Just a Beta...

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Traditional implementation of clinical information systems follows a predictable project management process[1]. The selection, development, implementation, and evaluation of the system and the project management aspects of those phases require considerable time and effort. The purpose of this paper is to describe the beta site implementation of a knowledge-based clinical information system in a specialty area of a southeastern hospital that followed a less than traditional approach to implementation. Highlighted are brief descriptions of the hospital's traditional process, the nontraditional process, and key findings from the experience. Preliminary analysis suggests that selection of an implementation process is contextual. Selection of elements from each of these methods may provide a more useful process. The non-traditional process approached the elements of communication, areas of responsibility, training, follow-up and leadership differently. These elements are common to both processes and provide a focal point for future research.

INTRODUCTION

System implementations typically follow a predictable pattern and process. A beta test implementation offers clinical sites the opportunity to be involved in software customization and evaluation specific to organizational needs. Beta sites also require significant commitment from the organization for the time and potential risk involved in implementation of a non-turnkey product[2]. The Maternal Fetal Medicine division in a southeastern hospital undertook such a beta implementation for a knowledge-based clinical documentation system in the Labor and Delivery area.

The clinical information system design addressed problems that the developers, two physicians, perceived with paper systems. These problems were insufficient documentation and sub-optimal clinical management[3]. From their clinical practice, they were aware that gaps in the availability of clinical information and barriers to the accessibility of protocols of care contributed to less than desirable clinical practice. Their solution began with the creation of a comprehensive database for patient information. They created a knowledge-based system that integrated the clinician entries with practice and hospital based care algorithms. Together this solution allowed for comprehensive documentation and clinical management support. Hospital specific customization ensures clinicians receive decision-support and prompts based on their own protocol driven practice.

METHODS

A description of the hospital's traditional processes for system implementation provides a background for understanding the organization and serves as a comparison with the nontraditional beta process.

Traditional Process

Traditional system implementations at the hospital follow the Systems Development Methodology (SDM). The SDM provides standards and guidelines to deliver projects on schedule, within budget, and with satisfied users while communicating organizational roles/responsibilities and fostering teamwork and communication. Projects must be part of the ISD Strategic Plan (yearly management planning) or approved by the ISD Board (meet monthly to target changing needs.) Projects requiring a work effort greater than three months use the full SDM that has six phases with identified deliverables, critical tasks, and documentation. The six phases are Objectives, Requirements, Design, Development, Installation, and Post-Project as shown in Figure 1.

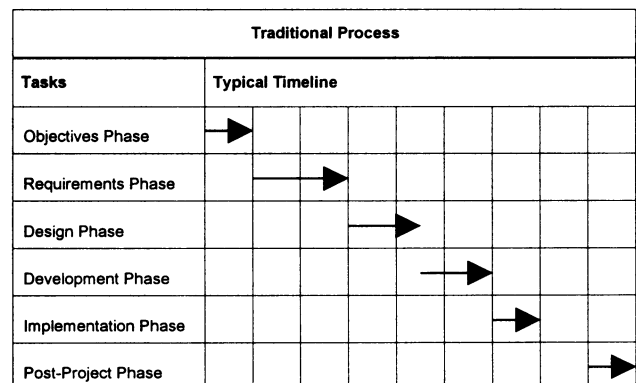| Traditional Process										
Tasks	**Typical Timeline**									
Objectives Phase	→									
Requirements Phase		→								
Design Phase				→						
Development Phase						→				
Implementation Phase								→		
Post-Project Phase										→

Figure 1: Traditional Process

The Objectives Phase includes identifying the business problem, project scope, risk assessment, and high level functionality/solution. Additional tasks in this first phase include assessment of benefits and costs, development of the business case, and proposing project participants and steering committee members. Identification of staffing/personnel needs, project major milestones, and a scheduling estimate complete the list of tasks for this phase.

The Requirements Phase includes describing business process flow and identification of automation requirements for specific business functions. This second phase includes definition of business rules, change control, data requirements, system constraints, dependencies, controls, audibility, and security. Additionally, development of the testing approach, training approach, capacity/performance requirements, technical requirements (hardware/software/infrastructure), and solution options and recommendations are accomplished.

The Design Phase transforms requirements into a systems solution. Tasks include designing screens, error messages, help screens, report layouts, flows and central points, and defining databases. Additional tasks include recovery procedures, training plans, test plans (functional, system, and acceptance), identifying any environmental concerns, and network connectivity requirements.

The Development Phase transforms the design into a system meeting the functional and performance requirements. This phase includes program coding, software installation, testing, business controls certification, completion of user manuals, and completion of operations manuals. Additional tasks include change management, installation checklist, and fallback and recovery plans.

The Installation Phase moves the system to production and includes data conversion, training (users and operations), guides, and procedures.

The Post-Project Phase determines if the installed system has met business requirements and benefits as planned. The evaluation is usually completed up to 9-12 months after installation.

Two roles identified for every system implementation using the SDM are the Application Owner and the Project Manager. The Application Owner has overall system responsibility including the development of the business justification, identifying strategic information needs, and defining the business requirements. Additionally, the Application Owner

resolves conflicting requirements and frequently handles change control/requests.

The Project Manager responsibilities include designing, coding, testing, sizing, and identifying infrastructure requirements. Other Project Manager duties include developing meeting schedules, managing risks and dependencies, selecting solution alternatives, and identifying the technical solution.

The SDM details a methodical and structured process for system implementation and project roles. Expectations and boundaries are clear and phase-specific documentation formalizes the communication. Each phase is distinct and separate from the next with required phase exit procedures and documentation.

Nontraditional Process

System selection for the beta test was the result of an informal review of available systems by the new physician chief. His prior experience in developing and using clinical systems provided a strong clinical perspective to the selection process. Although the system is a beta system, the intention was that this system would develop to manage the clinical information needs for the entire service area. The beta project was a negotiated component of the new physician chief's contract with the hospital. The project subsequently received ISD Board approval as a stand-alone system (no interfaces) and without ISD support (vendor hardware and software support).

The kick-off meeting in October 1998 was an important event in the process; starting at that time the vendor system team structured the implementation almost entirely. The major phases of the project and their time lines appear in Figure 2.

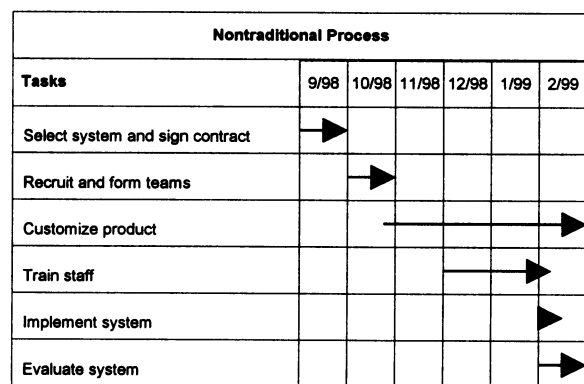| Nontraditional Process						
Tasks	9/98	10/98	11/98	12/98	1/99	2/99
Select system and sign contract	▶					
Recruit and form teams		▶				
Customize product			——————————			▶
Train staff				—————	▶	
Implement system					▶	
Evaluate system						▶

Figure 2: Non-Traditional Process

Team recruitment of select individuals began before the meeting. The kick-off meeting included a system

demonstration that was the first system view for most team members. There were eight work groups identified by the vendor in the kick-off meeting. They included the:

1. Protocol Team – who revised and developed, as necessary, the medical and nursing care algorithms. This team was lead by the physician chair and included physicians, residents, nursing staff, and the vendor project manager;
2. Data Entry Team – determined naming structures/definitions and evolved to work more specifically on the nursing guidelines. This team was lead by the nurse manager and included nursing staff, nursing systems analyst, and the vendor project manager;
3. Drug Team – created to match currently used medications and their protocols to the system tables. This team involved the vendor project manager and a nurse;
4. Findings Team – responsible for assuring that the normal values of labs and other diagnostics matched hospital values. This team involved the vendor project manager and several nurses;
5. Reports Team– charged with developing the reports generated by the system. This team involved the vendor project manager and a quality assurance staff member;
6. Authorities Team – responsible for setting the levels of access and ordering structures. This team involved the vendor project manager and a nurse;
7. Demographics Team – this function became incorporated into the Data Entry Team so this team did not convene;
8. Quality Assurance Team – created to develop the queries that would facilitate process improvement activities. This team has not met to date because of the need for sufficient system data collection in order to activate the queries.

Customization of the product was one of the primary responsibilities of the Protocol Team. This group was the most active initially. Typically, the vendor project manager co-led the meetings with a member of the medical or nursing staff. Review of system protocols from the alpha site prompted necessary revisions that the vendor project manager forwarded to the programmers for change. This process took about 4-6 weeks to complete.

The nursing component was not an original part of the system so this component required significant development. The Data Entry group activities culminated in the development of the initial nursing component. This portion of the customization required about 4 weeks.

The Reports Team began to identify issues with computer-generated patient records including hospital requirements. After identifying hospital requirements, the group negotiated needed approvals.

The Findings, Drug, and Authorities Teams functioned in the background and quickly accomplished their work, often informally, resulting in customized system tables and cards.

These preliminary teams met, determined their outputs, delivered the outputs and for the most part completed their work.

Approximately four weeks before the projected go-live date, a Working Group Team formed that took the place of the original teams, essentially picking up any activities and tasks not identified or completely addressed by the preliminary teams. This oversight group identified essential issues and potential barriers to the pending implementation and developed solutions. Members of this team included the physician leader, nursing leadership, a nursing systems analyst, and the vendor project manager.

Training of approximately 50-60 staff (physicians and nurses) started in early December 1998 and continued through the first week of February 1999. A temporary computer lab was set up close to the unit to facilitate staff accessibility to training and practice. Nurses received 10-15 hours of intensive training to prepare them to be "super-users." The nursing training schedule was divided into five, three-hour sessions done weekly.

Physicians were encouraged to participate in the nurse training as well, although most participated in separate sessions of 2-4 hours to prepare them to use the system. Residents received training with a more flexible schedule and the attending physician schedule was much more flexible and impromptu. Flexible management of participant scheduling difficulties for both nurses and physicians included recognizing the conflicts associated with holiday commitments and an upcoming accreditation visit.

The go-live date was originally set for mid-December 1998 but barriers to staff scheduling and system customization pushed the date to mid January 1999. The date was pushed back another week when it was discovered that essential leaders would be out of town on the mid-January date. Closer examination of the later January date placed the implementation close to an accreditation visit that set the final and actual go-live date for early February 1999.

Go live occurred as scheduled in early February 1999 with a complete/abrupt cutover to on-line charting. Vendor system support was physically available continuously during the first days of use and subsequently the first week after some negotiation with the vendor. Mobilization of additional nursing staff and physician support occurred as nursing and physician leadership became aware of the need. After the first week, vendor system support continued at a high level with pager accessibility 24 hours a day, seven days a week.

Evaluation of the system began immediately. During the first week of use, system staff noted user requested changes and began collaborating with staff to develop the next version. System staff had anticipated and prepared the staff to expect that changes would be necessary when they were "really using the system." Installation of the next version with minor, mostly technical changes, happened the week after go live. Implementation of the next version with some of the user-requested changes occurred the following week. Evaluation is a fluid situation with the system staff and users working together daily to understand how the system can facilitate their work flow and data flow.

DISCUSSION

Systematically comparing the two different processes for implementation revealed interesting insights in the perceived success of this project. These insights include pluses, minuses, and key learnings.

Pluses
- Teams were changed/dissolved when they no longer met the needs of the project.
- Alterations in times and schedules were more manageable because of the small size of the teams and project.
- Team and staff had ready access to vendor system staff and team members during the customization process. The vendor staff had a makeshift office/work room on the unit to facilitate staff access.
- The flexibility was useful since the team members continued with their clinical responsibilities as well as the development and implementation responsibilities.
- Quick turn-around time from kick-off meeting to go-live date.
- Option to try the system first and then make needed changes.
- Vendor responsiveness to user and organizational needs regarding customization,

training, support, and subsequent system changes.
- Use of Key Point cards at computers and weekly Newsletters in mailboxes and bulletin-boards kept staff informed of processes, changes, and issues.

Minuses
- Roles and boundaries were ambiguous because of the lack of structure including whether the physician proponent or the vendor was in charge of the project.
- With the exception of the physician chief, the Steering Committee, Medical Focus Team, and Technical Focus Team targeted high levels and did not have clear communication lines with the actual work groups. In fact, many of the work group members were unaware of the existence of these teams as identified in the formal vendor/hospital contract.
- Overlap among groups and group decisions that lacked communication or documentation resulted in occasional conflicting decisions or decisions with unpredicted impacts.
- Because of the fluid nature of the process, communication sometimes was not as clear or broad as it might have been, i.e. a canceled meeting/training not communicated to everyone.
- The local nature of the project and the speed of implementation, as well as the time of the year, fostered the exclusion of some individuals from the development loop, i.e. student nurse faculty and pharmacy.
- The local nature of the project resulted in sometimes overlooking or initially discounting holiday schedules and other organizational scheduling issues (i.e. accreditation visit.)
- A clearer understanding and articulation of nursing activity and documentation standards could have enhanced development of the nursing component.
- Team members received no formal system training other than a system demo before beginning the customization.
- The absence of clearly stated evaluation criteria frequently required additional discussions to clarify the current state.
- Inadequate testing time prior to go-live by end-users required that some screens and cards be quickly reprogrammed to match actual practice.
- The work groups did not clearly identify the process for prioritizing changes before go-live.
- The start of training before the completion of customization, training on the non-customized version, and scheduling issues that prevented some staff from attending the final training

session resulted in incomplete dissemination of go-live system processes. For example, nurses completed some system tasks assigned to physicians resulting in confusion and discord.

Key Learnings
- Clearly identify players, roles, and boundaries.
- Prioritize items including those required before implementation versus those delayed until the next version/system update.
- Working Group needs to include staff involved in the use of the system both at the clinical level (nurses and physicians) and at the system management level.
- Communication is a critical part of an implementation and is especially critical when the project is fast-tracked
- Communication strategies such as abbreviated minutes, e-mail, and issue lists are essential.
- Careful brainstorming of essential stakeholders would assure no important department omissions in the planning.
- Timely, concise communication to the staff can eliminate many of the rumors and miscommunications that surface when a process is inconsistent with organizational norms.
- Visibility of important decision-makers, leaders, and others involved in the process helps to decrease staff anxieties.
- Attempts to have as many routines as possible remain stable when making a major change pay off in staff morale (i.e. maintaining typical holiday schedules).
- Filter change requests through the Work Group and not just the vendor to manage priorities as well as practice issues.
- Formal training of team members before customization would provide a more thorough system understanding and foundation for decision-making.
- Emphasize any procedures changed or differing from processes learned in training especially system role clarification for physicians, nurses, and clerks.
- Finally, frequent, repetitive emphasis on essential system elements allows staff the opportunity to integrate new system processes into their work. System developers and implementation staff should not assume that just because busy clinical staff "heard" or "read" system materials/training modules that they actually "learned" it.

CONCLUSION

A streamlined implementation, as with this vendor-lead beta implementation, allows for customization and quick turn-around. The process allowed many functions to occur simultaneously resulting in a greatly reduced timeframe. Given the limited focus of the project with one clinical setting and a dedicated physician champion, the non-traditional approach to implementation allowed for greater flexibility. Essential components of the traditional process such as identifying roles, more formalized communication strategies, and change control may provide options for structure without losing desired flexibility.

At this point it is too early to determine if one process is better than the other. Another caveat of this comparison is that of comparing a "turn-key" implementation with a beta implementation; we are not really comparing "apples to apples" but perhaps "apples to oranges." Yet in today's information system environment where systems are less developmentally tested and more customizable there may not be as great a difference. Teasing out common elements (communication, areas of responsibility, training, follow-up and leadership) in the implementation processes and beginning to explore and understand them in the practical application of system implementation methods has provided one possible beginning framework for methods evaluation and future research.

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