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# Nurses, pharmacists, and information technology in public healthcare

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# NURSES, PHARMACISTS AND INFORMATION TECHNOLOGY IN PUBLIC HEALTHCARE

by

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ABSTRACT

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The purpose of this study was to explore the healthcare professional's experience during the implementation of information technology. The focus is on the implementation of a computerized medication ordering, dispensing, and tracking system in acute care departments of a 600- bed public hospital. Spradley's qualitative, ethnographic research methods were used to discover the personal meaning of the implementation. How do pharmacists and nurses feel about the implementation of an advanced technology system? Are there any barriers to implementation? Findings suggest a resistance to implementation by professionals in the disciplines of Pharmacy and Nursing. Resistance is based on their perceptions of a need for training, technical and managerial support, process

planning, as well as dissatisfaction with the technology. In response, nurses have devised methods to circumvent the system. Findings also suggest that preexisting organizational culture affects implementation of information technology.

## Introduction

### General Problem Statement

The increasing cost of providing healthcare, both in the private and the public sectors, has become a major influence on the industry to seek innovative solutions that will increase efficiency. Both management and employees may be challenged by these developments, which in many cases take the form of technological upgrades and restructuring of long established processes and relationships. Healthcare workers' ability and willingness to participate in these innovative solutions has been questioned both internally, from within healthcare disciplines, as well as externally, by the public.

Currently, hospital systems across the country are either planning, or have already

begun, implementation of a new information technology that is proposed to revolutionize the dispensing, documentation, tracking, and billing of medications. A large portion of what hospitals do is to provide pharmaceutical treatment for an infinite variety of patients' diagnoses. Indeed, a key mission for both pharmacy and nursing personnel is to get the right medication to the right person, at the right time. In addition, this needs to be accomplished in a cost effective manner. There also must be a high degree of accountability associated with the entire process. The development of automation and subsequent computerization of this mission has been an evolutionary process. The term evolutionary refers to both the developmental aspects of the technology, as well as to the change theory involved in the growth of this industry. In many cases the companies that produced technology previously used by hospitals have been purchased by bigger companies and those, in turn, have again been purchased by even larger companies. The information technology system that is the focus of this study is the result of just such an evolutionary change process. Evolutionary, as used here, refers to a Darwinian phenomenon by which the more powerful survive. However, the term, evolution, can also refer to the end result of a failure to adapt to an environment. Production and sale of a system that does not provide the intended benefits to customers may result in an evolutionary demise at the teeth of a smarter competitor.

This qualitative study is intended to help gain understanding of the experiences of public healthcare workers undergoing change in the form of information technology implementation. The focus is on those who are actually doing the work that was to be transformed by the implementation of that information technology system. This ethnographical work is focused on the following questions:

1. How do pharmacists and nurses feel about the implementation of an advanced technology system in the healthcare environment?
2. Are there any barriers to implementation?
3. How do professionals respond to implementation?

One could rephrase these questions in a larger research question: is there resistance to change? If there is resistance, what are the roots of that resistance? The literature review, on which this research stands, explores current knowledge in areas that are relevant to success or failure of implementation of information technology. In addition, the literature review provides insight into the dynamics of introduction of any new process or system to an organization. The topics of identity, group dynamics and resistance to change are closely related to each other and to the success of new technology. The effect of information technology on work itself is looked at from the point of view of possible reasons for failure of information technology systems.

A subject that may be overlooked by many organizations seeking transformation, and a subject definitely overlooked by manufacturers and vendors of technology, is that of anxiety related to technology. This very human phenomenon is considered in the literature review. An understanding of its effect on learning should play an important role in construction of any training program related to implementation. Acceptance or rejection of information technology at the level of the worker may hinge on this often-misunderstood factor. For that reason it is an important part of a literature review associated with gaining an understanding of implementation of information technology.

The effects of implementation on the organization and the role of management during that implementation are also discussed in the review of the literature. Findings and implications of this research point to the importance of all of these considerations.

The research made use of Spradley's (1979) ethnographic interview process to explore the personal meanings of implementation to healthcare professionals. A total of twenty-six interviews were conducted at two stages of implementation. The ethnography section of this paper contains the transcribed notes of these interviews. Care was taken to maintain the informants' personal meanings. Informant language and terminology is carefully quoted throughout. This language provides the source for analysis of data.

Analysis of uncovered ethnographic data was accomplished by a systematic examination of the language and terms used by the informants. Taking an anthropological approach, the "cultural meanings that people use to organize their behavior and interpret their experience" (Spradley, 1979) were interpreted by sequentially utilizing Domain analysis, Taxonomic analysis and finally Componential analysis.

Domain analysis is a discovery process that points out areas of cultural knowledge called domains. Taxonomic analysis provides understanding of the internal structure of the domains and Componential analysis separates cultural meanings into themes that are common to the different informant groups (Spradley, 1979). A more detailed description of this qualitative process of discovery is contained in the Methods section of this work.

The answers to the research questions, provided in the conclusion of this work, provide information that will be useful in selection of areas for future qualitative ethnographic and phenomenological exploration, as well as establishing topics for quantitative research. That research is essential to attainment of a better understanding of the effects of information technology on the worker, as well as to provide information that can result in improved product design processes. This and future research may provide insight that could assist public and private organizations in accomplishment of organizational cultural changes that must

accompany implementation of process change.

Although limited in size, this research does generate implications for recommendations for action within organizations that are planning, or have already begun, implementation of the system that is the focus of this study. These implications could also be of value to the manufacturer and vendor of the technology system. These recommendations are contained in the Implications for Action section of this research paper.

## Literature Review

### Background

In 1992 healthcare costs were predicted to comprise 15% of the gross national product by the year 2000 (Brockopp, Porter, Kinnaird & Silberman, 1992). Healthcare's share of the GNP is actually now 13.85 % and predicted to reach 15 % by 2002, and move to 17 % by 2005 (Kaluzny & Shortell, 2000). Competition has now become an incentive to control costs and improve service (Healthcare Advisory Board, 1997). A shortage of healthcare professionals has become a severe problem (Anderson & Pulich, 2000; Kinnaird & Little, 1999). Discontent

of workers within healthcare organizations has become a difficult issue to resolve (Fottler, Crawford, Quintana, & White, 1995).

Perhaps, most importantly, there is a major safety component to the issues already mentioned. Medication errors are on the increase (Cohen, 2000). The actual number of errors is difficult to assess. Many, if not most, are never reported internally, let alone made public. According to a Doctor of Pharmacy who is the Director of a large hospital pharmacy, “a large percentage of potentially lethal errors are caught somewhere along the process, often perilously close to the point of administration” (Laura Steinmetz, Pharm.D., personal communication, February, 2000).

At the same time, healthcare workers have gained a reputation for being resistant to change. A popular opinion today is that the very changes that are needed in order to improve service, decrease costs, and perhaps improve working conditions, are resisted by healthcare workers. This opinion is supported in several articles, books and studies (Bolles & Sunoo, 1998; Carr, 1994; Carr, Hard & Trahant, 1996; Curran & Ed, 1999; Freed, 1998; Hultman, 1998; Mancini, 1995; Shortel & Kaluzny, 2000) found in the preliminary review of the literature.

Although there has been much work in the field of identifying barriers to organizational change there appears to be a need for further information regarding the effect of implementation of information technology on the worker in the

healthcare setting. In quantitative work done by Pillar and Jayourna, (1999) to assess the effect of reengineering on nursing and patient outcomes, findings pointed to a need for further research. Although they found that "…information technology had a tremendous impact on acute care hospitals", it was difficult to determine the results on nursing as a single discipline." The data concerned patient outcome rather than the personal meaning that the reengineered system had to individual employees.

Kouwitt and Hollingsworth, (2000) see nursing as "the thread that ties healthcare together", and that information technology is an opportunity to improve communication throughout that thread. They offer little information concerning the personal meaning of this innovation.

Argyris, (1993) provides a great deal of information concerning diagnosis of an organization's ability to learn. His study gets down to describing, at a personal level, the deeply engrained defense mechanisms that are behind the barriers. These unconscious defensive routines are transmitted throughout an organization and become a way of life. Does information technology influence these defensive routines in any way? Do "defensive routines" (Argyris) affect the success or failure of implementation?

In an editorial in Nursing Economics, Curran (1999) refers to the increased dissatisfaction among healthcare consumers, but does not address the phenomenon

from the point of view of the healthcare worker. Anderson and Pulich (2000) write of staffing shortages and the difficulty in finding qualified, “good staff ”. There does not appear to be reference to what effect that implementation of information technology is having on this staffing shortage. Kinnaird’s and Little’s (1999) nationwide survey of healthcare HR managers reveals a critical shortage, particularly in nursing and pharmacy positions. These are disciplines that are experiencing massive information technological upgrades. What is the relationship, if any, to the staffing shortage?

Identity, group dynamics and resistance to change.

In order to understand the factors that influence an organization’s acceptance or rejection of implementation of a new technological system, it is useful to review properties of identity, group dynamics, information technology and anxiety. . Cameron and Quinn, (1998) describe the changed mind-set of the automobile factory worker after a major culture change. They speak of a “gut-level, values centered, in-the-bones change…” that influenced accountability and productivity in a strongly positive manner. Cameron and Quinn go on to say that without that culture change there is little hope of enduring improvement in the organization. Cameron and Quinn (1998), Martin (1990), Cox (1991), Gordon (1991), and Schein (1993), describe organizational culture as having its own language, shared meanings, symbols, definitions of success and failure. Culture generally reflects

how things are experienced in a given organizational environment.

MacDonald (1998) addresses the issue of resistance to change and management of change in relation to perspective. Reality is dictated by perspective. Douglas, (1983) writes that we live in “individually unique worlds”. There are irreconcilable differences of perspective that cause us to perceive reality differently. We adapt by use of a process of acceptance. The essential fear of isolation causes people to want to be accepted by others. Individuals respond by acting “as if” (Douglas) there was a one certain reality for all. Similar beliefs and ideas bring people together (Douglas). Acceptance of a reality is influenced by the human desire to reduce the feeling of isolation.

Attachment to perspective is further increased by the shared reality of peers. Douglas (1983) claims that a group is formed when two or more individuals are jointly characterized by a “shared sense of communications”. A shared identity and one or more shared goals facilitate a sense of “we”. Reference groups (Douglas) fulfill two functions. They provide a standard of comparison and supply a pressure toward conformity. In an effort to define ourselves as a group, we contrast the beliefs of our group with those of another. Cohesive work groups develop a mistrust of other groups (Douglas). This creates the “we and them” phenomenon. “They” are doing it to “us”. “They just don’t see it.” Being a “we” provides security. All outside of that “we” are seen to be unaware of the truth.

Experience influences perspective. “Expertise and perspective go hand in hand” (Mac Donald, 1998). With added experience and gained expertise, one is less inclined to change a point of view, or approach, to the area of expertise. Reference groups possess a set of shared experiences. Economists will view *IT* (information technology) differently than do sociologists. Managers experience IT from a different perspective than that of employees. A “sociocentricsm” (Douglas) develops within these shared realities. Subdivisions within these categories may experience different points of view or sub-perspectives (Mac Donald).

This phenomenon of multiple perspectives does not encourage a sharing of views. The greater the number of perspectives the more each perspective, or reference group, may be seen as being challenged, or distorted (Mac Donald, 1998). Challenge to one’s perspective may then be perceived as a challenge to one’s reality. This may result in a protective posture being adopted by owners of each perspective. This protective stance becomes resistance to change.

This resistance is increased with more expertise in a given subject, and becomes what Mac Donald (1998) refers to as an “ informed view.” Perspective then influences one’s reality and one’s reality influences one’s perspective. In addition, it is not safe to become an expert in too many subjects. This can lead to too many perspectives. How many “we” can one belong to before losing the identity of being part of a “we”?

"We" have "our" reality and associated information. On the macroscopic scale, organizations function in a similar manner. An organization is more comfortable with its own information than with information from the outside. The "we" of the organization is maintained. External information tends to be rejected. The "not-invented- here syndrome"(Mac Donald, 1998) is the result of this psychology.

At the sub-organizational level, all of the various reference groups are practicing the same not- invented- here syndrome (Mac Donald, 1998). Information external to the perspective / reality of a given "we" tends to be rejected. Those individuals who increase their expertise, and thus expand their reality, are not to be trusted and may even be considered traitors to a particular "we". Also, "we" are not going to share "our" information with "them". Knowledge, information, and expertise become lost in isolated pockets (Mac Donald). Change would seem to be impossible under such conditions.

MacDonald (1998) however, states that: "the pressure for change is unrelenting". Outside influences of competition and environment push organizations to attempt innovation in spite of the described resistance phenomena. Information and knowledge "exists in scattered bits" (MacDonald) and must be found and put together. Yet, the multitudes of "we" guard their perspective/ realities. This may indeed be the challenge to implementation of change and innovation within any organization.

O'Dell, (1998) takes a perhaps more positive stance in regard to the failure of organizations to share information, both internally and externally. She believes "people have a natural desire to learn, share what they know and to make things better." O'Dell cites a study done in 1994 by Gabriel Szulanski, professor of management at Wharton, that points to organizational barriers as the culprit. Szulanski's research identifies four barriers as:

1. Ignorance of existing knowledge or the need for that knowledge.
2. Lack of time, money and management resources to pursue that knowledge.
3. Lack of preexisting relationships that would facilitate the transfer of knowledge.
4. People may not be motivated to share that knowledge because they do not perceive a clear business reason for doing so.

However, O'Dell (1998) goes on to describe not- so- positive organizational personalities that discourage innovation and learning. She speaks of "silo companies" that contain elements that hoard information internally with the intention of preventing other groups from excelling, while hoping to improve their own performance. She also refers to the NIH (not- invented-here) syndrome that was described earlier (Mac Donald, 1998). O'Dell describes the "babel company" in which departmental dialect eliminates a coherent vocabulary that would facilitate transfer of information. She continues to describe the "bolt-it-on" approach in which systems are merely added on top of old systems with the hope

of improvement. Whether or not barriers to change reside at the organizational level, or personal individual level, they are common themes in the literature.

Information technology and work.

The “holy grail “ of IT is organizational transformation (Baskerville and Smithson 1995). They describe 5 reasons that IT fails in organizations:

1. New approaches to IT become dogmatic and ideological. A single successful application becomes a dogma that must be practiced by all organizations that desire to be successful. These are the organizational fad diets that are claimed to be the cure for everything from cancer and hair loss, while guaranteeing increased profit, and improved customer service. Hanseth and Braa (1999) conclude that applications are far from universal. Universal application of a technology is possible only at the theoretical level. With implementation, these theoretical universal applications disappear into the emergent, unique, ever changing realities of the locality.

2. Researchers search for the one fad diet that will cure all organizational ills and result in “excellence” and “world class service”. This is the one-diet-fits-all quest. This requires huge generalizations of reality, often resulting in inappropriate applications of technology.

3. IT experts often overlook other necessary organizational transformations in favor of technology. The technology can become the focus of change rather than

the desired improvements of organizational culture.

4. Management theory overlooks the unpredictability, and chaotic nature of human organization. Mechanical thinking, that often accompanies IT, may not fit the emergent organization.

5. IT needs to be adaptive to the emergent, learning organization. Design should be one that facilitates double loop learning. IT needs to more than just a faster messenger boy. Flexibility of design would allow the technology to be configured to be continuously appropriate to the emerging needs of subgroups within an organization.

Attewell (1998) argues that due to rapid technological change there is a tendency for researchers to focus on the latest cutting edge technology that is being used by highly financed, advanced organizations. Theoretical models become the focus at the expense of empirical research concerning “what is happening now”. He further claims that since theoretical work is less expensive than data collection, funding tends to move toward theoretical research. This has the effect of diminishing the examination of real world technological implementation.

Attewell (1998) points out that there is a tendency to discount negative impacts of IT as “being intellectually uninteresting”. These negative findings are dismissed as start up and learning curves problems that will go away with time in use. Attewell claims there are studies that demonstrate a high rate of

“discontinuance/abandonment /non-use rates” of important highly advertised technology.

In apparent agreement with Baskerville and Smithson (1995), Attewell (1998) cites findings that demonstrate IT impacts are not consistent in all applications and environments. There is no one sure “fad diet” for all. The unpredictability of impact in any given setting increases the difficulty in implementation. Attewell recommends research into failed or rejected systems as a means of understanding the process of change as well as the technology itself.

Bannon(1996) describes CSCW, “computer supported cooperative work”, as an “umbrella term” that covers any approach that includes humans, computers, and cooperation. In this way, the “fad diet” aspect, possessed by many IT dogmas, may be avoided. CSCW involves IT technology that is applied to “cooperative work”, which is distinctive from other forms of work. Bannon describes CSCW as an approach that includes participatory design. The people who are doing the work actively participate in the design of the IT system. One could see the potential for application of a CSCW approach to the multidisciplinary, computerized, medication ordering, dispensing and tracking system on which this research project is centered.

CSCW involves understanding the work that is to be transformed, from the perspective of the personal meaning of those performing the cooperative work.

Bannon (1996) refers to ethnography as a means of understanding the personal meanings of those performing the work. The human issues and practicalities involved in getting the work done influence the design of the system. This is the inversion of the traditional division- of-labor approach in which people must attempt to adapt to a technological system. Prescribed procedures are inflicted upon them by an administration that lives in a separate culture and reality than those actually performing the work.

Suchman (1983) describes this "discrepancy" between office procedures that supposedly dictate how work will be done, and the actual way in which work is accomplished. The unofficial elements of actual work routines provide unrecognized influence on successful or unsuccessful accomplishment of work. Suchman depicts the results of workers who follow the "…procedures, no more and no less" as "…usually the office grinds to a halt very quickly".

Ethnography is therefore a method of discovering these realities of work. The participatory design aspect of CSCW could provide the insight into the reality of the work. It could also provide for the emergent nature of implementation. While clean and structured at the time of inception, implementation reveals an ever increasingly "more complex lattice" (Hanseth and Braa, 1999). The evolving organizational dynamics cause an increasing number of overlaps and links that may only be effectively understood as a result of a continuous ethnographic

approach. CSCW, as understood by this student, may possess the potential for inclusion of self –ethnographic, evaluative properties that could result in an IT system that is adaptive, flexible, and therefore continuously appropriate to the application. Truex, (1999) suggests just such a continuous qualitative evaluative process, rather than inflexible strictures of standardization. Truex goes on to say: "…standards might be better seen as a continuous emergent language game".

Anxiety and technology.

According to Brosnan (1998) technophobia is a term used to describe the resistance to technology. This resistance has been demonstrated to not be the property of any particular age group. Contrary to expectations, the resistance is not a "transitory phenomenon" (Brosnan) that is experienced by those who were old enough to have missed technological education. Brosnan goes on to claim that studies have shown that "children are becoming computer anxious at an earlier age". Brosnan also claims that technophobia is more prevalent in the under thirties age group than in the over fifties.

Brosnan (1996) cites a 1996 study commissioned by Motorola amongst the British that reported 49 percent of the general public did not use computers at all. This study also claims that 43 percent did not use any form of new technology. He defined new technology as "mobile phones, PCs, computer games, etc." Only 17 percent had used the Internet. Of the non-users, only 25 percent claimed lack of

interest as the reason for non-usage. Brosnan sees these results as providing implication for the theory that “psychological factors” play a role in resistance to use of computers. He defines psychological factors as “anxiety, or negative attitudes”.

Spielberger (1966) defined anxiety states as “subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation of the autonomic nervous system”. Raub (as cited by Brosnan) defines computer anxiety as “a form of state anxiety with the computer providing the threatening stimulus”. Spielberger further defined anxiety as being of two types. Trait anxiety is a “relatively stable personality characteristic…induced by a broad and diverse set of conditions.” State anxiety is a situational phenomenon that specifically related to that situation. Spielberger’s work proposes that people with trait anxiety are more likely to experience state anxiety.

Weil and Rosen (as cited in Brosnan, 1998) found similar levels of computer anxiety in Europe, Asia, and North America. There does not seem to be a cultural bias regarding computer anxiety. Brosnan (1998) does, however, correlate computer anxiety with a loss of control, fear of negative evaluation, and unfamiliarity of the associated language of the technology. Brosnan also claims that there are contradictory findings regarding demographic variables. Siervert’s study showed neither age, gender, nor education was related to computer anxiety

(as cited in Brosnan, 1998).

Anxiety is generally accepted as a deterrent to performance and learning (Brosnan, 1998). Gaudy and Spielberger (1971) state that "there is overwhelming evidence consistently pointing to negative relation between anxiety and learning." They also point out that anxious people will become upset if suddenly plunged into uncontrolled situations. The anxious person requires more gradual transitions that involve frequent experiences of success.

Is computer anxiety a factor in resistance to implementation of information technology in healthcare? If this is the case, how can organizations address that issue? Gaudy's and Spielberger's (1971) examination of anxiety's effect on learning and achievement would point to the necessity of adequate support systems and structured training in which one experiences success over time.

Howard's (1986) research theorizes that the roots of computer anxiety are complicated. He shows that there are three interrelated roots to the problem. Operational origins can be treated relatively easily, while knowledge based origins and psychological origins are progressively more difficult to overcome. Computer stress may come from one or any combination of these three roots.

Howard (1986) suggests that training and experience will address much of the anxiety that exists, if that training is given over a prolonged period of time. His study does show that a brief session will not succeed in significantly reducing

computer anxiety. “Short term, high intensity training programs are probably ineffective” (Howard).

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Effects of implementation.

Worthley and Di Salvio(1995) see the issue as being a managerial problem. “Unenlightened use of technology” by management results in failure of good technology. They go on to suggest that many chief executive officers of healthcare organizations are clearly displeased with their investment in the technology. Computer implementation changes the work place for better or worse. They suggest three important lessons. Implementation will impact the organization beyond the planned area of application. These organizational impacts are significant for the effectiveness of the technological implementation. These effects are unplanned and often unexpected and therefore under- managed. Change implementation is unpredictable (Balogun and Johnson, 1989). It is difficult to understand the emergent impact within an organization. Implementation is linked to the local practices, habits and culture (Hanseth and Braa, 1999). These unintended impacts are due largely to political, as well as social forces that are at work behind the scenes within the organization. Creation of order from one perspective may create disorder from another (Hanseth and Braa).

Balogun and Johnson showed that there are both facilitating and obstructing processes involved in change implementation. Obstructing processes can be issues of design, unintended consequences, and cultural obstructions. These cultural obstructions can involve old learned management styles with their accompanying employee reactions. Issues of design can include communication, training and inadequate management of the implementation process.

Balogun and Johnson (1998) divide facilitating processes into “designed change goals”, and “designed change interactions”. Planned new structure, workflow, roles and relationships are examples of goals. Interventions are put into place to facilitate the attainment of the goals. Computer support systems such as hot lines, roving experts, on- going education are all planned interventions or designed change interactions.

Both obstructing and facilitating processes can instigate unexpected impacts, changes and results. This fact creates an emergent process that is inherent in implementation of a technological system. Balogun and Johnson (1998) further refer to these as “positive developments and unexpected consequences”. Although both were unplanned, they have very different effects on the acceptance and success of a new system. Unforeseen consequences may hinder acceptance of the new system. Failure to manage unexpected consequences can undermine the faith in the technology and management. Dudik (2000) describes capitalizing on

positive developments in his theory of “strategic breakthrough and exploitation”. Positive developments can represent breakthroughs that can be enlarged to benefit the organization.

Another unintended process that is described in the work by Balogun and Johnson (1998) is the “black hole” phenomenon. Implementation may reveal an unexpected process or issue for which no procedures exist. Who does what? An example of an obstructive force, this may be a result of inadequate design, followed by inadequate implementation management. Balogun and Johnson go on to describe situations in which this “black hole” phenomenon could have an unexpected positive impact. Previously non-communicating staff took the initiative and liased to solve the problem. This could have come as a result of a commitment to success of the project, or just plain survival instinct. New relationships and unexpected alliances could result that, in themselves, may have unexpected positive or negative impact on the culture of the organization. The emergent possibilities are infinitely unpredictable.

Worthley and Di Salvio (1995) claim that “experience has shown” that personnel turnover and absenteeism increases with computerization. Technical expertise is costly and competition for these people is extreme. Technical personnel and chief information officers are difficult to retain. IT systems therefore suffer further under-management and lack of support.

Management and implementation.

Innovative changes require new managerial mindsets (Hitt, Recart i Costa, and Nixon, 1998). These mindsets will require strategic and structural flexibility. Appropriate application of technology is key to successful implementation. Hitt et al. (1998) go on to say that establishing a mission statement for the organization will enhance the integration of strategy and implementation. An implementation of a system that is consistent with the mission of the organization is essential to gaining appropriate application of the technology. The key question to be answered by the mission statement is: "what is it that we do?" The next logical question would seem to be: how can this technology be used to accomplish that mission?

Poole, Van de Van, Dooley and Holmes, (2000) describe "cycles and motors of change". The "life cycle model" represents the change process as a progression through phases or steps that are prescribed at the beginning of the process. The "teleological model" sees the change cycle as that of goal formation, evaluation, and modification of actions and goals as learning takes place as the process progresses. The "dialectical model" makes uses of emerging conflicts that then provide a synthesis. Emergent confrontation of opposing entities continues to fuel the dialectical progression. The "evolutionary model" is a "repetitive sequence of variation, selection, and retention events among entities". This cycle is propelled

by competition between entities for scarce resources.

Poole et al. (2000) show that change theory is really a composite, or hybrid of the above described ideal models. There may be more than one change motor at work. They have arrived at 16 possible hybrid theories for what powers change in an organization. Use of these theories in explaining and planning change is based on what Poole et al. refer to as “template matching”. In this manner a model or hybrid of models is applied to a relevant situation.

Esteban and Joaquim (1998) charge that management has not yet succeeded in translating strategy into action. A strategy that includes an information technology system that is smoothly interfaced between departments and disciplines may have been developed, but why is it not working in the expected manner? Prahalad and Hammel (1994) argue that management emphasizes analysis over “creativity and exploration”. Analysis may inhibit creativity. Perhaps there is a tendency to create what can be analyzed more easily. Systems may be designed with the ease of analysis in mind. In this case it would seem that the tail is wagging the dog.

Donaldson (1995) argues that American management suffers from a lack of intellectual analysis. He makes the criticism that rational science of organizations has been replaced by a “passing parade of fads, and fashions” that has resulted in a “profusion of paradigms”. Donaldson charges that “novelty seeking” diminishes the resources available for paradigm consolidation, and that American

organizational theory is largely anti-management. Although Donaldson's work primarily concerns organizational theory and not systems implementation, the two cannot be truly considered in respective vacuums.

Coyne and Subramaniam (1996) suggest that "models and toys" may rarely fit actual reality of application. Does the work at the drawing board ever really fit the nitty- gritty of accomplishing actual work? Hitt et al. (1998) further suggest that a major problem in successful application of strategy to implementation may be one of structure. They claim there is a wide spread tendency to separate responsibility for thinking and acting within the management structure. This brings about a situation in which there is a planning department and a doing department.

This disconnect, or structural flaw in the hierarchy, could be expected to result in inappropriate application of technology, ineffective interfaces, as well as frustration of implementers. It would be a logical assumption that the end result would be customer dissatisfaction and rejection of the system by the worker. At this point management may step back into the picture and declares: "the technology is flawed".

Lewis (1997) addresses this managerial failure to implement successfully with a call for the establishment of organizational shared vision. He lists 7 positive forces that are put in motion by attainment of an organizational shared vision. These proposed forces would obviously facilitate a greater chance of successful

implementation.

Lewis (1997) claims a shared vision brings about an elevation of workers' aspirations. Their work has greater meaning. There is an increased sense of commitment, motivation, and energy that is directed at a common purpose. Factionalization will decrease. People become aware of an organization's competencies that make it distinguishable from the competition. Organizational activities take place within a context and thus directly reflect what it wants to create. Risk taking, creativity, innovation and growth are promoted. Finally, there is a measure by which individuals can access their worth and performance, as well as that of the organization. Lewis (1997) proposes the use of tools to test the organization. The intent of which is to determine the organization's needs and opportunities, as well as provide a final check on the extent and depth of the shared vision before implementation.

The task of implementation of an information technology system in the health care setting at least partially falls upon the shoulders of nurse managers, pharmacy directors and technical support personnel. Abbot (1996) describes the challenges that are presented to nurse mangers. The roles of change agent, knowledge source, leader, facilitator, designer, and risk taker are all demanding responsibilities. System implementation may proceed in a step- wise progression, but this is not always the case. Often, economic realities of package purchased by

administrations dictate implementation on a far from practical schedule. An organization may find itself in the unenviable position of paying for an entire IT system long before it is reasonably possible to implement more than a portion. Therefore, the people at the management level may feel pressured to accomplish the impossible. Pressure to get the system up and running, so as to enable the organization to realize the economic benefits, may decrease training and planning time drastically.

Reality may differ dramatically from the ten steps that Abbott (1996) proposes. The “evolutionary implementation process” (Abbott) may actually become a revolutionary process in the reality of today’s healthcare environment. Abbott’s (1996) prescription for successful implementation may not be a realistic possibility. Creation of a pro-change environment may not be an easy task. The existence of technophobia may slow that process down. “Evolutionary” implementation design may be prevented by economic realities. Individual innovativeness may not be part of an organizational culture. Communication pathways necessary for interdisciplinary collaboration may not be present. Organizational shared vision may not have ever been truly established prior to implementation. Mangers may not be prepared for the unexpected interactions and unforeseen, emergent consequences that come with implementation. Economic and time restrictions may prevent timely management of these

emergent consequences. Technical knowledge may be lost in pockets or intra organizational silos. In addition, the technology may be inappropriate to the application, or that technology may not be fully developed at the time of purchase. These are all issues that have been addressed in this review of the literature. These are also the issues that seemed to reappear in the ethnographies of real people interviewed in this study.

The following qualitative study is an attempt to provide a realistic picture of how the implementation of a multidisciplinary information technology system is experienced by the health care professionals at a large public acute care institution.

## Research Design and Methods

### Site and Social Network

"Implementation of an information technology system represents a significant and challenging change" (Lorenzi, Riley, 2000) to a publicly funded healthcare facility in Clark County. It involves basic changes in key processes of healthcare. The Pyxis Med Station System is built around the delivery of medications to the patient. These processes include three major areas: methods of delivery of

medications to departments; process of nurses accessing medications; and computerization of legal documentation and processing of charges for the entire system (Pyxis Corporation, 2000).

The Pyxis Connect System changes the manner in which transcription and communication of physician orders to pharmacy are accomplished. The Pyxis Connect System also affects pharmacy procedures involved in processing these orders.

The nursing staff is further affected by the Pyxis Bio ID system. This is a computerized fingerprint recognition system that is intended to allow only qualified personnel into the Pyxis Med Station. The new information technology is intended to increase accountability for medications, eliminate lost orders, improve efficiency of communication, (Teich, Mercia & Pankaj, 2000). The system claims to "eliminate lost revenues, reduce costs, decrease medication errors, prevent theft, and improve service to stake holders" (Pyxis Corporation, 2000).

University Medical Center is a publicly funded hospital facility in Las Vegas, Nevada. This 600 bed teaching institution serves a population base of 1.2 million. This is a full service institution that includes "Quick Care" clinics that provide neighborhood services. Patients in need of further testing and, or hospitalization are referred to the main facility. Medical-surgical, obstetrical, orthopedic,

oncology and geriatric patients are all served by this one and only public hospital in the valley. Nursing students and medical students are trained in this facility. A pharmacy school is scheduled to open within the next 3 years. All of these disciplines will be making use of the new information technology system that is the focus of this research.

This institution was using a paper-based system for ordering, documentation, accountability and billing for medications. The old paper system is cumbersome, mistake prone, slow, and costly (Johnson, P., personal communication February 4, 2001). Mistakes in transcription may lead to medication errors. Patients may wait for medications that must move through this slow process. Charges may be lost and accountability for medication may be questionable. The new technology is proposed to improve, if not remedy, this situation.

An average of 300 medications per hour are delivered to patients. On an average, six people process each medication order before the patient sees the medication. A registered pharmacist is required by law to review the patient profile before approving the order. The patient profile lists the medications that the patient has been given, as well as height, weight, allergies, and history and diagnosis. The pharmacist looks for potential drug interactions, inappropriate dosage, and possible alternative, more cost effective, regimens of pharmaceutical treatment. After the medication is given, 4 people are involved in documentation, charging

and billing for the medication. The management of this institution declined to provide any figures regarding types, rates or frequency of medication errors. Nurses obtain medications (meds) from the Med Station by identifying themselves by scanning their index finger with the Bio ID and typing in a password. They then enter the patient name and the medication required into the computer, and the Med Station opens the appropriate drawer containing the medication. Any unused narcotics are either returned or wasted in the presence of a nurse witness. This witness must identify himself/herself by scanning a finger and typing in a personal password.

No medication is given without the order of a physician and review of a pharmacist. Emergency medications may be given according to written protocol, or verbal order, if they are on the over-ride list. These listed medications are available from Med Station after the nurse uses the identification procedures already described. Medications not available in Med Station are kept in the Central Pharmacy.

Pharmacy and Nursing are separate departments, each with their own management systems. Patient care areas are served by an attached pharmacy satellite that is responsible for reviewing and entering orders into the Pyxis Med Station by use of the Pyxis Connect System. No medications are located at the satellites.

Selection of Ethnographic Informants

The emergent design aspect of qualitative study allowed for changes in data collection strategies as the discovery process progressed. Pharmacy management, nursing management, staff pharmacists, as well as nursing staff were interviewed. Twenty-six interviews were conducted. A snowball technique was used to find participants. Initial contact was made with the Director of Pharmacy, who then assigned the Pharmacy Secretary the task of locating potential informants from both disciplines.

After an interview, that informant was asked if he or she had a suggestion of who else would be interested in participating in the interview process. This offer was only twice refused. Both of these refusals became extended declarations of discontent with the system and then agreed to have their statements treated as data. In addition to the snowball technique, the interviewer randomly approached staff members and asked if they would care to participate. This is an example of "nonprobability sampling" (Johnson, 1990). Johnson provides a description of this selection method as "fortuitously uncovered" informants. He goes on to report of a great many ethnographic reports in which informants were "serendipitously or opportunistically encountered, often using the most unsystematic of choices". As long as the researcher understands were such an informant is in relation to the criteria chosen for sampling, the researcher can place collected data into a theoretical framework. In this case the framework involves the two disciplines at

two point of time in implementation.

An attempt to find informants who would equally represent two distinct levels of professional experience, perhaps demonstrating different meanings related to those degrees of experience, proved unsuccessful. The emergent design of qualitative research became apparent as that concept took on qualities of a subject for an entirely separate study.

Informed consent from each participant was obtained. A signed promise of anonymity was likewise provided to each participant (See Appendix I). Confidentiality was maintained through encoding of field notes. Interviewed participants were assigned a random number. Field notes from each participant were numbered (See Appendix II). At no time were names documented or recorded. The informants were thereafter referred to by their respective numbers. This strict use of numbered informants was a response to the request of the initial informants that were interviewed. Many informants expressed fear of discovery of their point of view regarding the system, management, and their own performance using the system.

It is hoped that the assured confidentiality of the content of the interviews enabled informants to enjoy the opportunity to freely voice their feelings. Consistent with qualitative, ethnographic studies, the meanings of lived experiences will be described. The willingness to participate, or lack there of, does provide

ethnographical and phenomenological information.

Pharmacy and nursing management was interviewed. Altogether seven registered nurses were interviewed in the initial phase of implementation. Two of these were nurse managers. One nurse educator was included in the original seven informants. Five registered nurses were interviewed three months into implementation. One of these was a nurse manager. Nine pharmacists were interviewed in the early phase. Two of these were pharmacy managers. One Assistant Director of Pharmacy was interviewed and the Implementation Manager was also interviewed. Four pharmacists were interviewed three months into implementation. One of the pharmacy management people refused a second interview.

Interviews were open ended and lasted as long as the informant felt comfortable speaking. The length of interview ranged from three minutes with one pharmacist, to two hours with another pharmacist. Most interviews averaged 30 minutes to 45 minutes. Three pharmacists were interviewed twice and two nurses were interviewed twice. The interval between these sets of interviews was two months. Altogether, 24 hours of interviews were conducted, resulting in a total of 26 complete interviews.

The first set of interviews was conducted while the initial implementation was in progress with most staff members possessing no more than one month of work

experience with the system. The second set of interviews took place two months later, well into implementation. The system was implemented progressively, department by department, so there was a variance of up to a month in how much time informants had been at work with the system. The staggered timing of interviews is consistent with Gould's (1981) encouragement of use of data collected at several points in time.

The role the researcher.

The role of the interviewer, as seen by the informant, is critical to data collection. Johnson (1990) speaks of the relationship between researcher and informant as one of collaboration, and it is that collaboration that provides the core of ethnography. He states that this relationship may be "fortuitously uncovered or consciously constructed". In this case the informants were fortuitously discovered. No effort was made to follow a single group of informants over time. Rather, the emphasis was placed on what was happening to any member of the two disciplines at two points in time. This was typical of an emergent data collection model that is dependent on the naturalistic setting. Rotating shifts, schedule changes, patient assignments and workflows all played a part in the selection of informants over the three- month period.

The researcher is a Registered Nurse with 25 years of experience as well as experience in implementation of new processes through redesign, facilitator

training and extensive experience with the Pyxis system. The researcher was careful to consciously construct an interview environment of empathy for the informant's experiences and personal meanings while maintaining an unbiased point of view. This required a great deal of concentration and self-control. The task of maintaining neutrality in the face of emotionally packed statements was not an easy one.

Cooperation appeared to be more easily obtained after informants had been assured that neither Pyxis, nor the institution in which they worked, employed the researcher. This in itself implies data to be explored. The researcher was repeatedly asked to provide reassurance of the confidentiality of their statements.

Data Analysis

Collection of data.

In addition to actual formal interviews, six hours was spent in observation of consenting participants while they were working with the system. Field notes regarding the observations of the process of order validation and entry by pharmacists were recorded. Field notes on observations of retrieval of medications by nurses were also made (see Appendix II). Interactions between nursing staff and pharmacy staff regarding the system were observed and recorded.

Specific data collection techniques were emergent in the field. Due to

participants' objection to the use of recording devices, all information was recorded on paper in the form of notes. Notes were taken during the interview, as well as immediately after the interview. These were then reviewed the evening following the interview and transcribed into a more readable form and applied to domain analysis work sheets (see Appendix III). Care was taken to preserve the language and terms used by the informants in order to retain the personal meanings of the experience of the participants.

Descriptive questions (Spradley, 1979) were asked during the interview in order to generate data. These questions took the form of *grand tour* questions, *example* questions, *experience* questions, and *native language* questions and *metaphorical* questions. Grand tour questions were used to gain insight into an informant's total experience at a work location on a typical day. "Would you describe a typical morning's activities to me?" An example question could be "Give me an example of the term 'hassle'?" An experience question could be " Can you tell me of an experience that you had accessing a stat medication?" Native language questions (Spradley) could involve asking the informant to provide a term that is commonly used to describe something or an event. "What does 'stat' mean to most nurses?" Metaphorical questions ask the informant to use a metaphor to describe an experience.

Interpretation of data.

The ethnographies were interpreted in terms of the meanings that the informants brought to the interviews (McMillan & Schumacher, 2001). The contents of the interviews were then categorized into areas of similarities in hope of finding commonalities that would provide data. Spradley's (1979) domain analysis was used to determine patterns and themes.

The first step in this process was to select a semantic relationship. "Strict inclusion"(Spradley, 1979) means X is a kind of Y. One technique used was to ask informants to provide a metaphor that described their experience with implementation. So the included term "circus" is a kind of negative metaphor for the experience of implementation. In this case "Metaphor for the experience" is the cover term. "The Bio ID is a pain." X is a kind of Y. Pain (X) is interpreted as a kind of negative metaphor for the experience (Y). Another semantic relationship is "cause and effect" (Spradley, 1979). X is a result of Y, or Y causes X. The statement, "The damn machine causes me to be late passing meds" is such a semantic relationship. "Damn machine" is an included term. "Late passing meds" is a cover term.

The next step was to prepare a domain analysis worksheet. The worksheet consists of space for included terms, semantic relationship, and cover terms. Domain analysis worksheets were used to organize the data (See figure 1).

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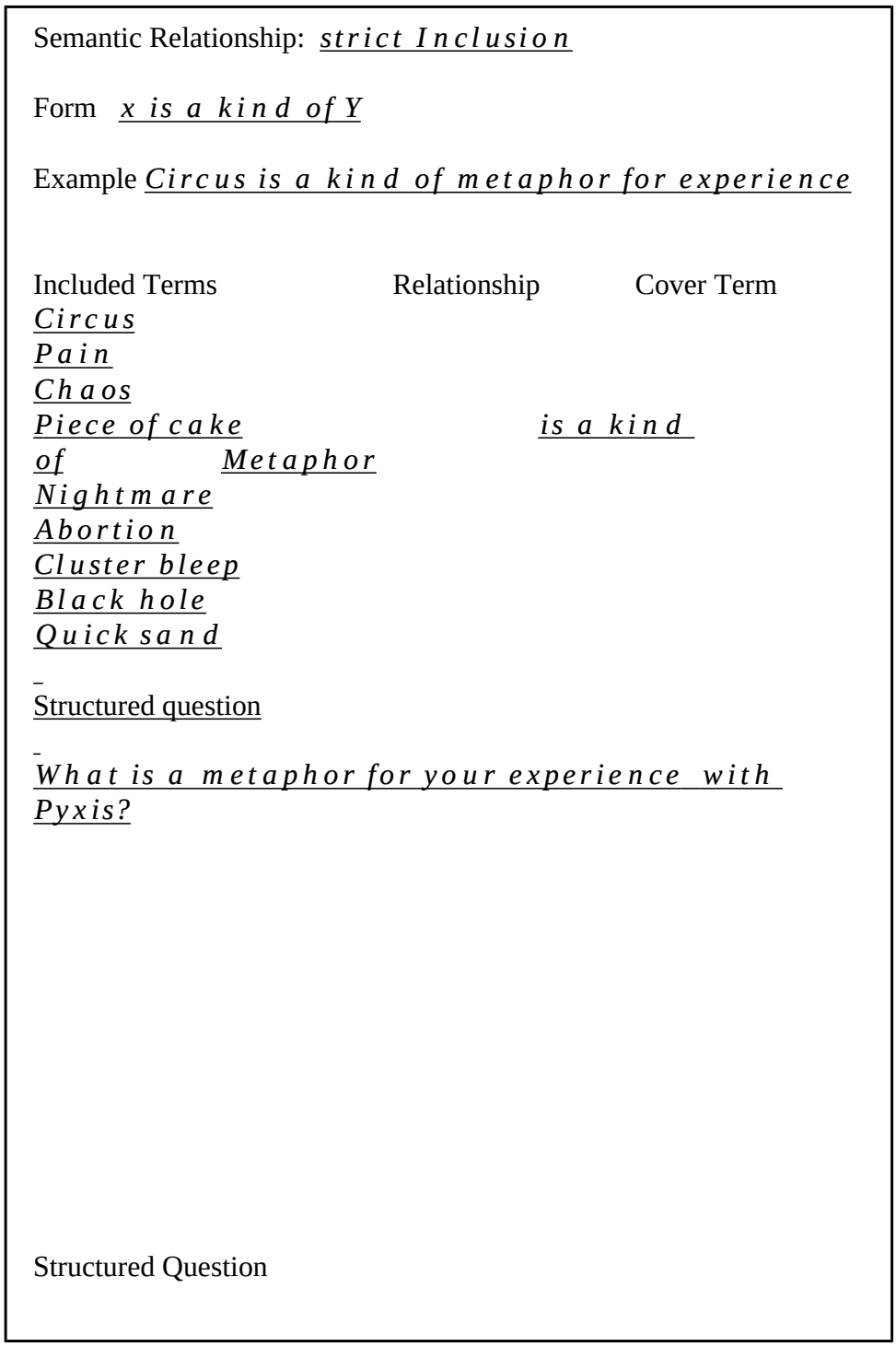
Figure 1. Domain analysis worksheet: example.



Semantic Relationship: *strict Inclusion*

Form *x is a kind of Y*

Example *Circus is a kind of metaphor for experience*

| Included Terms | Relationship | Cover Term |
|---|---|---|
| *Circus* | | |
| *Pain* | | |
| *Chaos* | | |
| *Piece of cake* | *is a kind of* | *Metaphor* |
| *Nightmare* | | |
| *Abortion* | | |
| *Cluster bleep* | | |
| *Black hole* | | |
| *Quick sand* | | |

Structured question

*What is a metaphor for your experience with Pyxis?*

Structured Question

Language used by the informants is classified as “included terms”, (Spradley, 1979) and “cover terms”. Domain analysis work sheets (see Appendix III) were utilized to record field notes and find semantic relationships within informant language.

Actual informant language is used in order to capture the personal meaning. (see Figure 1). Some of this language was rich in emotional content. A list of hypothesized domains was constructed. The hypothesized domain of "ways to circumvent the system" is on that list. The cover term "late passing meds", which was caused by the included term "damn machine", could also be part of that hypothesized domain list. In this manner, answers to specific questions, as well as spontaneous language of the informants, is organized into themes or domains (Spradley, 1979).

Structural questions were created for each hypothesized domain. Such a preliminary hypothesized domain is "training and education". The accompanying question would be: "How were you trained to the use Med Station?" This facilitates greater understanding of the cultural scene being studied and identifies "native categories of thought" (Spradley, 1979). The list of hypothesized domains grew in length with further research and review of the ethnographies.

The domain analysis worksheets were used to identify domains that finally were used to construct a taxonomy (Spradley, 1979) (see figure 2). Taxonomies were constructed for several hypothesized domains to demonstrate their relationship to acceptance or resistance to implementation (See Appendix IV).

The ethnographic process continued with the construction of a componential analysis (see figure 3). This provides information on the "components of

meaning" (Spradley, 1979). This exercise provided insight into what the different disciplines were experiencing within the time structure.

Included terms are assigned an appropriate domain and an analysis of components of each domain is accomplished. A sample componential chart is included in the text to demonstrate analysis of personal meanings related to the Bio Id System. A master componential chart was constructed to demonstrate the overall findings of the study (See Appendix V).

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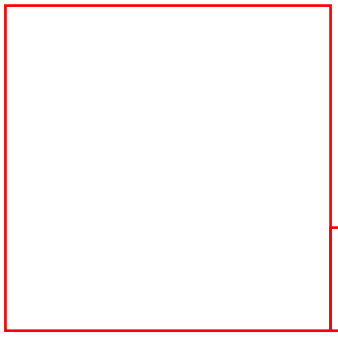
Figure 2. Taxonomy of three of the cover term's relationship to the hypothesized domain of "frustration": example.

| Included Terms | Cover Terms |
| --- | --- |
| Domain | |

Nightmare

Cluster bleep

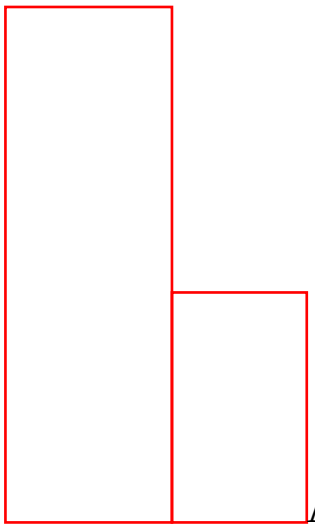
Chaos



Circus Metaphor for experience

Quicksand
Black hole

Slow down
Can’t get ‘em
Won’t open
Gets stuck Affect on obtaining meds Frustration



Always have to call for help
Get in line
Frustrating
Get in trouble

There goes my schedule

Slave to the computer
Spend all my time in here
Not a computer repairman
It is down again today Experience with “Connect”

 Creates extra step
Not available to help med students
50 orders behind already
No support

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Figure 3. Componential analysis: Example.

| | Acceptance of Bio ID | Rejection of Bio ID |
|---|---|---|
| | Great system, fast, no problem | finger doesn't work, slow, always broken, get in line |
| | 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |
| Roles | | |
| Early implementation | | |
| Pharm. staff | 9 | |
| Manager | 1 | |
| Implementer | 1 | |
| RN staff | 6 | |
| RN manager | 1 | |

RN educator 1

Late implementation

Pharmacy staff 4

RN staff 4

RN manager 1

The following are ethnographies and observations that provided the data for the domain analysis. This narrative is intended to provide a view into the experience of healthcare professionals experiencing implementation of a complex new system.

## Findings and Interpretations

### Ethnography

#### Pharmacists interviewed in the naturalistic setting during early implementation.

Ethnography "discerns how people construe their world of experience by the way they talk about it" (Sturtevant, 1972). The manager who is responsible for implementation talks about the experience:

> I feel robbed. I don't feel that I have done a good job here. I can't perform at the level that I know that I could. There has been far too much to do, too fast, with not enough support, training and this has been a chaotic

experience.

These are the emotionally expressed statements made by a person in a supervisory role of the implementation of the Pyxis system. Number 3 goes on to say this:

The rumor mill has it that nursing is not holding up either. The official stance here is that “we are making study progress towards our goal.” That is what I am told to say. Think the staff is still in the game but it is borderline. We are all very frustrated, under-staffed; running out of time, there is way too much to do. Yea, I would say the best metaphor for my experience with Pyxis is the term: robbed.

This proved to be a recurring theme in this researcher’s experience interviewing twenty-five professional healthcare workers at a public acute care facility. These ethnographies were focused on their personal, confidentially related feelings regarding the recent and ongoing implementation of the information technology system described in the introduction to this work:

Oh, I guess the best metaphor I can think of for this thing is nightmare. I don’t love my job anymore. I am not a computer repairman. I love patient care, but I hate trying to fix a broken computer. We had zero training. Nothing is correct, the

scanners have not worked right, and the upgrade did not configure right. Connect is not working, and the problems are not being addressed. The technical Support- guy lives three hours away, and isn't available on holidays. The expected,

promised support isn't here. I refuse to fix machines, and they have forgotten why we are here. The system has failed. We are not a bunch of idiots. Technology is wonderful, but this is not good at all. There is no support within the organization, and the company has stretched their people to the limits. There aren't enough machines.

These were comments made by a healthcare worker, number 21, who is based in a pharmacy satellite. Satellites are small offices located adjacent to patient care areas from which pharmacists provide support to nurses and doctors. The people at these locations transcribe physician's orders using the new Pyxis Connect System. They then program the Pyxis Med Stations to make the newly ordered medications available to the nurses. Satellites do not contain any stock of medications. The old system involved having that pharmacist leave that office to pick up the orders from the patient care areas. Another of these satellite pharmacists, designated number 27, described the experience:

> I'm a slave to a computer. I'm not available to talk with medical students, nurses, Residents and patients. I'm stuck in a box, fiddling with a computer. It

has increased the tech's work, increased FTEs, increased maintenance, and decreased time with patients.

There is no priority in entering medications into the system. An aspirin gets put in

ahead of a cardiac medication. Today there were 50 orders waiting for me and I

was about two hours behind. That means nurses are waiting for two hours for their

meds. That means the patients are waiting two hours. It decreases pharmacist's interventions. Interventions are where I can save us money. I can help the Docs pick

a better med for the patient. I'm too busy playing with the computer now.

When number 27 was asked to provide a metaphor for the experience with the new system, the reply was: "Pyxis slave". When asked how the system could be improved, the response was: "ejection button".

Number 15, working in the same capacity, had a conflicting point of view. This person was relatively new to the field, having been at his institution for one year. This pharmacist, who had previously worked in retail, provided the following information:

I don't have to go out to pick up orders any more. Nursing can call me if they have questions. This is better than the old way. My eyes do get tired from staring at the computer all day. These two screens are difficult to focus on, but see how I can magnify the orders so that I don't miss anything. I want too become an expert with this thing. It is the most advanced thing out there. I am excited about the chance to be on the cutting edge. I've had to teach myself because the education and backup isn't that great, but I'm getting pretty good at it.

Another pharmacist, number 32, who serves in a satellite, addressed the education and training component of the implementation. These are the personal meanings of a professional with ten years experience, ten months of which has been at this institution:

We needed better training. It has lots of bugs and we have not been trained to trouble-shoot. There is virtually no technical support. The Med Station does not work. We have actually had no training. I'm frustrated, angry. A small number of people have knowledge about certain things. It's like pockets of knowledge scattered around. If the right person is here you can get an answer to a question, otherwise you are on your own. Now keep in mind that people

are depending on me to get them their meds on time, and I am dependent on a machine that breaks every day. There is a minimum of two hours delay when it

goes

down. It should have been piloted in one location first, and all of the bugs worked out. No one is available to fix it on weekends and nights.

My first impression was this is going to be a hassle. But I was surprised to find

that the Connect System works pretty well. It is a good search engine and I can make

notes on the orders to be passed to other people. The clarity's impressive. I can recall filed orders. But the Med Station and Bio ID are a different story. This kind of

research should have been done first. They never talked to us about what we needed.

I have been a tech, a pharmacist, a manager and a director and know what I'm talking about. The whole deal was cut years ago and they just dumped it on us. Number eleven's metaphor for the Pyxis experience was " bugs in the system". Number eleven is another satellite pharmacist who works closely with nurses: The drawers get stuck, or they open when they aren't supposed to. Scanners don't always work. If the paper gets put in wrong we get a blank sheet of orders. Some of the problem is technique, not the technology. People have not been trained. We need better training. The system could have been designed better too. Pyxis

doesn't

support well. It is overwhelming to nurses.

The shortest interview was with number 23. It took place in the central pharmacy. An employee of over ten years, this person gave a strong personal meaning to the experience of implementation:

I hate it. We are not very happy here about this. It is horrible. You don't want to talk to me about this. I don't know anything about it accept that I hate it. Go away. No one cares how we feel. They just shoved it down our throats.

Number 28 expressed a somewhat different experience. This person chose to use a sentence as a metaphor:

It is taking pharmacy in a new direction. Love it. Better for all ends. It's a good system. Nobody is waiting for transport. Just scan the order and it gets entered. I haven't learned to do that yet. It cuts the process by half. It is a time saver. It removes the med from the screen when the patient is moved or discharged. It impacts everybody differently. We are adjusting staffing to accommodate the system.

Concerning training number 28 stated: "There is no existing training for me. Nurses get better training. It is sink or swim. Baptism by fire. It's a three ring circus now."

Number eighteen, an experienced pharmacist implementer, expressed these

feelings:

I enjoy the project. I enjoy problem solving. It is an asset to the hospital. Probably an asset to the RNs. I get frustrated with the resistance to change. The first step should be to increase accountability. There is a lot of learning involved. If

everything goes right it will make the job easier.

Regarding education and training, number eighteen went on to say: “Everybody is not educated equally. Everybody has a piece of knowledge. A handful of people know segments of information”.

Number eighteen provided this metaphor for the experience, “pressure”:

It’s different each day. Frustrating, because there was not enough time allotted to implement. It felt like a dam broke. We are somewhat supported. Pyxis provided a lot of support at the start. I don’t feel appreciated like I should. They don’t see it from the office. If they were here they would know. It could be fine- tuned a lot better. It is very challenging. I guess I am frustrated.

These ethnographies were obtained from pharmacy personnel in early implementation. The Pyxis System involves several disciplines of healthcare providers. What were nurses experiencing at that time?

Nurses interviewed during early implementation.

One of the people responsible for education of nursing staff was number one. This

is a nurse with many years of experience in nursing education. The experience of implementation for number one was described like this:

I like trouble- shooting and teaching. I enjoy the work. People are just resistant to change. Some don't like being in line to use the Bio ID. It works fine. They can't have lotion on their hands. They can't use alcohol to clean the scanner. A piece of tape will clean the scanner. They keep using alcohol and it ruins the surface. The finger scanner is good. I'm pleased with how nurses are faring. It takes various

lengths of time to teach individuals. There is a learning curve to these things. A lot

of it is attitude. I'd say 95 percent of the nurses are resistant.

This person rated the training for the program:

Education is good as it is. The implementation is adequate. There does not seem to be any correlation of successfully learning the technique with a person being mechanical or not. Those with computer experience seem to do better. They have a

better understanding. We have good support. I think new people have less trouble.

It's all attitude. I'll stay here a while and then move on.

Number seventeen had a different personal meaning. Seventeen is a nurse with

three years experience.

I'm angry. I'm frustrated. It's a circus. We can't get what we need. I'm unhappy with the finger scanner thing. I help people out all the time by letting them use my finger. It seems to work most of the time. Some of the Asians can never make it work. Meds should be available stat if we need them stat. We have to call pharmacy and then they get to it. Some of the stuff is on over- ride so you can get it, but often it isn't there. Sometimes it is a two-hour wait. They are not listening to complaints. It is time consuming. Routine meds are not in the Pyxis. It is a ridiculous system. What an abortion. I prefer the med carts. I take up to seven patients and getting meds is hard. I do what I can to help. I'm mad and I don't care who hears me.

Number seventeen asked the researcher about his plans for the future. When the researcher replied that they probably included administration, the response from seventeen provided additional personal meaning. "You're going to be one of them. One of the bad guys. Why would you want to be one of the bad guys? One of them?"

Number nineteen, an experienced nurse, expressed his/her personal experience with the Pyxis during early implementation:

I'd like it if it worked. The finger print thing sucks. Everybody is complaining. Convenient? I wait in line for my meds. It will continue no matter what, and I

will get used to it. The delay of meds is frustrating. It interrupts work. When the finger scanner doesn't work we can use a password to get in. My metaphor would be the word frustrated. Or, so-so. It may help prevent errors eventually. Most non-Caucasians can't access the machine because the Bio ID doesn't work for them.

Number four, another experienced RN had this to say during early the implementation phase:

I like it, but it has problems. It's a good system but it has problems. Sometimes the meds aren't there. It slows the delivery of meds. I'm mad when meds aren't available. I 'm mad when I'm standing in line. I hate the fingerprints. I'd rather use a code. My finger doesn't work. Make this easier. My finger never works. They say they are working on it so it will read everybody's fingerprint. I'd call it 100

percent recommendable though.

Nurse number 26 described the Pyxis experience:

> I like it. It has been positive personally. It is less and more frustrating. There's more control over the meds. They need to fine- tune the teaching. Education is an issue. The computer tutorial is not adequate, and people are not using it. We got five minutes of education.
>
> Witnessing narcotics takes too long. They should change the size of the med

vials to be more relevant to what we actually use. There should be a better design of location of meds. I have no problem with the drawers. There is a decreased availability of pharmacists. They can't answer the phone because they are too busy entering orders on the computer. Meds are late getting here. There are malfunctions with the narcotic drawers though. The override is convenient. It has

decreased documentation time and there are no narcotic counts now.

Nurse number 29 had this to say:

I like it. There are some glitches. The Bio ID doesn't work. My finger won't register. The pass- word doesn't always work. It takes a couple of attempts. The metaphor that I'd use would be "frustrated". It's just a different tool. Get rid of the Bio ID. I rarely see a line at the Med Station now. Increase the over- ride list. We need adequate training and education. There are varying degrees of frustration. People are adjusting. We must adapt to it. I don't think you could improve the system.

After three months of using the system, another set of interviews was performed. Once again, care was given to provide for the anonymity of the informants. Several times the interviewer was asked for reassurance that the contents of the interview not be associated with the identity of the informant. Some informants, however, stated that they did not care "who hears what I have to say".

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Pharmacists interviewed after three months of implementation.

Three months into implementation number 57, a pharmacist, expresses these feelings:

More bugs than ever. More stuff broken now. I gave up making it work. I'm frustrated. People are just going around the system whenever they can. The over-ride gets used whenever they want to get anything out in a hurry. It's a billing

and accounting nightmare. Chaos. The words heard most often are "borrow a finger".

There goes accountability.

Connect sort of works until we get a black sheet because the order paper is

the wrong color. Who is renewing meds? Now there's a black hole. No one really

knows. RNs should, but don't. We only can fill Med Station once a day so I get a

lot of calls from nursing. Orders are entered faster now. We are learning, but the

Med Station brakes regularly. Drawers get stuck. The machine does weird things.

Bio ID is horrible. It has not gotten better. Nobody really cares. It's a cluster bleep for nurses.

Pharmacist number 27 relates this after three months into implementation:

I'm tied to the computer more than ever. Nursing is going to kill us. I'm not available to the floors. I'm a slave to the computer. I'm not a computer fixer. It still breaks. I wonder about the narc counts. How long before we give up?

I've Learned to work the system pretty well, but I still think it stinks. My metaphor:

"I'm not a pharmacist anymore."

Number 15, was revisited three months into implementation. This is the personal meaning that a relatively new pharmacist has given the experience:

I've gotten to really know how to use it now. I can enter and verify the orders faster.

I rarely have to go to the floor now. I like the two- screen idea. I can magnify them

and read the doctor's handwriting. I guess the Bio ID is still a problem for nurses. I

don't have to deal with it much. It's a great system. Cutting edge. I never have to

leave the room. The phone gets busy though. It still goes down now and then. The
support still isn't that great. Sometimes meds don't get re-ordered. Nursing still complains, but what else is new? Some people just don't like change.

Number 58, a Doctor of Pharmacy, was only interested in providing a short statement regarding the implementation. However it provides an interesting insight into one way by which to relate to implementation of information technology:

> If I learn to work this technology, they can make me staff, in addition to my own work as a Pharm. D. I know it has a lot of glitches. Who needs it? I'm too busy to talk to you today, and besides, I don't know anything about it.

Nurses interviewed after three months of implementation.

Four experienced RNs were interviewed after using the system for three months. It may be interesting to make note of the fact that these informants were nurses that nursing administration had recommended as "sensible, experienced nurses".

Number 72, a nurse supervisor, related this experience of the Pyxis system:

It was initially frustrating. Kinks are working out. Medications that weren't there, are appearing. I still stand in line. Lines are shorter though. Part of the reason is that we have gone to a lighter patient /nurse ratio. We had to go to two patient to one nurse, instead of the three to one we had before Pyxis.

So that's an improvement brought about by this thing. We are supposed to be getting new order sheets that are the right color so that we don't have to copy them on to white paper before we use Connect. That will speed things up. We were told that the connect system was also a copier, and then we found out anything you copied went to pharmacy. They got all kinds of interesting stuff. Kinks are time delays. Accessing the meds is a kink. Meds not getting here when we ordered them is a kink. Narcotics vials in weird doses is another kink. Reporting problems is definitely a kink. Who's got time?

Any positive experiences? Let me think. I don't know. When everything is working, it is efficient. I would have inserviced everybody. Teach people how to use the equipment. Have a person, instead of a machine, teach me. The computer ran me through a tutorial thing and then gave me a little paper saying I had been trained. I think 30 minutes to an hour of personal training would have made a difference. The finger print thing is frustrating. Many nurses aren't able to make it work. So much time is spent waiting. Some one should talk to the person that purchased it and put it into the system. The boss should take the complaints up the ladder. They go nowhere. A lot of frustration here.

Nurse number 34 agreed to share experiences with the interviewer at the request of the nurse supervisor of the intensive care unit. The experience was described to the researcher:

The big problem is how it is stocked. Not often enough, and the over-ride meds are not relevant to the needs of the area. If someone in pharmacy doesn't consider it a stat med it isn't on over-ride. Over-ride makes certain so-called emergency meds available even if they are not ordered for your patient. Well, if I need to give a suppository to a patient before he leaves for a procedure then I have to wait for pharmacy to process the order before it is available through the machine. That may take hours. If a Doctor wants a local anesthetic for a procedure I have to order it and wait for pharmacy to get to that order. I used to be able to just pull a bottle of Lidocaine off a shelf and get the job done. Narcotics run out regularly and then we have to go down to the main pharmacy to get it. User errors also cause machine failures. The Bio ID does not work well at all. We went to a code for a while. Now we are back to using the finger print scanner.

The metaphor is "not perfect". We need physician direct order entry. The order scanner is a pain. Each sequential step is verified by human beings, and they can make mistakes. Then the machine doesn't work.

Who-does-what is another problem. There are things that aren't being done because there has been no policy written to cover a situation. Who orders expired meds? We find ourselves breaking a lot of rules to just help our patients get the meds on time. Often I ask for one narcotic and it gives me two.

What do I do then? I have to find another finger that works to witness the return. That takes time. We are busy here. Eventually I find a finger.

Number 42, an experienced intensive care nurse had this to say about the experience of using the new information technology:

A big design flaw. The metaphor I'd use is "very frustrated". Or "does not work as advertised". I save all the receipts for the meds that I return or waste just to cover myself because I don't trust the thing. Inaccurate dispensing is a problem. Garbage in garbage out. It is supposed to be sophisticated. It is not. It runs out of Percocets and morphine. It slows down the schedule of dispensing meds. We had no input into the design. We bypass the system whenever possible. We borrow meds on the over-ride. Punch up one med and take everything that I need. It's like quick sand. The younger people may accept it better. I'm not sure about that. Feel my fingers. They are always cold. That's just me. So I have to warm my finger before I can access the machine. Make the Bio ID work for a starter. It was not working for weeks and they told us it was our fault. We weren't using it correctly. Then they finally came out and found that the lens was cracked. That was after weeks of them telling us we didn't know anything. I use the over-ride to get what ever I need in a hurry, and worry about it later. They don't stock enough.

Nurse number 48, another experienced ICU nurse, expressed a different aspect of

the experience:

> There is a great potential for abuse. It does not make narcotics accountable enough. It is too easy to walk with narcotics. They don't see it yet, but a couple of years from now there are going to be a lot of addicted nurses because of this machine. It exposes narcotics and nobody witnesses anything anymore. We just get a finger whenever we can. Sometimes that is way after the fact. Look, the machine is way back behind that wall. It takes forever to find someone to witness. The drawers open up by themselves sometimes. I've seen people put in totally false passwords and have it open for them. My finger works ok, but a lot of people can't get in. I watch the new grads because I think it is an open invitation for abuse. It does weird things. Management listens to us but there is nothing they can do. The old way was better. We had each patient's meds in the rooms.

This student researcher had an opportunity to interview a Registered Nurse that is employed by a public hospital other than the institution of which this study was the focus. This informant was selected because of an apparent confirmation of some of the claims made by the other informants. The informant is a long time professional with extensive military background and impressive rank. This is valuable input that will be useful in gaining an understanding of how nurses adapt to information technology:

I guess Pyxis is Ok. I've used it since September. It is a pain though. It does present a barrier to giving care. When I can get it to give me a med, I usually grab everything that I can use out of that drawer so that I don't have to dink around again. I've got sick and dying people to take care of and I have no time for technicalities. I'm sure the billing is way off. But the priority is the patient, not the damn machine or the bill. We are way over regulated. The Joint Commission has created too many meaningless regulations that are only barriers and end up costing us all more money. When I need a med I need it now, not after pharmacy has had time to enter and approve the order. I know my meds. I'm not exactly new at this.

A new graduate nurse, number 55, agreed to participate. This person's response was interesting:

I like it. It's convenient compared to not having Pyxis. It can be a hindrance when there is not a med that you want. The Bio ID is sensitive. It's great though. They need to increase the bank of meds. The discrepancies are somewhat of a pain. Oh, I have not passed meds here yet. I am just helping out until I get my license. I am not really allowed to use it yet. I don't have a password yet. I guess I haven't used it much at all.

Observations

During the course of the period of ethnographic interviews this researcher was

allowed to observe healthcare professionals operating all three components of the Pyxis system. Two pharmacists were observed on two separate occasions in two locations. Four nurses were observed during one session and two were observed at a separate location on another occasion. The total observation time was eight hours.

Pharmacist number 15 was observed using the Connect System to enter orders. Part of the observation time was a tour of the system conducted by the informant. Part of this hour session was spent in quite observation. The researcher requested that the informant proceed with normal procedure.

The guided tour involved the informant expressing praise for the system as the function of each task was explained. There are two screens over which a single mouse may travel. Information from one screen can be moved to another screen. Physician orders are read, checked and the ordered medications are then entered into the patient profile that makes those medications available at the Pyxis Med Station for nurses. Nurses or ward clerks have sent the orders to this screen by scanning them into the system at the nurses' station. The pharmacist sits in the satellite and performs the task of entering those orders into the profile.

Orders are stored in the system so that they may be reexamined if necessary. The orders can also be magnified so that handwriting can be studied to insure that there is no mistake made in reading the order. Notes can be made directly on to the

order to be referred to later. Each time a new order is written for a patient, whether or not it contains medications, the pharmacist reviews it. During early implementation, Pharmacist number 15 stated that he was still learning to use the system but enjoyed being part of the new technology. Those comments are contained in the ethnographic section.

The next observation was of Pharmacist number 27. It provided an entirely different picture of the experience. This person had come into work to find “fifty orders waiting to be entered”. This person expressed extreme dissatisfaction with the system. Those comments can be found in the ethnography. The system had “gone down “ during the night and the person on duty was not able to “get it going until late in that shift”. The researcher asked to observe as this pharmacist worked at entering these sets of medication orders into 50 different patient profiles so that the nurses could then give these medications. The phone rang often with nurse complaints regarding their situation that was due to the orders not being in the patient profiles. As the pharmacist worked on the backlog of orders, the morning orders were coming into the system as physicians made their rounds and wrote new orders for their patients. A certain amount of these orders involved modifying the orders that had not yet been entered.

The process of entering orders includes several steps that must be accomplished in the correct order so that the order will be moved from one screen to another screen

and thus be entered into the profile, as well as stored. If one step is not accomplished correctly the procedure is started again. Pharmacist number 27 expressed frustration with the system and what was termed “extra steps”. In addition, number 27 complained of feeling like a “slave to the computer”. With the old system this person thought that her/his time would have been spent out on the floor collecting the morning orders, conferring with the physicians as they made their rounds, as well as making direct contact with patients and nurses. Twenty-seven said that there would be little chance to leave the office this day. Nurses were observed using the Med Station component of the Pyxis System. In each observation the finger scanner (Bio ID) was demonstrated. Several situations in which the scanner did not function for a particular nurse were demonstrated. Efforts to clean the scanner surface were also viewed. One nurse demonstrated that she needed to warm her fingers under water before the Bio ID allowed her access. After the nurse scans the right index finger a password must then be typed into the computer. If all is functioning the nurse then selects the patient and appropriate medications. If the pharmacist has not entered that medication into the profile it is not available. If it is an emergency medication it should be on an over-ride list that then makes it available. An order can be entered later to account for that medication usage. On several occasions the researcher observed drawers not opening.

On three occasions narcotic drawers opened to expose more medications than had been requested. The extra medication must then be returned to the machine with a witness who must go through the fingerprint scanner/ password procedure. On one occasion the witness could not make the Bio ID accept the fingerprint. Another nurse was asked to come to the Med Station to witness the return of that initially requested narcotic.

In some instances the medication that was on profile was not in the machine. The Pharmacy was called to restock the machine or a nurse went to Central Pharmacy. It is on the ground level in another building. On four occasions the researcher observed nurses using the override list to cause “the machine” to expose medications that were not yet on profile. The explanation was that this was done so that the patient would not have to wait for the pharmacist to enter that order. After that order had been entered, the nurse went back to officially access the medication that had already been given. The machine then records that medication as having been given at the time of official access, not at the time of actual access, which was earlier in the day.

Nurses complained that narcotics, in particular, were now in inconvenient dosages in order to fit the machines drawers. This then necessitates the removal of more than one vial, or the wasting of part of a vial in order to accommodate the prescribed dose. All wastage must be witnessed using the fingerprint/ password

procedure. Another nurse must be found to witness this event. The researcher observed the actual waste- witness procedure being accomplished well after the event of the disposal of the narcotic.

During the majority of observed interactions the Med Station functioned. However the above- described events occurred quite often. Every nurse that was observed to interact with the system experienced at least one malfunction of that system during observation. Malfunctions are defined by nurses as: drawers not opening; drawers opening inappropriately; Bio ID not accepting fingerprint; medication not present in the machine; needed medication not on profile; profile being used to access another medication; over-ride being used to access other medications; narcotic witnessing done at a later time than actual return or waste of that narcotic; inappropriate narcotic dosage present in the machine; and nurses leaving the patient care area to obtain medications from Central Pharmacy.

It is perhaps noteworthy, at this time, to provide the researcher's perception of an observed change of attitude between early observations and ethnographies and those done later in implementation. Whereas, in the first set of ethnographies and observations many of the informants expressed frustration regarding their experiences, the later observations were perceived by this researcher as containing a sense of resignation and a determination to work around the technology. There did seem to have been a certain skill developed in the use of over-rides and

alternative profiled medications to obtain the immediately needed medication. It appeared that post- actual-time-witnessing of narcotic wastes and returns have become accepted events. Similar feelings of frustration with the system were present over the entire three-month period. It seemed that nurses had developed methods of circumventing the procedures in three months.

In the late implementation observations every nurse interviewed or observed did state that the Pharmacy Satellite Pharmacists were working hard to help them accomplish their task of getting medications to the patients in a timely manner. It appeared that all were ignoring the practice of new procedures that would have previously been considered unacceptable or taboo.

## Conclusion

This qualitative report is intended to help provide understanding of the experiences of health care professionals during the implementation of an information technology system in the public acute care setting. This information hopefully will generate questions to be answered by further research. In addition, the ethnography contained in this work may provide useful information to organizations, manufacturers and vendors of information technology. The study is focused on the experiences and personal meanings of 22 Pharmacists and Nurses gathered in the course of 26 interviews and eight hours of observation in the naturalistic setting. These informants were selected by initial introduction of key

middle management personnel to this student by Pharmacy Administration. These middle management personnel then suggested other people to interview and a snowball method was used to obtain the remaining informants.

This snapshot of experiences suggests that the information and theories presented in the literature review are accurate. There may indeed be certain principles that should be followed in order to enhance the prospect of successful implementation. The literature review did point to the following principles: organizations do possess sub-groups that have uniquely different, and possibly divergent, perspectives on any given situation

(Douglas, 1983); work groups may develop a mistrust of other groups, thus developing a "we-they" culture; a "not invented here syndrome" (O'Dell, 1998), in which ideas not originating from the reference group are rejected.

O' Dell (1998) also describes barriers to sharing of knowledge. These may be elements of the dynamics observed at this particular site of field research. These barriers: ignorance of existing knowledge; lack of time, money and management resources to pursue that knowledge; and lack of preexisting relationships that would facilitate the transfer of knowledge, are manifestations of the organizational culture.

Baskerville and Smithson (1995) point to a situation in which necessary organizational transformations are overlooked in favor of technology. This leads

to the technology becoming the focus of change, rather than the desired improvements of organizational culture. The original purpose of the technology can become lost in a stubborn determination to make a system work. Management may choose to ignore the experiences of those on the ground working with the technology. Priority to accomplish implementation on a time schedule dictated by contracts, administration and corporate commitments could replace the original goal of making work more efficient. Suchman' s (1983) idea that actual work tends to be performed in a manner far differently then office procedures prescribe, may be demonstrated here, as professionals find ways to circumvent the new technology.

The unpredictability, and chaotic nature of human organization may be overlooked. The mechanical thinking, that often accompanies technology, may not fit the emergent organization (Baskerrville and Smithson, 1995). They go on to suggest that technology needs to be adaptive to the organization. Technology should also facilitate double loop learning. The ethnographies do not appear to describe an organization that is able to examine the way in which it learns. Technophobia (Brosnan, 1998) may be present at this site. Professionals repeatedly made statements that could be interpreted as expressions of that phenomenon. The amount of variance in degrees of anxiety expressed by informants could be related to various levels of state, versus trait, anxiety in

individual informants. Gaudy and Spielberger (1971) claimed that anxiety does not enhance learning. Howard (1986), as well as Spielberger and Gaudy, propose that the anxious person needs gradual prolonged exposure to new situations. This exposure should contain experiences of success. Howard continues to say that the short, intense training session is ineffective. The training described by nearly all of the informants seems to, at best, demonstrate that short training sessions was the mode chosen by the organization. This does not reflect an awareness of anxiety as a component of resistance. There seems to be no planned approach to overcome the anxiety concerning new technology.

Change implementation is unpredictable (Balogun and Johnson, 1989). Worthley and Di Salvio (1995) see that issue as being a managerial problem. The ethnographies suggest that these unexpected changes are perceived as not being addressed by management. The nurses' experiences, after three months of implementation, point to unanticipated changes in work habits occurring as a result of the new technology. Some of these emergent conditions may not be consistent with budgets and missions. Pharmacists related the addition of FTEs to accommodate the technology. Nurses reported that a change in staffing ratios was a result of the new system.

Balogun and Johnson (1998) also accurately predict a "black hole effect" in which certain functions are not addressed by implementation. Ethnography describes a

situation in which medications are not being re-ordered because no one seems to know “who’s job it has become to do so” under the new system. This alone, points to many areas of possible concern. Lack of communication between subgroups, the we-they syndrome, non-management of emergent results of implementation, and failure of the subgroups to work together suggests organizational cultural problems. Those problems could extend beyond information technology implementation.

The pre-existing organizational culture may be amplified by implementation of information technology (Hanseth and Braa, 1999). Failures of that organizational culture may become enlarged. Information technology may change the organizational culture in unforeseen ways (Balogun and Johnson, 1989). New relationships may be built and old relationships may change or disappear. New priorities may replace those of the pre-implementation organization. Survival instincts can bring about an unplanned change in procedures that may not be consistent with old priorities or legalities.

Some personnel may revile in the addition of a new technology for the sake of learning a new technology. Others may lose their identities, as well as roles and accomplishments, that had previously provided job satisfaction. Some people may become entirely overwhelmed and use anger as a means of coping.

The work represented in this paper is but a snapshot taken through a very small

window. However this picture does seem to be consistent with ideas expressed in the review of the literature.

The personal experience of the research student conducting the interviews is worthy of comment. A good many of the informants expressed fear of their statements being connected to them. This seemed to be most true in the discipline of Pharmacy. The interviewer was repeatedly asked for reassurance concerning this. The interview sessions often took on the properties of a therapy session in which the informant felt the need to “unload” or “vent” feelings of frustration and anger. One interview was terminated because that informant stated that she/he was “too angry to talk about it”.

A related subject is the interviewer’s perception that although the opening statement made by the informant may have been “I like it”, the ethnography then mainly contained complaints about that system. Often these complaints became detailed as well as emotionally charged. This was true of both disciplines. This generates the question of interviewer effect versus the surfacing of true feelings. Since management had recommended several of these informants, the student questions: was the informant initially merely parroting an expected response? At the same time, the student questions the extent to which his demeanor or personal attitudes affected the ethnography.

It may be helpful to know that the student has worked with, as well as help

implement, a similar information technology system during his career as a Registered Nurse. The last such system was the Pyxis system. That experience was with an older generation of technology and did not possess many of the features included in the current system. In addition, the student is married to a Doctor of Pharmacy that has recently implemented such a system on a slightly smaller scale. The student researcher can say that he initially entered this ethnological process with, if anything, a bias in favor of the system.

Implications for Further Research

Clearly there is an implication for further research into the effects of information technology on organizations as well as individuals. Future qualitative study at both the public administrative or corresponding corporate levels, and the organizational level, are indicated. Answers to questions regarding which hybrid of change theories (Poole et al., 2000) was involved in the decision process to purchase and implement this system may provide some insight. At the organizational level an understanding of the motor for change could also shed light on the rationale for the timing and methods of implementation. The perceived problems that have accompanied implementation could be explained by such research.

Reproduction of this research, that makes use of a larger sample size, will provide a more complete picture of the studied phenomena. In addition to using a larger

sample size, this research should be performed over a greater duration of time. The increase in research time would allow for participation of informants from a greater number of work areas within the organization. The increased duration of the study may further uncover the emergent nature of implementation.

Quantitative work could be pursued regarding the validity of varied training methods. Training duration and quality seem to be recurring issues in the ethnography. The information gained in specific research regarding training on this type of system could then be applied to future implementation. This work does suggest a disparity between the perceptions of the educator and that of the educated.

Future research could involve study of acceptance and adaptation to change brought about by technology, as related to degrees of experience and seniority within the organization. This was beyond the practical scope of this research. This study was unable to obtain a significant number of new nurses or pharmacists that would provide data to suggest a difference in experiences. This is an appropriate subject for future quantitative and qualitative research.

A recurring theme expressed in the ethnography is a perceived lack of technical support. Further qualitative research with users of the technology may help substantiate the findings of this work. Quantitative research regarding the effects of varying levels of support on successful implementation and customer

satisfaction could benefit all parties.

In addition, several of the ethnographies claim deficient workmanship in manufacture of that technology may be a factor contributing to the experiences of the informants. There is a perception that the Bio ID System technology is not advanced enough for this application. There also is a perception that Med Station regularly malfunctions, thus creating unplanned work flows. These malfunctions are perceived to be both mechanical and software related. This research concludes that these are the shared perceptions of the majority of informants. These perceptions provide ample material for future studies.

As suggested in the literature review, a close look at the existing organizational culture may be the first step of implementation. This may be the real key to successful use of information technology. Implementation of any meaningful organizational change may first entail the restructuring of the manner in which the organization functions. Issues of organizational power, communication, priorities and mission are all subject for closer study before attempts at implementation have a chance at success. The ethnography and observations in this study do seem to suggest that preexisting organizational traits were amplified by implementation of this technological system.

## Implications For Action

The findings of this research imply action for change in five areas. These

implications for action are based on principles stated in the literature review as they apply to the results of the ethnographic research.

Organizational culture and implementation.

This research suggests that there are organizational cultural issues of communication and trust that need to be addressed before a successful implementation can proceed. Ethnographic findings show that there is considerable negative emotion directed at management and administration regarding implementation. This “we-they “ environment could be addressed with a Teams training approach that is designed to build a shared vision within work units and throughout the organization. This will require an investment of resources and a genuine commitment from the administration to instill that shared vision at every level of the organization.

Training and technophobia.

Consistent with the work of Spielberger, Gaudy, Howard and Brosnan, computer anxiety must be recognized as a real human phenomenon that effects learning and therefore successful implementation. Technophobia that may be the result of both trait and state anxiety presents barriers to learning and subsequent use of technology.

Short, intensive training sessions are not appropriate for many of the intended users of the technology. The literature states that training provided over a period

of time is an effective means of overcoming anxiety related barriers. Learning is further enhanced when it contains experiences of success. Computerized tutorials are an example of short intensive training sessions. In addition, computerized tutorials require a person that possesses a state anxiety related to technology to use that same threatening stimulus to learn.

Ethnography points to a perceived need for human instruction. The ethnography also depicts a disparity between the perceptions of the trainer and those of the informants regarding the effectiveness of the training. A new approach to training will require an investment of resources.

Unanticipated changes and unforeseen consequences.

Implementation of technology impacts organizations in unexpected areas, and creates unanticipated changes and unforeseen consequences. An organization that fosters a free flow of communication will be able to see changes as they occur in the course of implementation. Management must possess the commitment and resources to capitalize on unexpected positive changes and manage the unforeseen consequences appropriately.

The ethnography in this work described feelings of inadequacy by those involved in the management of the emergent properties of implementation. An increase in the number of implementation managers may be one answer to this situation. Ongoing ethnography of those who are performing the work that is being

transformed would provide these implementation specialists with much of the necessary information. This approach may eliminate the “black hole effect”, as well as increase the organization’s ability to respond.

Another unforeseen consequence is the perception of informants that, because of the Connect System, the pharmacist is no longer available in the patient care areas for consultation with physicians and nurses. Pharmacists believe that interventions, which are a means of reducing cost and improving outcomes, are now not being accomplished. Pharmacists expressed a sense of becoming “slaves to a computer, rather than being pharmacists”. Pharmacy staff and leadership can develop a new staffing model that will provide clinical pharmacists and Doctors of Pharmacy to perform those critical clinical functions, while basic pharmacists and technicians handle processing of orders. The details of such a work flow change need to be designed by those performing the work. This new staffing model may require a change in the FTEs as well as a change in the culture of the Pharmacy Department.

Yet another unforeseen consequence is the nurses’ perception of the advent of inconvenient dosages of narcotics as a result of the drawer sizes in the Med Station. An issue that may be partially related to this unforeseen consequence is the informants’ perception of decreased narcotic accountability. These important moral / legal issues could be addressed as design flaws, or as opportunities for

process change.

Technical support.

Informants repeatedly expressed a perception of inadequate technical support that was manifested by either unresponsiveness or prolonged response time. The vendor and the customers could brainstorm to arrive at an improved method of communicating the need for immediate technical support. This brainstorming method also could result in an improvement in proximity of that technical support. Superb technical support is a reasonable expectation of the customers of this product.

Design flaws.

Observations and ethnographies describe apparent malfunctions of the Med Station and Bio ID. Clearly the manufacturer and vendor need to examine these systems for opportunities to improve workmanship and upgrade technology. A design approach that is referred to in the literature as “computer supported collaborative work” would be appropriate. As described earlier in this paper, the key principle of CSCW is participatory design. The literature does not allow for the existence of a universal technology. Each locality has its own unique application. If that wasn’t challenging enough, each locality is staffed with humans. This fluid environment dictates the necessity of involvement of the users of the technology in the design of that technology.

Ethnographic research into how work is actually accomplished at the specific locality is essential to the design of, and appropriate application for, that technology. Ongoing ethnographic research after initial implementation implies continued relevance. The “not- invented-here” syndrome may be avoided as the user has, in a very real sense, invented- it- here.

Circumvention of an expensive system that results in loss of revenues and diminished accountability can be remedied by user participation in addressing issues of physical placement as well as access into the system. Ethnography and observation does suggest a need for development of a more streamlined method of access. Circumvention may be the user’s answer to the entire access procedure regardless of the existence of an obviously flawed Bio ID System. The research indicates that nurses are taking more medications than they need for a single patient as a means of avoiding the access procedure for subsequent patients. This is a clear example of costly circumvention of the technology.

A problem solving task force, consisting of all involved disciplines, may result in breakthrough technology or processes. This breakthrough technology may include the use of swipe cards instead of typed access and Bio IDs. Coupling that type of access system to other technologies, such as computerized master staffers and Pyxis generated medication administration records, could result in further breakthrough technology. These ideas are merely the author’s speculation,

however the need for an alternative to the present Med Station access procedure is indicated by this research.

All five areas of implications for action described in this work are related to organizational culture and therefore related to participatory design theory. To reiterate: an organization that talks and listens to it self, as well as possess a common vision is key to successful implementation of information technology in the public healthcare setting.

This qualitative research discovered four findings: resistance to the implementation does exist; resistance is based on a perception of lack of technical and managerial support, inadequate training, poor process planning, and dissatisfaction with the technology; nurses have created means by which to circumvent the system; the pre-existing organizational culture has contributed to this resistance.

## Proposed Future Qualitative Research

Comparative Study of Implementation of Information Technology in Public and Private Healthcare Settings

Implementation of Information Technology in Public Healthcare: is there resistance? (A larger sample size, with a longer duration of research.)

The Effect of Technophobia on Acceptance of Information Technology in the Healthcare Setting.

Organizational Culture and Implementation of Information Technology in Healthcare.

Implementation of Information Technology in Healthcare: effective training techniques.

Effect of Implementation of Information Technology on Job Satisfaction in Healthcare

Participatory Design of Information Technology in Healthcare

Motors of Change Related to Implementation of Information Technology

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