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Improving Workflow in Home Healthcare Industry: A Case Study

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ABSTRACT

Home healthcare industry is facing increasing pressure to change business processes and manage information flow electronically. With the help of a case example, this paper describes how a web-based system could improve the workflow communication problems in home healthcare companies. Every department of the case company has its own software to assist in everyday operations but is unable to communicate with one another electronically. All documents necessary in the coordination of care have to move physically between departments. The proposed solution is a web-based electronic form management system that would improve regulatory compliance and operating efficiency.

INTRODUCTION

Healthcare is a trillion dollar industry, but it is experiencing huge losses (10 – 20 % of revenues) due to wastes and inefficiency in information handling (Gambon & DePompa, 1996). The industry is facing many problems that need urgent attention. Firstly, it relies heavily on paper records (IT Health Care Strategist, 2001), which constitutes a large proportion of its operating expenses. Secondly, healthcare industry invests very little on IT, only \$12 billion to \$14 billion a year (Raghupathi & Tan, 1999). Thirdly, the use of information technology by this industry lags far behind other industries (Austin, Hornberger & Shmerling, 2000; Raghupathi & Tan, 1999). And finally, there is a cut-throat competition among service providers in healthcare industry. Clearly, the healthcare industry needs to address these problems for its long-term growth and healthcare provision for all at affordable prices.

Within the overall healthcare industry, home healthcare is a specific sector, which is the major concern of this paper. Home healthcare is a broad term for medical-related services provided in a home setting. The services range from infusion therapy for such procedures as chemotherapy to nursing to leasing of durable medical equipment. Overall, the trends in home healthcare are upward. Physicians and hospitals are turning to homecare as a less costly alternative to hospitalization and, in some cases, even physician office visits (Barkholz, 1997). However, this sector of the healthcare industry is facing the similar challenges as the overall healthcare industry.

In addition, there is a government regulatory pressure on home healthcare companies. As the market expanded, Medicare home-care expenditures exploded to \$18 billion in 1999, up from \$3.5 billion in 1990. In response to the inflationary spiral, Congress built home health cost controls into the Balanced Budget Act of 1997 (Modern Healthcare, 1998). "These new payment systems create incentives to provide care efficiently and control spending growth," said Michael Hash, deputy administrator of the Health Care Financing Administration (Auer, 1999). The Act of 1997 put many companies out of business. In 1997 there were more than 1,000 home health agencies in the state of Texas, and in 1999 there were less than 200, according to state Sen. Mike Moncrief, vice chairman of the Senate Health Committee (Auer, 1999). One of the main reasons that contributed to closure of many healthcare companies is the very high costs associated with the paperwork and report generation mandated by the Balanced Budget Act of 1997.

It is suggested that the use of information technologies and reengineered processes could streamline the workflows in organizations and make them more efficient and effective. A reduction in time spent on paperwork will allow agency caregivers to spend more time with clients (Benson, Michelman & Radjenovic, 1996). Workflow

technologies can facilitate enterprises' requests for improved competitiveness by increasing productivity and enhancing services for customers. Workflow is the automation of a business process; documents and tasks are passed from one participant to another for action, according to a set of procedural rules (Lawrence, 1997).

The main purpose of this paper is to acquaint practicing managers with the extent that IT influences business operations in efficiency increases and cost reductions. We design and justify the development of an Internet-based information system for a home healthcare company as an example of a typical problem being faced by the home healthcare companies. This article identifies workflow process problems at Health Care Unlimited (HCU), a home healthcare provider, and provides a solution using a web-based system to overcome those problems. The rest of the paper is organized as follows: a background on information technology in healthcare; the research method used; an introduction of the home healthcare agency called Health Care Unlimited of McAllen, Texas; the description of the existing system and its problems; the description of the new system design; the results and concluding remarks.

BACKGROUND

The Internet offers great promise, but the healthcare industry has yet to embrace it. There is, however, a significant amount of cost associated with the initiation of these technologies (Hyatt, 1999). There is also a tremendous amount of confusion and cynicism among CEOs. According to Larry Grandia, former CIO at Intermountain Health Care and current president and CEO of Daou Systems, San Diego, CEOs are "nauseated with new technology fads." He says the key question CEOs are asking is quite direct: "When am I going to be able to harvest our info tech investment?" (Solovy, 2000).

When there was investment in IT, it was in departmental computer systems resulting in "islands of information" with restricted information flow and availability, ultimately impacting the productivity of the organization (Stampiglia, 1997). Many applications of IT require significant effort in rethinking and restructuring process (Heterick, 1995).

Healthcare organizations are facing intense demands to lower costs and improve quality while simultaneously expanding access to care. Information technology can alleviate a lot of problems in health care industry. Many predict that IT will have a major impact on health care (Gambon & DePompa, 1996; Health Informatics Journal, 1999; Kohn, 2003; Linial, 95). This includes impact on hospitals (Pendharkar, Khosrowpour & Rodger, 2001), home health care (Kennedy, 1995; Nugent, 1999), outpatient facilities and clinics (Prince, 2001).

There are several benefits of using the Internet and IT in the healthcare industry. Healthcare organizations can broaden the accessibility of applications to users, facilitate exchange of information, reduce costs, enhance revenue, and provide better delivery and quality care of patients (Bowers, 2002; Eng et al., 1998; Kendall & Levine, 1998; Kerwin, 2002; Nelson et al, 1998; Newell, 2001; Solovy 2000). Pendharkar, Khosrowpour and Rodger (2001) report improved quality of service by integrating different data systems and McDonald (1998) reports improved efficiency through electronic medical records.

RESEARCH APPROACH

From a managerial perspective, however, the workflow management with the help of information systems should focus on how to achieve the lasting competitiveness. According to Feeny and Willcocks (1998), enduring challenges that companies face when attempting to achieve competitive advantages include, focusing IS efforts to support business strategies, devising effective strategies for delivery of low-cost and high-quality information services, and choosing the right technical platform on which to mount IS services.

There has been limited published research that has examined workflow improvement in home healthcare industry. Thus, a case study approach was used to gain an in-depth understanding about the way in which the organizations went about examining the workflow issues. A case study is basically a "methodology based on interviews, which are used to investigate technical aspects of a contemporary phenomenon with its real life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" (Yin, 1994). Thus, a case study approach may lead to a more informed basis for theory

development. It can provide analytical rather than pure statistical generalizations. Thus, “theory” can be defined as a set of concepts and generalizations. A theory can provide a perspective and a way of seeing an interpretation, which ultimately leads to understanding some phenomenon. In this case, technical and financial factors need to be considered when designing a new information system.

Following is the description of a home healthcare agency that planned to move from an environment of “islands of information” to an integrated web-based workflow system.

A CASE STUDY

Health Care Unlimited, Inc. (HCU) is a privately owned and operated home health agency providing services in the Rio Grande Valley since 1991. Its main office is located in McAllen with branches in Harlingen, Rio Grande City, Falfurrias, and Laredo. Corpus Christi and Brownsville are the next planned expansion sites. HCU is, at this time, licensed to serve 13 counties: Cameron, Willacy, Hidalgo, Starr, Zapata, Webb, Jim Hogg, Nueces, Kleberg, Duval, Jim Wells, Brooks, and Kenedy. HCU employs 129 full-time and 780 part-time staff. For the month of March 2002, the census registered 507 Medicare/Home Health Division clients; 84 Private Duty/Specialty Division clients; 1050 Medicaid/Attendant Division clients along with 985 clients being served by Century Medical, the Durable Medical Equipment (DME) Division.

Because of the large number of home healthcare agencies available to provide services to the public, HCU must distinguish itself from the others. The agency must be able to deliver what it promises: “One Call Does It All.” In order to accomplish this promise, several processes are in place to coordinate the care of the clients. Every process requires flawless coordination – from the initial phone call (intake) to the last signature on the discharge instructions.

Home healthcare agencies have to ascertain compliance with regulations set forth by Medicare/Medicaid agencies. HCU is currently accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). This accreditation is mostly for prestige; it symbolizes the agency is ready and willing to meet especially difficult criteria.

The home health department or Medicare Division has a contract through the Texas Department of Health to provide licensed and certified home health services. These services are what are often referred to as “skilled services”. Home health services are intended for those clients whose health will deteriorate without follow up after being dismissed home from a hospital. The care is provided by registered and licensed nurses, physical therapists, dietitians, respiratory therapists, etc. to a qualified homebound patient.

The attendant or Medicaid Division is contracted with the State of Texas to provide two programs: Primary Home Care (PHC) and Community Based Alternatives (CBA). PHC provides the indigent elderly and/or disabled assistance with activities of daily living, environmental cleaning and meal preparation. Primary Home Care provides clients between one and eight hours a day of attendant assistance. The CBA program provides clients not only attendant services, but nursing services, minor home modification, adaptive aids, durable medical equipment and medical supplies. The goal of the CBA program is to provide individuals with meaningful choices regarding long term care services. This goal is accomplished primarily by facilitating the development and utilization of services that allow individuals to avoid premature nursing home placement and provide current facility residents an opportunity to return to the community.

Current Situation

There are three problem areas: (1) Medicare Division, (2) Medicaid/Attendant Division, and (3) DME Division/Century Medical. Following is the description of each area.

(1) Medicare Division: Patient Care Technologies, or PtCT, is the external software being utilized to capture information mandated by Center for Medicare/Medicaid Services (CMS). Nurses use specialized laptop devices to perform all documentation at the patient’s bedside. The information obtained is patient driven; all data needed pertaining to the care of the client can be accessed through PtCT. This program, however, cannot provide any information to perform any billing function. Datacron is the software that is used to obtain any visit-driven

information such as how many visits were performed and by what disciplines, i.e. RN, LVN, PT, HHA, etc. Datacron and PtCT have two separate databases. A program that is supposed to be the health care standard interface for clinical and financial departments - Health Level 7 - was purchased over one year ago has not been able to be utilized.

(2) Medicaid/Attendant Division: Vesta is the software being utilized to maintain the database of all clients and attendants for the Medicaid/Attendant Division. This program is able to provide reports such as client census, status, and date of nursing visits. Vesta, however, is unable to communicate with any of the other software programs in the agency. All referrals from within the agency must be re-entered into Vesta in order to process any paperwork for admission of clients. Vesta is used to bill for all PHC/CBA services electronically.

(3) DME Division/Century Medical: Century Medical, our DME division, is HCU's sister company. Century Medical, or CenMed, conducts business in an office adjacent to HCU in McAllen. CenMed supplies all durable medical equipment, adaptive aids and medical supplies to our Medicaid and Medicare Home Health Division, and is also the primary supplier for our Medicaid/Attendant Division as well as the provider of choice to other home health agencies. CenMed uses a software system called MestaMed. All referrals received by Century Medical get entered into the MestaMed database. Once the patient information gets entered into MestaMed, an order form is created and items approved get scheduled for delivery. When delivery is confirmed, a statement is created and sent to billing.

Coordination of Care

The items or supplies issued by CenMed through the Home Health Division are part of the care package. For example, if a client gets admitted into Home Health for wound care, the supplies needed for the nursing care of this client are covered by the patient's admission and do not become a separate supply charge. Those items not covered through the Home Health admission are usually obtained through a third party resource: Medicaid, Medicare, insurance or private-pay.

Because Home Health is more of a "package deal," the coordination of care is not as intense. On the other hand, nothing is a "package deal" with the Medicaid/Attendant Division. Every piece of equipment or medical supply delivered must be processed through for approval and signatures from doctors, nurses, and State caseworkers, even before it is submitted to CenMed for delivery.

The coordination of care of over 700 CBA clients, includes all branches with the exception Laredo, requires meticulous attention to detail. All documents are moved physically (walked from McAllen Office, and next-day delivery from other branches) from Medicaid Division to Century Medical. More than 75% of CBA clients require delivery of medical supplies on a monthly basis. Then CenMed is charged with the task of placing the orders for each client once per certification period. Orders are typically handwritten on standard forms or printed from Vesta. Writing and transcribing of requests have created confusion in the form of transcription errors resulting in the wrong item being delivered, lost orders (missed deliveries), as well as duplication of efforts. All information supplied by the Medicaid/Attendant division is re-entered into MestaMed by CenMed staff. As a result of this confusion, every piece of paper that gets delivered is duplicated. The person receiving the request, signs a copy, and the sending division files the copy. There is also no checks and balances or timely confirmation of deliveries by CenMed; therefore missed deliveries do not get discovered often times until the delivery ticket is found missing.

Compliance Issues

The Texas Department of Human Services (TDHS) performs the compliance monitoring for the CBA program. Depending on the outcome of compliance monitoring on contract performance standards, TDHS may review or audit agency every six months to two years. Five out of 11 performance standards, on compliance monitoring, deal with adaptive aids, durable medical equipment and medical supplies. Discrepancies, errors and omissions found during audits can cause licensure problems, i.e. suspension of referrals, suspension of payments or both - also known as a vendor hold. The minimum standard of 90% compliance is necessary to continue contracts with TDHS. When a sample audit is performed, and 90% compliance is not met; the sample audit shifts to a 100 % audit of charts. A patient complaint can also trigger a TDHS audit.

Because the Medicaid/Attendant Division accounts for 43% of the revenues for HCU, a great deal of effort is put forth in complying with established regulations. It is imperative that guidelines established by TDHS are followed in order to keep down the risk of being placed on vendor hold.

Current System Hardware

HCU installed a Windows NT based LAN/WAN in the fourth quarter of 2001. The networked computers are connected via Fast Ethernet (100 Mbps). Individual workstations vary, but are at a minimum Pentium I 133MHz, and are all pre-installed with the Microsoft Internet Explorer web browser.

PROPOSED SYSTEM

The proposed system utilizes a web-browser based front-end intranet application. The purpose of the application is to allow electronic entry and receipt of orders between the Medicaid/Attendant Division and Century Medical. The project will focus on the Medicaid/Attendant division as a first phase. HCU may consider extending the program to include the Medicare division in the future based on the results of this project.

Initial New System Plan

The initial plan for the new system was to utilize the existing network and develop a proprietary front end, web browser based application for sharing forms between the divisions. The current flow of documents was investigated and a work flow diagram was created (as shown in Figure 1). Figure 2 shows the improved workflow diagram for the new system. The process improvement and electronic information flow for the major areas (Medicaid/Attendant Division, and DME Division/Century Medical) have been incorporated in this diagram.

Feature/Functionality Matrix

The design requirements for the new system were identified, and a feature/functionality matrix was created (Table 1). The matrix identifies the functional requirement or feature, the priority associated with it (A = required, B = highly beneficial, C = beneficial), and the current estimated programming time to add the function. This was utilized to develop a cost estimate of developing the system (Table 2). The estimated cost was \$18, 797.

Commercial Application Evaluation

In the course of conducting research for this project, several commercially available applications for electronic form management were identified. Three programs were evaluated against our feature functionality matrix to determine if any met the needs of HCU (Table 3).

Based on the Cardiff LiquidOffice's ability to meet all of our design requirements, their sales department was contacted to obtain information. The local (Dallas, TX) sales representative provided us with pricing information, as well as a demonstration version of the Liquid Office Form Designer software used with the eForm management system. The Form Designer software was utilized to re-create the three forms primarily used by the PHC/CBA and DME departments of HCU. The software easily allowed creation of Adobe Acrobat "fill and print" PDF files that would be used in the LiquidOffice system. LiquidOffice also allows input/export to ODBC compliant databases, which would allow it to communicate with both the Vesta and MestaMed software.

Table 1. Feature/Functionality Matrix for the Proposed System

Feature/Function	Priority	Programming Hrs.
Icon to access program	A	.5
Insert partial name, see all occurrences	A	4
Input Medicare or Medicaid number and retrieve name	B	16
Automatically fill in current date	A	.5
Review before submit	B	4
Submit button – sends to next department	A	8
Printed form 2067 and 3670 match State format	A	8
Prior form entries automatically populates appropriate fields in the next form	A	8
Electronic Signature	A	10
Goods/services price list databased and available on drill-down menu	C	16
Automatically enter common fields from Medicaid/Attendant division forms into MestaMed	B	24
Reports of forms filed/closed on periodic basis (i.e. daily, weekly, monthly), include date submitted and date processed	C	12
Automatic report generation of forms not acted on within prescribed time	A	12

Table 2. Cost Estimate of the Proposed System

Item	Cost/Unit	Units Req'd	Extended Cost
High end PC/ Windows NT server	\$2,837	1	\$ 2,837
Programming			
Priority A	\$120/hr	51 hrs	\$ 6,120
Priority B	\$120/hr	44 hrs	\$ 5,280
Priority C	\$120/hr	28 hrs	\$ 3,360
Training	\$40/hr	20 hrs	\$ 800
Validation	\$40/hr	10 hrs	\$ 400
Total Cost			\$18,797

Description of the Selected New System

Cardiff LiquidOffice will be installed on a Windows NT server (Dual Pentium III 1GHz processors, 1GB RAM, 60GB hard drive). It will operate in conjunction with the existing Windows NT Fast Ethernet network at HCU, and support the existing installations of Windows, Internet Explorer, and Adobe Acrobat Reader. LiquidOffice includes LiquidOffice Form Designer (distributed XML form design to HTML and Adobe® PDF), LiquidOffice Form Server (centralized XML based eForm Management System), and LiquidOffice Web Desktop (accesses secure eForm accounts using Web browsers).

Table 3. Commercial Application Evaluation

Feature/Function	Priority	Cardiff Liquid Office	Accelio ReachForm™	DMS Control™
Icon to access program	A	✓	✓	✓
Insert partial name, see all occurrences	A	✓	✓	✓
Input Medicare or Medicaid number and retrieve name	B	✓	✓	
Automatically fill in current date	A	✓	✓	✓
Review before submit	B	✓	✓	✓
Submit button – sends to next department	A	✓	✓	✓
Printed form 2067 and 3670 match State format	A	✓	✓	✓
Prior form entries automatically populates appropriate fields in the next form	A	✓	✓	✓
Electronic Signature	A	✓		
Goods/services price list databased and available on drill-down menu	C	✓	✓	
Automatically enter common fields from Medicaid/Attendant division forms into MestaMed	B	✓	✓	
Reports of forms filed/closed on periodic basis (i.e. daily, weekly, monthly), include date submitted and date processed	C	✓	✓	✓
Automatic report generation of forms not acted on within prescribed time	A	✓		

Table 4. LiquidOffice Cost Estimate

Item	Cost/Unit	Units Required	Extended Cost
High end PC/ Windows NT server	\$2,837	1	\$ 2,837
Liquid Office eForm Management 50 User License	\$15,000	1	\$15,000
Installation	\$10,000	1	\$10,000
Total Cost			\$27,837

RESULTS

The proposed system (Cardiff LiquidOffice) eliminated the workflow integration problem in Medicaid/Attendant Division, and DME Division/Century Medical. Some of the activities in these divisions were reorganized or streamlined, otherwise known as reengineered.

The new system was also evaluated for cost effectiveness. As per project management practices, every IT project should go through cost-benefit evaluation process. Such evaluation may include both tangible and intangible costs and benefits (Tan, 1995). Tangible benefits may include productivity improvement, reduced paper usage, time saved, and quick completion. Intangible benefits could be increased user satisfaction, ease of use and improved corporate image. Tangible costs may include initial cost of hardware and software, and implementation costs. Intangible costs may include user resistance and decreased staff morale. However, due to the difficulty in quantifying the effect of intangibles in terms of dollars, our focus was on the tangibles.

Cardiff provides a cost savings calculator along with their sales information for the LiquidOffice application. This tool uses hourly labor rates for all levels of personnel who originated, routed, and/or approved

forms, along with the number of forms used per year, and the number of employees involved, to determine the labor cost savings by eliminating the manually filled and routed forms (Table 5). Implementation of an eForm management system would be expected to save HCU a minimum of \$106,524 annually.

Table 5. Cost Savings with LiquidOffice

	Current Method	With LiquidOffice	Cost Savings
Minimum Cost per Form	\$4.68	\$1.99	\$2.69
Number of Forms per Year	1800	1800	
Number of Employees	22	22	
Total Cost per Year	\$185,328.00	\$78,804.00	\$106,524.00

While the authors believe that hiring a local programmer to implement a system similar to LiquidOffice may be less expensive initially, purchasing a proven system appears to be more attractive. Creating a new system would run higher risks of unforeseen technical problems that could significantly increase our cost estimate. LiquidOffice includes unlimited technical support, as well as free upgrades, for an annual fee of \$3,000.

The new system was also reviewed by the Director of Operations of HCU. She was impressed with the usability of the PDF forms, as well as the proposed improvements in speed, accuracy, and legibility that would be achieved with electronic form management. The function of the system that most intrigued her was LiquidOffice's ability to provide notification to users if forms had not been processed in pre-determined periods of time. This ability would greatly aid HCU in complying with State regulators, and would ensure improved customer satisfaction, by preventing lost orders. Given the potential improvements in efficiency, in addition to the significant improvement in compliance, the director believed that the cost of the system would be easily justified.

The proposal was presented at the HCU executive team meeting and was approved to be included in the next budget. Cardiff personnel would perform an on-site installation, including database connectivity to HCU's existing client management programs, and program deadlines and events to aid in regulatory compliance for each of the forms utilized.

The proposed IT system is very significant to HCU as it could muster the support of senior executives. One of the authors of this paper holds a senior management position at HCU and she brought a clear understanding and organizational complexities to the project design and its solution. As insider, she could bring the realism and seriousness to the proposed system. The direct involvement of a senior manager and the interest of the Director of Operations are good indications that this project will be successful at HCU. Literature suggests that for successful completion of IT projects, top management support is a critical factor (Meyers, Sivakumar & Nakata, 1999; Kurupparachchi, Mandal & Smith, 2002), and this project secured that support.

CONCLUSION

It is evident that home healthcare sector needs information technologies to improve operations and flow of information. To cope with government regulatory requirements and also to become competitive, home healthcare companies are relying more and more on information technology systems. However, the transition from a traditional manual system to an electronic system poses challenges both to IT experts and company management: IT system design should consider company specific details; and IT system should be financially justifiable. The research presented in this paper emphasizes these two issues in home healthcare companies.

The paper described how a home healthcare company with workflow problems went about designing and choosing a web-based system that could improve their operation. Several lessons could be learned from this work. Based on our experiences gained during this research, we offer the following suggestions to practicing managers:

- Don't get stuck with different systems that do not communicate with one another and which contribute to

wastage of time and money (avoid 'islands of information'),

- Analyze the situation, identify the problem areas, chart the manual process and then reengineer the process using technology,
- Search for and evaluate solutions against the needs,
- Companies need to reengineer business processes, using IT as an essential enabler, in order to achieve significant benefits, and
- Do the cost-benefit analysis and then go ahead with the decision to purchase and implement the new system.

The case study approach used in this research has strengthened our understanding of workflow complexities in healthcare. The lessons learned from this work could easily be transferred to other health related organizations where new IT systems implementation is being contemplated. The healthcare industry, in general, with extremely rising costs and ingrained inefficiencies can become more cost effective through such technologies, which would ultimately benefit us all.

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