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ABSTRACT

This paper reports the findings of a pilot study undertaken to ascertain the feasibility of incorporating the Theory of Planned Behavior and the Taxonomy of Work Values into the explanation of physician technology acceptance of a new organizational technology – Computerized Physician Order Entry (CPOE). While Davis's Technology Acceptance Model has received much empirical support, we posit that certain complexities associated with the physician population and the hospital environment warrant the inclusion of other theoretical models as a means of furthering our understanding of technology acceptance. Although preliminary in nature, this study finds support for the inclusion of both the Theory of Planned Behavior and the Taxonomy of Work Values in further research examining this complex phenomenon.

INTRODUCTION

This study examines the feasibility of utilizing the constructs associated with the Theory of Planned Behavior (TPB) (Ajzen, 1988) as well as the Taxonomy of Work Values (Dawis, 1984) to explicate physician acceptance of Computerized Physician Order Entry (CPOE) beyond that which is possible with the Technology Acceptance Model (TAM) (Davis, 1989) alone.

We posit that although the TAM is useful in explaining general technology acceptance behavior, certain complexities associated with the physician end-user population require expanding the theoretical framework to include the TPB and specific work values. This pilot study seeks to ascertain the appropriateness of incorporating the Theory of Planned Behavior and the Taxonomy of Work Values into the study of physician technology acceptance within the healthcare environment.

Computerized Physician Order Entry is an automated clinical decision support intervention that enables healthcare organizations to improve patient safety, clinician workflow processes and resource utilization. CPOE embraces the precepts embodied within the concept of "evidence-based medicine" (Hieb & Handler, 2001), and may minimize the risk to a medical organization's reputation and financial viability. Kaushal and Bates (n.d.) provide the following definition of CPOE in the National Library of Medicine's "Health Services/Technology Assessment Text (HSTAT)":

> CPOE refers to a variety of computer-based systems of ordering medications, which share the common features of automating the medication ordering process. Basic CPOE ensures standardized, legible, complete orders by only accepting typed orders in a standard and complete format. Almost all CPOE systems include or interface with CDSSs of varying sophistication. Basic clinical decision support may include suggestions or default values for drug doses, routes, and frequencies.

CPOE embodies a shift from traditional, paper-based care coordination activities to automation of the order entry processes. As such CPOE represents a dramatic step forward for healthcare organizations. This shift can be an agent for change, eliminating confusing or illegible hand-written order documentation, minimizing transcription errors and fundamentally reducing clinical mistakes. A study examining the market perception of CPOE vendors defined CPOE as a system that "…meets the IT requirement of direct care providers such as nurses and physicians

founded upon a CPR (Computer-based or Clinical Patient Record) to assist in charting, supports physician order entry (POE) and provides rules-based alerting and reminders (Klas, 2002).

In an effort to add flexibility to the processes and change hospitals face when implementing CPOE systems, the Leapfrog Group now defines the point at which hospitals have fully implemented CPOE to be when prescribers enter at least 75% of medication orders via the CPOE system (Health Data Management, 2004). Moreover, with regard to the utilization of computerized order entry, the Leapfrog group has broadened its definition of "physicians" to include all clinicians authorized to order pharmaceuticals for patients.

Physician workflow potentially becomes more efficient with CPOE due to the embedded rules and artificial intelligence technology that incorporate knowledge tools and clinical decision support capabilities, ultimately enabling physicians to spend more quality time with their patients.

Numerous groups, including the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the Leapfrog Group, the National Quality Forum, and other researchers and organizations in this country have recognized the medical, fiscal, and overall strategic advantages associated with investing in technology that places physicians at the center of the order entry process. Despite the obvious advantages and documented improvements to patient outcomes that have been associated with the use of CPOE, as of 2000 only one third of all U.S. hospitals had installed automated order entry systems – with a mere 1 percent of those organizations mandating its use by physicians (Ferren, 2002).

STATEMENT OF THE PROBLEM

The potential for improved outcomes and increased patient safety realized by CPOE is recognized by the healthcare industry. However, according to a 2003 Leapfrog Group report (Leapfrog Group, 2003) very few U.S. hospitals have implemented any level of automated order entry processes that feature medical error notification capabilities. The explanation for this paradox is multi-faceted. CPOE represents a major operational and cultural shift for healthcare organizations regardless of their size or scope. However, within the healthcare environment, it is imperative that IT systems provide concurrent support between the clinical and business objectives. More importantly, if a system does not represent the "realities" of the health care delivery process, then the needs of the caregivers may not be met, and there exists a risk that the system will not be used (Dhillon, 2005).

Physicians, nurses and extenders function in a healthcare ecosystem known for its highly technical and specialized patois, which can be confusing and nebulous to the many non-medical professionals within the healthcare organization. Within the guise of IT systems design and implementation, there is a strong need for clear and concise communications between the medical personnel and the Information Systems (IS) staff. Chen, Miller, Jiang, & Klein (2005) propose that the existence of a "communication gap" between IS users and IS professionals may play a part in impeding the successful implementation of technology solutions if the communication skill requirements (both oral and written) that are perceived and expected by both the IS users and IS professionals are not appropriately aligned.

Expenses related to upgrading existing order entry systems for enhanced medication order processing, funding for additional workstations and resources, specialized systems training, and the challenges associated with achieving and maintaining physician buy-in and acceptance have all contributed to the limited success that CPOE has achieved thus far. It is within the context of physician acceptance of the Computerized Physician Order Entry technology that we base this study.

Physicians are highly educated, highly trained professionals, working in stressful and highly politicized medical environments. We posit that physicians accept technology based not solely upon the variables of perceived usefulness (PU) and perceived ease-of-use (PEU) – the integral constructs of TAM (Davis, 1989) – but also upon factors specific to physicians and the medical profession.

The objective of this pilot study is to examine whether or not a relationship exists between the constructs associated with the Theory of Planned Behavior, the Taxonomy of Work Values and physicians' acceptance of technology.

LITERATURE REVIEW

The Technology Acceptance Model

A recent article in the popular press (Healey, 2004) contends that computerizing physician orders is an early example of technical innovation that will change both the delivery of healthcare and the physician-patient relationship. However, the organizational changes associated with the implementation of new technology are seldom whole-heartedly welcomed by the employees tasked with utilizing those technologies (Lorence & Spink, 2004; Agarwal & Karahanna, 2000; Venkatesh & Morris, 2000; Agarwal & Prasad, 1999; Hu; Chau, Sheng & Tam, 1999). Davis' technology acceptance model (1989) has been the dominant theory and remains an important and viable tool for researchers in this arena. According to Chau (1996), it is perceived usefulness and perceived ease of use that are hypothesized and empirically supported as the fundamental determinants of user acceptance of a given new technology. The TAM's utility is evidenced by the numerous modifications and augmentations that have been made by researchers to address the question of technology acceptance as it relates to variables such as gender differences (Venkatesh & Morris, 2000; Gefen & Straub, 1997), user inexperience (Taylor & Todd, 1995), and culturally induced beliefs (Veiga, Floyd & Dechant, 2001). Some of the more significant contributions to the initial TAM research are summarized below.

Chau (1996) divided perceived usefulness into two types: Near-term usefulness and long-term usefulness. In his study, near-term usefulness had the more significant influence on the behavioral intention to use a technology. Other research has corroborated this finding that perceived usefulness is most important in the early stages of technology adoption when learning to use the technology is a major concern (Agarwal & Prasad, 1997; Davis et al., 1989). In 2000 Venkatesh and Davis published the results of four longitudinal field studies that tested an extension (TAM2) of the original technology acceptance model. TAM2 avowed that user acceptance was significantly influenced by social influence processes (such as subjective norms, voluntariness, and image) and by cognitive instrumental processes (such as job relevance, output quality, result demonstratability, and perceived ease of use). It should be noted that TAM2 was tested and validated only in situations where technology use was mandated.

In 2003, Venkatesh and Davis with others put forward and validated a Unified Theory of Acceptance and Use of Technology (UTAUT) which sought to integrate essential elements from eight previously established models. These models included the Theory of Reasoned Action (TRA), the original Technology Acceptance Model (TAM) and TAM2, the Motivational Model (MM), the Theory of Planned Behavior (TPB), the Combined TAM and TPB (C-TAM-TPB), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT). UTAUT proposes three direct determinants of intention to use technology (performance expectancy, effort expectancy and social influence), and two direct determinants of usage behavior (intention and facilitating conditions). UTAUT was found to explain up to 70 percent of the variance in the intention to use technology (Venkatesh et al., 2003).

Although technology acceptance research has made valuable inroads into the complexities of the how and why humans choose to accept or reject technology - and the pace at which that acceptance or rejection occurs - many of the studies utilizing the TAM, or some variant thereof, have centered on the technology acceptance dynamics associated with non-specific user populations working in varying occupational settings, utilizing a wide spectrum of information technology solutions (Veiga et al., 2001; Venkatesh & Morris, 2000, Gefen & Straub, 1997; Taylor & Todd, 1995).

Regarding the acceptance of technology by physicians, there has been limited research. Hu and Chau have conducted research regarding the adoption of telemedicine technology both at the organizational (2002), and at the individual physician levels (Hu & Chau, 1999; Hu et al., 1999). Their research suggests that individual physician professionals might differ in their decision to accept technology from the end-users and business managers that are more commonly studied in technology acceptance research.

Indeed, Dhillon (2005) revealed a presence of conflicting ideologies between hospital clinicians and administrators in a case study of differing perspectives between caregivers (i.e. physicians and nurses) and hospital managers (administrators) regarding a new hospital information system, which was perceived by the caregivers as being designed and implemented by management as a way to enforce hospital goals and objectives. The caregivers felt that the new system could not be effectively utilized because it did not reflect the very nature of their clinical

work, and many in the organization perceived "…a clear mismatch between the formally designed information system and the actual [clinical] practices."

Likewise, Johnson et al. (2002) explored the adoption of computer-based IS by medical groups in a managed care environment and concluded that the factors influencing the adoption of these technologies remained unclear; thus a continued need for research in this arena appears highly justified.

The Theory of Planned Behavior

While the TAM was initially derived in part from the Theory of Planned Behavior, this study reintroduces the TPB for a closer examination within the healthcare environment. Proponents of the Theory of Planned Behavior (Ajzen, 1988) contend that a behavior can be predicted by an individual's intention to perform that behavior. Intention to perform a behavior, in turn, is influenced by the individual's perceived control over the performance of that behavior, his or her attitude toward performing the behavior, and his or her perception of social pressure or approval from important referent individuals (also referred to as "social norms") to perform the behavior.

The Theory of Planned Behavior is derived from the Theory of Reasoned Action which includes the constructs of attitude toward behavior and subjective norm but not perceived behavioral control (Ajzen, 1991). Behavioral control reflects an individual's beliefs regarding the ease or difficulty of performing a behavior and incorporates the individual's past experience as well as anticipated obstacles. Behavioral control is similar to TAM's construct of perceived ease of use (Davis, 1989); however, it goes further by integrating past experience as well as the sense of control one may have with regard to choosing a behavior (as opposed to having a behavior mandated). Attitudes are formed by beliefs about the possible outcomes of a behavior, the likelihood of the outcomes, and the values placed on them. The TAM only considers one attitude as influencing technology acceptance – perceived usefulness. It seems reasonable that other attitudes (such as general feelings toward technology, what is appropriate or not when providing medical care, and the likelihood of success) could influence one's willingness to embrace new technology. Social norms are determined by the perceived expectations of significant others and the individual's motivation to comply with these expectations. People vary not only in their willingness to comply with others, but also in their knowledge of appropriate norms for behavior. We posit that both of these factors may be relevant for a physician population.

According to the Theory of Planned Behavior, individuals behave in accordance with their beliefs, and the theory has considerable support for behaviors in medicine, education, business, and the general population. The Theory of Planned Behavior implies that doctors' attitudes, their subjective norms and perceived behavioral control are positively related to their planned and actual behavior concerning the acceptance of new organizational technology operationalized as a Computerized Physician Order Entry (CPOE) system.

Taylor and Todd (1995) developed a theory (C-TAM-TPB) which combined the TAM's perceived usefulness construct with the attitude toward behavior, subjective norms, and perceived behavioral control constructs of the TPB. While our research also combines the two theories, we additionally add the taxonomy of work values to further explain physician technology acceptance.

The Taxonomy of Work Values

The Taxonomy of Work values suggests that the acceptance of CPOE will be furthered when CPOE reinforces those occupational values which are most important to physicians (Dawis, 1991). The concept of work values is rooted in the studies on work adjustment begun in 1957 by the Work Adjustment Project at the University of Minnesota under the direction of René Dawis and Lloyd Lofquist (McCloy et al., 1999). The impetus for their research was to explore aspects of an individual's work adjustment and develop assessment tools to measure and predict an individual's adjustment to work. Adjustments were found to be related to 21 vocational needs or "reinforcers," which were measured by having individuals complete the Minnesota Importance Questionnaire (MIQ) (Rounds et al., 1981). The reinforcers were then factored into six occupational values: Achievement, Working Conditions, Recognition, Relationships, Support and Autonomy/Independence.

Occupations are currently described by the Occupational Information Network (O*NET) based upon their relative standing on the occupational values within this domain (as well as other variables) as a means of creating a

taxonomy of work (Peterson et al., 1999). Research supports the contention that the fit between individuals' values and occupational characteristics has important consequences for both individuals and organizations – including improved performance and job satisfaction (Dawis & Lofquist, 1984).

According to the O*NET (online.onetcenter.org, 2004), the occupational values most strongly associated with physicians include: achievement, autonomy/independence, relationships, and recognition. Furthermore, in light of the unique nature of the work performed by physicians, the values espoused within a physician's code of medical ethics are also expected to be potential motivators for technology acceptance. Although there does not exist one unique set of practices or principals guiding the ethical conduct of physicians, the values expressed in the Hippocratic Oath are most widely accepted.

METHOD

Research Setting and Participants

The opportunity to observe and document the activities associated with a six-hospital healthcare system's technology implementation became available to the researchers in 2003. During the past eighteen months, data has been collected from this health system's medical leadership, as well from attending physicians practicing in those units participating in the CPOE roll-out (n = 26). An orthopedic unit within the system's primary hospital was chosen to be the first area to implement CPOE, in part because of that unit's less complex treatment protocols, and because one of the attending physicians had been identified as a technology advocate and project champion. After approximately 6 months, rollout of CPOE moved to the primary hospital's trauma unit as a way to test the system efficacy in a highly stressful treatment environment indicative of progressively more complex treatment protocols. The primary hospital's rehabilitation center became the third unit to utilize CPOE within the staging of the pilot testing opportunities among the health system's physician and extender communities.

The CPOE implementation will now move forward to all remaining units within the primary hospital facility over the next 24 – 36 months, followed by diffusion of CPOE to the remaining five hospitals in the healthcare enterprise. It is expected that full implementation will be realized during the next 3 – 5 years.

Data Collection

The findings reported here are the result of semi-structured interviews and surveys (see Appendix A) conducted by the researchers with participating physicians. Because a large-scale case study is the overarching research goal questions centered on both the theories of interest here, as well as numerous contextual factors thought to impact the acceptance of technology in a healthcare setting, are included in the interviews and surveys.

Analysis

Simple descriptive statistics are utilized for the purposes of this paper. Due to the limited sample size and the nature of the data collection, these are most appropriate for the preliminary examination of the theories thought to be related to technology acceptance in the current pilot study.

RESULTS

Descriptive analyses suggest support for our research assertions. The constructs associated with the Theory of Planned Behavior impacted the physicians' acceptance (or lack thereof) of CPOE within the current environment. Also, the occupational values of interest were found to be appropriate to physicians and perceived as being related to the hospital's implementation of the Computerized Physician Order Entry system.

To discern the impact of the Theory of Planned Behavior on physician technology acceptance, doctors were asked several questions gauging the constructs of perceived behavioral control, attitudes toward technology, and perceived social pressure regarding technology usage.

When asked "To what degree do you feel individual physicians will influence the decisions regarding CPOE?" there was variability in the responses. Specifically, only 27% (7) of physicians expressed the opinion that they have little or no input in these decisions, whereas the remaining physicians expressed the belief that individual physicians do or can have a great deal of impact in CPOE implementation.

In order to examine physicians' attitudes toward technology, questions were asked regarding their general use of computers and their expectations toward CPOE. When asked to describe personal computer usage (both at home and on the job), only one physician indicated a lack of comfort using the Internet, email, and basic word processing programs. The vast majority (85% or 22 physicians) indicated very frequent to near constant computing technology usage including the use of office productivity software, internet medical research, and extensive use of PDAs. Twenty percent of respondents (5 physicians) indicated considerable technological sophistication, to include database management activities, website development/maintenance, and computer programming. Not surprisingly, the more sophisticated users tended to be those directly involved in the development and roll-out of CPOE.

Physicians' attitudes toward CPOE specifically were evaluated using two questions – one to assess the degree to which they found the technology "appropriate for physicians," and one to measure their expectations for "success" of the technology initiative. Regarding whether or not CPOE is a suitable tool for physicians, there appeared to be consensus that it is, but with a notable caveat. Eighty one percent of physicians (21) agreed that while CPOE is "appropriate" for their personal use, it is also equally appropriate for use by their extenders (physician assistants and nurses) on their behalf. Eighty percent (20) of the physicians interviewed expected a successful CPOE implementation at their hospital.

Hospital medical leadership professes to fully support CPOE, and as such pressure for physicians to use the technology is evident. All but one physician indicated that they believed that the hospital leadership and culture "embraces technology," however 15% (4) physicians indicated that leadership should pursue technological innovation more aggressively. It should be noted that medical leadership's support of technology did not appear to affect individual physician acceptance of CPOE; no physician reported that this was a major factor impacting their personal acceptance of the technology.

Two factors that did impact acceptance were the physicians' knowledge of CPOE implementations at other healthcare organizations and their level of participation in this project. The 12 physicians that indicated that they had "read about successful CPOE implementations at other hospitals in the U.S." were more positive in their expectations and evaluations of the current CPOE project.

With regard to whether or not appropriate work values had been selected for study, all of physicians indicated that a sense of achievement or success was an important motivator and 96% (25) asserted that autonomy was important to them on a daily basis. Relationships with patients were important to 88% (23); however, 3 doctors indicated that patient relationships were less important than successful treatment of the patient. Fewer physicians (65%) indicated that recognition from leadership was important.

The second, and more central issue, was the degree to which CPOE was seen as impacting the values that physicians hold in high regard. If, as anticipated, CPOE was seen as furthering these values, then the motivation to embrace it should be increased; however, if CPOE was seen as undermining or negating these values, then the physicians should be less likely to accept this new technology.

Eighty eight percent (23) of the respondents felt that those values embodied by a physician's code of medical ethics could be advanced with a suitable CPOE initiative.

Results also indicated a strong case for adopting CPOE based on the linkage between it and the value physicians place on patient relationships and professional achievement/success. Specifically, 88% (23) of the medical personnel interviewed saw the potential that CPOE presented for providing better care to patients by preventing pharmaceutical errors, increasing efficiency, and enabling better communication with other hospital personnel. These factors underlie both physician occupational values.

Approximately 40% (10 out of 26) of the physicians viewed CPOE as potentially undermining their independence, resulting in their possible rejection of the technology. Physicians indicated three ways in which

CPOE might undermine their autonomy: the use of pre-defined order sets, the ability of other physicians to second-guess patient orders, and scrutiny over medication and other care decisions. Each of these potentialities is seen as detrimental to physician autonomy.

Recognition from medical leadership did not have a clear impact on physician acceptance of CPOE. Two plausible explanations are: 1) only 23% (6) respondents saw a direct linkage between using CPOE technology and appreciation expressed by hospital leadership, and as stated above 2) hospital administration does not believe that their recognition of physicians is important.

DISCUSSION

Contributions, Strengths, and Limitations

Whereas previous studies have examined the roles that attitudes, norms, and control play in diverse behaviors and the role work values play in job performance, the current study provides preliminary empirical support for the contention that all of these factors also influence technology acceptance.

Questions which examine the constructs associated with the Theory of Planned Behavior, those aimed at measuring the degree to which physicians perceived control over the development and use of CPOE, the attitudes of physicians toward this technology and their expectations for its successful implementation, and even pressure to use the technology all indicate that these factors are very much at play in the current change initiative and are influencing the degree to which the physicians embrace CPOE as a useful component of patient care.

Opinions regarding the success of the current CPOE version were mixed among those actively participating in the planning and implementation stages of the project. For the most part success is anticipated, which appears to be a direct reflection of their interaction with the medical leadership and Information Systems (IS) department throughout the project. Of interest was the fact that those physicians who had played significant roles (i.e. physician liaisons, champions, etc.) in the CPOE implementation process had markedly more positive attitudes toward the new technology and expressed a greater willingness to use the new technology than those who did not have an active role in the planning and implementation activities. This supports the contention that perceived sense of control plays a role in doctors' behavioral intentions.

Among those physicians who have been less involved with the planning and implementation (end-user physicians) of CPOE, there was consensus that computerized order entry would be implemented in some fashion, but they did not appear certain that the current CPOE system would succeed. Moreover, these individuals expressed less enthusiasm and support for the system as a whole. But because they saw the technology as being embraced by their peers – whose opinions they value - we believe that the less involved physicians experienced social pressure to accept CPOE.

A better understanding of physician opinions in all three of the Theory of Planned Behavior's realms will allow the organization to tailor its technology implementation strategy in such a way as to dispel many concerns physicians have through increased participation and training or developmental activities. In this instance, the knowledge obtained regarding sense of control, attitudes, and normative pressure all provide the potential for structuring the technology initiative in such a way as to help ensure success.

Although the four occupational values characteristic of physicians do not apply to all professions, all professions can be characterized in terms of their standing within the occupational value taxonomy. As such, the potential for organizations to tap into these values and utilize them to facilitate large-scale technology-based change initiatives exists. For example, an interesting distinction arose when physician medical administrators were asked to rate the level of motivation that work values had on physicians. The administrators agreed that achievement, autonomy/independence, and patient relationships were important to most physicians to varying degrees, but the administrators unanimously indicated that recognition from hospital leadership was of little or no importance to practicing physicians.

In addition to support for the inclusion of the two theories above, other knowledge was gained as part of this study that might be used toward increasing physician technology acceptance in the future. For example, a strong

emphasis was placed on the need for the CPOE technology to be structured and implemented in such a manner as to support the physicians' normal workflow, rather than creating additional tasks. Physicians stipulated that their extenders be given full and easier access to the order entry system, since extenders have historically had full access to written patient orders. With regard to the less technology-savvy physicians this indicated a measure of ambivalence toward actually using this technology in a hands-on way, and a preference for the "old way of doing things." Although this is recognized as a potential impediment to universal acceptance of CPOE, the medical leadership has indicated that there are currently no plans to offer extrinsic reinforcement for adopting CPOE.

The current study is not without limitations. The number of physicians currently utilizing the CPOE technology is limited and therefore data collected thus far is not appropriate for traditional statistical analysis. In addition, sampling criteria such as age, gender, and ethnicity are not considered relevant to the study at hand, but may be included in future research initiatives.

Furthermore, actual model testing and research conclusions can not be fully realized at this time. The study is longitudinal in nature and completion within the projected timeframe will be dependent upon the speed and efficacy with which CPOE is implemented across the entire healthcare enterprise. As the number of physicians interviewed increases, statistical analyses testing the theories put forth can be conducted.

Concluding Remarks

This research endeavor presented the opportunity to substantially contribute to an understanding of both the individual and contextual factors that play a determinant role in the acceptance of new organizational technology. While the existing literature has been instrumental in providing a framework for understanding behavior in this realm, this study has provided the opportunity to observe the dynamics of technology acceptance within a technology-rich healthcare setting and upon its primary actors – the well-trained, highly-educated physician and extender workforce.

The data collected within the parameters of this study have validated that the constructs associated with the Theory of Planned Behavior may be predictors of technology acceptance insofar as physician's attitudes, subjective norms and perceived behavioral control are positively related to their planned and actual behavior concerning the acceptance of a Computerized Physician Order Entry (CPOE) system. Moreover, the data have supported the Taxonomy of Work Values constructs that the values espoused within a physician's code of medical ethics – specifically those related to patient safety – were important motivators for their acceptance of the CPOE technology.

As previously discussed, the number of physicians currently utilizing the CPOE technology specific to this study is limited and not appropriate for traditional statistical analysis. However, as this is a pilot study aimed at examining the appropriateness of including additional factors when predicting technology acceptance, the limited sample size is not inappropriate for drawing conclusions toward this end. Specifically, the population included in this pilot study represents approximately 5% of the physician population at the medical facility being studied. Future research utilizing larger samples will obviously be required to statistically validate the assertions made here with regard to the physician population as a whole.

It is important to note that the defining characteristics discussed in this study are not unique to one industry – i.e. healthcare. Indeed, we believe the data will have far reaching implications for all industries, and more specifically for the many organizations engaged in change initiatives centered on technological innovation. Such insights can lead to new and innovative ways to mentor, train, and motivate technology users within diverse industries and organizations world-wide.

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APPENDIX A

SURVEY INSTRUMENT

Background Data Form for CPOE Participants*

Name_____
Age_____ Sex_____
Work Address_____
Telephone_____
Email_____
The following questions pertain to your work experience, current job, and technology usage.

1. Medical specialty_____
2. Do you have any secondary specializations within your area? Yes_____ No_____
   If yes, what are they?_____
3. Number of years as a practicing physician _____
4. Number of years at PCMH _____
5. Have you ever served as the PCMH Physician Chief-of-Staff? _____
6. Time in current position _____
7. Is your practice limited to PCMH? If not, where else do you practice and how frequently?
8. Please describe your personal computer usage, both at home and on the job.

General Interview Instrument*

Date _____
Participant Name _____
Participant Position _____
Organization _____

1. How would you describe the organizational culture at PCMH? Would you describe the hospital leadership/administration here as more task or relationship oriented?
2. To what degree do you feel the culture and/or leadership embraces technology?
3. Do you know why Computerized Physician Order Entry (CPOE) is being implemented at PCMH?
4. How was that communicated to you, and by whom?
5. Are you directly involved with the CPOE project? If so, please explain.
6. To what degree do you feel individual physicians will influence the decisions regarding CPOE?
7. In your opinion, what is the primary benefit of CPOE?
   If the physician response does NOT address "patient safety" then ask the follow-up question:
   Would you relate the Physician Code of Ethics and the responsibility to "*Do no harm*" to CPOE? If so, how?
8. Have you read about successful CPOE implementations at other hospitals in the U.S.? If so, does this influence how you feel about CPOE?
9. Do you think it will be a success at PCMH? If yes, what factors do you think have contributed to its success? If no, why not?
10. Do you think CPOE will be successfully implemented at the other UHS hospitals? Why or why not?
11. To what degree to you think the following concepts are important to physicians in general and how do you perceive CPOE impacting them (if at all)?
    a. Physician achievement/success
    b. Physician independence
    c. Recognition from leadership

* A similar instrument may be used for non-CPOE participants

* Interviewer may deviate from this list of questions as participant answers warrant

d. Patient relationships

12. Do you feel that CPOE is an appropriate tool for physicians?
13. Do your feelings of responsibility toward your patients impact your acceptance of this technology? How so?
14. Do you think that CPOE will influence your malpractice risk? If yes, how?
15. Is there anything else you'd like to share?