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Trends in Information Technology Management Functions and Strategies

A Study of 66 Nebraska Firms

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Executive Summary

At the beginning of the computer era in most corporations, computer operations were highly centralized. The computer center manager would acquire all hardware and then work with an operating department to automate some transaction-intensive business activity (usually an accounting function). With the advent of departmental computers and desktop devices in the late 1970's and early 1980's, applications began to move to departmental devices and the desktop.

This increased dispersion of data plus an ever increasing amount of business activity being computerized placed new demands for access and the development of networking technologies. In many respects, the decades of the 1980's and the 1990's saw the applied merger of computer and communication technologies as evidenced by local- and wide-area networks, client server technologies and desktop applications that increased connectivity and enhanced the availability of information. Stand-alone applications on older architecture gave way to more network-centric solutions with desktop accessibility to relational data bases for greater data access. Meanwhile, operational control of much of the IT environment was being decentralized.

The late 1990's and early 21st century saw the explosion of web-based technologies leading to new strategic opportunities for the application of information technologies. A new generation of devices and applications created the "electronic platform" upon which the enterprise now operates. The emergence of greater challenges for data security, the integrity of operations, and the complexity of diverse technologies led to major management issues.

A 2007 summary of 66 Nebraska firms revealed that firms of all sizes are moving toward a greater centralization of key components of this information technology environment. Today, over one-half of the firms described themselves as having centralized IT management, while over 20 percent defined themselves as "diverse" with management of many activities decentralized. The IT environment is relatively complex with nearly 40 percent reporting mainframe operations, nearly 80 percent with robust enterprise-wide LAN/WAN environments and 40 percent with a robust web environment.

Within this complex environment, the functions that are currently under centralized IT management are security, the IT infrastructure, and IT standards and policies. Help desk and procurement of IT devices are also highly centralized – no matter the size of the enterprise. The study respondents also indicated that these and other key issues that affect the basic attributes, operational continuity and security of the electronic platform will be further concentrated with the IT management in the near future.

The acquisition and development of business applications/processes is perhaps the least centralized – particularly for the smallest firms. Even though these various business applications (accounting, human resources, marketing/sales, etc.) may be acquired by appropriate departmental management; once installed, the IT department is more likely to be charged with the maintenance and support of those systems.

It goes without saying that the information technology operating environment has become more complex over the years. Its migration from those early single-function transaction devices to the electronic platform upon which the firm operates today has been an amazing transformation in just one generation of IT managers. As future strategic opportunities provided by even more innovative information technologies emerge, the issues IT management must address will grow. The role and breadth of responsibilities for the IT department will further evolve and change.

Introduction

At the beginning of the computer era in corporate America, most firms justified the purchase of their first computer to automate some key business activity central to the firm's core mission. The business process they planned to computerize had probably gone through various stages of automation, including, perhaps, very early punch cards and hand-wired circuit boards on IBM or Control Data equipment. In the late 1950's or early 1960's, an IBM 1401 may have been installed. Those early systems were usually "stand-alone" applications such as accounts receivable, accounts payable, customer billing, payroll, inventory control, etc.

*"The IBM 1401 is called the Model T of the computer business, because it is the first mass-produced digital, all-transistorized, business computer that can be afforded by many businesses worldwide. The basic 1401 has an optional Storage Expansion Unit which expanded the core storage to an amazing 16K. The 1401 processing unit can perform 193,300 additions of eight-digit numbers in one minute. The monthly rental for a 1401 is \$2,500 and up, depending on the configuration. By the end of 1961, the number of 1401's installed in the United States alone will reach 2,000—representing about one out (of) every four electronic stored-program computers installed by all manufacturers at this time. The number of installed 1401s will peak at more than 10,000 in the mid-1960's, the system will be withdrawn from marketing in February 1971."*¹

The group of individuals that developed those early business systems was generally from the firm's accounting or other functional department that knew the application and then learned to code the application's various steps and processes into computer programs. (It was before the era of computer science programs at the region's postsecondary colleges and universities. The first Nebraska baccalaureate students with computer science degrees did not enter the labor force until the early 1970's). This group of individuals "owned" all the equipment, the applications and all the associated processes and procedures. They were normally housed in the data processing department. Some companies had that department in street-level facilities with glass windows to visually demonstrate to the passing public their advanced technology and forward-thinking leadership in the world of computers. (These visual displays of their computer operations predated the security concerns of today.)

The evolution of information technologies has been dramatic in the workplace. The computer centers were moved from the glass-front space to an interior room with locks and halon systems to suppress fire. Major power upgrades, air conditioning, neutral grounds and other environmental attributes were required to house the large heat-generating devices. However, further advances in technology left some of that large environmentally controlled space obsolete.

Coax cable connected terminals with "green screens" throughout the building and a substantial dolly was required to transport paper reports to users as print speeds advanced to thousands of lines per minute.

Throughout the 1970's as the professional programmer and analyst appeared on the scene, more business applications were developed and implemented, driven by the users' insatiable demand. The first computer devices started appearing outside the computer room in the late 1970's as special purpose machines such as word processing devices were used to increase the

¹ History of Computing Project; <http://www.thocp.net/hardware/mainframe.htm>

productivity of the stenographic pool. Also, Digital Equipment Corporation and Hewlett-Packard introduced departmental machines that could perform some departmental functions, freeing those department managers from their dependence on the data processing department and the mainframe computer.

By 1981, when IBM announced its personal computer, the concept of desk top computing in the business environment had been validated and the demands of users dramatically changed. With spreadsheet and word processing, the user had new-found freedom for desktop computing. This capacity then led to new demand for data from the mainframe and departmental devices so desktop users could analyze and review data.

While desktop computing was a necessary condition for the highly productive computer world of today, it was not sufficient. The other requirement was communications. The origins of telephone communications date back to March 10, 1876 with Bell's exclamation, "Watson come here, I need you." Compared to telephone communications, computer technology was a late arrival. The first electronic computer with vacuum tubes was invented in 1939 by John V. Atanasoff and Clifford Berry at Iowa State College. In 1975, the first "home computer" called the Altair 8800 was sold for \$397. This was followed quickly by a variety of desktop devices, including the Apple II in 1977. In 1979, VisaCalc, the first electronic spreadsheet program for Apple was released. It was preceded by Word Star 1.0, the first word processing program in 1978.²

In most firms, communications was the domain of the people in charge of telephones. The technologies that allowed local-area and wide-area networking of computers emerged in the late 1970's and early 1980's. These technologies connected compute devices creating highly productive enterprise-wide sharing of information. The emergence of user developed inquiry capabilities, placed further demand for LAN and WAN technologies. Further advances in the technologies and software led to the client-server environments.

"In 1973 DARPA (Defense Advanced Research Projects Agency developed TCP/IP protocol suite which was to become the backbone of the language used to communicate on the... "www" or World Wide Web."³

Since the 1960's, the name of the computer department and its mission frequently changed. The array of disciplines and professional degrees within the department broadened substantially. Today, in large organizations, personnel responsible for different parts of the technical environment and functions are spread across the firm and in some cases, across the world and/or with vendors outside the firm. The budget, equipment, security of physical equipment and data, management and control, etc. are frequently dispersed.

Information technology is no longer just a strategy to automate some transaction-oriented processes. It has become the electronic platform upon which the entire enterprise operates. It touches nearly every employee, supplier and customer. It is strategically important to the operations and management of every operating division. It has become the basis of major competitive advantage (or disadvantage) in the market. Sound management of the technology environment is essential to the success of the enterprise.

² The History of Technology: Computing Communications, Electronics and Space; http://web-friend.com/help/general/tech_history.html

³ History of Computing Project: Computing Communications, Electronics and Space; http://web-friend.com/help/general/tech_history.html

A recent survey by the AIM Institute was designed to document the scope of activities now assigned to Omaha and Nebraska IT departments. Sixty-six Omaha and Greater Nebraska firms, with a total of 68,939 Nebraska-based employees, completed the survey. They had a total of 5,082 IT employees representing 6.44 percent of the total Nebraska IT workforce.

The average Nebraska employment for each responding firm was 1,045 employees with 77 IT professionals. The range in total employment was quite large, however, ranging from three employees to over 10,000 employees. IT employment ranged from no IT employees to over 1,200 technology professionals. Several employers had operations outside Nebraska in other states and foreign locations. Inconsistency in responses to some questions in the questionnaire made it impossible to make an accurate estimate of either total employment or IT employment levels outside Nebraska for these 66 firms. While precise estimates of total employment outside Nebraska are impossible to make, 34 firms had employees outside Nebraska but only 18 of these had IT employees outside the state.

Businesses that completed the survey represented the general breadth of Nebraska business and commerce. The number of firms and employers represented include:

Number of Firms/ Employers	Business Category	Number of Firms/ Employers	Business Category
9	Nonprofits	2	Construction
8	Insurance	2	Other
6	Consulting	1	Architecture
6	Education	1	Engineering
5	Financial Services	1	Manufacturing/Distribution
4	Utilities/Energy/Oil	1	Pharmaceuticals/Medical
3	Government	1	Security/Protection
3	Retail	1	Services
3	Legal	1	Telecommunications
2	Healthcare/Wellness/Fitness	1	Transportation
2	Printing/Publishing/Photography		

Findings

The questionnaire asked employers to respond to increasingly more specific questions about the role of IT within the organization today. As would be expected, responses frequently varied by the size and age of the enterprise.

Question: The convergence of computer, communications and digital technologies has changed the strategic vision/use of IT in business. How would you describe your firms view of IT's role in business processes today?

Table 2 – IT's Role by "Size of Enterprise"				
IT's Role	Size of Enterprise			
	All sixty-six respondents	Over \$100 million revenue	\$10 to \$100 million revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
Business activity and processes have been engineered to capitalize on new information technologies.	66.7%	66.7%	56.9%	77.3%
Historic business activity and processes have been automated to achieve greater efficiency.	80.3%	76.2%	84.2%	81.8%
Most business activity processes have remained unchanged.	15.2%	23.8%	10.5%	13.6%

The above table groups 62 of the 66 respondents that indicated their total revenues. The data shows a general pattern that smaller firms have adapted somewhat more quickly than larger employers to a re-engineering of business practices and automation to achieve efficiency. This general pattern is not particularly surprising simply because the size and number of the legacy systems and hardware in the largest firms make the task much more daunting. Responses do not total 100 percent because respondents were asked to mark all that apply. The table also clearly shows that employers in all size groupings have made substantial progress in modernizing legacy systems as new technologies have emerged in recent years.

Table 3 – IT's Role by "Age of Enterprise"				
IT's Role	Age of Enterprise			
	All sixty-six respondents	Founded before 1985	Founded 1985-1994	Founded 1995 or later
	N = 66	N = 46	N = 7	N = 13
Business activity and processes have been engineered to capitalize on new information technologies.	66.7%	65.2%	71.4%	69.2%
Historic business activity and processes have been automated to achieve greater efficiency.	80.3%	80.4%	100%	69.2%
Most business activity processes have remained unchanged.	15.2%	15.2%	0%	23.1%

The respondents were also grouped by the age of the company. The above data is somewhat surprising in that employers that started in 1995 or later have essentially no better record of

adapting to the newer technologies than the older firms. A closer look at estimated total revenue reveals that of the 13 employers who started in 1995 or later, nine had annual revenues of \$10 million or less, three with \$10 million to \$100 million and one with over \$100 million in annual revenue.

Question: Which best describes the technology environment in your company?

Table 4 – Technology Environment by “Size of Enterprise”				
Technology Environment	Size of Enterprise			
	All sixty-six respondents	Over \$100 million in total revenue	\$10 to \$100 million in total revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
Centralized – all equipment, systems acquisitions, development, maintenance and support is centrally managed.	56.1%	61.9%	73.7%	40.9%
Decentralized – operating departments or divisions make network, equipment and application decisions for virtually all aspects of the IT needs.	3.0%	4.8%	0%	0%
Diverse – some activities like the voice and data networks, IT standards, some applications are centralized, while some departments and divisions make decisions for their unique IT needs and applications.	21.2%	33.3%	15.8%	13.6%
Outsource/Contracted – the majority of equipment, systems acquisitions, development, maintenance and support has been outsourced or contracted to vendor or vendors from outside the company.	15.2%	0%	10.5%	36.4%

While the majority of larger employers have large centralized general-purpose IT departments, there is a wide variation in operations. A very few employers have decentralized models where operating departments and divisions make virtually all their own IT decisions. None of the large employers with over \$100 million in revenues outsources its total IT functions, while over one-third of the smaller entities use outsource solutions for their IT functions. While the data is somewhat imprecise, the respondents indicated that over the next three years, the trend appeared to be towards increased centralization of the IT function for firms of all sizes. Later data will show that issues such as security, IT standards, procurement, helpdesk, and others are driving employers to seek solutions that, most efficiently, meet total enterprise needs.

Question: Which best describes the IT technology and network infrastructure in your company?

Table 5 – IT and Network Infrastructure by “Size of Enterprise”				
IT and Network Infrastructure	Size of Enterprise			
	All sixty-six respondents	Over \$100 million in total revenue	\$10 to \$100 million in total revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
Mainframe environment for some applications.	37.9%	57.1%	42.1%	22.7%
Robust web environment (numerous business-to-business, business-to-customer, and other business uses).	40.9%	47.6%	47.4%	31.8%
Very limited – no web presence	12.1%	23.8%	5.3%	9.1%
Robust enterprise – LAN/WAN environment	78.8%	95.2%	73.7%	72.7%
Limited and/or multiple but unconnected LAN/WAN environment	3.0%	0%	5.3%	4.6%
Stand-alone desktop devices and applications.	13.6%	28.6%	15.8%	0%

Many larger firms have large mainframe environments for many applications. The above data generally revealed a rapid move to the more current network-centric solutions using the web and LAN/WAN technologies no matter the size of the firm. It is somewhat surprising, however, that nearly one fourth of the largest firms reported very limited to no web presence. It is also interesting to observe that 95 percent of the largest firms have robust LAN/WAN environments. Nearly 29 percent of the large enterprises reported stand-alone desktop devices and applications, more than any other size grouping.

Table 6 – IT and Network Infrastructure by “Age of Enterprise”				
IT and Network Infrastructure	Age of Enterprise			
	All sixty-six respondents	Founded before 1985	Founded 1985-1994	Founded 1995 or later
	N = 66	N = 46	N = 7	N = 13
Mainframe environment for some applications.	37.9%	41.3%	28.6%	30.8%
Robust web environment (numerous business-to-business, business-to-customer, and other business uses).	40.9%	39.1%	57.1%	38.5%
Very limited – no web presence	12.1%	17.4%	0%	0%
Robust enterprise – LAN/WAN environment	78.8%	84.8%	71.4%	61.5%
Limited and/or multiple but unconnected LAN/WAN environment	3.0%	0%	0%	15.4%
Stand-alone desktop devices and applications.	13.6%	17.4%	14.3%	0%

Just as by firm size, the firms of all ages have embraced robust web and LAN/WAN environments. It is somewhat surprising that mainframe technologies are used by nearly one-third of the firms started since 1995. However, as noted above, three of the 13 had estimated gross revenues from \$10 million to \$100 million, and one had revenues over \$100 million

annually, suggesting the potential for some relatively large transaction-based applications that best fit a mainframe processing environment.

Question: There are certain activities that are frequently viewed as corporate-wide IT responsibilities. Which of these functions is your IT department accountable for?

Table 7 – Functions of IT Department by “Size of Enterprise”				
Functions of IT Department	Size of Enterprise			
	All sixty-six respondents	Over \$100 million in total revenue	\$10 to \$100 million in total revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
Security – (corporate data, network, systems, etc.)	81.8%	100%	89.5%	63.6%
Business continuity/pandemic contingencies	66.7%	71.4%	73.7%	63.6%
Data mining, corporate-level reporting, etc.	53.0%	81.0%	52.6%	31.8%
Internal information technology helpdesk	74.2%	85.7%	84.2%	59.1%
Voice communications and technology	63.6%	76.2%	68.4%	50.0%
Information technology infrastructure	83.3%	100%	89.5%	68.2%
Information technology standards/policies	81.8%	100%	89.5%	63.6%
Procurement of all IT hardware, devices and services	74.2%	85.7%	89.5%	59.1%
Strategic initiatives/business reorganizing	48.5%	66.7%	47.4%	36.4%
No IT department – all outsourced	16.7%	0%	10.5%	36.4%

There were three areas for which over 80 percent of all IT departments were accountable – security, information technology infrastructure, and information technology standards/policies. In fact, for the largest 21 firms with over \$100 million in revenues, 100 percent of the IT departments were accountable for these functions. Over the years, industry has increasingly determined that certain things cannot be effectively delegated or disbursed to functional departments within the corporation. Lack of strong enterprise-wide leadership in these areas can lead to severe long-range challenges. Also, a very high percentage of employers in the \$10 million to \$100 million and less than \$10 million groupings also have these functions assigned to their IT departments.

Two other areas of concentration within the IT departments for all 66 firms were internal information technology helpdesk and procurement of all IT hardware, devices, and services. For the largest firms, over 85 percent of the IT departments were accountable for the two functions.

Likewise, for the employers with \$10 million to \$100 million in revenues, a substantial majority had assigned to their IT departments functional responsibility for the internal IT help desk and procurement of all IT equipment. Similarly, nearly 60 percent of the smallest employers assigned these responsibilities to the IT departments.

Perhaps the function that varied greatest by size of firm was data mining, corporate-level reporting, etc. Eighty-one percent of the largest firms assigned this responsibility to the IT department. Substantially lower percentages of the smaller firms’ IT departments were accountable for this function. The terminology ‘data mining’ suggests more sophisticated analysis of integrated and disparate data files to gain a strategic insight that is not available from

traditional management reporting functions. Given current technologies, this data mining activity is more likely to occur in the largest firms.

Finally, business continuity/pandemic contingencies were assigned to over two-thirds of all IT departments with nearly three-fourths of all the largest firms' IT departments accountable for this activity. Voice communications technology also was the responsibility of the IT department for over two-thirds of the large- and medium-sized firms.

While the percentages varied somewhat by age of firm, the priority of the issue assigned to the IT departments were nearly identical to the priorities when the firms were arranged by size.

Question: Business applications/processes – select all activities in which the corporate IT manager/department has major responsibilities?

Table 8 – Business Applications/Processes by “Size of Enterprise”								
Business Application/ Processes	All sixty-six respondents		Size of Enterprise					
			Over \$100 million in total revenue		\$10 to \$100 million in total revenue		Less than \$10 million in total revenue	
	N = 66		N = 21		N = 19		N = 22	
	Acquire/develop	Maintain/support	Acquire/develop	Maintain/support	Acquire/develop	Maintain/support	Acquire/develop	Maintain/support
Finance/Accounting	48.5%	66.7%	66.7%	76.2%	36.8%	68.4%	40.9%	59.1%
Manufacturing/ Distribution	12.1%	13.6%	19.0%	19.0%	10.5%	15.8%	4.6%	4.6%
Marketing/Sales	36.4%	43.9%	57.1%	61.9%	31.6%	36.8%	22.7%	36.4%
Engineering/Technical	30.3%	30.3%	47.6%	52.4%	26.3%	31.6%	18.2%	9.1%
Human Resources	36.4%	54.6%	61.9%	71.4%	15.8%	47.4%	27.3%	45.4%
Customer Service	34.8%	43.9%	52.4%	61.9%	31.6%	42.1%	22.7%	31.8%
Legal	13.6%	18.2%	28.6%	33.3%	5.2%	10.5%	4.6%	9.1%
Real Estate/Building/ Facilities	16.7%	22.7%	38.1%	47.6%	10.5%	10.5%	0%	9.1%
Procurement	28.8%	31.8%	52.4%	47.6%	21.0%	21.0%	9.1%	22.7%

At the business application/process level, every IT department had major responsibilities for some of the firm's business applications. However, less than half of all 66 firms' IT departments were accountable for acquisition/development of the various business applications and processes. It is interesting to note, however, with only a few exceptions, once the business applications/processes were acquired/developed, the IT department were more likely to be charged with maintenance/support of the applications.

Finance/accounting was the business application most frequently assigned to the IT department. Nearly 50 percent of all IT departments had responsibilities to acquire/develop these applications and 66.7 percent of the departments were subsequently responsible for maintaining and supporting those applications.

The largest firms' IT departments were more likely to have major application acquisition/development responsibilities than enterprises with either the \$10 million to \$100 million or less than \$10 million in gross revenue. Over half of the largest firms' IT departments were responsible for acquiring and developing applications for finance/accounting; marketing/sales; human resources; customer service; and procurement. Once installed half to three-fourths of these IT departments then maintained and supported those systems.

It is difficult to explain why these large IT departments have a greater role in the support of application acquisition/development and maintenance/support than the smaller firms. Some possible explanations might include:

- More "off-the-shelf" solutions are available for smaller organizations allowing departmental initiatives rather than corporate IT responsibilities.
- Many of the smaller firms do not have robust IT departments with the technical and application skills to acquire/develop a variety of technical and application software. (The average IT employment for Nebraska firms was 16.2 IT employees for firms with gross revenues under \$10 million compared to 35.2 IT employees for firms with revenue of \$10 million to \$100 million and 188.4 IT employees for the largest firms.)
- Earlier it was reported that 36.4 percent of the employers with less than \$10 million in gross revenues "described their technology environment" as outsourced/contracted. It is likely that some of these companies also outsource or contract for application service and support. None of the largest companies described their technology environment as outsourced/contracted.

Summary

Data centers of the 1960's and 1970's were highly centralized operations. A very expensive, extremely limited hardware platform (as measured by today's standards) was dedicated to one or two high-transaction processes developed in house by a few FORTRAN and COBOL programmers. These individuals controlled the computer environment including all functions such as security of both the hardware and data; standards; policies; strategic initiatives; and reporting. The bulk of the strategically critical operating and historical data was maintained on microfilm, paper records and tape reels stored in Kansas salt mines.

In the late 1970's and early 1980's, the advent of departmental computers, personal computers, LAN and WAN technologies and application software created opportunities to decentralize technical platforms, applications and data. This increased freedom and control by functional departments created new issues for management. With management information disbursed, the need for data access created the demand for greater data communications and connectivity. Distributed data frequently meant reduced data security. Communications technologies created greater opportunities for security breaches. Technology standards failed to keep up with rapidly changing technology environments.

The emergence of Internet and Intranet technologies; the web; wireless and satellite communications; an explosion of portable and miniaturized devices; and the literal digitalization of the world knowledge – both current and historic information within the enterprise and throughout the public domain – created previously unimaginable opportunities in the 1990's. While these technologies have allowed greater distribution of processing power and greater access than ever before, they have created a very strong demand to recentralize certain aspects of the enterprises digital environment.

The data from this survey clearly shows a trend toward recentralization of major technology management and operational functions for the enterprise. For all firms – 56 percent of the respondents described their technology environment as increasingly centralized with all equipment, systems acquisition, development, maintenance and support more centrally managed. In addition, 23 percent of these employers suggested even greater centralization over the next three years. When firm size is considered, the largest firms with total revenues greater than \$100 million described their technology environment as highly centralized. The firms with \$10 million to \$100 million reported 74 percent of their technology operations as centralized.

The respondents were rapidly embracing newer technologies, with 41 percent of all respondents reporting a robust web environment. Nearly 50 percent of the two largest categories of firms, those with total revenues from \$10 million to \$100 million and those with revenues greater than \$100 million, reported robust web environments. Both groups also reported major plans for greater web expansion in the next three years. These firms already had robust enterprise-wide LAN/WAN environments. Maximizing the benefits of the technologies frequently require a strategic enterprise-wide view of the technology and its application to business and operational issues within the firm.

The areas showing the greatest centralization of management were:

Table 9 – Functions of IT Departments by “Size of Enterprise”				
Functions of IT Departments	Size of Enterprise			
	All sixty-six respondents	Over \$100 million in total revenue	\$10 to \$100 million in total revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
Information technology infrastructure	83.3%	100%	89.5%	68.2%
Security (corporate data, network, systems, etc)	81.1%	100%	89.5%	63.6%
Information technology standards/policy	81.1%	100%	89.5%	63.6%
Other applications centrally managed				
Internal information technology helpdesk	74.2%	85.7%	84.2%	59.1%
Procurement of all IT hardware, devices, and services	74.2%	85.7%	89.5%	59.1%
Voice communications technology	63.6%	76.2%	68.4%	50.0%
Data mining, corporate level reporting, etc.	53.0%	81.0%	52.6%	31.8%

Each of the above areas tends to have enterprise-wide implications. Multiple solutions such as different technology infrastructure, different standards, multiple technology helpdesks, multiple point of origin to acquire equipment, etc. create a demand for substantial additional coordination and system integration solutions. For some key technology issues, an enterprise-wide view is very productive.

However, there is substantial evidence that specific business applications and processes may be productively distributed to the specific operating departments. Of all the business applications and processes evaluated, only finance and accounting approached the 50 percent level of centralization for acquisition and/or development of this software by all IT departments.

For all other business applications/processes, the 66 firms reported only one-third or less of the IT departments had primary responsibilities to either acquire or develop the required software applications.

The data segmented by firm size, however, revealed that the largest firms – those with over \$100 million in revenues – were much more likely to acquire or develop major business applications for the enterprise.

Table 10 – Business Applications/Processes by “Size of Enterprise”

Business Applications/Processes	Size of Enterprise			
	All sixty-six respondents	Over \$100 million in total revenue	\$10 to \$100 million in total revenue	Less than \$10 million in total revenue
	N = 66	N = 21	N = 19	N = 22
	Acquire/Develop	Acquire/Develop	Acquire/Develop	Acquire/Develop
Finance/Accounting	48.5%	66.7%	36.8%	40.9%
Human Resources	36.4%	61.9%	15.8%	27.3%
Marketing/Sales	36.4%	57.1%	31.6%	22.7%
Customer Service	34.8%	52.4%	31.6%	22.7%
Engineering/Technical	30.3%	47.6%	26.3%	18.2%
Procurement	28.8%	52.4%	21.0%	9.1%
Real Estate/Building/Facilities	16.7%	38.1%	10.5%	0%
Legal	13.6%	28.6%	5.2%	4.6%
Manufacturing/Distribution	12.1%	19.0%	10.5%	4.6%

These larger firms, more likely, had relatively complex business processes that did not lend themselves to “off-the-shelf” solutions available to smaller companies. In addition, the larger IT staffs (an average of 188.4 IT professionals) provide a greater depth of experience and talent to acquire/develop key business applications.

The prevalence of department or division management of applications and processes is supported by several factors including:

- More “off-the-shelf” solutions available for smaller organizations.
- Many smaller firms do not have robust IT departments.
- More outsourcing of IT functions by smaller companies.

Almost without exception, once the business application was operational, the IT department was more likely to assume major responsibilities for its ongoing maintenance and support. This pattern, shown in an earlier table, existed for all sizes of firms. It seems to suggest that even though an operating department may select application software, that department may not have the necessary technical skills to maintain and support the software as later releases and updates must be installed and functional enhancements are required.

Finally, it goes without saying that the information technology operating environment has become more complex over the years. Its migration from a limited functional transaction processing device to the electronic platform upon which the firm operates has been an amazing transformation in just one generation of IT managers. As future strategic opportunities provided by even more innovative information technologies emerge, the scope of issues faced by IT management will grow. The role and breadth of responsibilities for the IT department will also evolve and change becoming even more complex.

It is reported that there is an ancient Chinese curse that states, "May you live in interesting times." Management of information technologies has certainly been interesting over the last few decades. It will likely become even more interesting. I suppose whether an IT manager views these times as blessed, challenging, stimulating, or cursed, will depend upon the day and specific events in the life of that manager.