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RESISTANCE TO MANDATORY TECHNOLOGY USE – THE CASE OF EMR IN THE UNITED STATES HEALTHCARE INDUSTRY

Research in Progress

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Abstract

Organizations implement information systems (IS) to enable the capture, storage, and analysis of large datasets and inform decision-making. In the United States, government agencies are deploying IS-centric plans to remedy cost and quality issues in healthcare by aggregating and analyzing data on worker performance, patient outcomes, and administrative processes. Federal agencies hope that data-driven approaches will improve administrative decisions and the treatment of patients. A review of existing IS research suggests, however, that the goals of technological interventions often prove difficult to attain. One reason is that technologies do not always suit the context of use, so workers resist. When resistance is locally severe (i.e., many workers in the same organization resist), the organization can customize or replace the technology to satisfy its workers and generate desired outcomes. But when the technology and its uses are mandated, such as in healthcare, organizations have little flexibility in adoption and implementation decisions, and workers have few opportunities to act on their frustration via their use of the technology. How, then, might workers respond when traditional forms of resistance cannot escalate and derail implementation? I investigate this question through a qualitative study of healthcare workers' responses to the electronic medical records (EMR) program. Under this program, organizations must adopt federally-certified EMR and comply with standards for use, or face financial penalties for noncompliance. Preliminary evidence suggests that when opportunities for localized resistance to change are limited, workers leverage political and social structures—such as professional organizations—to resist changes to their work. Continued study in contexts where technology use is mandated is essential for the development of theories that go beyond localized resistance and provide a comprehensive view resistance. Practically, a comprehensive understanding of resistance can inform policy and technology design, implementation, management, and evaluation in healthcare and elsewhere.

Keywords: Digital Scut Work, Electronic Medical Records (EMR), Healthcare, Implementation, Globalized Resistance.

1   Introduction: Resistance to Technology Implementations

The U.S. healthcare industry is undergoing a federally-mandated transition from paper-based patient records to electronic medical records (EMR). In the hopes of achieving efficiency and quality improvements in healthcare, the 2008 Health Information Technology for Economic and Clinical Health (HITECH) Act mandated that all organizations receiving Medicare and Medicaid payments—over a million hospitals and practices (CMS, 2015)—adopt and use federally-certified EMR technologies. The federal mandate has increased EMR use, with 78% of providers now using the technology (CDC, 2015). In an effort to build a national digital infrastructure of patient data, the HITECH Act also mandated that doctors, nurse, and others charged with using EMR use features that satisfy stages of "Meaningful Use" standards to ensure data accuracy. Although most providers complied with the first stage of standards (CMS, 2014), most have since struggled and failed to comply with the second and third stages; in the face of these struggles, the government has indefinitely postponed the fourth stage (CMS, 2016). This paper explores whether this non-compliance represents workers' resistance against mandated technology implementation and use.

Studies of technology and work provide useful lenses for explaining the changes a new technology implementation introduces and, ultimately, how its outcomes arise. Studies often point out that workers' actions at the point of use of the technology—e.g., their decisions to use or not use various features or their development of "workarounds"—bring about post-implementation changes (Barley, 1986; Leonardi, 2011; Orlikowski and Barley, 2001). Resistance of this type fascinates IS researchers because its outcomes can be dramatic: In the face of resistance, organizations may decide to cancel the technology (Bauer, 1997), expend resources customizing it (Chou and Chang, 2008), or find ways to subdue resistance (McAfee, 2006). Research on resistance emphasizes actions that take place at the point of technology use and relates these behaviors, such as intentional misuse and sabotage (Perrow, 1967; Shaiken, 1985; Wynne, 1988), to organizational-level outcomes (Joshi, 1991; Lapointe and Rivard, 2005; Marakas and Hornik, 1995; Markus, 1983).

Researchers have devoted significant effort to investigating the antecedents of resistance. A common antecedent is workers' anxiety about potential or realized changes to their jobs and work practices (Beaudry and Pinsonneault, 2005; Hiltz and Johnson, 1990). Other factors, such as previous experiences with technology (Marakas and Hornik, 1996) or effort expectancy (Venkatesh et al., 2003) also influence how a worker reacts to new technology. In short, research suggests that resistance results from workers perceiving new technology as an intrusion into an otherwise stable work world (Markus, 1983). As Keen (1981, p. 28) explained, resistance becomes "… a signal from a system in equilibrium that the costs of change are perceived as greater than the likely benefits." Keen noted that in practice, a new technology can threaten individuals and groups by "intruding on their territory, limiting their autonomy, reducing their influence, or adding to their workload."

At the heart of workers' resistance in these studies is the idea that local action may alter, stymy, or end implementation of the offending technology. But in settings where external forces mandate implementation for all organizations and specific uses for all workers, local resistance may not be effective. In the U.S. healthcare system, for example, non-compliance with EMR implementation and standards of use results in financial and legal penalties. Thus, although workers may voice their frustration, local resistance to universal, mandated technology implementations may be unlikely to produce satisfactory outcomes. How, then, do workers effectively resist mandated technologies?

In the balance of this paper, I report on the results of a qualitative research study aimed at understanding resistance to EMR in healthcare. I found that although many doctors, nurses, and other healthcare workers at my fieldsite voiced frustration with how their organization and the government are using EMR to track and evaluate performance, local resistance was limited. In other words, most workers, even those adamantly opposed to the program, used EMR in a compliant fashion at the stage one level.

However, the professional organizations to which these workers belong—led by the American Medical Association—are engaged in global resistance to the higher stages of use via political and social avenues such as lobbying Congress. I strive to expand notions of resistance by identifying relevant concepts and theories that might help contend with global, not local, actions.

2 Methods

2.1 Setting: Mandatory EMR implementation in the U.S. healthcare industry

The U.S. federal government's healthcare technology program promoted the rapid uptake of systems that are capable of capturing, storing, and processing data in ways that can improve healthcare organizations' financial decisions (Blumenthal and Tanevenner, 2011), treatment decisions (Ash et al., 2011), patient intake/output (Appari et al., 2012), and workflow design (Park et al., 2012). The construction of a national healthcare information infrastructure necessitates that EMR technologies be interoperable, or capable of transmitting data and information between organizations without losing clinical value in the process (HIMSS, 2009). To this end, the Centers for Medicare and Medicaid Services (CMS) distributed over $26 billion in monetary incentives to eligible practices and hospitals between 2010 and 2015 to cover the costs of adopting and implementing certified EMR technologies.

The EMR program has been successful in installing standardized technologies in millions of healthcare organizations. But executing the technology-led transformation also requires that doctors, nurses, and other healthcare workers use EMR in standardized ways. This step of the program is proving difficult. CMS defined "Meaningful Use" standards to ensure that all data entered into the EMR—and, ultimately, into the national health information exchange—are accurate and reliable. Healthcare organizations must comply with a new stage of Meaningful Use each year (Murdoch and Detsky, 2013). In early stages, compliance means using EMR for record-keeping (e.g., visit notes and patient demographic information) and administrative (e.g., billing and payments) functions. Additionally, organizations and workers must consult general reference materials and guidelines based on the best-available evidence (Blumenthal and Tanevenner, 2010).

The required features in late stages of Meaningful Use are more prescriptive than they are supportive. Some features interrupt workers' use of the EMR to display messages that require acknowledgement (Wright et al., 2011). Alerts and reminders appear in pop-up style windows, notifying physicians of errors or reminding them, for example, to order exams (Schwann et al., 2011: 869). Some features analyze external medical research data and an organization's own EMR to provide care recommendations (Ash et al., 2012; Mann, 2011; Wright et al., 2011). According to the HITECH Act, healthcare organizations and practitioners must progress through four stages of Meaningful Use and ultimately make decisions based on the outputs of such features; if they do not, they are fined.

The program, however, is in jeopardy. CMS postponed deadlines for late-stage Meaningful Use compliance, citing healthcare organizations' difficulty in implementing advanced, prescriptive EMR functionalities. We sought to understand how and why this delay occurred and designed our study to assess traditional forms of resistance—that is, local resistance—and possible new forms of resistance.

2.2 Data Collection

I gathered a corpus of ethnographic observation and semi-structured interview data at a large, multi-site healthcare clinic in a southwestern U.S. city to garner a nuanced understanding of resistance to the U.S. EMR program. The clinic, referred to hereafter as SWC, treats over 400,000 patients across its 21 facilities; I conducted the present study in 4 of those facilities. Because previous qualitative research on technology and work shows that people are not always capable of accurately describing their day-to-day work (Collins, 1974; Orr, 1996) and that informants' retrospective accounts of specific events

often misrepresent what happened (Bernard et al., 1984; Huber and Power, 1985), I first employed ethnographic observation to study resistance to EMR. By observing the day-to-day work of caregivers and administrators, I gained a deep understanding of what motivates them to use EMR and what might keep them from complying. I expanded my fieldnotes into detailed narratives of what I saw immediately after each observation (Emerson, Fretz, and Shaw, 1995; Miles and Huberman, 1994).

I also employed semi-structured interviews (Weiss, 1995). Because interview questions may be more effective when they are designed with knowledge from ethnographic observation than when designed from an external perspective (Spradley, 1979), I infused the questions with references to what I saw in the field. Because healthcare workers are busy professionals, I broke the interview protocol into 15-to-30 minute modules and conducted the interviews over the course of several field visits. I interviewed each participant for a total of 45 to 90 minutes. I interviewed 5 administrators as well as 20 physicians, 5 nurses, 4 nurse practitioners, and 2 physician assistants across two specialties—internal medicine and cardiology—to assess caregivers' perceptions, attitudes, and actions toward EMR. I studied two specialties to ensure that our findings were not relegated to one type of practice. In total, I interviewed 36 participants.

The workers in my study complied with standards for EMR use, but they voiced significant frustration with the technology as they used it and as they spoke in interviews. Although not resisting at the local level, healthcare workers were resisting at the national level. Thus, I assessed the national-level interactions among stakeholder groups in the EMR program. These interactions generated publicly-available artifacts—such as legislation, open letters, and opinion pieces—that served as primary data sources for our inquiry. I examined the HITECH Act, Meaningful Use standards, and updates issued by federal agencies. I also evaluated reports from the CMS EMR Incentive Program website, which included posts explaining the rationale behind changes to the federal standards. Additionally, professional organizations such as the AMA were negotiating the future of the EMR program on behalf of caregivers in a public way: sending open letters to federal agencies, often with the backing of Congressional members (AMA, 2015); launching websites and portals for AMA members and the general public to support the movement (see breaktheredtape.org); and holding town hall meetings in various regions of the U.S. to discuss how to best resist late stages of Meaningful Use. All of these actions left artifacts, such as written correspondence or publicly-available audiovisual recordings.

2.3   Data Analysis

My analysis of interview, observation, and primary source data was interpretive and iterative (Anconca and Caldwell, 1992; Emerson, Fretz, and Shaw, 2005). I began analysis with repeated readings of all data sources—fieldnotes, interview transcriptions, and primary source documents—and continued with these readings until I had a firm grasp of the sources' content. I then followed qualitative guidelines (Strauss and Corbin, 1977) for open, selective, and axial coding. In open coding, I noted occurrences in the texts where themes or concepts emerged. As I encountered more themes, I redefined codes, conflated codes with other codes, or made codes more granular. When additional passes through the data yielded no further codes, I deepened the analysis via selective coding to look closely at particular concepts or themes. My analysis revealed that federal mandates rendered local resistance largely futile, resulting in local frustration and global resistance.

3   Findings

3.1   Local Frustration: "Digital Scut Work"

At most points during a typical shift, workers in my study complied with stage one standards for EMR use. For example, the doctors I observed recorded notes in the EMR per federal standards, although

they varied in where and when they did so. Some dictated their notes using speech recognition tools while in the room with the patient; others wrote notes by hand during the patient visit and entered the notes manually or via dictation afterward. In contrast to some prior studies of EMR implementation (e.g., Ash et al., 2012; Gupta, Raja, and Khorsani, 2014; Kane and Labianca, 2011; Lanham, Leykum, and McDaniel, 2012), I observed little misuse of the system and documented few "workarounds."

Healthcare workers' compliance, however, stood in stark contrast to the attitudes and opinions they expressed in interviews regarding the effects EMR were having on their day-to-day lives. Doctors repeatedly spoke with contempt for the types and amounts of work required to comply with federal standards. Disdain for one type of work, which we termed "digital scut work," emerged as a theme in their responses. Digital scut work refers to new data entry, data cleaning and organizing, and coding or billing tasks that arose in conjunction with EMR use. One internal medicine physician provided an example of digital scut work in his description of using the EMR for e-prescribing medicines:

> *We do e-prescribing, and so I write up the prescription with the software. I choose the number of days for the prescription to be filled, say 60 days before he has to come and see me again before a refill. Then I put in how many doses per day. From that information, you would think the system could figure this out, but no, I still have to calculate it myself and manually input how many pills the pharmacist should give the patient.*

Similar accounts of frustration with menial tasks emerged in my interviews with cardiologists. For example, EMR use policies allowed other healthcare workers such as nurses, nurse practitioners, and physicians assistants to record information during a patient visit. However, if the visit included a medical diagnosis or other task in the physicians' domain, the physician had to "sign off" on the record. Using paper records, this "signing off" might have required skimming through a page or two of handwritten notes and making note of potential errors or omissions. With EMR, the amount of data a physician had to comb through increased. Predefined EMR fields demanded longer, more detailed notes than paper did and, therefore, required significantly more time signing off. As one cardiologist put it,

> *I go to look at a note, say from a PA, and I'm clicking 40 times. Say the PA, PAs on average see like 15 to 20 patients a day, and I review the notes and sign off on them. So if the PA sees 20 patients, I'm clicking 800 times to catch maybe one or two things that are most of the time very minor.*

The added "digital scut work" reflected in these examples was not simply an annoyance to the healthcare workers we interviewed; it had dramatic effects on an already-strained work-life balance. When I asked our informants how much time, on average, EMR use added to their work week, they often reported on the order of several (four or more) hours:

> *I'm spending three hours more per day, and that's probably an underestimate, just trying to get caught up. I write my notes real-time, in the room with the patient, but then that leaves no time to answer the phone calls, to answer the people that have called in, or sign off on the labs. So I'm leaving at eight o'clock every single day of the week, after coming in at seven, and spending nights and weekends catching up. [cardiologist]*

> *I end up having to do dictation and charting at home in the evenings…That cuts into my home time, my time with my family, and that can damage relationships. Let's not even talk about how it cuts into sleep. [internal medicine doctor]*

At the fieldsite, management used EMR data to track and report individual workers' performance, which was hampered by this digital scut work. One doctor, visibly and audibly upset with management's use of the system in this way, explained his frustrations in an interview exchange:

> *There's so much stuff to do, so much of it's a waste of time, that we can't get our actual notes done. That means you can't close out the chart. You can't close out the charts, then you get on the shit list. Then there's a list that goes out that everybody gets to see: "Who is the lazy person?" Or maybe they're the ones who are busy. Maybe they're seeing a lot of patients, not lazy…[internal medicine doctor]*

> *Can you elaborate on this "shit list"? [interviewer]*

> *Well, the clinic puts out, somebody puts out a list of people that haven't closed their charts out after a certain period of time. And how many open charts they still have after three days or 72 hours or something like that… So the clinic, it's an email, to all doctors, 'Here are the doctors that haven't closed out.'… And the notion of being shamed by not closing out my charts is inconceivable … Putting out a list of the bad guys. [internal medicine doctor]*

In addition to "shit lists" for closing out charts, administrators distributed similar lists detailing doctors' effectiveness in meeting benchmarks for their patients' health outcomes—blood pressure reduction, cholesterol level control, and other population health goals—to encourage better performance. In interviews, doctors repeatedly voiced their concerns about these administrative functions, which they viewed as wrongly taking precedence over the functions that were valuable to treatment of the patient. Whereas the technology demanded doctors' scut work to ensure the completeness and accuracy of patients' records, administrators use of the technology served no clear patient purpose; instead, it provided them with a panopticon to view and manage the staff's activities. Although healthcare workers might have been able to locally resist these tailored administrative uses of the EMR, these uses were tightly tied to a mandated technology and set of standards; thus, workers turned to global resistance.

3.2 Global Resistance: The AMA's Anti-Meaningful Use Effort

Analysis of primary source documents suggests that healthcare workers channeled their local frustrations into collective action by leveraging the political power of professional organizations such as the AMA that have a history of exerting political influence. For example, in 2014, the AMA spent over $19 million on lobbying efforts on Capitol Hill to urge politicians to consider the organization's ideas about medical education, malpractice reform, and healthcare technologies (OpenSecrets.org, 2015). Many of these lobbying efforts aim to sway particular members of Congress to vote one way or another on issues. But in mobilizing against the federal EMR program, the AMA and other professional organizations openly addressed entire federal agencies, such as the Department of Health and Human Services, to voice their concerns over the program.

For example, a letter signed by the AMA and 41 other professional organizations urged DHHS Secretary Sylvia Burwell to delay or cancel stage 3 of Meaningful Use. The letter indicated that although healthcare workers remained compliant with federal standards for EMR (also known as EHR) use in their local settings, they intended to resist the changes at the institutional and political levels:

> *The undersigned medical societies agree that interoperable, useable, and clinically relevant Electronic Health Records (EHRs) are the essential foundation for the implementation of MeritBased Payment System (MIPS) and Alternative Payment Models (APMs). The physician community, however, is extremely concerned with*

> *the current direction of the Meaningful Use (MU) program. To date, 80 percent of physicians are utilizing EHRs, but less than 10 percent of physicians have successfully participated in MU Stage 2. Furthermore, due to the inflexible MU regulations and certification requirements, vendors have created software products that are frequently unusable, administratively burdensome, and in many instances do not promote clinically relevant patient care ... If the administration finalizes the proposed MU Stage 3 regulation now, vendors will create software that will lock-in problematic technology, which physicians and patients will be living with for years to come.*

The letter to the federal government went on to note that, beyond problematic technologies, the evaluation methods tied to the technology could lead to unexpected outcomes. Specifically, it echoed the sentiments of some of our informants regarding the administrative uses of the EMR. One physician at SWC viewed compliance standards and their enforcement as attempts to "make all providers the same, and make all patients the same," a perspective that is reflected in the AMA's letter:

> *The proposed MU Stage 3 regulation exacerbates problematic policies of MU Stage 2 by continuing to "count" physicians' compliance with one-size-fits-all objectives rather than focusing on the clinical activities that should support differences in medical practices and patient care .... There seems to be a view among some policymakers that by requiring more certified EHRs to populate the landscape the systems will achieve interoperability. The physician community strongly disagrees, and we are concerned that spreading poor performing systems may exacerbate the problem.*

In addition to the letter, public statements by AMA president Steven J. Stack, M.D. also indicated that the AMA and other professional organizations were optimistic about their abilities to shift federal policy and successfully resist the EMR program:

> *There is growing bipartisan recognition in Congress that the direction of the Meaningful Use program needs to be reassessed in light of usability and interoperability challenges with electronic health record systems.*

4   Discussion

Healthcare workers' optimism regarding their ability to resist EMR implementation via political avenues suggests that they intend to continue their efforts until a desirable solution emerges. The AMA has launched a new movement to rally the public around its cause (see breaktheredtape.org), holding town hall meetings on issues related to EMR and calling for citizens to contact their representatives. Our findings suggest that healthcare workers' local frustration with EMR is not manifesting itself through misuse of the technology; rather, it is coalescing into a nationwide movement against the technology, or global resistance. Continued research in this context will contribute to understanding of resistance to technology in at least two ways.

First, existing studies of resistance tell us little about the mechanisms by which workers resist a new technology when local resistance, such as rejection or misuse of the technology (Joshi, 1991; Lapointe and Rivard, 2005; Markus, 1983), is impossible due to regulations or other mandates for technology use. In cases of mandate, examining how workers' frustrations influence their behaviors at the point of technology use may be insufficient for understanding resistance. My findings suggest that one way workers might resist is through global resistance, particularly when workers have the ability to unify and mobilize through outlets like professional organizations. In other words, when local forms of resistance are impossible—e.g., because the technology is mandated by the federal government—

workers may take to political and social outlets to act upon their frustrations. A focus on generating theories that account for global resistance does not imply that local forms of resistance should be ignored or discounted. Rather, if we accept the assumption that changes to work begin at the individual level and "reverberate up levels of analysis" (Barley, 1986: 76), an inquiry into global resistance necessitates that we begin by accounting for individual actions. Previous studies have thoroughly documented and explained these local actions and how they relate to organizational outcomes of technology implementation (Davis, 1989; Joshi, 1991; Lapointe and Rivard, 2005; Marakas and Hornik, 2001; Markus, 1983). But the mechanisms by which workers recognize that local resistance is insufficient or impossible, assess alternative resistance possibilities, and act to collectively resist are largely unknown.

Second, existing documented outcomes of resistance to new technologies are often confined to the boundaries of the organization. We know that resistance often leads to implementation failure (e.g., Barker and Frolick, 2003), customization of the technology (e.g., Chou and Chang, 2008), or the generation of new social structures among workers (e.g., Barley, 1986). Studying global forms of resistance could aid IS understanding of resistance in contending with the broader institutional, political, and social outcomes that might emerge when workers collectively resist a new technology. The presence of global resistance might require scholars of technology and work to assess how workers actively shape institutions, policies, and societal structures through their mobilization against technology. For example, in the current case, will the institution of medicine, traditionally characterized by its reign over esoteric knowledge about the human body, shift toward new paradigms of practice? More broadly, how might the social standing of high status professional workers persist in the face of technologies and policies that aim to quantify and routinize their work? And finally, what tactics characterize successful global resistance, and what unexpected or negative outcomes may result from it?

5 Conclusion

The next several years of EMR expanded use and healthcare work resistance will provide a glimpse into what we might expect to see as IS take hold in societally-important industries. I intend to rigorously study the processes of use and resistance over the next year and beyond in an effort to generate theory that explains how and why widespread resistance emerges and influences outcomes. In addition to advancing IS theory, my findings may have practical implications for technology design, healthcare IS implementation strategies, and government policy. My observation and interview data may help in uncovering some of the factors that underlie healthcare workers' resistance to EMR and thus provide insight into how to overcome the challenges to successful implementation. Furthermore, observation and interview data regarding EMR may also help to develop implementation strategies that acknowledge workers' frustrations with mandated technologies and provide avenues for alleviating some of the dissatisfaction. Finally, my analysis of archival data and communications between government and professional agencies might inform policy by highlighting the points of agreement and contention among stakeholders in EMR implementation and mandated IS implementations more generally.

References

American Medical Association (AMA) (2015a). AMA calls for design overhaul of Electronic Health Records to improve usability. Retrieved from: http://www.ama-assn.org/ama/pub/news/news/2014/2014-09-16-solutions-to-ehr-systems.page**.**

Ancona, D. G., & Caldwell, D. F. (1992). Bridging the boundary: External activity and performance in organizational teams. *Administrative Science Quarterly*, *37*(4), 634-665.

Appari, A., Carian, E. K., Johnson, M. E., & Anthony, D. L. (2012). Medication administration quality and health information technology: a national study of US hospitals. *Journal of the American Medical Informatics Association*, *19*(3), 360-367.

Ash, J.S., McCormack, J.L., Sittig, D.F., Wright, A., McMullen, C., & Bates, D.W. (2012). Standard practices for computerized clinical decision support in community hospitals: A national survey. *Journal of the American Medical Informatics Association*, *19*(1), 980-987.

Barker, T., & Frolick, M. N. (2003). ERP implementation failure: A case study. *Information Systems Management*, *20*(4), 43-49.

Barley, S. R. (1986). Technology as an occasion for structuring: evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, *31*(1), 78-108.

Bauer, M. (1997). *Resistance to new technology: nuclear power, information technology and biotechnology*. Cambridge, UK: Cambridge University Press.

Beaudry, A., & Pinsonneault, A. (2005). Understanding user responses to information technology: A coping model of user adaptation. *MIS Quarterly*, *29*(3),493-524.

Bernard, H. R., Killworth, P., Kronenfeld, D., & Sailer, L. (1984). The problem of informant accuracy: The validity of retrospective data. *Annual Review of Anthropology*, *13*(1), 495-517.

Blumenthal, D., & Tavenner, M. (2010). The "meaningful use" regulation for electronic health records. *New England Journal of Medicine, 363*(6), 501-504.

Center for Disease Control (CDC). (2014). *National Ambulatory Medical Care Survey EHR survey factsheets.* Retrieved from: http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.

Centers for Medicare and Medicaid Services (CMS). (2014). Eligible Professional Meaningful Use Table of Contents: Core and Menu Set Objectives Stage 1 (2014 Definition). Retrieved from: http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/EP_MU_TableOfContents.pdf.

Centers for Medicare and Medicaid Services (CMS). (2015). CMS Fast Facts. Retrieved from: https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/CMS-Fast-Facts/.

Centers for Medicare and Medicaid Services (CMS). (2016). EHR Incentive Program: Announcements. Retrieved from: https://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/index.html?redirect=/ehrincentiveprograms/.

Chou, S. W., & Chang, Y. C. (2008). The implementation factors that influence the ERP (enterprise resource planning) benefits. *Decision Support Systems*, *46*(1), 149-157.

Collins, H. M. (1974). The TEA set: Tacit knowledge and scientific networks. *Science Studies*, *4*(2), 165-185.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340.

Emerson, R. M., Fretz, R. I., & Shaw, L. L. (1995). *Writing ethnographic fieldnotes*. Chicago, IL: University of Chicago Press.

Gupta, A., Raja, A. S., & Khorasani, R. (2014). Examining clinical decision support integrity: is clinician self-reported data entry accurate? *Journal of the American Medical Informatics Association*, *21*(1), 23-26.

Hiltz, S. R. and K. Johnson (1990). User satisfaction with computer-mediated communication systems, *Management Science, 36*(6), 739-764.

Healthcare Information and Management Systems Society (HIMSS). (2009). What is interoperability? Retrieved from: http://www.himss.org/library/interoperability-standards/what-is-interoperability.

Huber, G. P., & Power, D. J. (1985). Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal*, *6*(2), 171-180.

Joshi, K. (1991). A model of users' perspective on change: the case of information systems technology implementation. *MIS Quarterly*, *15*(2), 229-242.

Kane, G. C., & Labianca, G. (2011). IS avoidance in health-care groups: A multilevel investigation. *Information Systems Research*, 22(3), 504-522.

Keen, P. G. (1981). Information systems and organizational change. *Communications of the ACM*, 24(1), 24-33.

Lanham, H. J., Leykum, L. K., & McDaniel, R. R. (2012). Same organization, same electronic health records (EHRs) system, different use: exploring the linkage between practice member communication patterns and EHR use patterns in an ambulatory care setting. *Journal of the American Medical Informatics Association*, 19(3), 382-391.

Lapointe, L., & Rivard, S. (2005). A multilevel model of resistance to information technology implementation, *MIS Quarterly*, 29(3), 461-491.

Leonardi, P. M. (2011). When flexible routines meet flexible technologies: Affordance, constraint, and the imbrication of human and material agencies. *MIS Quarterly*, 35(1), 147-167.

Mann, D. M. (2011). Making clinical decision support more supportive. *Medical Care*, 49(2), 115-116.

Marakas, G. M., & Hornik, S. (1996). Passive resistance misuse: overt support and covert recalcitrance in IS implementation. *European Journal of Information Systems*, 5(3), 208-219.

Markus, M. L. (1983). Power, Politics, and MIS Implementation. *Communications of the ACM*, 26(1), 430-444.

McAfee, A. (2006). Mastering the three worlds of information technology. *Harvard Business Review*, 84(11), 141-151.

Miles, M. & Huberman, A. (1994). *Qualitative data analysis: An expanded sourcebook.* Thousand Oaks, CA: Sage Publishers.

Murdoch, T. B., & Detsky, A. S. (2013). The inevitable application of Big Data to health care. *Journal of the American Medical Association, 309*(13), 1351-1352.

Orlikowski, W. J., & Barley, S. R. (2001). Technology and institutions: What can research on information technology and research on organizations learn from each other? *MIS Quarterly*, 25(2), 145-165.

Orr, J. E. (1996). *Talking about machines: An ethnography of a modern job.* Ithaca, NY: ILR Books.

Park, S. Y., Lee, S. Y., & Chen, Y. (2012). The effects of EMR deployment on doctors' work practices: A qualitative study in the emergency department of a teaching hospital. *International Journal of Medical informatics*, 81(3), 204-217.

Perrow, C. (1967). A framework for the comparative analysis of organizations. *American Sociological Review*, 32(2), 194-208.

Schwann, N.M., Bretz, K.A., Fry, D., Ackler, F., Evans, P., Romancheck, D. … McLoughlin, T.M. (2011). Point-of-care electronic prompts: an effective means of increasing compliance, demonstrating quality, and improving outcome. *Anesthesia & Analgesia*, 113(4): 869-876.

Shaiken, H. (1985), *Work transformed: Automation and labor in the Computer Age*. New York, NY: Holt, Rinehart, and Winston.

Spradley, J.P. (1979). *The ethnographic interview*. New York, NY: Holt, Rinehart, & Winston.

Strauss, A., & Corbin, J. (1997). *Grounded theory in practice.* Thousand Oaks, CA: Sage.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425-478.

Weiss, R. (1994). *Learning from strangers: The art and method of qualitative interview studies.* New York, NY: Free Press.

Wright, A., Sittig, D. F., Ash, J. S., Feblowitz, J., Meltzer, S., McMullen, C., ... & Middleton, B. (2011). Development and evaluation of a comprehensive clinical decision support taxonomy: comparison of front-end tools in commercial and internally developed electronic health record systems. *Journal of the American Medical Informatics Association*, 18(3), 232-242.

Wynne, B. (1988). Unruly technology: Practical rules, impractical discourses and public understanding. *Social Studies of Science*, 18(1), 147-167.