Definition and Relational Specification of Work-around

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Abstract

There are many investigations of nursing work-arounds reported in the literature.[1] Despite numerous studies the concept remains vague and not logically linked to a theory base. Assumptions associated with many of these studies are not clearly articulated, leading to poor logic fit with analysis. Nursing literature reflects the assumptions that work-arounds are bad and must be eliminated. This paper defines work-around in its full range of variation consistent with a complex adaptive system base from two perspectives: essential attributes when operating as a mediator and as a moderator. Given the need for increased conceptual rigor in Nursing Informatics research, the moderator/mediator delineation is important. Moderating variables tend to be endemic to situations and are relatively resistant to intervention while mediating work-arounds may represent appropriate problem solving management of routine exceptions[2] A clearer understanding of work-arounds can inform integration of the Electronic Health Record and safety, quality and efficiency initiatives.

Introduction

Work-arounds are a ubiquitous phenomenon associated with nurses' use of health information technology in acute care.[3] Work-arounds are described in relation to the general complexity of nursing activity in acute care[2], and more specifically as an inherent component of clinical information technology utilization.[4] In 1986, Gasser discussed that when computing resources and the task to which they support do not align there is a "misfit". Further, there is never a perfect fit between work processes and computing. According to Gasser, "working around" is a strategy for accommodating a misfit. They tend to be ad-hoc strategies to solve problems, and they can conflict with the formal ideology of system use.[5] More recently, the notion of misfit is being talked about as exception: defined as failure in the design or execution of the work system.[6]

The term work-around is considered jargon in formal dictionaries. Mirriam-Webster defines a work-around as a plan or method to circumvent a problem (as in computer software) without eliminating it.[7] In computing dictionaries the term refers to "a temporary kluge used to bypass, mask or otherwise avoid a bug or misfeature. Customers find themselves living with work-arounds for long periods of time rather than getting a bug fix".[8] Work-arounds have been described as "clever methods for getting done what the system does not let you do easily".[9] In hospitals, they are often viewed as blocks that prevent the accomplishment of tasks.[4] In general, they are "informal temporary practices for handling exceptions to normal workflow" but when successful have the potential to be adopted as routine practices.[1,2] Work-arounds have also been described as improvisations people make "to get the job done, even when indicators suggest something amiss. They fail to contain problems or improve processes, leaving factors that confounded one person's work to confound again".[10] The prevalence, obscuration and informality of healthcare information technology (HIT) work-arounds coupled with the potential severity of error outcomes has prompted a call for a better understanding of causes, nature and consequences. Specifically cited is a need for theory development concerning the processes involved in work-arounds to better inform intervention programs.[4] This paper will focus specifically on the nature of work-arounds as the underpinning to further theoretical development.

The Nature of Work-arounds

Healthcare professionals are described as masters at work-arounds; primarily because of the sheer volume of dysfunctional work processes encountered.[11] A common perception is that work-arounds "create an environment that is ripe for failure".[11, p.52] In other words, work-arounds are linked to errors and cited within the context of patient safety events [4,p3]. For example, a nurse caring for a patient utilizing a barcode medication delivery administration program is required to scan the medication and then scan the patients' armband. In a common situation, a patient on isolation precautions would require the nurse to carry a scanner and a multi-dose bottle into and out of the patient's room, potentially contaminating both the scanner and medication bottle. If performed as

designed, this medication administration would require a number of extra steps. The nurse works around the system, scanning both the bottle and a photocopy of the armband prior to entering the room, so that only the immediate dosage of medication for that encounter enters the room. In another case, the nurse has only one half of the ordered dosage. The nurse double scans the ½ dose to record complete administration, gives the partial dose, and plans to complete the administration when the medication is delivered.[12]

Conversely, there are situations where work-arounds are considered to be advantageous, and where work-arounds may be an expectation.[14] For example, nurses may keep a hand-written log of intravenous insulin administration to supplement fragmented information in the computer. In another fairly well known computer glitch, the scheduling of post-dialysis medications can become complex and medications easily "missed" because their timing and delivery is dependent upon dialysis therapy which can change from day to day. Drug administration times cannot be predetermined and therefore pre-scheduled. Hospitals and nurses have developed work-arounds to communicate delivery times of these non-routine medications. Successful work-arounds are not commonly described in the nursing literature, and perhaps not labeled as such, but are an important HIT adjunct in the delivery of safe patient care.[1,3,4,15,16]

Work-around literature often operates under the assumption that work-arounds are inherently dangerous and a threat to patient safety.[10,11,12,13] Most discussions of work-arounds as sources of error appear to be based on the premises of a linear, input-throughput-output model, a kind of event-oriented view where efforts are focused on defining specific problems and devising narrowly targeted responses.[17] In reality our practice settings are more characteristic of complex adaptive systems. Exceptions always occur in complex adaptive systems. A systems perspective is a relational view that rather than focusing on defining a specific problem and targeted responses looks at patterns of connection across layers of organization and seeks to learn more about the links between a system's structure and its observed behavior set within the context of a network of human relationships.[17] A model based on a systems perspective will specify relationship patterns across a number of concepts such that moderating and mediating effects are described. A moderator is an independent variable that affects the strength and/or direction of the association between another independent variable and an outcome variable.[18] A mediator is a variable that specifies how the association occurs between and independent variable and an outcome variable.[18] Appraisal of the moderator and mediator effect in data can provide a more exact explanation for an outcome.

Related Concepts

Work-arounds are employed to accomplish a task when there is a disruption to processes.[19,20] In many cases, work-arounds are successful. For example, in a multisite study Tucker and Edmondson[18] found that nurses utilized some type of quick-fix in 93% of problems encountered. Because work-arounds often have beneficial outcomes it is difficult to closely associate this concept with errors and mistakes as has been inferred.[4]

Work-arounds, intentional in their nature, are compared to the concept of deviance with the notion that work-arounds basically represent acting in one's self-interest rather than the good of a patient or organization. Deviance has typically been described in psychology and criminology literature and is representative of persons who do not comply with social norms.[21] The term is generally interpreted as harmful to others and/ or the organization. A more contemporary concept, constructive deviance, is being tested in healthcare.[22] Constructive deviance is defined as "behaviors that violate the organizational norms with the intent of helping the organization"[22] and can include unauthorized behaviors that positively aid the organization.[23] Work-arounds, when compared to constructive deviance appear to represent isolated individual events that require a problem as a precursor and that are not directed at an organizational level. Constructive deviance does however support an assumption, as Tucker and Edmondson have inferred, that the primary motivation behind nurses' use of a workaround is to manage complexity and do what is right for the patients they care for.

There is a connotation of risk and patient safety compromise associated with work-arounds in acute care. Ironically, in the computer software industry, work-arounds and patches are considered beneficial. Because of the complex nature of computer programming, most software is released with minor flaws. Patches, a concept similar to work-around, is a fix created and applied to cover flaws in software applications which may cause errors, crashes or other unwanted behavior such as security breaches. Patches are defined as a fix for a flaw or error.[24] Much like work-arounds, patches are temporary in nature, and may introduce new problems. Patches are a temporary solution until a permanent fix can be delivered. Unlike work-arounds, patches are openly discussed and are created by systems administrators based on issues identified by users. A recent example was a software flaw in a commercial email system. Emails were being incorrectly blocked. A patch was delivered to all email accounts within one week, which temporarily fixed the problem until a permanent solution was installed in the next upgrade. In the week prior

to patch delivery, customers were supplied with a work-around; detailed instructions on how to manage email accounts temporarily. Work-around, patch and fix are related, but clearly different. However, what is clear in the computer technology field is that there are underlying assumptions: no technology is exception-free and no simple technology is available to remove exceptions from workflow.

Field Expediency is a concept first coined during the Vietnam War, describing the nurse's ability to improvise under adverse circumstances.[25] The concept of field expediency is best described as "a course of action used in the absence of a more suitable or traditional method to achieve an objective".[25, p53] Field expediency touches on the ethical dilemma of following a protocol as designed versus doing what is right and just to fulfill care needs. Synonyms would include to improvise or to make do. The creative solutions that characterize field expediency occur under stressful or adverse circumstances when there are deficits such as equipment or personnel.[25] Similarly, work-arounds occur in very complex, stressful environments when some deficit is present. Unlike field expediency, there may be no absence of a traditional method in a work-around scenario, but the work-around is chosen as the most suitable, pragmatic choice to get the job done at the time. This further supports the assumption that nurses may choose to perform a work-around based on doing what is right and best for the patient and situation, rather engaging in work-around as a deviant or noncompliant act.

Complex adaptive systems, by nature, will incur exceptions and challenges. Woods and Cook describe adaptive capacity as a system's ability to cope with disruptions and challenges.[26] Adaptive capacity has boundaries: resilience is how well the system adapts to variation and brittleness describes the amount of negative consequence a system can incur before it breaks. The authors identify that the computer infrastructure is becoming more vital to patient care delivery, and that heavy reliance on HIT will increase the brittleness of systems.[26]

A case study describes the failure of a pharmacy system which resulted in inaccurate medication administration records hospital wide. The nurses detected the inaccuracy of the medication records, and temporary remedies ensued so that no errors occurred. The point is that the resilience of the system was evident in the nurses, not in the technology. "It was people who detected the failure, planned a response and work-around, and restored the pharmacy system".[26,p70]

There is an inherent value in nurses' ability to creatively problem solve and perform work-arounds. If it is assumed that exceptions will occur in the use of HIT, we must rely on nursing to provide the additional adaptive capacity once a system has reached it boundaries. As we become ever more reliant on HIT to deliver care, it would follow that we should not undervalue the nurse as the buffer to successful and safe application of technology.

Improvisation and Intuition

There is an underlying assumption that nurses are making rational decisions when choosing a work-around as an alternative. A rational decision is made by gathering information on an identified issue, selecting alternatives, implementing the choice and then receiving feedback about the outcome.[27] A second type of decision, one that is improvised, operates very differently. For example, the problem or exception that initiates it can be framed in multiple, ambiguous ways, so that the problem and problem solving are concurrent. Improvisation is flexible; it can be used to fill gaps in standard procedures and can be fine-tuned to fit the occasion. Further, feedback from the engagement returns to the nurse before a firm decision is made, which usurps the formation of any pre-planned decision.[27]

Franceschi has explored work-arounds in healthcare in terms of improvisational and compositional creativity. Improvisational actions are momentary, associated with no planning, and have little time between conception and execution.[28] In compositional creativity, there is more time between the conception of the action and its completion. Compositional creativity is planned ahead, with a temporal delay between the idea and the execution.[28] Franceschi has postulated that "improvisational creativity characterizes the emergence of work-arounds because there exists little or no time between the idea conception and execution".[28, p15]

Quite similar to improvisation is the idea of intuition. A classic definition of intuition is: "the absolute-velocity insistence of the intellect upon the laggingly reflexed brain to its attention to significance of various special-case, brain-registered, experience relationships. Intuition is intellect coming instantly in at highest speed into dominance over lower speed, lagging brain reflexing".[29] Much as in improvisation, there is no delay between the intellectual spark and the execution of an action. Intuition is a brain-registered experience relationship coming instantly in at the highest speed to shape and inform the nurse's behavior. Intuition works in a moderating way between the problem or exception and the outcome.

Tucker and Edmondson also delineate two types of problem solving behaviors as a way of categorizing the nature of work-arounds.[6] First-order problem solving behavior addresses the immediate problem or block, but does not address the underlying causes. Second-order problem solving finds a solution to the immediate problem and engages in finding a long term correction. Second-order problem solving embodies communication, root cause analysis and experimentation.[6, p92] Second-order problem solving requires extra time and effort and the personal status or influence to successfully negotiate a change.[6] For nurses, who often lack the time or the personal status required to negotiate change, a first-order solution may be the preferred course of action.

Defining Work-around

Based on the review of literature, the underlying assumptions underpinning the work-around definitions offered in this paper are:

1. Healthcare is a complex adaptive system.
2. Exceptions always occur in complex adaptive systems.
3. Work-arounds exist in response to exceptions within complex adaptive systems.
4. There is never a flawless relationship between work processes and computing.
5. There is no technology available that will remove exceptions from workflow.
6. Work-arounds themselves exist as value neutral but may result in consequences ranging from detrimental to beneficial.
7. Work-arounds are performed by nurses to manage complex environments and to expedite patient care.
8. HIT workarounds are an expected nursing behavior.
9. There is inherent value in the nurses' ability to creatively problem solve and develop work-arounds at the direct patient care level.

Based on this review, two types of work-arounds emerge, those that occur instantaneously and those that require forethought and communication.

Intuitive work-around: The degree to which a nurse relies on special case, brain-registered experience relationships to remedy an exception when there exists little to no time between idea conception and execution. Intuitive work-arounds are moderators of the relationship between exceptions and outcomes.

Problem-solving work-around: The degree to which a nurse figures out ways to remedy an exception and communicates with others to address underlying causes of exceptions. Problem-solving work-arounds are mediators of the relationship between exceptions and outcomes.

 Conclusion

In conclusion, work-arounds are about nurses trying to manage complexity in the context of competing demands.   . Workarounds represent a whole continuum of outcome behaviors ranging from beneficial to detrimental. Misunderstanding of the nature of work-arounds and inattention to system process interactions might help explain why interventions aimed at reducing errors by removing work-arounds may fail. This paper has offered two definitions of work-arounds with underlying assumptions. There is a need to study the entire range of work-around behaviors from a complex system perspective, as has recently been suggested by the Institute of Medicine.[30] A better understanding of work-arounds will help us target and test appropriate strategies in the optimal integration of HIT in acute care while informing the integration of the Electronic Health Record and safety, quality and efficiency initiatives.

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