Information Systems Strategy Development and Implementation: A Nursing Home Perspective

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Like most providers in the long-term care (LTC) industry, the Miami Jewish Home and Hospital for the Aged (hereafter called the Home) faced an increased demand for computerization due to regulatory changes and changes in the marketplace. For example, the initiation of the prospective payment system on June 22, 1998, as well as HCFA's (Health Care Financing Administration's) move toward development of an outcomes database using statistical data from the minimum data set (MDS) has forced all long-term care facilities into increased computerization. Also, the ORYX initiative from the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) will require all accredited facilities to report outcomes. And the impending Year 2000 (Y2K) problem has forced everyone to evaluate existing systems. In addition, the push of managed care has focused attention on the cost of delivering care, with emphasis on length of stay, utilization, and cost of care per episode. With these and other factors creating pressure, the Home initiated the development of a strategic information systems (IS) plan.

Background

The Home is the largest proprietary, not-for-profit nursing home in the Southeast. Over the past fifty years it has evolved from a 23-bed nursing home in 1945 to a 498-bed geriatric care facility on a twenty-acre campus consisting of 398 long-term care beds, 32 acute care beds, and 68 Medicare-certified skilled beds. The Home is committed to providing a high standard of advanced healthcare, education, and research. In addition, the Home operates the following:

- 101 independent living apartments and two assisted living facilities—a 90-bed facility on campus and a 40-bed facility in northern Broward County
An Outpatient Ambulatory Health Center that is licensed to the acute care hospital
The Community Mental Health Center
A residential program for recently released patients from the State Mental Hospital system
Two adult day care centers
A nursing home diversion program that provides case-managed services to Medicaid recipients in their homes

The Home specializes in the care of Alzheimer’s disease through special programs in the nursing home, as well as in assisted living and adult day care facilities.

The Home is unusual for an LTC organization. Traditional long-term care has included residential programs for the elderly and disabled. Reimbursement for care has come principally from government sources—mostly Medicaid—and some private pay. The typical nursing home is a 100-bed facility with a traditional residential care component. With the advent of the DRG (diagnosis-related group), the LTC industry has begun to focus on other non-traditional paradigms of care, foremost among them being the short-term skilled nursing and sub-acute facilities. Sub-acute programs are funded through the Medicare program following an acute care stay with eligibility of one hundred days. This adds a new wrinkle to the traditional LTC programs: they are now billing Medicare and billing at discharge rather than on a monthly cycle.

Assisted living centers are becoming more popular. Like traditional long-term care they are residential in nature but do not require as much nursing care as long-term care. These programs are primarily private pay; currently, there is no government reimbursement. Independent living facilities are also becoming more popular in the LTC industry. The independent living facility is also strictly private pay, with no government reimbursement, and it resembles a rental apartment complex rather than a nursing home. The Home has all three care settings in addition to the LTC component. The software selected must have the capability for each program.

The Need for an Integrated Information Systems Strategy
Several computer systems were in operation at the Home and its associated programs. A “best of breed” strategy had been used to select systems. At the nursing home and hospital a clinical system recorded physician orders, nurses’ progress notes, care plans, and the MDS. A financial system processed the billing for the nursing home, hospital, Ambulatory Health Center, and Skilled Nursing Facility (SNF), as well as the accounts payable and general ledger for all programs and facilities. The Community Mental Health Center and the Channeling programs operated their own systems. Little or no thought had been given to integrating these systems.
Pressure to increase computerization within the Home was building, as a number of departments requested and sought computer systems. The dietary department was planning to purchase a production and clinical diet office system. The Ambulatory Health Center was deciding on a system to automate their appointment book. The general services department was looking at a preventive maintenance system, and the purchasing department was looking at a materials management system. Management decided that they could no longer do business as usual when individual departments were acquiring their own computer systems. Some form of organization and strategy was needed.

The Home, recognizing the importance of aligning business strategy, business structures, and information technology, decided that an overall IS plan should be developed and priorities established. The plan would encompass not only the software systems needed to support the business but the hardware and data-communication infrastructures that formed the foundation for the Home's information technology. Information technology should be viewed as an asset. Managing this asset requires an understanding of its components and of how those components contribute to the overall goals of the organization. A strategic IS plan would provide a blueprint for this asset.

**Initial Phase: Needs Assessment**

The initial phase in the development of the IS plan was to perform a needs assessment. This phase was started in March of 1997 and included interviews with key department heads, executives, and board members. As part of the interview process these key individuals were asked to respond to a set of questions that touched on their department's role in the overall mission of the Home, the description of the computer systems currently in use, and the department's near- and long-term information needs. The questions on the Key Individual Questionnaire were as follows:

1. Describe your department's responsibilities and how it supports the overall mission of MJHHA [the Home].
2. Describe the computer system(s) you currently are using and what are the strengths and weaknesses, satisfactions, and dissatisfactions of those systems?
3. What information systems do you need to help you and your staff fulfill your departmental responsibilities?
4. What is working well?
5. What are your organization's near-term information needs, and what are their priorities?
6. What are your organization's long-term information system needs, and what are their priorities?
7. What information systems have you seen, or heard of, that you would like to have further considered for your department's responsibilities?
8. What needs do you have that may be able to be supported by a computer system, but you are not certain those systems exist?
9. If a new computer system were to be selected in the near future to fulfill your department’s needs, what have you learned from the past that you would want to employ or avoid?
10. In general, what other information system needs should be considered that have not been given adequate attention, even if they do not affect your responsibilities directly?
11. What other comments or questions do you have?

These key participants were interviewed with special attention to their responses on the questionnaire. Results of these questionnaires and interviews were sent to each respondent for verification. In addition, an analysis of the current data-communications infrastructure was performed. The results from the questionnaires, interviews, and infrastructure survey eventually became the Information System Plan.

Major IS Problems

Several major IS problems emerged from the initial analysis of the questionnaires and subsequent interviews.

Central Information System Authority. It was recognized that there was a lack of direction for information technologies within the institution. As the Home grew, programs were added and the IS functions were supported by each program’s staff. This meant that autonomous MIS organizations were growing in the nursing home, Community Mental Health Center, and the Channeling project. Each of the MIS staffs were making plans and trying to coordinate their efforts to maintain some uniformity of approach, but because there was no centralized IS authority, there were no institutionwide IS policies or procedures to use as a guide in acquiring hardware and software. In addition, there was no overall, written disaster recovery procedure. The lack of IS leadership needed to be resolved.

Aging Computer Hardware and Network Infrastructure. Another problem was the age of the computer hardware and network infrastructure. The Home had installed its first computer network in 1985; the number then grew to 180 networked PCS by the beginning of 1997. Approximately 70 percent of these computers were 386s or less and would not support a Windows environment. This made it impossible to adopt newer software technologies. In addition to an abundance of aging computer equipment, the network infrastructure relied on an aging, thin-net backbone and was prone to failure on a regular basis. The chief complaint that was voiced during interviews was about the slowness of the computer system, which was directly attributable to the older hardware and network infrastructure.
**System Integration.** The different software systems were not integrated; there were separate systems for the clinical and financial functions in the nursing home and hospital, which existed on separate hardware platforms and did not interface with one another. The financial system resided on an IBM AS 400 Advanced 36, whereas the clinical system resided on a PC file server. The existence of separate systems gave rise to separate censuses that were never reconciled with one another. A reduction in the amount of duplicate data entry required to support both systems—with a corresponding reduction in the numbers of data errors—was needed.

**Executive Information System.** The final problem identified in the interview process was the lack of management information accessible by department managers and executives. A weakness in LTC systems has been the lack of executive information systems. Older DOS-based systems concentrated on the regulatory requirements of producing an MDS, physician order sheets, and medication administration records. But many systems were no more than word processors, and nursing home staff were inexperienced with computer technologies. Even if a nursing home used a computer in its business or accounting office, it most likely did not do so in clinical areas. It was therefore unusual for clinicians and administrators to have the sophisticated information systems that are prevalent in other industries.

**Addressing the Issues**

The next product to arise from the construction of an IS plan was a delineation of the critical issues faced by the Home and recommendations for addressing those issues.

**Unified Commitment to Information Technology.** Senior executives of the Home needed to determine what the level of monetary expenditures and investment of resources would be in their effort to use IT to help meet the organization’s current and future needs. Senior leadership recognized that the intelligent use of information technology was important if the Home was to meet its mission, goals, and objectives.

**Focused Information Technology Leadership.** The Home’s MIS efforts were splintered into several groups, each following their own priorities. This resulted in a lack of standards, policies, and procedures, as well as a weak support staff. Senior executive management needed to decide whether or not the MIS organization would continue in its decentralized structure or whether there would be a centralized MIS department.

**Integration and Adaptation of Technology.** The use of computers at the Home, as is true in most organizations, had simply evolved. The acquisition of computer hardware and software was accomplished more by immediate necessity than through an organizationwide planning process. The problem was the disparity of the systems and lack of integration, as well as a lack of access to data.
In the absence of integration, interfacing is the next-best solution, but interfaces tend to be expensive and add an additional level of intricacy to a system. So when making major software acquisitions, the Home had to decide between using an integrated solution and interfacing the systems they already had. They knew that once systems are selected, there must be a commitment to modifying current processes to take advantage of the information flow. Old processes and procedures must be examined in response to the way the new software systems manage information.

**Recommended Plan**

The direct result of the interviews and questionnaires was an inventory of specific IT solutions for each department. These solutions grew out of the needs identified in each department—needs ranging from simple upgrades of existing software systems to the acquisition of new systems to overall integrated solutions for multiple departments. The estimated cost of each solution was provided. The list was long and exhaustive and would have required more resources than were available if the plan were to be accomplished all at once. Initial estimates were for expenditures of $2.3 million over five years, representing about 5 percent of the yearly operating budget. The Home had never spent more than 2 percent of its operating budget on information systems.

The list was prioritized and placed on a time line. Priorities were given to each item on the list based on how critical the item was in meeting the goals and objectives of the organization. Of primary importance, and therefore high on the list of priorities, was the reengineering of the network infrastructure. It would make little sense to acquire new software and hardware systems if the infrastructure was incapable of handling the increased traffic. Priority was given to solutions that would accommodate more than one department’s need. In the end, this initial list of priorities was presented to the senior executive group for final approval.

The final phase in the development of the plan was the creation of a mission statement. IS goals were created, as was a vision for IT. Guidelines were selected that would help the Home accomplish its goals and objectives—the last part of the plan’s development.

**Implementation of the Plan**

To ensure that the implementation of the Information System Plan would be a success, it was important to create an organization to manage it. An IS executive steering committee was formed consisting of the CEO, CFO, and the COO of both the nursing home and the community programs, the senior MIS director, and the medical director. The purpose of this group would be to oversee major IS issues and decisions and to set priorities. This group would ultimately approve the Information System Plan and oversee its annual review and
modification. It would establish policies regarding IT activities and ensure that these activities were consistent with the plan.

A users’ information systems committee was established, for the purpose of recommending software purchases and coordinating system implementations. This group consisted of representatives from the following departments: clinical, marketing, nursing, financial, administrative, ancillary services, social work, and information systems. This group was charged with monitoring the development and implementation of all information systems. It would review and evaluate project requests, develop priorities, and provide communications between the user community and IS. Finally, this group would propose computer-related policies or changes to existing policies.

In order to help the executive steering committee evaluate the efficacy of any new system acquisition, a cost-benefit analysis was required. Prior to any system being approved by the steering committee, the department director prepared a cost-benefit justification for the purchase. This analysis was reviewed by the CFO for completeness.

The executive steering committee first met in December of 1997. On its agenda for that meeting was a discussion of the initial set of priorities. Five projects had been selected for inclusion on the agenda. Two of these projects were critical to any further progress under the plan: the reengineering of the network infrastructure and a program to continually upgrade and replace old computer hardware throughout the organization. A third was the procurement of an integrated clinical and financial nursing home information system. The fourth was the acquisition of a scheduling and billing system for the Ambulatory Health Center. The final project discussed was a Y2K project to assess and correct any issues that relate to the date function in the new millennium.

Reengineering the Network Infrastructure. The data-communication network at the Home was initially installed in 1985, using coaxial cable for the backbone and workstation segments. As the network expanded, additional thin-net segments were added. In 1990 additional workstations were added to the network using Category 3 UTP wiring. Within the last couple of years new stations were added with Category 5 UTP wiring.

Problems arose in the existing cable plant. Segments did not meet IEEE specifications, which resulted in a high rate of collisions and poor response time. Coaxial segments that ran outside buildings, even though they were protected with electrical surge protection to guard against lightening strikes, were still prone to being struck and disabling large portions of the network. The decision was made to replace the coaxial backbone and any outside segment with fiber optic cable, replace all Category 3 UTP with Category 5, and replace nonintelligent hubs with intelligent switches and hubs capable of fast Ethernet.

Replacement of Old Computer Hardware. PC networks were installed in 1985 and an e-mail system was begun in 1988. By 1991 all nursing stations had computers; nurses were completing their daily documentation responsibilities with a computer. Historically, the LTC industry has never
enjoyed enough reimbursement to afford the extensive outlays of capital necessary to build information systems. Reliance on Medicaid without cost reimbursement inhibited available capital. If not for the generous philanthropic support from the community, the Home’s computer systems would not have been possible.

By 1992 all progress in computerization came to a halt as capital was diverted to more important projects. The result of this policy decision was a stagnation in the growth of the computer systems at a time when technological progress was needed. By 1997, when capital became available, the Home resumed its computerization efforts. The IT industry was producing Pentium computers running 32-bit operating systems, and software was aligned with this platform. The Home was far behind this technology and had a long way to go to catch up.

The Information System Plan called for a program that would set the life of a computer at five years. Twenty percent of the computers in the organization will be replaced each year. The computer replacement costs will be included in the annual capital budget. Additional funding will be available for printer and software upgrades. The Home should never be in the position of having computer equipment that is significantly out of date.

**Integrated Nursing Home Information System.** The Home’s financial system is ten years old, resides on an IBM System/36, and contains the A/R Billing, G/L, and A/P applications. The clinical system is seven years old and resides on a network of personal computers and contains Physician Orders, Care Plan, MDS 2.0, and Progress Notes.

The Home sought systems that integrated both financial and clinical systems, incorporated the diversity of operations, and used the latest in technology. A perfect system would consist of the applications just mentioned, as well as dietary, materials management, pharmacy, and function for not only the nursing home but rehabilitative services, independent and assisted living, and the acute care hospital.

The philosophy was to adopt a modified “best of breed” approach. The primary goal was to find an integrated system that combined as many of the Home’s functions and programs as possible. The more functions incorporated under an integrated system, the fewer nonintegrated systems would be necessary, thereby reducing the need for an interface engine. A single vendor was sought to provide the necessary software systems for the wide-ranging programs. Conversations with many vendors had led to the belief that any of several could provide the majority of system functions, leaving only a few for interfacing.

A search for an appropriate system began with a request for information (RFI) from twenty-five vendors of LTC software. The informational brochures and demonstration disks were evaluated and scored using a checklist derived from the needs assessment conducted during the development of the Information System Plan. Each vendor’s system was reviewed for the presence of
each item on the checklist. A total score was computed, which represented
the total number of checklist item functions that were present in the software.
The higher the score, the more functional the software. The top eight vendors
were selected for a short list. These eight vendors were each sent a question-
naire for more details about their companies, including the number and type
of clients they had, financial statements, and references. From the results of
the questionnaire four vendors were selected to provide demonstrations.

The questions on the Vendor Questionnaire were as follows:

1. How long has your company been in business?
2. Who owns your company? Is the company private or public? Is the
   company a C Corp., S Corp., Partnership, or a Sole Proprietor? Please list
   your corporate officers.
3. What is your annual revenue? Please provide a financial statement.
4. How many customers do you have?
   a. How many single nursing homes not affiliated with chains are your
      customers?
   b. How many chains and the total number of homes affiliated with those
      chains are your customers?
5. How many customers do you have in the state of Florida?
   a. How many single nursing homes not affiliated with chains are your cus-
      tomers in Florida?
   b. How many chains and the total number of homes affiliated with those
      chains are your customers in Florida?
6. How many customers do you have running both your financial and clinical
   systems?
   a. How many single nursing homes not affiliated with chains are running
      both your financial and clinical systems?
   b. How many chains and the total number of homes affiliated with those
      chains are running both your financial and clinical systems?
7. How many states are you doing business in?
8. What is the predominant area of the country that you do business in?
   What three states have the most customers?
9. How many full time equivalents (FTEs) are employed by your company?
   How many FTEs are devoted to providing support for your nursing home
   product? How many FTEs are devoted to providing training for your nurs-
   ing home product? How many FTEs are devoted to research and devel-
   opment of your nursing home product?
10. From what location does user support for your nursing home prod-
    uct come?
11. When is support available? How many days a week do you provide
    support? What are the hours that support is available? If support is not
    available twenty-four hours a day, seven days a week, is there a support
    person on-call?
12. What is the average response time for a support call to be answered? What is the average response time for a problem to be resolved? If support is not available twenty-four hours a day, what is the average response time for your on-call person?

13. What is the size of your largest single nursing home? How many of your nursing home customers have more than 300 beds?

14. What other products, other than your nursing home products, do you sell/support?

15. What operating system platforms does your nursing home product run on?

16. When do you anticipate release of your 32-bit software?

17. Is your software Year 2000 compliant?

18. What are your plans for the Balance Budget Act and the Prospective Payment System?

19. Please provide your top three references who are using both your financial and clinical systems.

20. Please provide a price list of all applicable software for a 500-bed nursing home.

A problem quickly developed as the Home attempted to schedule software demonstrations. A wish list of the desired features in an LTC software product—the result of the departmental needs assessment—was sent to each software vendor selected. After reviewing the list of features, several vendors withdrew from contention because their products were not capable of providing the features the institution was looking for. They seemed unwilling to have their software product put under such rigorous testing.

It soon became evident that finding good LTC software would be problematic. The majority of products were of two types: those designed for single 100-bed homes and those designed for chains of 100-bed homes. Very few were designed to handle the multitude of programs and care environments in place at the Home. It also became obvious that the level of sophistication had barely risen above MS-DOS. Very few vendors ran in a 32-bit Windows® environment. Some vendors claimed to have software but could not produce an integrated demonstration or referrals to clients running it; most were working on their 32-bit products, with delivery of the new technology scheduled for twelve to eighteen months. It was decided that the Home would delay implementation of an integrated system for twenty-four to thirty-six months in the hope that by then the newer technology would be available.

The Home would address a more pressing issue—the Y2K readiness of its existing systems. The decision to delay a decision on an integrated system was predicated not only on a dearth of available software that incorporated the newer technologies but a need to have all the systems ready for the millennium. Neither the clinical nor financial systems were Y2K compliant. When a reasonable time line was developed, there was some concern expressed by the
executive IT group that a conversion of both the clinical and financial systems could not be completed prior to the change in the millennium. Given the lack of a viable 32-bit software product, the decision was made to upgrade the clinical system with a Y2K product from the existing clinical software vendor and to convert the financial system to another vendor's product that was Y2K compatible and was designed to handle a multiprogram facility.

The question could be asked: What makes the software that was selected capable of handling the multiple programs operated by the Home when the other programs were not? It came down to a very simple feature: the use of an admission number. Residents carry a medical-record ID number that never changes, no matter how many admissions or how many programs they may have. The addition of an admission number that is unique to each admission for that resident allows the facility to track not only information associated with each admission but also across all admissions. Very few LTC software packages offered this feature—a feature that becomes critical to the effort of keeping a detailed and accurate census when residents can move between facilities and when they can be admitted to two or more facilities at the same time.

Conclusion

The Home is currently in the process of implementing these projects. The time frame for completing the network infrastructure is three months, and it should be completed by December 1998. The upgrade to the clinical information system will be completed by January 1999, and the conversion of the financial system will be completed by June 1999. The goal of an integrated clinical and financial system has not been abandoned. The financial system vendor will be given an opportunity to prove itself for consideration of eventually converting to its clinical system, thus providing an integrated solution.

The Information System Plan has been under way for a year now and should be evaluated for relevance in light of any changes that have been made or changes in circumstances and assumptions that contributed toward the plan in its development. Adjustments will be needed regarding the decision not to purchase an integrated clinical and financial nursing home system. Priorities will be aligned with changes that have taken place with the addition of new programs and activities, and the priorities for the next set of system acquisitions will be established. In short, a reevaluation of the plan will be made to keep the plan up to date.

It is clear that development of an information strategy can be a valuable experience. If anything can be learned from the lessons of the past two years it is the need for a blueprint to guide an organization through pitfalls that occur when adopting information technology. LTC information system technology is still in its infancy, but there is some evidence that it is beginning to emerge. Even though there was a desire to find a system that relied on the latest in software technology, that was not possible. Several vendors are beginning to show an interest in adopting these new technologies such as Object Orientation and
compliance to an open architecture and standard. With time these technologies will become a reality. When considering priorities and risks, it is important to be certain that the vendor has a commitment to providing this technology and is able to demonstrate that commitment.

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