered by certain systems, sometimes known as in-line systems, but the processing of the transaction is delayed until a batch of transactions has gathered. A completely online system has the clear benefit of being timely. Thus, why aren't all modern systems online? Cost and the presence of 'natural batch applications' are the two main causes. Batch systems often have lower operating costs than their online equivalents. Batching often results in considerable cost savings for both the transaction processing and data input functions. Yet, an online data entry/batch processing system may be less costly than a pure batch system if the data-entry function can be completed when the original data are recorded. The choice between batch and online processing involves balancing cost and timeliness. Online transaction costs have generally been declining while the importance of timeliness has been rising. As a consequence, the majority of applications now employ online data input, and the percentage of apps that also use online processing is rising.

The natural batch applications have been the only ones exempt from this shift to online processing. Payroll for an organization, for instance, may be processed weekly or biweekly. The company is aware of the deadline for running the payroll, thus there is no specific benefit to online processing's timeliness. Online data input may still be advantageous in this situation to allow for easy adjustments to personnel, exclusions, deductions, and salary rates. Hence, hybrid systems for online data input and batch processing will still exist [3]–[5].

DISCUSSION

Functional Information Systems

It is feasible to develop a framework based only on the key business activities of the organization a functional information systems framework instead of taking into account the two major categories and associated application areas. Consider a company where engineering, people, marketing, accounting, and production are the main areas of operation. Then, applications may be classified as belonging to the production information system, the marketing information system, the accounting information system, and so on. Simply said, this functional strategy is an alternative to categorizing applications. According to a different perspective, the entire IS is made up of a number of subsystems, each of which provides data for different activities within the function. Each functional subsystem is made up of a sequence of subsubsystems that may be connected to one another.

For instance, the production information system is likely to include related subsystems for sales forecasting, production planning, production scheduling, planning for material requirements, planning for capacity requirements, planning for personnel requirements, purchasing materials, and planning for inventory. The marketing information system may have subsystems for market research, sales information, new product creation, product planning, product pricing, and promotion and advertising. A cost or responsibility accounting system, financial reporting system, and system for creating reports for shareholders and other external groups are likely to be included in the accounting information system, which is typically the oldest and most completely developed functional system. The drive toward integrating these useful information systems has been one of the most significant themes of the late 1990s and early 2000s. Instead of beginning with functions, these integration initiatives often concentrated on business processes the series of actions necessary to complete an outcome like order fulfillment or material purchase.

A process-centered approach makes it simpler to identify the connections between previously independent information systems and the areas where integration is appropriate. These integrated systems are sometimes created by the internal IS department, but most typically, software bundles known as enterprise resource planning systems are bought from outside vendors. Later on, we shall revisit various ERP systems.

Vertical System Integration

Another key feature of certain systems is their ability to function across organizational levels or, in some cases, independent businesses at various levels of an industry hierarchy, such as an automotive manufacturer and the affiliated independent dealers. A vertically integrated information system is one that supports many vertical levels within an organization or sector. For instance, a vertically integrated sales information system in a single company might record the initial sales data and generate invoices, summarize these data on a weekly basis for use by middle managers in tracking slow- and fast-selling items as well as productive but also unproductive salespeople, and further analyze these data for long-term trends for use by top managers in deciding strategic directions. A national fast-food chain may create a sales information system with modules for both operational units and the national organization in a manner like this. As a result, the operational unit module's data collection at the store level already has the information needed for the national organization module to handle it. These fundamental details are periodically, maybe every night, sent through telecommunications links to the national organization. An essential aspect of applications is their degree of vertical integration.

Decentralized Systems

Instead of referring to a typical type of applications like transaction processing or decision support systems, the term "distributed systems," also known as "distributed data processing," refers to a way of delivery. In distributed systems, the computing power is divided across many locations and connected to those locations through telecommunications connections. Distributed systems may be supported by both local and wide area networks. Distributed systems are so systems where computers of a certain size are situated at different physical locations where the company does business and where the computers are connected by a variety of telecommunication links to support a certain business activity. While the economics of distributed systems are not entirely obvious, dispersal has tended to be favored. Distributed systems often result in higher expenses for support and communication but lower prices for computers. Placing smaller workstations and microcomputers in non-central

Increasing the capacity of a big system at the central location often costs less than growing capacity at remote sites. Disadvantages of distributed systems include a higher security risk due to simple access, reliance on high-quality telecommunications links, and a larger need for coordination between locations. Yet in the majority of cases, the economic benefits exceed the drawbacks. For businesses all across the globe, distributed computing is now the standard.

Client-server architecture

A specific kind of distributed system known as a client/server system took center stage in the 1990s and has remained prominent in the twenty-first century. A central server computer, such as a midrange computer or a powerful workstation, and a number of client computers, which are often desktop microcomputers, share the computing power in this sort of system. The division of labor between the client and the server varies significantly depending on the application, but typically

the client offers the graphical user interface, welcomes data entry, and displays the immediate output, whereas the server looks after the database against which the new data are processed. Either the client or the server may handle the transaction's actual processing. For instance, in a client-server retail application, the server may be a workstation in the back office, while the client could be a sophisticated cash register on the sales floor. When a credit sale is performed, the register inputs the data and sends it to the server, which gets the customer's information and changes it in light of the transaction. The server then sends the register a credit permission signal, and the register prints the sales document. The server compiles and prints each customer's bill at the end of the billing cycle while also creating summary reports for shop management.

Now that we have a fundamental understanding of the characteristics of a client/server system, let's examine its three components. Initially, the client building block manages the user interface and may access dispersed services through a network. It typically runs on a Computer. Occasionally the processing is also done by the client. Second, the server building block manages the storage of data related to the application, often executing on a larger computer. Databases, Web pages, or even objects for object-oriented applications might constitute this related data. Sometimes processing is handled by the server. Middleware, a very ambiguous word that refers to all the software required to facilitate interactions between clients and servers, is the third building component.

Middleware, in this first approximation, is the "glue" that enables a client to request a service from a server. Server operating systems, transport stack software, and service-specific software are the three subcategories of software that make up middleware. In order to make the system invisible to users and even application programmers, the server operating system, also known as a network operating system, is tasked with building a single-system image for all network services. The user is unaware of which tasks are carried out where on the network since it seems to be a single system. Several versions of Microsoft Windows Server, UNIX, and Linux are the three main server operating systems. Communications using certain protocols, such Transmission Control Protocol/Internet Protocol, may be transmitted over the network thanks to transport stack software. Some of the necessary transport stack software is often included in the server operating system, although other middleware items can be needed. To provide a specialized service, like electronic mail or the World Wide Web, service-specific software is employed [6]–[8].

Protocol for Hypertext Transfer

Think about the division of duties between the client and the server. Where is the application really processed? is the query. Initially, there were just two levels in client/server systems: a client tier and a server tier. A fat client or thin server model is one in which the majority of processing is performed on the client. It is a thin client or fat server paradigm if the majority of processing is carried out on the server. Database servers, for instance, are often thin servers, while Web servers and groupware servers are typically fat servers. Three-tier client/server systems gained popularity in the middle of the 1990s. The most typical three-tier setup makes use of an application server that is distinct from the database server. The processing is done on a midrange system or high-end PC acting as the application server, the data are kept on a huge computer acting as the database server, and the user interface is housed on the client, which is typically a PC. Let's look at a few client/server system examples.

A three-tiered strategy was employed by an East Coast electric utility provider to improve its customer care system. The utility's 450 customer care agents now have access to the several

datasets the business keeps on its 1.5 million consumers thanks to the new technology. The consumer enquiries are processed by four servers that access data from the corporate mainframe using PCs as clients, according to the customer service agents. As a Canadian supplementary health insurance started transitioning to client/server technology, it focused on setting up a three-tier architecture for its most mission-critical system, which processes claims for prescription medications purchased from more than 3,500 pharmacies throughout Canada. The application servers were Sun workstations and Hewlett-Packard midrange systems, the database server was a Unisys mainframe computer, and the clients were PCs running Windows that were situated in the pharmacies. The tier 1 and tier 3 components of the system were developed by programmers using the C and C++ programming languages. They created the transaction processing component using BEA Tuxedo, a specialist programming tool.

In the twenty-first century, there is a renewed focus on using thin clients to support distant regions, tiny sites, and mobile workers where it is challenging to frequently update the client software. For instance, the $1.8 billion travel management business Maritz Travel Company adopted a thin client strategy based on Citrix Systems' MetaFrame software and Microsoft's Windows NT Terminal Server Edition. The client serves as a "dumb" terminal when using the Citrix architecture, where programs are executed on a server and just shown on the client. Maritz originally granted Citrix licenses to 15,000 users, and it intends to expand the apps to roughly 50 of its distant locations. Maritz's Chief Information Officer, Richard Spradling, lists several benefits of the thin client strategy. Users always have access to the most recent version of an application, performance of the apps has improved, and over time, Maritz will spend less money on hardware by acquiring thin client devices rather than regular PCs or other fat clients, according to Spradling. Maritz continues to employ thin clients in its contact centers for all of its customer care professionals ten years after the first thin client implementation.

A thin client strategy is also being used by Xerox Corporation. Up until recently, Xerox replaced the PCs used by employees every three years, which meant that every year, 10,000 workers received new computers. Since 2005, Xerox has used thin clients, which are less costly. As a result, many important applications, such those supporting sales and service staff, are now run on servers. Software centralization will save maintenance costs and improve security since the programs won't be dispersed across thousands of client devices. According to Janice Malaszenko, Vice President and Chief Technical Officer for Information Management Strategy, Architecture, and Standards at Xerox, "We're striving to be more efficient and want to accomplish more with less money."

Virtualization

The delivery of IT services via virtualization, which comes in a variety of forms, is becoming more and more common. A physical server is divided into many virtual servers using server virtualization. A complete operating system may be installed on each virtual server, and these operating systems can vary from one virtual server to the next. In order to generate the virtual servers and manage the resources of the multiple operating systems, the actual server often runs a hypervisor application. The firm will save money and space by lowering the number of physical servers required in an IT shop and using each virtual server as if it were a standalone physical server. The desktop environment, or everything a user sees and uses on a PC desktop, is isolated from the actual desktop computer via desktop virtualization and accessible through a client/server computing architecture. When a user works from a desktop device, all the programs, apps, and data are retained on the server, and all the programs and applications are operated on the server. This virtualized desktop environment is stored on a server rather than on the local storage of the

desktop device. The server handles practically of the work, therefore a thin client is a highly suitable desktop device; of course, a conventional PC, a notebook computer, or even a smartphone might also be used as the client.

Web Services and Service-Oriented Architecture

Client/server systems are still crucial as we start the second decade of the twenty-first century, but service-oriented architecture and Web services are the hottest buzzwords when thinking about the development and deployment of application systems. An application architecture known as a "service-oriented architecture" is one that is built around a group of interconnected functions, or "services." A service is a task that is clearly defined, self-contained, and independent of the environment or the current status of other services. When services are functioning on several computers, using various protocols, and utilizing various operating systems and languages, there has to be a way to link them to one another. The main benefit of SOA is that once services are developed, they may be utilized again in many applications with just little changes in the connections. Moreover, the services might be created by a company itself, their software could be acquired from a vendor, or they could be purchased on a pay-per-use basis from a vendor.

Web services, a specific set of technologies built around the XML standard of communication, are not the same as SOA, despite being based on similar principles.1 In practice, Web services may be the means by which SOA services communicate with one another, but that would not necessarily be the case other connecting technologies may be used. The majority of critics nowadays, however, virtually exchange the phrases SOA and Web services. Even though there are many companies promoting their SOA-focused solutions, such as IBM, Oracle, Hewlett-Packard, TIBCO Software, and SOA Software, SOA is still a slow-moving technology. Just 23% of respondents to an InformationWeek poll from 2009 reported having implemented a SOA project, with another 15% having one in the works. In the same study, 14% of respondents said they are experimenting with SOA right now, 17% said they expect to explore SOA in the next 24 months, and 31% said they are not analyzing or contemplating SOA. The data is tagged using XML in the Web services method. Web Services Descriptive Language, Universal Description, Discovery, and Integration, and SOAP are additional protocols used in Web services for data transport and service description, respectively.

Companies like Automated Data Processing, Pep Boys, and BT Group are among those that have invested in SOA. ADP desired improved integration and more code reuse as it evolved from a payroll firm to a full-service HR provider. For instance, ADP wanted to utilize the same code in every application since all of its HR services demand users to submit data for new workers. This led to a SOA strategy. Bob Bongiorno, Senior Vice President and Chief Information Officer for Employer Services at ADP, claims that because to SOA, ADP was able to offer an HR solution for a new market area in around one-third of the usual time. Pep Boys, a retailer of auto parts, is developing a connected inventory application as part of its point-of-sale system upgrade utilizing IBM's SOA architecture. Pep Boys liked how SOA allowed businesses to reuse application components. An application may be utilized with other applications, such customer service, when it has been recond as a service, as Pep Boys' tax module was at the point of sale.

BT Group started a significant SOA initiative. Designing simple services like invoicing or customer address validation that could be utilized by both BT's retail customers and a third-party broadband provider utilizing BT's network was how BT launched its SOA program. BT listed the IT services that were utilized to carry out the 160 essential business operations that the firm offered.

It is common practice to reuse SOA services created to complete one procedure in another. As a consequence, when they create new applications, BT and its business partners may benefit from the SOA infrastructure. According to BT's Chief Architect George Glass, the SOA strategy has helped the business reduce the time it takes to sell a new client service from 270 days to 90 days [9], [10].

Systems for Transaction Processing

Let's start our study of applications with transaction processing systems, the "grand-daddy" application that got everything started. In the majority of firms, thousands of transactions are processed every day, including sales, payments sent and received, merchandise delivered and received, recruiting, dismissing, and paying personnel, as well as dividend payments. These systems provide a range of summarized reports that are helpful to upper-level management in addition to the papers and updated records that are produced as a consequence of the transaction processing.

For "paperwork" enterprises, like banks and insurance companies, transaction processing systems are life-or-death systems, and they are crucial for the vast majority of medium and large organizations. As these were the first computerized systems, most firms still spend the bulk of their big machine computing time on these systems. Most of the time, a typical cost-benefit analysis may be used to defend these transaction processing technologies. Compared to a manual approach, these technologies can handle transactions faster and more affordably. There are many different types of transaction processing systems, including mainframe- or midrange-based ones, two- or three-tier client/server systems, and systems that employ service-oriented designs. While many mainframe- or midrange-based transaction processing systems are still in use, the majority of the most recent systems are client/server systems or utilize SOAs. You don't have to be an expert on these systems to be a manager. You just need to be aware of the nature, significance, and complexity of transaction processing systems in general. As a result, we will confine our discussion to two exemplary systems for processing transactions for discrete company operations: payroll and a system for entering sales orders.

System for Payroll

A payroll system seems to be very basic at first look. Operators enter each employee's amount of hours worked, and the system processes these transactions in batches to create payroll checks. This brief overview, although accurate, just touches the surface of the system since it only covers around 10% of it. The payroll processing subsystem is also required to maintain year-to-date totals of net income, individual deductions, social security income, and other tax types. Moreover, it must be able to calculate social security contributions, as well as federal, state, and local taxes, and manage both required and optional deductions. What further subsystems are required? 5.4 provides a list of the main subsystems of most payroll systems along with the responsibilities of each. The payroll system is therefore both common and complex. Since it would need a staggering number of payroll clerks to conduct a contemporary paycheck and keep all the accompanying data, the payroll system is often simple to justify on a cost-benefit basis.

Order Entry Program

We'll use a mainframe or midrange-based order entry system, although client/server technology is undoubtedly an option. An online order input system works on a very simple principle. The sales person inputs the data into the system when orders are received. A point-of-sale transaction

recording system or a microcomputer on the sales representative's desk may be used for the data entering. After that, either at the point-of-sale terminal, the sales representative's workstation, or in the computer center, the computer updates the necessary data and produces an invoice.

Again, this simple explanation just reveals a portion of the tale. A more thorough explanation is given in Section 5.5, which also demonstrates how each transaction interacts with as many as six files on the computer system. More than a dozen other forms of computer output could be produced in addition to the invoice. For instance, if the customer's credit limit will be surpassed, the computer may verify their credit history and deny the transaction. A multipart shipping document is produced if the requested item is in stock; if it is not, a message asking the customer whether they wish to back order the item is delivered. The order entry system will periodically or as needed produce sales reports broken down by item or by customer, customer statements, inventory reports, information on the status of back orders, and reports on accounts receivable. Exceptional circumstances, such as when an item is out of stock or a consumer tries to go over the predetermined credit limit, will also cause the system to issue reports. In certain situations, managerial intervention may be required. When an item is out of stock, the order entry system may automatically print out purchase orders, as well as past-due payment reminders for clients. An important benefit of such an online system is that questions may be responded to quickly.

An interorganizational system in which orders are placed directly by the client or their computer is a significant order entry system variation. An early, pre-Internet example was the American Hospital Supply Corporation's ASAP system, in which hospital staff entered their own orders using order input terminals that were located on the customer's property and connected to AHSC's computer. Customers could now place purchases much more easily thanks to this, which also significantly cut down on the time and expense of printing and distributing order forms. More recently, orders have been made utilizing electronic data exchange from the customer's computer to the seller's computer which will be covered in 7. By the late 1990s, the World Wide Web has advanced the order input procedure by facilitating self-order entry by both customers and companies using a Web browser and an Internet connection. For instance, numerous organizations acquire networking equipment from Cisco Systems online, while both consumers and corporations order Computers from Dell online [11], [12].

CONCLUSION

The Batch operating system provides a lot of benefits and is a highly effective method to utilise resources. It does, however, have a few drawbacks that must be considered. All things considered, it is a fantastic choice for companies or organizations that need to let different users to access the same resources. Batch processing is used by businesses because it reduces the need for direct human involvement and boosts the productivity of routine operations. To lessen the strain on your systems, you may schedule batches of tasks containing millions of data to be processed simultaneously when compute power is most easily available. An operating system performs the following batch processing-related tasks: The operating system defines a job as a single unit that contains a specified sequence of instructions, programs, and data.

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CHAPTER 25

A BRIEF DISCUSSION ON ENTERPRISE RESOURCE PLANNING SYSTEMS

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ABSTRACT:

ERP software supports automation and procedures in finance, human resources, manufacture, supply chain, services, procurement, and other areas to help you operate your complete organization. In this chapter author is discusses the customer relationship management systems. The benefits of implementing an ERP system include improved efficiency, greater visibility into business operations, and enhanced decision-making capabilities. However, implementing an ERP system can be a complex and costly process, and requires careful planning and execution to ensure success.

KEYWORDS:

Business, Customer, Management Systems, Relationship, Transaction.

INTRODUCTION

While enterprise resource planning systems provide similar functions to typical transaction processing systems, they go far beyond and should be treated as a unique application area. A general ledger accounting system, accounts payable and receivable, material requirements planning, order management, inventory control, and human resources management are a few examples of common business functions that are carried out by an ERP system, which is a collection of integrated business applications, or modules. These modules are often bought from a software provider. In certain instances, a business could choose to purchase just a portion of these modules from one vendor, combining them with modules from other suppliers and with the business's current applications. At least two aspects set an ERP system apart from older methods of creating or acquiring corporate applications. Secondly, a common set of definitions and a common database are used to integrate the ERP modules.

As a transaction is executed in one area, such when an order is received, its effects are instantly seen in all other areas that are connected to it, like accounting, production scheduling, and buying. Second, a certain manner of doing business a specific set of business processes has been reflected in the design of the ERP modules. ERP systems are built on a value-chain perspective of the company, in contrast to a functional IS approach, where functional departments coordinate their activities. Hence, by using an ERP system, a corporation agrees to modify its operational procedures. Whenever a business buys an ERP system, it may need to modify its procedures to match those included in the software package. The ERP software package adapts to the business, not the other way around [1], [2].

Why did the majority of big and medium-sized businesses either adopt ERP systems or give it significant consideration in the late 1990s and early 2000s? While the advantages of ERP may vary depending on the company, several general advantages have developed. Often times, businesses are dissatisfied with their current organizational structure, which consists of discrete functional units, and they lack the application integration necessary to meet their demands for decision-making and planning. It takes a lot of time and effort to collect data, offer a cohesive picture of what is occurring in the company, and make informed choices and plans since the existing apps often do not "speak" to one another. While this scenario is not new, until recently, businesses could not get bundled remedies. Internally, creating a collection of interconnected applications would be expensive and take years even if the organization possessed the necessary IT resources. Many businesses are aware that their internal business processes need to be altered as a result of prior reengineering initiatives, and they think that adopting the procedures included in an ERP system that can be bought is the best and simplest method to do so. In order to compel business process reengineering, an ERP system might be used.

The Year 2000 issue contributed to the need for ERP systems in the late 1990s. Several businesses realized at that time that using dates after December 31, 1999 would cause their critical application systems to stop working properly. Just two numbers may be used to identify the year when these applications were coded often using COBOL by the programmers. They had no idea that their 1980s-era programs would still be in use when the new century began. To convert every reference from a two-digit year to a four-digit year in a company's programs would need a significant amount of work and money. Implementing an ERP system was a solid, if expensive, solution to the issue since it accurately accommodated dates beyond the year 2000. While the year 2000 issue wasn't always the driving force for the implementation of an ERP system, if the business was dissatisfied with its current, non-integrated suite of applications, the issue may have swayed the scales.

It should be stressed that since the organization must alter how it does business, implementing an ERP system is quite challenging. However, ERP systems are highly costly. An extensive ERP deployment often costs tens of millions of dollars and takes many months to complete. These implementation expenses include hardware and network expenditures, as well as advisory fees, in addition to the cost of the software licensing. Also, picking the best ERP software is a challenging undertaking. SAP and Oracle are the two industry titans in the ERP space. From the beginning, SAP has been the top ERP provider, while Oracle expanded in part by purchasing PeopleSoft in a hostile bid in 2005. The Sage Group, Infor Global Solutions, and Microsoft with its Dynamics products are among more ERP suppliers. There are compelling reasons to choose a single vendor for ERP purchases, such as the tight application integration that is available and the standardization of common operations.

On the other side, selecting a single provider may limit the adopting company's flexibility. The organization may be able to satisfy more of its specific demands and become less reliant on a single vendor by using a "best of breed" or mix-and-match strategy with many providers. On the other hand, such an approach often increases installation time and complicates system maintenance. With any strategy, it is often necessary to hire the vendor, a different consulting firm, or both to help with implementation. The implementation of an ERP system is a highly difficult undertaking for big, multi-divisional companies, requiring the sharpest brains, meticulous attention, and internal IT professionals, internal business managers, and external consultants. The potential benefits of an ERP system, including improved data for operational and strategic planning, increased productivity, profitability, and growth, make the expenses and efforts justifiable.

SAP ERP is an example of ERP.

The most well-known ERP system is SAP ERP, which was created by SAP AG, a German company with its headquarters in Walldorf. SAP is one of the top software companies in the world because to its R/3 system and its more recent iterations. More than 95,000 people use SAP across more than 120 nations. R/3 is a client/server system that uses a common, integrated database with shared application modules as opposed to SAP R/2, which was a mainframe-based ERP. Customers may utilize ABAP, a fourth-generation language created by SAP specifically for R/3, to augment or alter the standard R/3 modules if they so want. Nowadays, however, using SAP's NetWeaver platform, particularly SAP NetWeaver Developer Studio, to complete the development work is the ideal choice for businesses interested in creating new SAP-related apps or upgrading SAP modules. For creating Java 2 Enterprise Edition applications, SAP NetWeaver Developer Studio provides a simple user interface and a wealth of features.

In 1999, SAP introduced mySAP, which served as both a brand name for the new Web-enabled versions of its R/3 software and an overarching idea for SAP's goal of enabling its customers to operate over the World Wide Web. In 2007, SAP discontinued the mySAP brand and referred to their most recent ERP product simply as SAP ERP 6.0. The comprehensive SAP Business Suite comes with a broad range of business software modules, including the powerful ERP module. The family of SAP ERP software packages fulfills the previously provided generic definition of an ERP system. It is a system with several components that is closely interconnected. Any or all of these modules might be implemented by a business. Most importantly, the organization must modify its business procedures in order to comply with the procedures included in the program before implementing SAP ERP. Let's examine SAP ERP and the SAP Business Suite in more detail. The four main sets of modules that make up SAP ERP are financials, human resource management, operations, and corporate services.

SAP refers to each set as a "solution." Performance management and end-user service delivery modules are also offered. An employee portal and a management portal are both included in the delivery of end-user services. The employee portal allows employees to review and update their own address data, submit travel expense or leave applications, view and print summary pay information, and check their own benefits selections and vacation balances, among other things. We will discuss portals in more detail later in this article. Managers are supported by the manager portal in both the personnel and budgeting departments. The tools for financial and managerial reporting, working capital and cash flow management, payment behavior analysis, and well-known scorecard methodologies like the balanced scorecard and activity-based costing are all examples of the numerous analytics that are accessible. The SAP NetWeaver platform, which SAP uses as its integration and application platform, powers all of the major modules and guarantees smooth communication with nearly any other SAP or non-SAP software. The primary functional areas of SAP ERP are shown in Table 5.6.

ERP is a somewhat complete suite that, like SAP historically, excels in the operations sector.

Customer relationship management, product lifecycle management, supply chain management, and supplier relationship management are additional applications in the SAP Business Suite that are accessible in addition to the modules of SAP ERP. Let's list a few of the more fascinating capabilities, although the titles and primary business functions of the apps should provide a fair notion of what most of the applications accomplish. The CRM application's Web channel feature enables your company to do business-to-business or business-to-consumer online sales. It also

supports managing Web catalogs, managing content, segmenting and personalizing customers, and providing a Web shop locator. The enterprise asset management functionality of the PLM program enables the choice, acquisition, and installation of equipment. It also keeps track of the expenses of individual assets and aggregates these costs as needed. The supplier collaboration functionality inside the SRM program enables the electronic exchange of documents with suppliers in any format and offers the resources needed to set up and maintain a supplier portal [3]–[5].

All of the SAP apps that have already been discussed are universal software programs. Moreover, SAP and other ERP suppliers have created industry solutions in the first decade of the twenty-first century that are specifically catered to the requirements of certain sectors. For instance, SAP presently provides 24 industry-specific solutions, including those for the automotive, banking, chemicals, health care, insurance, life sciences, retail, and wholesale distribution industries. ERP software is increasingly more specialized, with versions for smaller organizations being provided and more industry-specific solutions being developed. Businesses decide which SAP modules or apps make the most sense for them to use. The top cable provider in the country, Comcast Corporation, has chosen the SAP Human Capital Management solution to handle the payroll and human resources business activities for its about 90,000 employees.

To generate business advantages in inventory management, retail and channel sales, Harry & David Operations Corporation, the premier gourmet food retailer, has chosen the SAP for Retail solution, comprising the SAP Merchandise and Assortment Planning and SAP Forecasting and Replenishment apps. These programs will help Harry & David be able to provide more specialized product options at its retail outlets. SAP ERP Financials will be implemented after Harry & David's food and beverage capabilities. According to Joe Foley, Chief Information Officer of Harry & David Holding, Inc., "We are positioned for enormous development, both as a direct retailer and as a wholesaler to many retail locations. The seasonality of our company necessitates a platform that can quickly expand and meet our ever-changing requirements. The only business model that can provide us a single operating platform that will reduce the cost of our infrastructure and give us a strong foundation for development is SAP's fully integrated business model.

In other instances, Graybar Electric Company, a major North American wholesale distributor of electrical, networking, and telecommunications products, has chosen the SAP ERP application to more efficiently manage its physical inventory and handle the tens of thousands of orders and quotes it receives from customers and vendors every day. As a consequence of improved forecasting and simpler reporting of key performance metrics, Graybar's inventory management has improved. Chargebacks have also been better controlled, and self-service features and improved workflows have increased efficiency. Dial Corporation has replaced its business software products from Oracle, Siebel Systems, and Manugistics with a single suite from SAP as part of an outsourcing arrangement with EDS. The SAP deployment, which included licenses, implementation services, and maintenance, cost around $35 million and comprised software for manufacturing, supply chain, finance, accounting, performance management, and customer relationship management. Dial chose SAP because, in the words of its chief information officer Evon Jones, "SAP and the procedures with SAP's software are considered as best in class and will produce operational efficiency," especially after you begin to get more insight into your supply chain. See the section labeled "What is the Experience with ERP?" for a more thorough explanation of a SAP implementation at a significant pharmaceutical company. “in Vollmann, Berry, Whybark, Jacobs, and Berry. Currently, ERP software solutions are still a popular

commodity; see the box captioned "Toyota Racing Accelerates Formula One Operations with SAP".

DISCUSSION

Database Management

A company gathers data from its operational systems—the transaction processing systems we just spoke about—and places the data in a data warehouse.

SAP helps Toyota Motorsport speed up their Formula One operations.

One of the most intriguing areas where SAP is used at Toyota Motor Corporation, the biggest automaker in the world, is at Toyota Motorsport GmbH, the company's motorsports division in Germany. To optimize ERP operations throughout its Formula One racing activities, Toyota Racing decided to install software from SAP's automotive sector solution in 2003. SAP for Automotive, comprising mySAP Product Lifecycle Management, mySAP Supply Chain Management, mySAP Human Resources, and mySAP Financials, superseded Toyota Motorsport's earlier, nonintegrated systems. Toyota opted to compete in Formula One racing in 1999 after capturing seven world championship championships with its World Rally Championship program. The Toyota Motorsport headquarters in Cologne, Germany, totally developed and built the whole vehicle, including the engine and chassis. A Formula One racing program needs between 20,000 and 30,000 made-to-order components, and these parts must be readily accessible. The components also need to be continually assessed. Toyota Racing believed that SAP software was the greatest option for properly controlling its supply chain, production, and finance operations, as well as for managing the massive quantity of data needed for the racing program to be successful [6], [7].

The competitive advantage that comes from properly using information is what Thomas Schiller, Toyota Motorsport's IT General Manager, remarked. "After carefully examining a number of providers, we determined that SAP could most effectively offer the strong data foundation that is essential to our organization. SAP provides us a competitive edge by ensuring that trustworthy information is widely accessible across all of our activities, enabling us to take quicker and more informed choices. We can efficiently carry out these choices and quicken our manufacturing and supply chain operations thanks to SAP's integrated solutions and broad capabilities. Toyota Racing decided to use Linux, Oracle Real Application Clusters, and Intel-based servers to operate the SAP software. The Oracle software enabled database clustering over numerous servers, allowing system operations to continue even in the event of a cluster node failure.

Due to the state of the world economy, Toyota withdrew from Formula One racing in late 2009, although Toyota Motorsport is still active as a high-performance research, testing, and production organization. The services that Toyota Motorsport presently provides include sophisticated component testing, automobile design and development, wind tunnel services, engine design and development, and separate "data warehouses" that allow customers to access and analyze the data without jeopardizing the operating systems. Data warehousing is the creation and upkeep of a sizable data storage facility that houses information about every facet of the business. For the data warehouse to be effective, the data must be current, accurate, and kept in a usable format. Moreover, managers and other users must have access to simple data access and analysis tools, which will encourage them to make full use of the data.

A data warehouse takes time and money to establish. Software for warehouse operations, software for warehouse construction, and software for warehouse access and analysis are all required. To

extract pertinent data from operational databases, ensure that the data are clean, convert the data into a usable form, and load the data into the data warehouse, warehouse building software is necessary. To administer the data warehouse and store the data, operation software is needed. The user may create customized reports from the data warehouse using the software tools in the warehouse access and analysis section, perhaps on a regular basis. They can also query the data warehouse to get answers to certain inquiries. Although add-on data warehousing software tools can be used to create data warehouses around traditional database management systems like Oracle or IBM DB2, more and more businesses are choosing to use comprehensive data warehousing software packages or data warehousing "appliances" to manage their data warehouses.

IBM InfoSphere Warehouse, Informatica Platform, Microsoft SQL Server, Oracle Data Integrator Enterprise Edition, and SAS/Warehouse Administrator are among the complete data warehousing software suites. A bundled solution made up of hardware and software called a data warehousing appliance has the software installed and optimized for data warehousing. Hewlett-Packard NeoView, IBM InfoSphere Balanced Warehouse, Netezza TwinFin, Oracle's Sun Oracle Database Machine, Sybase IQ, and Teradata Data Warehouse Appliance are a few of the data warehousing appliances currently available on the market. Keep in mind that certain data warehousing tools, like Sybase IQ, use third-party hardware. Column-store databases are another recent innovation in the data warehousing sector in addition to appliances. Assume a database of customers where each client's record is represented by a single row, and each column has the identical characteristic for each customer, such as their name or zip code.

All the characteristics for the first customer are serialized simultaneously when this database is saved in memory or on the hard drive as a conventional row-store database, then all the attributes for the second customer, and so on. All the values for the first property, such as customer names, are serialized simultaneously when the same database is saved in column-store format. This is followed by all the values for the second attribute, such as customer zip code, and so on. When full new rows are formed and old rows are updated, the classic row-store technique is often more effective at processing transactions. A column-store technique is more effective in queries that only involve a small number of columns, such as generating a report of sales by zip code. In this instance, just the sales and zip code columns must be accessed, and all sales and zip code values are kept collectively. Accordingly, operational databases, which are primarily used for transaction processing, are almost always row-store databases, whereas data warehouses, which are used for a variety of purposes, including querying, may be either row-store or column-store databases, depending on the warehouse's mix of uses. Infobright, ParAccel Analytic Database, Sybase IQ, and Vertica Analytic Database are examples of column-store data warehouse systems.

There are many different software solutions available for data warehouses constructed using conventional database management systems in the warehouse access and analysis sector. While certain access and analysis tools are included in complete data warehousing software packages, some customers require various kinds of analysis tools and choose to add another product. We will postpone further discussion of these analysis tools until the next, when we consider decision support systems, data mining, executive information systems, and especially business intelligence systems in more detail. Among the many analysis packages available are Computer Associates' CA ERwin Data Modeler, Information Builders' WebFOCUS, Oracle Data Mining, and SAS Institute's Enterprise Miner and SAS Visual BI. We consider the development and upkeep of the data warehouse to be an enterprise system, but these end-user reporting and analysis capabilities are intended to serve management—the subject.

Organizations of various sizes and types are effectively adopting data warehousing. Let's think about a few instances. The United States Postal Service has built a massive 32 terabyte data warehouse and is utilizing the system to assess various aspects of its operations, such as post office sales, the effectiveness of mail processing facilities, and the usage of human and transportation resources. Based on Teradata hardware and software, the data warehouse. The warehouse gathers retail information from 37,000 post offices, information from mail-processing centers, information about packages, information about air transportation, and information from the Postal Service's ERP and CRM systems. According to Wayne Grimes, Customer-Care Operations Manager for the Postal Service, the data warehouse now produces about 20,000 reports for 1,800 users each day using software from Microstrategy; the number of reports is anticipated to increase to 60,000 reports for more than 5,000 users. The data warehouse helps the Postal Service see its finances and operations much more clearly. The closing of the books at the end of the fiscal year used to take three to four months, but last year using the data warehouse it took less than five weeks.

As of January 2006, Walmart had a sizable data warehouse with 583 gigabytes of sales and inventory information. The Teradata 1,000-processor massively parallel system is the foundation for the data warehouse. According to Dan Phillips, vice president of information systems at Walmart, "Our database increases because we gather data on every item, for every consumer, for every store, every day." Phillips continues by saying that Walmart does not keep track of specific consumer purchases and deletes data after two years. Walmart has transformed its data warehouse into an operational system for controlling daily shop operations by updating the information there every hour. Managers may examine the database hourly to see what's going on at a specific shop or across a region of stores. Phillips shares a fascinating tale as an illustration of the use of the data warehouse: a few years ago, the IT staff at Walmart's corporate headquarters checked the data warehouse on the morning following Thanksgiving and discovered that East Coast sales of a holiday special on computers and monitors were significantly below expectations. The marketing team noticed that the PCs and monitors were not being exhibited together in shops, preventing shoppers from seeing what they were receiving for the advertised price. To organize the displays, calls were made to Walmart locations nationwide, and by 9:30 A.M. The data warehouse indicated to CST that the rate of sales was accelerating.

Walmart's efforts in data warehousing are not stagnant. Its Teradata-based warehouse has expanded to more than 1,000 terabytes by the middle of 2007. Later, in addition to utilizing the Teradata warehouse, Walmart chose to be one of the first users of the brand-new NeoView data warehousing system from Hewlett-Packard. The crucial Retail Link system, which enables Walmart's 20,000 suppliers to obtain information on the sales of their goods in Walmart shops, will be utilized in conjunction with the NeoView warehouse. Walmart is also able to do profit research on markdowns, market basket analysis to determine which goods are often bought together, and stock percentage tracking thanks to the Retail Connect technology. Walmart is using enormous volumes of data to its advantage via its data warehouses.

A Netezza data warehouse device is used by online dating service eHarmony to handle its enormous data warehouse, which contains 12 terabytes of information on more than 20 million registered customers. According to Joseph Essas, Vice President of Technology, scoring algorithms are used to the user pool of eHarmony in order to match possible partners. Next information is gathered on how satisfied users are with matches and the outcomes of the matches, and this information is input into Netezza for analysis and potential scoring system updates. The plug-ins required for the warehouse to function with Oracle, Microstrategy, and other software programs

used by eHarmony were given by Netezza. According to Essas, implementing Netezza was simple: "Within 24 hours we were up and operating. Essas has discovered that the Netezza warehouse is "more or less operating as claimed; I'm not exaggerating. It executes complex queries and excels at table scanning and other similar tasks. Data warehousing has the ability to help organizations make sense of and use the data they are currently gathering as they conduct their operations.

Systems for managing customer relationships

Customer relationship management is a kind of application that often obtains a significant portion of its data from the organization's data warehouse. An integrated approach to all facets of client engagement, including marketing, sales, and support, is what a CRM system aims to give. A CRM system aims to utilize technology to develop a solid connection between a company and its clients. By using CRM, the company hopes to better manage its own operations in light of client habits.

Several software programs have been developed to manage customer interactions, and the majority of them are focused on collecting, maintaining, and using detailed profiles of individual clients. These profiles are often kept in a data warehouse from which pertinent information about the company's clients may be extracted through data mining. Additionally, any employees who could deal with a consumer are given access to their online profiles. Additionally, Web-based front-ends have been developed so that customers can communicate with the business online in order to learn more about the goods and services it provides, place an order, check the status of an existing order, look up information in a knowledge base, or make a service request. CRM software packages provide businesses the ability to reach consumers via a variety of channels, including as the Web, call centers, field agents, business partners, and retail and dealer networks, in order to promote to them, sell to them, and provide customer care.

Let's try to distinguish the various CRM industry participants in a variety of ways as there are many of them. We will compare the top companies that market to bigger companies against those who market to small and medium-sized enterprises for the first cut. The top 15 CRM enterprise wins and the top 15 CRM small and medium company winners, or the top 15 vendors to bigger companies and the top 15 vendors to small and medium enterprises, are each year named by ISM, Inc., a strategic adviser to organizations planning and executing CRM initiatives. These lists are given alphabetically and are based on ISM testing and surveys. Using data warehousing and customer relationship management, Harrah's generates "Total Rewards." With 39 casinos across 12 states and Ontario, Canada, Harrah's Entertainment has developed an enterprise data warehouse to manage and analyze client spending via its Total Rewards program. A magnetic membership card is used to track all casino visitor transactions, including those at slot machines and gaming tables. Members earn both normal and extra points for using the card, which promotes its usage. The cardholder becomes eligible for a Gold, Platinum, or Diamond membership after accumulating a specified number of regular points, which grants benefits including club memberships and accelerated check-ins. The bonus points may be used at the casinos for free meals, beverages, and other advantages. With 6 million users of the card in 2002 and a total of 26 million members, the Total Rewards loyalty program has seen great success.

Unexpectedly, a statistical study of the Total Rewards data showed that the top customers for Harrah's were not the alleged "high rollers," but rather middle-aged or retired professionals who played slots and had extra money and leisure. These patrons' responses to surveys revealed that the anticipation and exhilaration of gambling was the main reason they went to casinos. With this realization, Harrah's made the decision to focus its approach on these clients in the center. For

instance, Harrah's centered their advertising on the euphoria associated with gambling. According to another study, consumers boosted their annual gambling spending at Harrah's by 24 percent if they had extremely positive encounters with the company, while their annual gambling expenditure fell by 10 percent if they had negative experiences. It seems that Harrah's attempts to make these middle-class clients happy largely via the Total Rewards program have been successful. Strong incentives are provided by the program to participants to concentrate their gaming at Harrah's facilities. Overall, according to Harrah's estimates, more than half of its patrons' yearly gambling budgets were spent at Harrah's locations in 2002, up from 36% when the program first started in 1997. The fact that Harrah's hotel occupancy rate surpasses 90% compared to the industry average of 60% is one outcome of the company's marketing strategy, which is focused on the Total Rewards program. The Total Rewards program, according to Harrah's Senior Vice President of Relationship Marketing David Norton, is directly responsible for the high occupancy rate.

Using Teradata database and warehousing software, Harrah's has developed their data warehouse on an NCR massively parallel processor server. The system uses Cognos business intelligence software for inquiries and reporting and SAS modeling software for questions. Harrah's officials think that the Total Rewards program is the lynchpin of Harrah's growth plan, proving that this cutting-edge data warehouse/customer relationship management system is effective. The majority of the top 15 CRM enterprise vendors provide a standard out-of-the-box CRM application with call center support, sales force automation, and marketing support in addition to templates for particular vertical industries like healthcare, manufacturing, distribution, and financial services. A hosted or on-demand solution is also provided by a number of these suppliers. With a hosted solution, the vendor's hardware is used to execute the program, and the customer is charged a subscription fee for each user who uses the application each month. Major software providers SAP and Oracle, two of the top 15 companies, both provide a hosted solution in addition to a typical CRM application. Salesforce.com is another significant participant in this industry; it solely provides hosted solutions and dominates the hosted market subsegment. Clear C2, Infor Global Solutions, RightNow Technologies, and Sage Software's SalesLogix are more providers in this area. A few vendors have made the decision to concentrate on a certain sector; Amdocs Ltd., for instance, concentrates on telecom carriers and Internet service providers.

Oracle, Salesforce.com, Clear C2, Sage Software, which has two products on the SMB list (Sage SalesLogix and Sage CRM), are among the repeats among the top 15 CRM SMB vendors. Microsoft joins this list with its Microsoft Dynamics CRM product, which is available as a traditional CRM or a based web solution. Additional products in this top 15 SMB list include FrontRange Solutions' GoldMine, NetSuite's CRM+, and StayinFront CRM. A handful of these top 15 SMB suppliers provide a Lotus Notes-based solution, such as Ardexus Mode and Relavis CRM. The section addressing Harrah's Entertainment contains an example of a CRM project employing a data warehouse. There are several such instances. For instance, BT Group plc has upgraded its online customer service by implementing a multimillion-dollar CRM system based on software from RightNow Technologies. The 10,000 contact center employees of BT may utilize the knowledge management system in the CRM application to respond to consumer inquiries. Moreover, it has an enhanced call handling system and a live IM-style facility where users may ask support workers questions.

Microsoft Dynamics CRM has been implemented by Resurrection Health Care, a Chicago-based integrated health care provider that runs eight hospitals, home and occupational health services, free-standing medical imaging facilities, nursing homes, and more. The sales team at Resurrection

uses its CRM system, which Sonoma Partners, a reseller, developed, to cultivate relationships with doctors and persuade them to recommend their patients to Resurrection's services including rehabilitation, home health care, and medical imaging. A range of information about each doctor may be recorded using the program, including notes from phone calls, emails, and in-person meetings, a list of collaborators, and even the doctor's complaints about Resurrection's services so that they can be addressed. In order to raise awareness of Resurrection's employee drug testing services and occupational rehabilitation services for workmen's compensation claims, Resurrection's sales team is also utilizing the CRM to manage connections with significant, non-health-related organizations. According to Chris Fletcher, an analyst at the research company AMR, "the usage of CRM is expanding into niches, including in health care to manage physician connections, and real estate management to keep track of properties." The industry leader in publishing books for people, Author Solutions, built its CRM system using a hosted solution from Salesforce.com and customisation by the consultancy company Appirio. Over 24,000 titles were published by Author Solutions in 2009, and the company generated income of close to $100 million. It has expanded as a result of the rise in popularity of self-publishing as well as acquisitions of other self-publishing businesses. The President and Chief Executive Officer of Author Solutions, Kevin Weiss, was aware that the business's technological infrastructure was out-of-date and that it needed to be ready for rapid expansion. He chose a SaaS solution since he was also aware that he did not want to administer the new technology himself. The additional companies have been swiftly transferred to Author Solutions' CRM system, called Gemini, as the business has expanded via acquisition. According to Weiss, "The applications have enabled us to move our clients through the manufacturing process more quickly. Customer support has increased. We have a top-notch production system to help our writers and provide for their every need. Several businesses have made public declarations in recent years that they are focusing more on their customers, and some of them are making good on those promises by adopting CRM systems.

Automating the Office

A broad range of office-related applications, such as voicemail, videoconferencing, electronic mail, word processing, copying, desktop publishing, electronic calendaring, and document imaging, as well as document creation, storage, and sharing, are referred to as office automation. The newest buzzword in office automation is unified communications, which is the merging of real-time communication services like telephone and IM with non-real-time communication services like e-mail, voicemail, and fax. Office automation, like other fields of IT, has its own buzzwords. A person may transmit a message using one medium and have it read using another using UC. For instance, a voicemail message may be left and accessed by e-mail. With strong solutions from companies like Avaya, Cisco, Hewlett-Packard, IBM, and Microsoft, among others, the UC products are improving and becoming more "unified" with time [8]–[10].

CONCLUSION

One of the primary features falling under the basic purposes of ERP is improving the customer relationship management. It improves the level of services provided by businesses, reduces delivery times, and speeds up performance rates. Another primary goal of using ERP in a business is error control. By making supply chain operations more scalable, effective, and manageable, ERP may greatly enhance such operations. These technologies assist organizations in integrating data from various points throughout the supply chain, streamlining and automating crucial procedures, and improving supply chain visibility to increase productivity and address issues. Instead, all of

your workers can see and exchange correct data in real-time, fostering better departmental cooperation and raising overall company efficiency.

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CHAPTER 26

A BRIEF DISCUSSION ON CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

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ABSTRACT:

A tool known as customer relationship management (CRM) is used to handle all interactions and connections between your business and its clients. The objective is straightforward: to strengthen commercial ties. A CRM system aids businesses in maintaining contact with clients, streamlining procedures, and boosting revenue. In this chapter author is discusses the intranets and portals. It involves gathering customer data, analyzing it to gain insights into customer behavior and preferences, and using that information to create personalized experiences for customers. CRM systems typically include tools for sales, marketing, and customer service, and they often integrate with other enterprise systems such as accounting and inventory management.

KEYWORDS:

Computer, Customer Relationship Management, Groupware System, social media, software.

INTRODUCTION

While there have been changes and these changes are still occurring, the fundamental principles, objectives, and difficulties of CRM have not altered over the last ten years. The price of CRM software has lowered, to start. CRM application cost peaked at $3,000 per licensed user in 2000, according to a Gartner analysis, and then fell to between $1,000 and $1,500 per licensed user in 2009. The shift to hosted solutions Software as a Service as the method of CRM distribution is maybe of greater significance. Compared to less than 1% in 2000, Gartner anticipates that SaaS will be the distribution strategy for 50% of all field sales software in 2009. Gartner forecasts that SaaS will be the delivery strategy for 25% of apps by 2012 and 40% by 2020 when taking into account all CRM applications. Moreover, SaaS-delivered CRM will cost less starting in 2020, dropping from $800 per user per year in 2009 to $500 [1], [2].

The integration of social media into CRM solutions is a new development in CRM. According to Clara Shih, CEO of B2C sales and marketing software company Hearsay Labs, "Facebook, Twitter, and other social networks have transformed into CRM for people. According to Ed Thompson, vice president of Gartner, social CRM will play a significant role in what CRM means over the next ten years. These are how an increasing number of individuals manage connections in both their personal and professional lives. Early pioneer in integrating social media into its CRM has been Salesforce.com. Salesforce.com and Google originally collaborated by allowing Google Ad Words, a tool that enables businesses to promote their goods on Google by connecting them with certain KEYWORDS, to be used in conjunction with primary CRM software. Then the two businesses said that any Salesforce.com user may add Google Apps to their current CRM software without paying a dime. Next, Salesforce.com and Facebook collaborated to release a solution that let developers create enterprise Facebook apps using Salesforce.com technology. Customer care

personnel may read and write messages on Facebook thanks to a feature that was integrated into the customer service application, called Service Cloud. More recently, Salesforce.com and Twitter forged a similar alliance so that a customer care agent could follow discussions on Twitter and participate as needed. These developments in social CRM enable firms to have a marketing and customer service presence on Facebook and Twitter, and they act as a natural step in assisting businesses in how to employ social media.

DISCUSSION

Videoconferencing

Face-to-face meetings and conferences may be held via videoconferencing instead of exorbitantly expensive and time-consuming travel. Most of the time, data and images created by computers, like a PowerPoint presentation, may also be exchanged during conferences. The use of desktop videoconferencing for one-on-one and small group conferences has grown. Nevertheless, because of how tiny a desktop PC's screen is, desktop videoconferencing would be insufficient for larger group conferences. The efficacy of the conference will decrease if an already tiny screen is divided into numerous smaller pictures. As a result, bigger companies often have a separate videoconferencing facility where a group of employees may join a conference with a group at another place [2]–[4].

Let's look at products from Polycom, Inc., a Pleasanton, California-based company, as an example of both group and desktop videoconferencing. Polycom cemented its position as the industry leader for voice- and videoconferencing throughout the globe with its 2001 purchase of PictureTel Corporation. The HDX series from Polycom offers a variety of conference room videoconferencing options built to function in a private boardroom, a big room, or an auditorium. The various HDX variants are designed to accommodate groups and rooms of varied sizes. Systems for whole rooms start at roughly $34,000. High-definition video is available on all models, and it is designed to be excellent at any data rate.

The more affordable devices emulate twin monitors on a single screen, whereas the more expensive models include two video displays. Much as in a face-to-face meeting, the audio is high-definition and it is able to tell which side of the room someone is speaking from. Just when necessary, audio is automatically triggered. People+Content is a data-sharing function that allows users to exchange material from laptops or Desktops that have an IP network connection. The HDX models also contain "People on Content." While using two video screens, people are on one and content is on the other; when using dual monitors, the screen is divided between people and content. People on Content is very helpful for presentations with distant speakers. The presentation materials the spreadsheet or PowerPoint slides are electronically put behind the speaker so that the distant audience sees the speaker standing in front of a screen showing the presentation materials. The speaker stands in front of a blue or green backdrop. Polycom provides Polycom PVX software for desktop computers, which is designed to function with your computer and a high-quality USB camera that is connected to the computer.

A third-party retailer's pricing ranges from $120 to $190. The previously mentioned data-sharing feature is included in Polycom PVX. Polycom provides the low-cost HDX 4000 series with high-definition video and audio for a desktop system with even more features. Of course, Skype, an Internet telephony firm with headquarters in Luxembourg, may also be used for one-on-one desktop videoconferencing, but no data sharing. Free audio calls or calls that include both video and audio to another Skype user are made after downloading the Skype program from the Internet.

For audio calls to a landline or a mobile phone, there is a fee. For the last year, one of the writers has utilized Skype to make video conversations to his grandson who is now studying in Germany.

Digital Mail

Telephone tag is eliminated by electronic mail systems, which enable quick, asynchronous communication between workstations on a network. The majority of systems include functions like sending a note to a distribution list, forwarding a note to another person with an attached message, responding to a note without having to input the address again, and saving notes in electronic file folders for later recall. The writers of this book often use email, and we don't think we could live without it. Of course, email communication may have certain disadvantages. The amount of email may become overwhelming since it is so simple to use, especially when standard messages are sent to a distribution list. The bane of email users is spam, unsolicited email that most of us consider to be rubbish. Since it relies only on text messages, email is likewise less personal.

Privacy difficulties emerge due to the possibility of electronic surveillance by superiors when individuals use inflammatory terms and phrases that they would never use in face-to-face communication (this is known as "flaming"). Yet for the majority of businesses and consumers, these disadvantages are completely outweighed by the benefits of quick, asynchronous communication. Electronic bulletin boards, listservs, computer conferencing, chat rooms, instant messaging, blogs, and, most recently, Twitter are examples of e-mail alternatives. Anybody with access to a bulletin board may publish messages and view other messages on an electronic bulletin board, which serves as a repository. Both inside of an organization and online are viable options for bulletin boards. A listserv is an electronic mailing list that receives messages submitted to its address and distributes them to all members of the specific mailing list.

Similar to a bulletin board, computer conferencing is organized around a certain subject. For instance, a professional association may organize a computer conference to discuss alterations to the agenda for its annual meeting. The society's bulletin, which may be electronically disseminated through a listserv, announces the subject and the Web URL where the conference will be hosted. People may take part in the conference by logging in, adding their viewpoint, and reading that of other participants. On the Internet, chat rooms are real-time forms of computer conferencing that cover a staggering range of subjects. A crucial real-time collaboration tool for enterprises, group chat supports communication for remote project teams and eliminates the need for in-person meetings, audio conferences, and video conferences.

Synchronous messaging (IM) is a kind of text-based real-time communication via the Internet that allows users to create private chat rooms with others. Research companies estimate that at least 20% of workers use instant messaging, proving that it is popular in business. A user-generated blog is a website where users may post journal-style entries, which are often shown in reverse chronological order. Blogs may cover any topic; sometimes they act as online personal diaries, and other times they provide comments on a specific topic like politics, the environment, or local news. A broadcast version of instant messaging, Twitter is a social networking and microblogging platform that allows users to post and read brief messages known as tweets [5].

As e-mail existed before client/server systems, it makes logical that the earliest widely used e-mail systems were mainframe or minicomputer based. Also, they were designed to function with exclusive operating systems. Examples include the ALL-IN-ONE by Digital Equipment and the PROFS by IBM. The more sophisticated mainframe-based systems, like PROFS, bundled

electronic calendaring and other related services with e-mail. There is no Graphical interface in this mainframe environment; instead, the email system is operated on the mainframe and the workstation is utilized as a terminal. A calendar with the current day highlighted, a clock, a message section where other users may directly contact this workstation, and a menu of additional options, such as processing schedules, opening the mail, searching for papers, and preparing documents, were all featured in PROFS's main menu. UNIX servers were intended to host the second wave of e-mail systems. Systems like Pine and Elm are well-liked. Again, there is no Graphical interface; this sort of email system operates on the server and uses the Computer as a terminal. These systems run significantly more affordably per user or each message even though they lack the capabilities of mainframe systems like PROFS.

The evolution of POP-servers and POP-mail serves as an example of how PC-based front-ends may be leveraged to provide consumers a more welcoming experience. Post Office Protocol, or POP, is the abbreviation for POP-mail, which is based on the analogy of post office boxes. A POP-client, such as Eudora or Pegasus, must be installed on the computer in order to utilize POP-mail. Pine is one of several email programs that may be used as a POP-server. Unless the user signs in and requests that mail be downloaded to their own computer, all incoming mail is stored on the POP-server, similar to how conventional mail is kept in a post office box until the customer opens the box and removes all of the contents. With the Eudora or Pegasus GUI, the user handles the mail on their own computer. The user may read their mail, delete some of it, save some of it in electronic file folders, and prepare some of it for answers. The user reopens a connection to the POP-server on the host computer and uploads any outgoing messages after processing the mail on the PC.

LAN-based client/server software systems that had well-designed GUI interfaces, compact inboxes, outboxes, wastebaskets, appealing typefaces, color, and other GUI elements made up the third wave of e-mail systems. Microsoft Mail and Lotus' cc:Mail are two examples of packages. These products satisfy an organization's needs if all they desire is email. LAN-based e-mail systems were quite popular in the 1990s, but more capable groupware systems like Lotus Notes/Domino and Microsoft Outlook/Exchange have mostly supplanted them in the 2000s. We'll discuss more about these groupware systems in the following section. Internet mail, a variant of this third generation of client/server e-mail systems, has gained enormous popularity for usage at home and in small businesses. Under a SaaS contract with a provider like Google or Microsoft, internet mail is gaining popularity for bigger enterprises.

The user's Web browser serves as the client software for Internet mail, while a powerful Web server run by an Internet service or software provider houses the server software. Naturally, the user must have access to the Internet via a supplier of Internet services or a connection to the Internet maintained by an organization. Microsoft Hotmail, Google Gmail, and Juno E-mail on the Web are three examples of these Internet mail services, which are often free for usage at home and in small businesses. Yet, most businesses now go beyond just sending emails. They want both the GUI interface of the POP-mail and LAN-based systems and the enhanced capability of the more dated mainframe systems. They desire document exchange and electronic calendaring. Groupware is the solution. In the next part, groupware will be covered separately from other types of applications. In conclusion, office automation is progressing slowly but gradually, and the usage of unified communications in conjunction with groupware or collaboration tools seems to be the key to ongoing growth.

Groupware and Collaboration

Notwithstanding the fact that ERP systems are, in reality, transaction processing systems, their relevance and significance warranted consideration as a distinct application field. Now, we want to use the same justification to support adding groupware and collaboration to the list of application areas for office automation. Groupware and collaboration are undoubtedly an element of office automation, but they are a highly important one that needs specific consideration.

Software created to help groups by promoting cooperation, communication, and coordination is referred to as groupware in the business world. These days, groupware is often referred to as a collaborative environment or by the word collaboration. The person making the choice must identify what characteristics are necessary before looking for a groupware solution that offers them. Electronic mail, electronic bulletin boards, computer conferencing, electronic calendaring, group scheduling, document sharing, electronic whiteboards, shared workspace, workflow routing, electronic forms, Internet telephony, desktop videoconferencing, learning management systems, unified communications, and instant messaging are some groupware features. Presence awareness, or the capacity to gauge other people's online accessibility, is one groupware feature required to facilitate real-time collaboration.

All the features that a business could want are not included by the top groupware programs, however in many instances add-on packages can be acquired to address the gaps. E-mail is a logical assumption as the core of a successful general-purpose groupware system, and Lotus Notes3 and Microsoft Exchange2, the two leading competitors, both include outstanding e-mail features. Lotus Notes kept the top spot up until 2004 thanks in large part to its exceptional capacity to distribute documents of all kinds. With 145 million business users, Lotus Notes is still utilized by more than half of the Top 100 firms. Exchange, however, has surpassed Notes in terms of installed base due to a number of factors, including Exchange's considerably lower operating costs, Exchange's user interface, and Microsoft's marketing power. No rivals even come close to the top two in terms of market share. There are other competitors in the market, meanwhile, who have intriguing groupware products, such as Oracle Beehive Collaboration Software, Novell GroupWise, HotOffice, Webcrossing Community, and EMC's Documentum eRoom.

To augment the collaborative features included in their main groupware solutions, the top two competitors have released extra products. Microsoft provides Microsoft Office SharePoint Server, an integrated set of server features with a wide range of collaboration tools including shared workspaces, shared calendars, presence awareness and instant messaging, document management, process routing, wikis, and blogs. Later, Microsoft Office Communications Server, which is the company's main UC product, provides optimized communications such as presence awareness and instant messaging (IM), VoIP phone, voice and videoconferencing, and mobile access. Microsoft Exchange and Microsoft SharePoint are also offered as hosted services, it is important to remember.

The main Unified Communications (UC) product from IBM, IBM Lotus Sametime, offers integrated, real-time communications services like presence awareness and instant messaging (IM), voice and video conferencing, VoIP telephony, mobile access, and community collaboration tools like chat rooms, quick connections to experts, and screen sharing. The team collaboration tool IBM Lotus Quickr offers a wide range of content and team services. On the content side, Quickr offers personal file sharing, where each user controls who has access to his or her files, as well as content libraries to organize and distribute material. Moreover, Quickr supports the

establishment of team locations such as wikis, blogs, forums, and team calendars. IBM offers hosted groupware services, much as Microsoft. IBM also provides a less priced solution called LotusLive iNotes, which a Web client is contacting a server housed by IBM. IBM LotusLive Notes utilizes the Notes client installed on a Computer to access a Domino server hosted by IBM—again, SaaS. While LotusLive iNotes offers email service, it lacks complete Domino capability. We will discuss more about the intriguing specialist groupware field of electronic meeting support systems in the next section. Like ERP systems, groupware is a growing and changing segment of the software market. Let's take a deeper look at Lotus Notes, one of the industry's top groupware products, to get a better knowledge of this area.

Lotus Notes is an example of Groupware Software

The first significant offering from Lotus Development Company was 1-2-3, which rose to prominence as the standard spreadsheet program in the 1980s and early 1990s. The second significant product was Notes, a groupware system that initially included robust document-sharing capabilities and a logical email package but has now developed into a more feature-rich offering. IBM was interested in Notes and Lotus's experience with PC and client/server software, and it spent $3.5 billion to acquire Lotus in 1995. As we have said before in this book, IBM was already a software powerhouse, but its expertise was in software for massive machines. In order to compete with Microsoft in that market, IBM believed it needed to strengthen its PC software capabilities. It also want the Notes groupware solution. Both IBM and Lotus seem to have profited from the takeover, with IBM allowing Lotus to function as an independent corporate entity. Users may edit the Lotus Notes welcome screen to their preferences.

The menu bar, which houses the menus of instructions required to carry out actions within Notes, is located at the top left of the screen. A row of icons is located immediately under the menu bar, allowing users to easily complete activities by clicking an icon with the mouse. A box with an address appears underneath the icon row. Enter the Uniform Resource Locator (URL) in the address field to go to a website you haven't been to before; to go to a page you have been to before, click the down arrow at the right end of the address field and choose the relevant URL from the drop-down list. The navigation bar, which is located to the right of the menu bar, enables users to move about in Notes exactly as they would in a web browser. The bookmark buttons are located on the left side of the screen and provide a potent means of accessing both Web sites and Notes databases, views, and documents. The user's mail, calendar, address book, "to do" list, and private journal are all accessible via "hot spot" links in the large area of the screen. The user's most recent Notes inbox entries are displayed in the upper left quadrant, the calendar entries for the current week are displayed in the upper right quadrant, and the user's mail is accessible via the lower half of the screen.

The inbox view of the mailbox is seen when the user accesses the mail, either by clicking the mail hot spot in the bottom-left corner of the welcome page or the mail bookmark button on any page, as in 5.10. A view action bar is shown above the list of e-mail messages in the bigger window to the right in addition to the bars and icons on the welcome page. The mentioned activities are related to the active view. New memo, respond, reply to all, forward, delete, follow up, folder, and copy into new are the items for the inbox view. These are all common operations used to handle email. A navigation pane on the left and an active view window on the right take up the majority of the screen. The active view pane in the inbox view displays a list of the user's mail messages together with information on who sent each message, when it was sent, how big it was, and the topic the sender chose. A user double-clicks a message to open it. Unread messages are indicated by a star

to the left of the sender's name. A variety of views and folders that may be used to handle the mail are shown in the navigation pane on the left. The electronic filing system for this user, for example, consists of a collection of file folders with titles like Academic Dishonesty, Accreditation MIS, ACM, and Advising. The folder "drafts" includes communications you are working on but have not yet sent. By selecting the calendar bookmark button on the left side of the page or the calendar hot spot on the welcome page, you may use Notes' useful electronic calendaring feature. There are several calendar views available, including one-day, one-week, and one-month views.

As previously mentioned, the user's mail files make up the Notes database. Another database is the calendar files, and a third database is the contacts list. In actuality, Notes' many databases serve as its beating heart. Each database includes a group of related publications on the same subject. An expert Notes user will probably have developed databases for the many tasks they are working on, including a large committee assignment, an ongoing research project, a graduate information systems course, and just a faculty discussion group. The user most likely does not wish to share these datasets with other people. Some databases, on the other hand, generated by employees throughout the organization are meant to be shared. As was already noted, Notes' ability to share documents is perhaps its strongest suit. This is accomplished via a number of public databases. Certain databases may be configured such that users may only view documents—not edit or create new ones—while others, like discussion forums, welcome contributions from all members.

Click the database bookmark button on the left side of the page to access a specific database. This displays the user's bookmarks for all the databases on the database bookmark page. By double-clicking on the appropriate database listing, the user may access a database. What happens if the user does not have the required database bookmarked? "Find a Database" and "Browse for a Database" options are now available on the database bookmark page. Every database has a similar initial screen, which includes the necessary tool buttons, a navigation pane on the left, and a list of subjects or documents in the view pane on the right. To see a document, the user must double-click on it.

The user may choose to keep databases on the Computer hard drive, but primary copies of the huge corporate or departmental databases of documents are saved on the server in the client/server system known as Lotus Notes, which Lotus refers to as a "Domino server powered by Notes." To ensure that everyone in the company has access to the same version of a document, corporate files are routinely duplicated from one Notes server to another. The server is accessible via a PC running the Lotus Notes client, which is password-protected appropriately. These connections might be made directly over a LAN or over the Internet. Notes is accessible using any Web browser on the Internet. Naturally, the Notes client is a Web browser in and of itself. The ability to keep copies of Web pages as documents in a Notes database is a significant benefit of using Notes as the browser.

Another advantage of Lotus Notes is that it can be used as a development platform, enabling businesses to build their own Notes apps that are tailored to their requirements. In reality, an increasing number of these specialized programs, such as project management, human resources, help desk, document management, health care, sales and marketing, and image applications, are commercially accessible via third-party vendors.

Using Lotus Notes

Have a look at three recent Lotus Notes/Domino application examples in three very distinct contexts. With $2.2 billion in sales in 2007, IMS Health, a British company, is the largest global supplier of market information to the pharmaceutical and healthcare sectors. IMS Health delivers

market intelligence to its clients through newsletters, a monthly magazine, and its website, such as details on pharmaceutical price and reimbursement in various international markets. IMS Health made the decision to expand on its current Lotus Domino-based content management system while redesigning its website to make it more appealing and user-friendly. IMS Health collaborated with consulting company Kelros to create the new Web site, and the business is pleased with the outcome. Neil Turner, Senior Manager of Editorial Publications, said that "Lotus Domino is very popular with our IT team because of the flexibility of the platform, which makes it easy to develop new applications and databases that are integrated with e-mail and calendaring, as well as to support our Web site." Users can dig down to pertinent material and get answers more quickly on the new site thanks to its much enhanced search and browsing options. IMS Health expects to see an increase in client renewals as a result of the new website's noticeable rise in traffic.

Almost 2,400 Baptist congregations are served by the Kentucky Baptist Convention, a cooperative missions and ministry organization. This nonprofit organization switched to Lotus Notes/Domino in 1998 so that its staff members could use e-mail, calendars, and scheduling tools. While KBC has its headquarters in Louisville, around 40 of its staff members travel all across Kentucky. KBC updated its Notes/Domino software, including Lotus Sametime, in 2008 to meet the communication demands of all company employees especially those who work remotely. With this improvement, KBC now offers its staff options including mobile access, presence awareness, instant messaging, and live chat. A central, conveniently searchable library of reference records was created using Lotus Quickr. Lotus Domino has also been used by KBC as a platform for development; the IT team has created more than 20 different business apps using Domino, and its website was built with Domino hosting in mind. Troy Fulkerson, Director of Information Technology at KBC, claims that the main advantage of the Lotus Notes and Domino platform is the sheer amount of work we can do with just one platform.

More than 2.8 million people in Japan get electricity from Shikoku Electric Power Company. With a focus on the requirement for high dependability and enhanced service levels, Shikoku Electric made the decision to establish a new communications system for knowledge exchange throughout the organization. The business built the new system on top of its current Lotus Notes/Domino application, which was operating on a number of UNIX servers. Shikoku Electric decided against using several smaller servers in order to install an enhanced Lotus Notes/Domino solution on an IBM System Z9 mainframe computer in order to control expenses. The IBM System Z9 offers numerous instances of Lotus Domino on a single device by using virtualization technologies. No additional hardware is required to deploy a new server; instead, a virtual server is only built on the mainframe. According to Shinji Nakauchi, System Promotion Group Head of Shikoku Electric's IT department, "We feel we have succeeded in establishing a system that is simple to use, with excellent dependability, and security.

Intranets and Portals

A network functioning inside of an organization that makes use of the TCP/IP protocol, the same protocol used on the Internet, was first described as an intranet. An intranet typically consists of a backbone network that connects many local area networks, or LANs. The organization may use the same Web browser, Web search engine, and Web server software that it would use on the Internet since the protocol is the same. On the other hand, visitors from outside the company cannot access the intranet. Whether or not employees have access to the Internet is a decision made by the organization.

An intranet offers the firm some amazing benefits. Implementing an intranet is a very simple effort requiring some programming on the Web server if a business already has an internal network of linked LANs, Web browsers on most workstations, and an operational Web server, as most firms have. Inside the company, email and document sharing are two features of a localized World Wide Web that may be accessed with little effort. A "universal client" that works on several systems is the web browser. Additionally, because users are already familiar with using a browser, very little training is required to build an intranet. Sending users an email message with the new application's URL makes it easy to deploy a new intranet application. The expenditures are manageable even if the business lacks a Web server and web browsers. Free web browsers are available, and a basic Web server that includes all necessary software is easily accessible for less than $10,000. Since intranets are so simple to put up, end users rather than the IT department in some organizations created the first intranet to facilitate the sharing of certain documents.

Several significant purposes for intranets exist inside businesses. The intranet is often used as both a resource for corporate knowledge and a beneficial tool for internal communications inside and between enterprises. The intranet may be used to publish general announcements, information about benefits, press releases, organizational policies, employee manuals, as well as an events calendar. An organizational directory that is integrated into the intranet may be used to locate phone numbers, email addresses, and perhaps even employees that specialize in a certain field. The intranet may support forums on specific subjects, wikis, and blogs. In addition, it may house a variety of self-service apps, including online training and the ability to update personal information like address and withholding. There may be even more significant elements that may be included into the intranet, depending on the nature of the firm. For instance, in a health care network environment, intranets have been used to compile medical information from patients, clinics, and labs that are spread out geographically into a single clinical database and make these records available to health care providers through a Web browser. The availability of individuals' medical histories on the intranet allows medical practitioners to quickly ascertain details like previous operations, drugs used, and allergies.

Let's look at two renowned organizations' intranets that have won awards. Mywalmart.com, Walmart's intranet, was named one of the top ten intranets worldwide in 2010 by Nielsen Norman Group, a consulting company for businesses looking to build products and services with the needs of people in mind. Walmart concentrated on developing a successful social networking intranet rather than constructing a conventional intranet website. While the intranet still disseminates company information, its main goal is to promote employee interaction, knowledge sharing, and relationship building. The Walmart intranet gives employees a place to learn about Walmart, locate coworkers, talk about things, and have online chats with business executives. Also, the website offers news, information on workplace perks, and access to self-service applications. Walmart does not intervene in intranet discussion threads; any criticism of Walmart is often met with responses from other associates. A year after the site's launch, around 75% of Walmart's 1.4 million U.S. colleagues frequently use mywalmart.com, and the firm anticipates that percentage to rise once the corporate perks Web site is completely integrated into the intranet. IBM’s intranet, dubbed within the firm as “w3 on Demand Workplace,” was chosen as a top 10 intranet in 2006 by Nielsen Norman Group, and it continues to get recognition as an exceptional intranet. According to Nielsen Norman, IBM's intranet, which promotes communication among its 329,000 workers in 75 countries, has achieved consistency and personalisation.

The following are some of the characteristics of IBM's intranet that Nielsen Norman has identified:

News that is personalized based on user-created profiles The development of role-specific portlets for personnel in sales, management, and finance A comprehensive employee database that enables its users to look for other workers in a variety of ways, including by specific areas of expertise A blogging platform where staff members may use BlogCentral to start their own blogs or subscribe to one another's blogs through RSS.

Accessibility: the intranet is made to be usable by those who have memory problems, physical impairments, and poor eyesight.

Intranets were first seen as rivals to full-service groupware systems like Lotus Notes and Microsoft Exchange. Both promoted internal communication inside the company. While intranets did not provide all groupware functions, they were far less costly. Groupware and intranets have become more integrated over time. Groupware clients like Lotus Notes are now Web browsers because groupware has completely embraced the Internet. Several intranets nowadays use the groupware client in place of a web browser. At the same time, intranets grew to be so difficult to use and complicated that some order and structure were required so that users could discover what they wanted on the intranet. The solution was a portal software that offered a framework and so made internal information simpler to access through a Web browser. Because of the additional software, intranets are becoming more costly. Several different software companies both big and small offer portal software, including group-ware providers IBM, Microsoft, and Oracle. Other portal products include TIBCO PortalBuilder, Open Text Vignette Portal, SAP NetWeaver Enterprise Portal, and JBoss Enterprise Portal Platform.

To handle the manufacturing of five million vehicles per year at 40 facilities in 16 countries, Volkswagen AG has built two significant gateways, one internal and one external. The internal iPAD portal offers buying agents throughout the organization a staggering amount of data on components. The iPAD portal, an external business-to-business web, reportedly "provides 360-degree views of suppliers, components, and projects," allowing Volkswagen to work more closely with its suppliers, according to Meike-Uta Hansen, Director of e-Supply Chain Integration and Services. This portal includes 55,000 users, connects to 16,000 supplier websites, and 30 apps. Suppliers get access to the particular data they need to follow VW's procurement requirements via the site, and they also get event-driven notifications to keep them informed of changes to VW's plans.

Ball Memorial Hospital in Muncie, Indiana, has utilized a portal effectively for its doctors and is presently expanding its usage to include all of its staff. Ball Memorial has created more than 20 apps for its doctors using IBM's WebSphere Portal and portal development tools from Bowstreet, Inc. According to Christina Fogle, e-Systems Manager at Ball Memorial, the tools reduced development time for more complicated systems by 40% and for simpler apps by as much as 70%. Now, the hospital uses the same capabilities for new employee self-service apps including benefits administration and travel.

To provide clinicians at CCHMC and two adjacent hospitals where surgery on fetuses is conducted, if necessary, with patient data, including computerized medical records and digital radiological pictures, the Cincinnati Children's Hospital Medical Center developed a Fetal Care Portal. The portal enables clinicians to access patient data on two side-by-side panels, one of which displays photos and the other of which displays textual reports. Physicians may utilize the database query capabilities on the site to examine patterns and come up with better therapies by accessing information about the procedures and results of other patients who have the same illnesses and

have had treatment at CCHMC and its two partner institutions. Intranets and portals have enhanced performance and communication for firms including Walmart, IBM, Volkswagen, Ball Memorial Hospital, Cincinnati Children's Hospital, and many more [6].

Industrial Automation

Numerically controlled machines, which use computer programs or tape with holes punched in it to control the movement of tools on complex machines, and material requirements planning systems, which depend on extensive data input to produce a production schedule for the factory and a schedule of required raw materials, are the origins of factory automation. These fundamental concepts are combined in the more recent computer-integrated manufacturing, which uses computers to create schedules and then execute them by commanding the many equipment involved.

One of the main strategies manufacturers use to combat the problems of global competitiveness is computer-integrated manufacturing. Manufacturers are improving productivity and quality while shortening the lead time for most products from the concept stage to the market thanks to the numerous CIM components. Strong CIM supporters include companies like General Motors, John Deere, Ford, Weyerhauser, FMC, and Kodak, among others. Engineering systems, manufacturing management, and factory operations are the three main areas under which CIM systems may be divided. The abbreviations used in this industrial automation section. Engineering systems, which include ones like computer-aided design and group technology, are meant to boost engineers' productivity. Systems that create production plans and track production in relation to these schedules are included in manufacturing administration; these systems are often referred to as manufacturing resources planning systems. Systems that really manage the functioning of the equipment on the factory floor are referred to as factory operations. Examples of these systems include shop floor control and computer-aided manufacturing.

CONCLUSION

Customer Relationship Management (CRM) gives a business the ability to match its strategy with customer demands in order to better address those needs and, as a result, secure long-term client loyalty. It is a tool for controlling all interactions and connections between your business and clients. The objective is straightforward: to strengthen commercial ties. CRM systems assist businesses in maintaining contact with clients, streamlining procedures, and boosting profitability. A CRM system boosts the quantity of leads coming in and speeds up the process of your marketing team finding new clients by smartly storing and maintaining your customers' information. It helps your sales staff close more transactions more quickly. Moreover, it improves client service.

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