MEDINFO 2004
M. Fieschi et al. (Eds)
Amsterdam: IOS Press

The Success Factor Profile© for Clinical Computer Innovation

Nancy M. Lorenzi[a], Janis B. Smith[b], Susan R. Conner[a], Thomas R. Campion[a]

[a]*Department of Biomedical Informatics, Vanderbilt University Medical Center, Nashville TN, USA*
[b]*Department of Systems Support Services, Vanderbilt University Medical Center, Nashville TN, USA*

Abstract

Fifty to seventy percent of information system projects fail. Most of the failures are not the victims of flawed technology, but rather organizational and people related issues. When Vanderbilt University Medical Center began an intensive electronic health record (EHR) effort, a process was carefully designed to select the clinical areas where new tools could be developed and pilot tested. The Success Factor Profile© was created to guide the selection of sites most likely to have innovation success. This paper describes both the tools and the processes used to select clinical sites for new computer tools development and pilot implementation. Early results demonstrated that the tools provided structure for the decision making process, permitting side-by-side comparison of "apples and oranges." Selecting the site most likely to succeed with computer application innovation and early implementation has broad applicability in healthcare informatics. Failure to succeed with early system users is not only costly, but also discourages users and developers alike, and may damage the reputation of the tools and systems across the institution.

Keywords:

Electronic Health Record, information systems success and failure implementation strategies

Introduction

A new enterprise implementation of an information system has a higher probability of some type of failure than success. The failure will most likely be attributable to the involvement of many departments or units and the sub-units within each. Each area may have different goals, needs, or staffing. Given this, during the many stages of the solution process, there are numerous opportunities to go wrong, whether the solution tends to be a technical one or not. As we delve into increasingly complex medical informatics problems, we will increasingly face this challenge. In reviewing information system failures cited in the literature, as well as drawing on our personal observations and experiences, we have seen the rising importance of the human issues that are often referred to as people and organizational issues. There is typically no one single cause in a given case. In fact, a snowball effect is often seen, with a shortcoming in one area leading to subsequent shortcomings in other areas. No precise statistics exist for the relative importance of the causes; however, personal observation tells us that the two most important are communications deficiencies and the failure to develop user ownership. [1]

Since much has been written about resistance to information systems, Vanderbilt Medical Center has paid particular attention and designed strategies to overcome the resistance to change. These resistance reduction strategies have been applied to several major efforts.

One effort was called E3 (electronic by 2003). This effort started in early 2000 when Vanderbilt University Medical Center explored creating and implementing an electronic health record for its outpatient visits (approximately 700,000 per year). The process started with selected clinicians envisioning how they would like to practice medicine in 2004. The initial visions from the clinicians were sorted and refined through the clinical environment. Only after the clinical visions were complete did the informatics professionals in conjunction with more technologically sophisticated clinicians begin to design the outpatient electronic health record.

The Informatics Brain-trust group (50% informatics professionals and 50% technologically sophisticated clinicians) reviewed the clinical vision, developed an integrated picture of current informatics efforts, investigated current options, and brainstormed future options. The number one priority of the clinical vision was a user friendly front-end to integrate the already available multiple products. When this group completed its work, the Informatics Center had its design team outline how the final layout could look. One of the world-class developers did the initial program for the Informatics Brain-trust. In a very short time period, this test product was used by 7 people on the Brain-trust group, then 12, then 25, then 75, etc. At that point we named the product—StarPanel

The goal of E3 was to remove paper-based processes from the 90 plus Vanderbilt Medical Group outpatient sites. Because of the StarPanel concept, the E3 effort has been a success. We were able to develop and implement electronic tools in all of the outpatient sites before the end of 2003. In light of the tremendous success of E3 was born E5. E5 is focused on implementing the same or modified electronic systems in the inpatient setting of the Vanderbilt University Hospital based on the informatics tools that were developed for the outpatient area.

Both the E3 and E5 initiatives are collaborative efforts between the Informatics Center and the end users. The E3 project fo-

cused on the clinical work in the outpatient area and what informatics could do to remove inefficient, paper-based and paper-dependent processes. Creating the informatics tools involved collaboration between the clinicians, the experts in work redesign and the information technology developers. These initiatives are transformation processes not information technology projects.

The E5 vision is to provide outstanding patient care, enabled by information systems and tools that also will transform the organization. The organizational vision includes improved patient care, efficiency, notification and processes. Some of the components of this involve: improved patient care: increased quality assurance, error prevention, increased efficiency, improved compliance, better and quicker documentation, improved notification, increased decision support. Improved process flow: reduced redundancy, fewer interruptions; more central access for information, increased efficiency, improved compliance, better and quicker documentation, improved notification, standardized system, standardized care, increased job satisfaction, change seen as reasonable, appeasement of technological misgivings, does not inadvertently worsen existing process

The technical vision involves improved infrastructure and software enhancements. Some of the components of this include: Improved Hardware Infrastructure: more than adequate hardware resources; no hardware shortages, zero downtime, fast computers, fast logon, ergonomic workstations, electronic whiteboards, electronic bed-boards, wireless access. Improved Software Services: input;/output; scheduling, one compliance method, one order/Rx interface, one driver for scheduling/workflow, one patient information database, and one set of note writers

Materials and Methods

To begin the process of getting buy-in for a major E5 type vision, the prospect of an electronic transformation of the paper-based work processes for inpatient care was introduced to Vanderbilt University Medical Center staff and physicians at a design workshop in May 2003. The success of the re-designed work processes and new tools in the outpatient clinics at Vanderbilt, led to enthusiasm for the transformation of inpatient care processes. A number of clinical services and units volunteered as pilot sites for the development of tools to streamline inpatient care. As the number of volunteer sites and their ideas about electronic transformation grew, it was apparent that the organizational infrastructure necessary to guide the transformation process required rapid development. In addition, a structured process for pilot site evaluation was needed to guide the selection of the areas where new tools could be developed and tested.

Transformation Process Design. The organizational infrastructure for transforming inpatient care processes consists of three groups: a Coordinating Council, a Steering Committee, and a Project Team. The organization's chief executive officer, the associate vice chancellor for health affairs and director of the informatics center, the assistant vice chancellor for health affairs and leader of the outpatient transformation work, the chief nursing, medical, and information officers, and the chief operating officer of the outpatient practices, as a liaison from the transformation work done there participate on the Coordinating Council. This Council is charged to establish the high level vision of a transformed organization, champion the organizational priorities and mobilize the resources to accomplish the work, solve large-scale problems, and maintain accountability.

The Steering Committee, comprised of operational department leaders key to inpatient care and physician leadership, is responsible to champion the transformation work, create organizational charge, mobilize resources, solve problems, and maintain accountability. Specific early responsibilities of the Steering Committee are selection of pilot site(s) for tool development and testing, and selection or approval of technological tools to be deployed.

The Project Team, headed by the outpatient transformation leader and the chief nursing officer, includes a project manager and representatives from Systems Support Services (the department responsible for end-user training and support). The team was responsible, in the early work of the electronic transformation process for the systematic evaluation of potential pilot sites and recommendation to the Steering Committee for site selection.

Pilot Site Selection. Knowing the failure rate of information systems the Project Team designed and used the Success Factor Profile© to assess each of the potential pilot sites. Pilot site evaluation was accomplished via structured interviews conducted by the Project Team with members of each unit's nursing leadership team. Area leaders were asked to describe:

- The area's "vital signs"
  - -Number of beds
  - -Types of patients cared for
  - -Average daily census
  - -Average length of stay
  - -Admission, discharge, and transfer activity
  - -Number of employees
  - -Composition of the workforce on a "typical" day
  - -Staff stability (turnover and use of supplemental staff)
  - -Identity and roles of key leadership personnel
  - -Unit operations
  - -Patient care documentation
  - -Unique site operations
  - -Current technologic efforts underway
  - -Site encapsulation
- Information Infrastructure
  - -Existing hardware
  - -Existing software
  - -Unique hardware / software
- "Peopleware" [2]
  - -Staff experience with and affinity for technology
  - -Staff previous responses to change
  - -Predicted responses to technologic change
  - -History with technologic change
  - -Current and potential technologic change champions
- Innovation Prospects
  - -Largest benefit anticipated from electronic transformation
  - -Biggest drawback anticipated from transformation

-Additional hardware needs
-Resources for the change
-Barriers and challenges likely to be encountered
-Desire to be a pilot site
-Technology "wish list"

Information about each unit's "vital signs" provided the Project Team baseline information about the activity typical of the clinical area. This data proved important when considering whether work done in a pilot area could be generalized to the remainder of the hospital. Two areas that initially were thought of as favorable, well-contained potential pilot sites did not have activity representative of most inpatient areas. Data about existing hardware and software was important in judging the investment necessary to fully implement new tools developed with the pilot area. Unique hardware or software was noted, as some applications had no utility in other areas of the hospital (for example, the fetal cardiac rhythm strip used only in Labor and Delivery), while others had broader utility (electronic capture of data from cardiac monitors applicable in all the hospital's intensive care units).

Information about the area's "Peopleware" provided insights about the potential impact of technologic change on staff in the area. Unit leaders were frank about the staff with which they worked and also revealed in the discussion the strength of the multidisciplinary collaboration, the area's spirit and energy, the sense of teamwork and team commitment, and other "soft" signals of success likelihood or the lack there of.

Innovation prospects data. From the data gathered at the eight potential pilot sites, the Project Team developed five descriptors of success likelihood with technology innovation. The success factors were:

- Innovation History: the area's record of innovation leadership and pilot program success for Vanderbilt University Hospital.
- Generalizability: relevant gains for the rest of Vanderbilt from the products and processes developed with the pilot area.
- Innovation "Personality": enthusiasm to pilot new tools and processes; resources for inevitable struggles; strength of the leadership team.
- Learning Opportunities: quality feedback for development and implementation teams to improve products and processes.
- Success Likelihood: probability of prosperous development and implementation of new tools and processes.

Three project team members ranked the areas visited, discussing the rationale for their ratings on each innovation success factor. Thereafter, two members of the team ranked the areas independently and without discussion. The results of all three rankings were nearly identical, though two Project Team members had no previous knowledge of or relationship with the prospective pilot sites, and three had substantial history with all the inpatient areas at the hospital. A level of inter-rater reliability had been achieved and the Team was ready to make its recommendations to the Steering Committee.

Results and Discussion

The results (see Table 1) of the Project Team pilot site evaluations were presented to the Steering Committee within days of calculating the final rankings. Though confident about both the process and the results, the team was mindful that the rankings could evoke an emotional reaction and was careful to remind the committee that the results were the rankings of the team. As well, the committee was reminded that the results applied only to the selection of pilot sites for the development and initial deployment of informatics tools and did not reflect an evaluation of patient care in an area or a judgment of individual caregivers or unit leadership. The results were presented as a *recommendation* for Steering Committee consideration, as that group was empowered to select the pilot sites.

Based on this methodology, there are two units B (at 7.1) and G (at 6.8) that have the highest probability of success in the initial pilot. However, based on this methodology, unit A (at 1.6) and C (at 1.7) have the highest probability of non-success.

When the information was presented to the Steering Group, considerable discussion ensued. General enthusiasm for the project led to far-reaching suggestions for the work ahead, while the committee simultaneously cautioned that the timeline for the work was aggressive. Selection of pilot sites resulted in rich discussion of the pros and cons of each area visited and additional suggestions about areas that had not been surveyed. Physicians, in particular, expressed strong opinions about the area to be selected. Additionally, patient movement between areas – for example, from the Emergency Department to the Operating Room to a postoperative area - was a theme that many participants spoke to. The performance of potential pilot sites against benchmarks of efficiency and effectiveness (i.e. length of stay, financial performance, and occurrence rate) was a final suggestion for consideration prior to final pilot site selection.

The Project Team was pressed on two issues. The first was the scope of the project. The Project Team leader had to contain the scope repeatedly, keeping visions of what might be accomplished hovering somewhere near "where the rubber meets the road," as opposed to where it touches the sky.

The second was the selection of the pilot sites. Steering Committee members were repeatedly assured that the Project Team could "argue" the advantages of any one of the potential pilot sites. No one site was completely wrong or another completely right. Here was the advantage of a solid method for site evaluation.

The Project Team focused attention on the project's goal of replacing duplicative and labor-intensive paper-based processes with electronic tools. Achieving that goal would be a transformation process, not an information technology project. That is, an area's past history with successful change, the excitement and commitment of the area's staff and leaders, and its local champions were the factors that would lead to transformation success or failure. As well, the presence and participation of innovators in the selected pilot areas was emphasized as crucial to the development of new informatics tools.

Table 1: Success Factor Profile © for Innovation

	Success Likelihood	Innovation History	Generaliz ability	Innovation Personality	Learning Opportunity	Pilot Rating
	Probability of prosperous implementation	History of leadership and pilot success in rest of VUH	Relevant gains for rest of VUH	Enthusiasm for implementation, resources for inevitable struggles, strength of leadership team	Quality feedback for development and project teams to improve processes and products	Quasi-scientific result based on Survey Team Assessment
Unit A	1	1	1	2	3	1.6
Unit B	8	6	5.5	8	8	7.1
Unit C	2	2	2.5	1	1	1.7
Unit D	5.5	8	5.5	6	5.5	6.1
Unit E	4	3	2.5	4	2	3.1
Unit F	3	4	4	3	4	3.6
Unit G	7	7	7.5	7	5.5	6.8
Unit H	5.5	5	7.5	5	7	6

On a scale of 1 (low) to 8 (high) with .5 indicating a tie, compare units according to column category.

Conclusion

The Success Factor Profile© for Clinical Computer Innovation provided a foundation for recommendation and final decision-making for selection of pilot sites for the development and trial implementation of new informatics tools to facilitate inpatient care.

References

[1] Lorenzi, NM. RT Riley. Managing Change: An Overview. *JAMIA* 7:116-124, 2000.

[2] Lorenzi, N.M. and R.T. Riley, *Organizational Aspects of Health Informatics: Managing Technological Change* for the Series Computers in Health Care. New York: Springer Verlag, 1994.

Address for correspondence

Nancy M. Lorenzi, Ph.D.
Assistant Vice Chancellor for Health Affairs
Vanderbilt University Medical Center
Eskind Biomedical Library
Room 436
Nashville, TN 37232-8340
Phone (615) 936-1423
Nancy.Lorenzi@vanderbilt.edu