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Steven Alter
University of San Francisco, alter@usfca.edu

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Steven Alter

School of Management, University of San Francisco

alter@usfca.edu

Abstract:

Although mentioned frequently in the organization, management, public administration, and technology literatures, workarounds are understudied and undertheorized. This article provides an integrated theory of workarounds that describes how and why workarounds are created. The theory covers most types of workarounds and most situations in which workarounds occur in operational systems. This theory is based on a broad but useful definition of workaround that clarifies the preconditions for the occurrence of a workaround. The literature review is organized around a diagram that combines the five "voices" in the literature of workarounds. That diagram is modeled after the diagram summarizing Orton and Weick's [1990] loose coupling theory, which identified and combined five similar voices in the literature about loose coupling. Building on that basis, the theory of workarounds is a process theory driven by the interaction of key factors that determine whether possible workarounds are considered and how they are executed. This theory is useful for classifying workarounds and analyzing how they occur, for understanding compliance and noncompliance to methods and management mandates, for incorporating consideration of possible workarounds into systems analysis and design, and for studying how workarounds and other adaptations sometimes lead to larger planned changes in systems.

Keywords: workaround, improvisation, adaptation, bricolage, exception, emergence

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I. WHY THEORIZE ABOUT WORKAROUNDS?

Workarounds have been reported and discussed in many situations, including decision making, client service, and record keeping in bureaucracies and service organizations; compliance or noncompliance with management policies and behavioral guidance; ingenuity and improvisation when faced with anomalies or inadequate resources; activities and interactions of nurses, doctors, and other medical professionals; and use of enterprise software and other software systems. Despite many studies of workarounds in healthcare and many discussions of workarounds elsewhere, workarounds "remain for the most part surprisingly under-investigated and theorized" [Pollock, 2005]. Even in healthcare, where workarounds are widely recognized, workarounds are a known but understudied phenomenon [Azad and King, 2008; Safadi and Faraj, 2010] and an area where "there has been little systematic integration of the research studying the nature, extent, or the outcomes of workarounds" [Halbesleben, Wakefield, and Wakefield, 2008].

Workarounds elicit a wide range of viewpoints and perspectives, examples of which will appear throughout this article. Workarounds may occur when cumbersome processes seem too slow, when information required by idealized processes is not available, when technologies malfunction, when situational constraints or anomalies make it difficult to perform work activities, when personal goals conflict with organizational goals, and when people feel motivated to bypass or undermine processes or decision criteria mandated by corporate management, labor agreements, industrial standards, or government regulations. Sometimes workarounds are viewed as both unremarkable and essential for performing everyday work. Sometimes they are viewed as questionable, undesirable, hazardous, and even unethical or illegal violations of procedures and responsibilities. Here are typical examples from the literature:

- "Given [the ERP system's] perceived inflexibility, users deviated from prescribed work processes and 'tweaked the system' to make it respond to their needs. … One instance of reinvention was the use of a field (the statistical code) to capture information of another nature (a credit card payment). Although not intended for credit card information, the statistical code field's purpose was reinvented by a user to work around an assumed system deficiency" [Boudreau and Robey, 2005, p. 13].
- Information systems for call center operators in insurance sales often require them to fill in data fields before providing quotes for insurance premium costs. Those constraints are designed to improve data quality by ensuring completeness, but are often circumvented by entering "dummy data in order to move through the system to gain the required information. These kinds of practice can seriously degrade customer data quality" [Lederman, Shanks, and Gibbs, 2003, p. 8].
- "Within the computerized order entry (COE) system, intentional blocks were designed to prevent ordering of excessive medication doses. To work around this block, one staff member reported intentionally selecting a medication dose in COE that did not match the physician's order simply to get the medication 'into the system.' As the incidence of excessive dosing was encountered, licensed staff from each of the five nursing homes were most often observed entering multiple doses of the same medication to obtain the full ordered dose instead of discussing the excessive ordered dose with the pharmacist or physician" [Vogelsmeier, Halbesleben, and Scott-Cawiezell, 2008, p. 116].
- "An international hotel chain's extremely restrictive Internet bandwidth policy for its internal network for employees limited email attachments to 2 or 4 MB and blocked commonly used social networking capabilities. Those restrictions made it difficult for hotel managers and marketing communication specialists to use email and social networking to contact customers and maintain relationships outside of the hotel. In one case, the IT manager of a hotel complained that the sales manager was sending 10–15 emails with attachments every afternoon (thereby trying to do his job). To overcome these limitations, hotel personnel surreptitiously used mobile devices, some provided by the hotel chain, to tap into much more powerful networks that were supposed to be reserved for guests. One marketing communication manager bypassed the limitations of the corporate bandwidth policy by paying personally for a virtual private network that he used from home with the tacit support of his immediate boss and his hotel's general manager" [Davison and Ou, 2013].

The scope of a broadly applicable theory of workarounds should cover all situations in which people intentionally perform or enable action X even though routines, instructions, expectations, requirements, software specifications, and/or regulations imply or state they should not perform action X. In some cases, X seems totally appropriate to

most observers in terms of business priorities, customer needs, and ethical considerations. In other cases, X is controversial in relation to business priorities and perhaps personally opportunistic, unethical, or even illegal.

Paraphrasing comments about agency theory in Eisenhardt [1989, p. 58], the theory of workarounds explains workarounds that occur in a variety of forms. In workarounds, one party or group (the actors) decides how to perform specific activities that may be delegated to them by principals (as in agency theory) or that they may perform independent of delegation from a principal. The theory of workarounds focuses on responses to two types of problems that may occur individually or in combination when people perform work: obstacles to doing work in a preferred manner and misalignment of goals and incentives of actors, principals, and other stakeholders. Most examples of workarounds mentioned in the literature involve some aspect of one or both of those factors. Obstacles to doing work in a preferred manner may come from many sources, including, among others, anomalies, exceptions, mishaps, details of the process, knowledge and skills of the actors, available information, features and capabilities of the technology, interests and requirements of customers, and the surrounding context. Misalignment of goals and incentives may come from many other sources, including misunderstandings, inadequate communication, and management confusion or inattention.

In essence, the theory of workarounds turns agency theory on its head. Agency theory is about defining arrangements that maximize an agent's conformance with the principal's goals and intentions. The theory of workarounds is about how agents and/or principals with some degree of behavioral discretion decide whether to follow established practices and what to do when exceptions, anomalies, and mishaps occur. While aspects of agency theory such as goal misalignments, moral hazard, and asymmetrical information are often relevant to workarounds, a theory of workarounds also should cover other situations in which workarounds related to exceptions, anomalies, and mishaps occur in the presence of totally aligned goals.

Goal. To my knowledge, no one has published a comprehensive theory of workarounds that covers most types of workarounds and most situations in which workarounds occur. A theory of workarounds could lead to insights related to organizations, management, work practices, standards, and technology adoption because workarounds are entwined with organizational research topics, practical management issues, and the implementation and use of technology. A theory of workarounds might contribute to understandings of issues such as the following:

- What is the meaning of terms such as *system, business process, method, practice, routine,* and *structure?* These terms can be viewed and used from an ostensive perspective, focusing on what should happen, or from a performative perspective, focusing on what actually happens, including temporary and persistent workarounds.
- What determines the proper balance between expectations that people in organizations will exercise judgment versus sometimes conflicting expectations that they will follow process designs, policies, and rules that attempt to control what they do?
- What is compliance vs. noncompliance when production pressures make it difficult or impossible to achieve organizational goals and also comply with behavioral expectations and/or established routines? Are workarounds a sign of compliance or noncompliance?
- Under what circumstances does organizational productivity require workarounds to bypass limitations of software, hardware, established or espoused work practices, and/or the organization's policies?
- Is the implementation of systems assumed to include or exclude existing or future workarounds that bypass built-in process designs, policies, or business rules in order to perform work effectively?
- How should methods for analyzing and designing systems in organizations treat the possibility and even the high likelihood of workarounds?
- What should be done about "shadow systems" in which employees build and maintain private paper records, spreadsheets, or databases in order to work around the limitations of established processes and officially authorized software and databases?
- Under what circumstances might it be possible for software to design and perform workarounds autonomously?

Organization. This article contains the following major sections: (Section II) definition of workaround, (Section III) five voices in the literature related to workarounds, (Section IV) theory of workarounds as a process driven by the interaction of key factors, and (Section V) discussion and conclusions. The proposed definition of workaround is more inclusive than most definitions in the current literature. The definition is compared with other definitions, and some of its implications are explained. The literature review organizes many topics and related examples from the

diverse literature related to workarounds by applying the five "voices" approach in Orton and Weick's [1990] discussion of loose coupling theory. This approach is useful for organizing many diverse examples from the literature, even though the topic of loose coupling itself is only one of many concepts included in Figure 2. The five voices related to workarounds include phenomena associated with workarounds, types of workarounds, direct effects of workarounds, perspectives on workarounds, and organizational challenges and dilemmas related to workarounds. Organization of the literature review in terms of the five voices and inclusion of a large number of illustrative examples demonstrates the broad applicability of the concept of workaround and the existence of vastly different views of what workarounds are and whether workarounds should be viewed as positive, neutral, or negative.

The proposed theory of workarounds is a process theory expressed in a diagram that identifies important factors related to the steps through which workarounds are instigated, designed, and executed. A temporal view of workarounds shows the progression from improvisation and bricolage to emergent and planned change. A concluding section discusses possible applications of the theory and directions for future research.

II. DEFINITION OF WORKAROUND

The proposed theory of workarounds is concerned with workarounds that occur in organizational settings. We define a workaround as follows:

> A workaround is a goal-driven adaptation, improvisation, or other change to one or more aspects of an existing work system in order to overcome, bypass, or minimize the impact of obstacles, exceptions, anomalies, mishaps, established practices, management expectations, or structural constraints that are perceived as preventing that work system or its participants from achieving a desired level of efficiency, effectiveness, or other organizational or personal goals.

Workarounds affect details of a work system's operation, either temporarily or over an extended period, but do not change its overall identity, purpose, and high-level architecture. Aspects of the proposed theory also apply to many workarounds in non-organizational settings that are peripheral to our focus, such as using a substitute material in a leisure-time project, selecting an alternate driving route to avoid traffic, or selecting a non-preferred menu item in a restaurant because the preferred item is unavailable.

With this definition, the preconditions for the occurrence of a workaround include:

- A specific process, policy, or set of practices within an existing work system
- Organizational and/or personal goals related to that situation
- An obstacle, exception, anomaly, mishap, established practice, management expectation, or structural constraint that might be perceived as something to bypass or overcome
- An ability to imagine and execute a workaround

Table 1 shows that this definition of workaround is broader and more inclusive than most definitions of workaround in the literature because it addresses a variety of issues that may or may not be addressed by the other definitions.

Based on this definition, many goal-directed actions or activities in organizations are not workarounds. For example, the following are not considered workarounds:

- Reengineering projects or other formal projects designed to produce major work system changes. These are not workarounds because major changes would affect the work system's high level architecture.
- Events or work system changes that occur due to inattention, accidents, or mistakes of work system participants. These are not workarounds because they are not goal-driven adaptations, improvisations, or other activities that attempt to bypass or overcome obstacles or exceptions.
- Improvisation or bricolage not involved with overcoming obstacles, exceptions, anomalies, mishaps, or structural constraints in specific processes or practices within a work system.
- Criminal actions, sabotage, or other attacks by people who are neither work system participants nor their direct managers. These are not workarounds because they are not adaptations or improvisations by work system participants.

Table 1. Comparison of the Proposed Definition of Workaround with Previous Definitions	
Definition from the literature	Additional issues addressed by the proposed definition
"… intentionally using computing in ways for which it was not designed or avoiding its use and relying on an alternative means of accomplishing work" [Gasser, 1986, p. 218].	A workaround may or may not involve computing and may be directed at issues other than accomplishing work.
"The results of [articulation] work appear as workarounds or kludges, that is, misfits with the idealized representations of work that requirements have represented. However inelegant, workarounds are necessary to meet local resource constraints, deadlines, configuration limitations, or a mix of technical capacities" [Gerson and Star, 1986, pp. 266–267].	Workarounds may or may not be related to articulation work that occurs between business process steps. Requirements may not exist in some situations where practices emerged over time. Also, the necessity of meeting local resource constraints is only one of many reasons for workarounds.
"'Workarounds' are nonstandard procedures operators devise to compensate for system deficiencies" [Courtwright, Acton, Frazier, and Lane, 1988, p. 1150].	Workarounds may or may not be performed to compensate for system deficiencies.
"We define the general sense of *workaround* as follows: When a path to a goal is blocked, people use their knowledge to create and execute an alternate path to that goal" [Koopman and Hoffman, 2003, p. 70].	The proposed theory of workarounds clarifies that this general sense of workaround applies not only to technical workarounds, but also to organizational settings.
"… informal temporary practices for handling exceptions to normal work flow" [Kobayashi, Fussel, Xiao, and Seagull, 2005, p. 1561].	A workaround may or may not be temporary, and may address problems with the espoused workflow, rather than just exceptions.
"Where a mismatch occurs between the expectations of technology and actual working practice, employees implement a 'workaround' allowing them to deviate from set procedures.… Workarounds are manifestations of employees disengagement from the monitoring technology" [Sobreperez, Ferneley, and Wilson, 2005, pp. 4 and 5].	Workarounds may or may not be related to mismatches between technology and actual work practices. Workarounds may or may not be manifestations of employees' disengagement from the monitoring technology.
"… some action that results in alleviating a computing or hardware problem, but which does not solve the problem" [IBM, 2006].	A workaround may or may not alleviate a computing or hardware problem. It may solve the problem, at least from some viewpoint.
"… reducing or eliminating the impact of an incident or problem for which a full resolution is not yet available" [Taylor, Cannon, and Wheeldon, 2007, p. 395].	A workaround may provide a full resolution of a problem.
"Computer workarounds are a post-implementation phenomenon widespread in organizations. They are commonly defined as non-compliant user behaviors vis-a`-vis the intended system design, which may go so far as to bypass the formal systems entirely" [Azad and King, 2008, p. 264].	Workarounds may or may not be "computer workarounds." Compliance or noncompliance is an issue for some workarounds but not for others.
"Workarounds are work procedures that are undertaken to bypass perceived or real barriers in work flow" [Halbesleben, Savage, Wakefield, and Wakefield, 2010].	A workaround may or may not have a goal of bypassing perceived or real barriers in workflow.
"'Workaround' is generally defined as a plan or method to circumvent a problem *without* eliminating it. ... We define workarounds as informal rules or work methods—not formally considered and outlined in the system design—employed in working with a system to handle a workflow problem" [Niazkhani, Pirnejad, van der Sijs, and Aarts, 2011, p. 490].	A workaround may eliminate a transient problem. A workaround may or may not involve a workflow problem and may or may not occur within or in relation to a formally defined system.
"Workarounds are informal, situated practices that typically attract little attention.... [In relation to bureaucracies,] a workaround involves (1) a specific policy procedure or rule enforceable by bureaucratic superiors (2) that constrains or impedes local implementation and goal attainment and (3) prompts a local response that is counter to the procedure or rule but responsive to the underlying policy intent" [Campbell, 2012, p. 721].	A workaround may or may not involve a policy or procedure and may or may not support managerial or policy intent.

The proposed theory of workarounds assumes that workarounds may be totally ethical, ethically questionable, or

fraudulent. Its only assumption about ethical or legal considerations is that decisions related to creating and executing workarounds may consider ethics and legality along with many other factors. Criteria for distinguishing between workarounds and unethical or illegal actions by work system participants are sometimes unclear, especially in situations where classification decisions affect outcomes. For example, an accountant would be performing competent accounting practice by suggesting that a client should take advantage of arcane accounting regulations concerning favorable deductions for partial prepayments by splitting one large contract into two smaller contracts, e.g., Jones and Luscombe [2007]. On the other hand, a field technician who made a mistake last month is simply lying by choosing to enter a more favorable error code of "customer error" instead of an accurate error code of "technician error."

Types of Changes That Workarounds Might Include

Defining workarounds in relation to work systems [Alter, 2006, 2008, 2013] rather than just processes or technologies affords a broader and more comprehensive view of the changes that can be included in workarounds. As illustrated in the work system framework in Figure 1, this article defines a work system as a system in which human participants and/or machines perform work using information, technology, and other resources to produce products/services for internal or external customers. The work system framework identifies three other elements that are part of a basic understanding of a work system: the surrounding environment that affects the work system (e.g., organizational culture, politics, and history; organizational policies and procedures; relevant standards and regulations; competitive issues; technological trends), the external infrastructure that the work system relies on, and strategies at several levels.

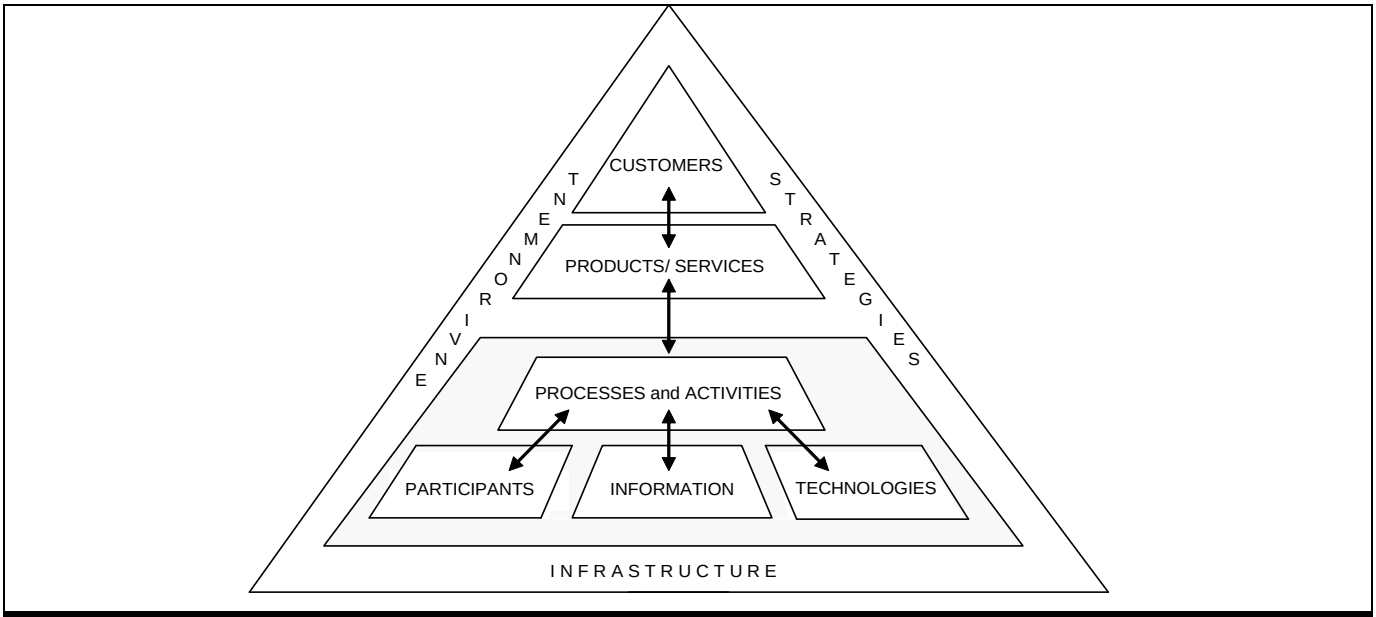

Figure 1. Work System Framework [Alter, 2013]

The following list identifies ways in which each element of the work system framework suggests both aspects of a work system that might change and possible sources of problems:

- **Processes and activities.** Do the work in a different way (e.g., skip steps, add steps, change the sequence of steps, use different techniques for performing steps), possibly because of the cumbersome nature of prescribed processes and activities.
- **Participants.** Allow or assign different participants to do the work (e.g., allow people who are not fully trained or qualified, are overqualified, or are temporary workers to perform steps), possibly because the people who should do the work are unavailable.
- **Information.** Do the work with different information (e.g., proceed before all information is available or use information from an unofficial shadow system), possibly because of problems with the quality, timeliness, completeness, or cost of the officially prescribed information.
- **Technologies.** Work around bugs and/or inadequate features of the work system's technologies (e.g., use old technology instead of prescribed technology, use prescribed technology in a non-prescribed manner, create spreadsheets or other personal information systems to bypass or augment sanctioned information systems or bypass the technology altogether).

- **Products/services.** Produce physical or informational products/services that deviate from expectations or specifications of the work system's customers, designers, or management, and that may aid or undermine other work systems. Past difficulties with the work system's products/services may instigate workarounds as countermeasures. (The term *products/services* recognizes that outputs of most work systems combine product-like and service-like characteristics.)
- **Customers.** Produce products/services for previously unserved internal or external customers. Alternatively, withhold products/services from some of the work system's current customers in order to minimize problems for the work system or its participants or customers.
- **Environment.** Perform workarounds involving activities, participants, information, technology, and/or products/services in response to situations in the surrounding environment, such as short-term emergencies, demand surges, challenges to the organizational culture, or changes in competitive issues, regulations, or business policies.
- **Infrastructure.** Bypass expected uses of infrastructure (technical, informational, and human resources shared with other work systems), e.g., by accessing information in a different way if corporate infrastructure is insufficient or malfunctions. Alternatively, workaround shortcomings in the work system's core by using infrastructural resources, such as human infrastructure to help in creating workarounds such as shadow systems or add-ons.
- **Strategies.** Work around strategies of the work system, department, or enterprise if those strategies or their mutual misalignments pose obstacles to achieving work system goals.

III. FIVE VOICES IN THE LITERATURE RELATED TO WORKAROUNDS

Figure 2 summarizes a literature review designed to find a large number of articles that identify specific examples of workarounds or provide relevant commentaries. The basis of the literature review was a series of Google Scholar searches using search terms such as "workaround"; "workaround + improvisation"; "workaround + bureaucracy"; "workaround + nursing"; "workaround + hazard," and so on. The 300+ articles that were found mentioned different types of workarounds in different situations and expressed a range of positive, neutral, or negative views of those workarounds and of workarounds in general. While inspection of additional hundreds of articles would have found other examples and possibly other types of workarounds, the examples and commentaries in the 300+ articles seemed sufficient as a basis for proposing a theory of workarounds. (Note: An archive of downloaded articles contains 289 articles. Many others that seemed repetitious or did not provide useful examples were not saved.)

The goal of Figure 2 is to organize the disparate but relevant topics that were found in the literature review and that, therefore, should be covered or included in some way by a comprehensive theory of workarounds. Figure 2 is modeled after a figure in Orton and Weick [1990, p. 217] that outlines a theory of loose coupling by identifying and linking five "voices" in the relevant literature. The five voices of loose coupling theory are the voices of causation, typology (types of loose coupling), direct effects, compensations (balancing loose and tight coupling), and organizational outcomes. Research and commentaries related to workarounds are organized throughout this literature review by using a similar five voices approach even though the topic of loose coupling itself is only one of many concepts included in Figure 2. As represented in Figure 2, the five voices in the literature of workarounds include phenomena associated with workarounds, types of workarounds, direct effects of workarounds, perspectives on workarounds, and organizational challenges and dilemmas related to workarounds. The rectangles in Figure 2 contain topics that can be grouped under each of the five voices (which are in ovals).

The arrows between the sections of Figure 2 say that various phenomena associated with workarounds lead to various types of workarounds, which in turn have various types of direct effects that are perceived through various perspectives on the benefits and pitfalls resulting from workarounds. In combination, the phenomena, types, effects, and perspectives generate a range of organizational challenges and dilemmas related to workarounds. The repeated use of the word *various* in the previous sentence emphasizes the diversity of topics and viewpoints within the relevant literature. Certain phenomena that are included in Figure 2 are more directly related to certain types of workarounds than to other types of workarounds; certain types of workarounds are more directly related to certain types of direct effects than other types of workarounds; and so on. The main point of the "voices of workarounds" approach in Figure 2 is to illustrate the breadth of ideas and examples that were found in the literature search and to provide a way of organizing those ideas and examples. The arrows represent a loose sense of causality because specific topics in the second, third, and fourth categories are more closely associated with some of the topics in previous categories and less closely associated with other topics in those categories.

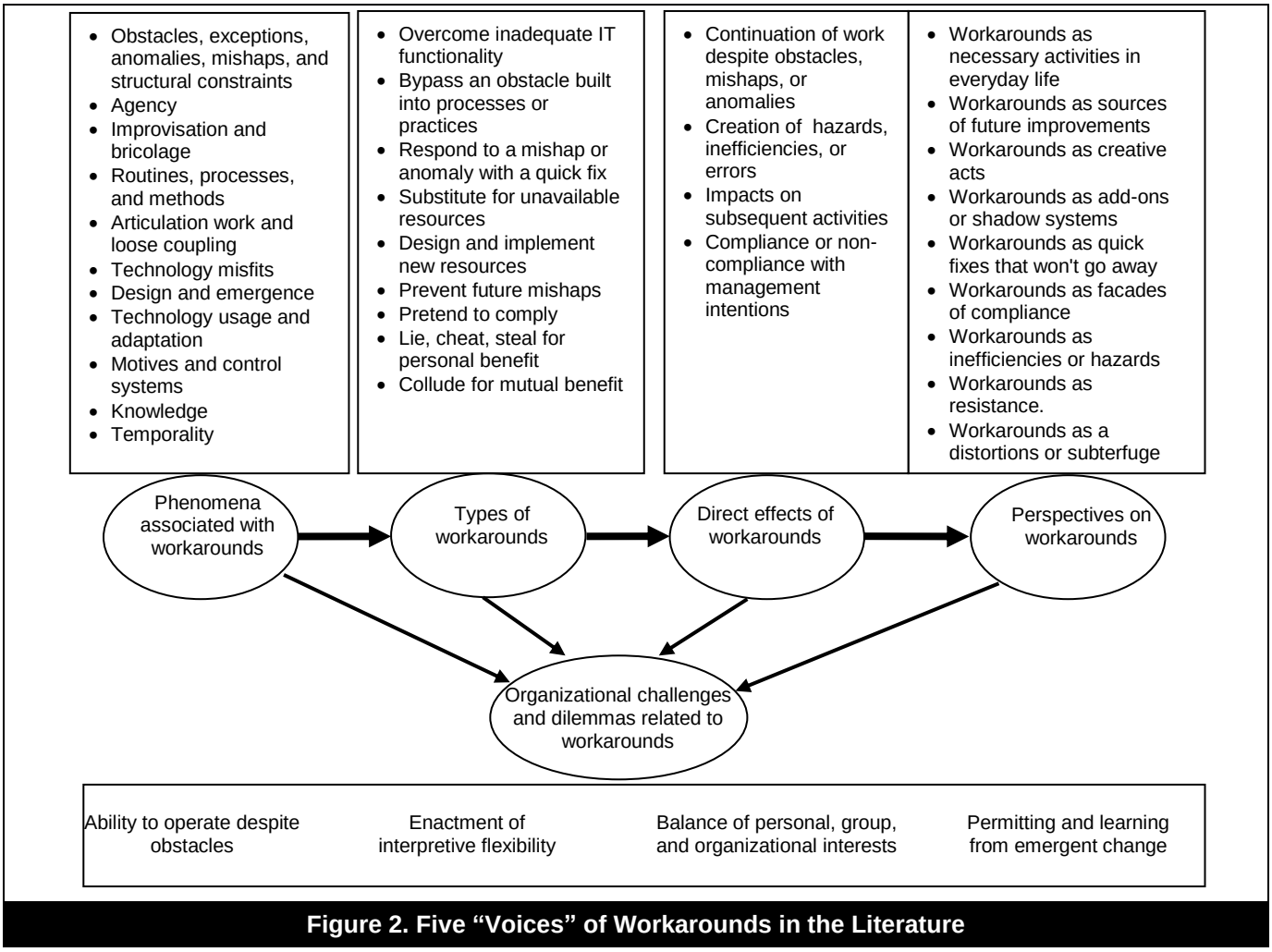

Figure 2. Five "Voices" of Workarounds in the Literature

Each of the workaround examples found in the literature search can be associated with one or more of the topics in each of the five voices in Figure 2. This section will mention each concept within each voice, in many cases providing several examples or references. While the literature search found many other relevant examples and commentaries for most of the concepts, additional examples would be repetitious.

Phenomena Associated with Workarounds

Since workarounds have direct effects on how work systems operate and how they evolve over time, the phenomena associated with workarounds touch a wide range of topics that have been studied by many authors. This summary of key phenomena associated with workarounds can mention only a few of the articles related to these phenomena.

Obstacles, exceptions, anomalies, mishaps, and structural constraints. The definition of workaround is posed in terms of overcoming conditions such as obstacles, exceptions, anomalies, mishaps, and structural constraints, all of which may be inherent in designed or emergent processes or management intentions, may appear from the external environment, and may occur due to variety of unanticipated circumstances.

Agency. Workarounds are fundamentally about human agency, the ability of people to make choices related to acting in the world. A useful theory of workarounds should reflect human agency within the context of the situations in which workarounds occur, i.e., situations in which people decide how to respond to obstacles, expectations, mishaps, and other conditions that prevent them from achieving a desired level of efficiency, effectiveness, or other organizational or personal goals. Many agency-related concepts that are relevant to understanding workarounds appear in agency theory [Eisenhardt, 1989], e.g., contracts between principals and agents, incentives, alignment or misalignment of goals, moral hazard, adverse selection, and information asymmetry. The theory of workarounds differs from agency theory in that agency theory focuses on contracts between principals and agents, whereas the theory of workarounds focuses on decisions about whether to pursue a workaround, and if so, which workaround to pursue.

Improvisation and bricolage. Workarounds are often viewed as instances of bricolage and/or improvisation. Bricolage is making do with what is at hand [Levi-Strauss, 1967], which may occur over short or long time spans. Improvisation is activity in which design and execution often overlap [Miner, Bassoff, and Moorman, 2001], i.e., bricolage during a short time span. Both improvisation and bricolage have been studied in a number of ways related to workarounds, e.g., IT and process workarounds as improvisation types in McGann and Lyytinen [2008].

Routines, processes, and methods. Workarounds often are viewed as exception handling and/or sanctioned or unsanctioned deviations from routines, processes, and methods. Attention to workarounds leads to basic questions about these concepts. The term *routine*, "repetitive, recognizable patterns of interdependent actions, carried out by multiple actors" [Feldman and Pentland, 2003, p. 75], may seem paradoxical because routines can change and become sources of flexibility and change rather than just inertia. Workarounds are a source of change when they illuminate a path toward greater efficiency or effectiveness. In relation to formalized and documented business processes that software vendors sometimes tout as "best practices," workarounds may be viewed as anything from desirable handling of exceptions to undesirable violations of best practices. Workarounds have similar relationships with prescribed methods, which may be interpreted either as requirements (you must do the work this way) or as guidelines (in general this is how the work should be done). Research on plans and methods has identified many situations in which plans and methods are not followed faithfully, even though they provide guidelines and constraints (e.g., Suchman, 1987; Truex, Baskerville, and Travis, 2000).

Articulation work and loose coupling. Workarounds of obstacles, exceptions, and cumbersome processes often occur when performing articulation work [Strauss, 1985], the "work that enables other work" [Sawyer and Tapia, 2006, p. 1], by addressing gray spaces and coordination, that is not described by formal processes and tends to be invisible to formal management systems. Workarounds also are essential in enacting loose coupling between systems, which usually is defined in relation to the separateness of systems despite occasional and indirect interactions [Orton and Weick, 1990, p. 203].

Technology misfits. Many workarounds occur because technology that is used does not fit realities and contingencies of day-to-day work. A widely studied example is ERP (enterprise resource planning), integrated software suites that embody seemingly logical but frequently unrealistic requirements, including forced sequences of process steps and conformance to inflexible business rules. Participants in work systems that use ERP software often see a need for workarounds in order to achieve goals related to efficiency, output, and responsiveness to customer needs.

Design versus emergence. Routines or processes bypassed by workarounds may have been designed formally or may have emerged over time through adaptations and improvements, including past workarounds. Ideally, initial designs should permit the appropriate amount of secondary design, finding a compromise between design and emergence in which features and capabilities designed prior to release are modified or bypassed after implementation as people engage in a process of "interaction, modification, and embodiment of the system in use" [Germonprez, Hovorka, and Gal, 2011, p. 1]. The creation of workarounds is part of that process.

Technology usage and adaptation. The impact of workarounds on technology adaptation and usage is quite significant, but may be understated in literature that highlights other topics such as appropriation of technology in local situations [Barley, 1990; Tyre and Orlikowski, 1994; Orlikowski, 2000; Boudreau and Robey, 2005]; post-implementation behavior [Jasperson, Carter, and Zmud, 2005]; affordances of technology [Norman, 1990; Markus and Silver, 2008; Leonardi, 2011]; structuration theory [Jones and Karsten, 2008]; human and material agency [Orlikowski, 2005; Rose, Jones, and Truex, 2005]; and identification of potential improvements by technology users [von Hippel, 1988]. A theory of workarounds might contribute to theory development and research in all of those areas because workarounds play a significant role in each area.

Motives and control systems. Reward systems that align enterprise and personal interests decrease the likelihood that inappropriate workarounds will be considered. The quality of control systems [Anthony, 1970; Beer, 1972; Kaplan and Norton, 1992] affects the likelihood that inappropriate or personally opportunistic workarounds will be noticed.

Knowledge. Appropriate workarounds are more likely to occur if the individuals or groups in organizations have knowledge needed to design and execute workarounds. For example, Gasser [1986] mentions workarounds by engineering analysts who knew from experience that the available engineering software gave incorrect answers unless they performed a workaround of inputting temperature coefficients for pipes carrying hot fluids as though the pipes were intended to operate cold. Workarounds are more likely to create new problems if work system participants who design workarounds do not understand the rationale (if any) for existing routines or processes. For example, there are many accounts of incomplete training leading to such incomplete understanding of complex

application software that work system participants see themselves as button pushers (e.g., Boudreau and Robey, 2005, p. 11).

Temporality. The importance and nature of time are relevant to any broad study of workarounds. Some workarounds are imagined and executed very quickly; others spring from extended deliberation; some last only until an obstacle disappears or until a more complete fix is available; others become institutionalized within organizational routines that endure for many years. Ciborra and Willcocks [2006] talk about the temporality of situations and says that it should be viewed as the temporality of everyday life rather than clock time. Lee and Leibenau [2000] and Shen [2009] discuss various aspects of structural time and interpretive time that are relevant to workarounds, such as allocation, sequencing, pace, temporal buffers, synchronization and coordination, cycle, rhythm.

Types of Workarounds

A number of articles (e.g., Gasser, 1986; Koopman and Hoffman, 2003; McGann, 2004; Ferneley and Sobreperez, 2006; Halbesleben et al., 2008; Ignantiadis and Nandhakumar, 2009) have proposed classification schemes for workarounds, often in relation to specific contexts such as healthcare, bureaucracy, or resistance to management policies. The types of workarounds identified in Figure 2 build on distinctions in the literature but are named in relation to different types of operational goals for the workaround. The following types cover the full range of workarounds that were found in the literature review.

Overcome inadequate IT functionality. Many workarounds occur because the available software and/or hardware lack specific functions or capabilities that are needed in order to perform specific work steps or to record specific data. For example, the inability of an enterprise software system to issue zero-dollar purchase orders resulted in a workaround of a minimum five-dollar cost whenever a vendor offered something for free [Strong and Volkoff, 2010]. Another example, mentioned earlier, involves workarounds of the inadequate bandwidth provided by a hotel chain's internal network [Davison and Ou, 2013].

Bypass obstacles built into existing routines. Work system participants attempting to perform their work sometimes design and execute workarounds that bypass constraints, obstacles, or anomalies built into routines, processes, or methods that they are supposed to use. For example, there are many accounts of bypassing requirements to enter temporarily unavailable data before proceeding with an online transaction or customer interaction. Often the workaround involves submitting "dummy data" that will be corrected later (e.g., Strong and Miller, 1995; Lederman et al., 2003). Some workarounds bypass impractical signoff or permission requirements. [Gasser, 1986]. Other repeated workarounds bypass computerized control systems, especially during changeovers [Supachayanont, 2011].

Bypass or overcome transient obstacles due to anomalies or mishaps. Some workarounds address transient anomalies or mishaps. For example, a striking study of medical workarounds focused on barcode systems used to assure that the right medication was administered to the right patient. Koppel, Wetterneck, Telles, and Karsh [2008, p. 408] found "15 types of workarounds, including, for example, affixing patient identification barcodes to computer carts, scanners, doorjambs, or nurses' belt rings; carrying several patients' prescanned medications on carts. ... [and] 31 types of causes of workarounds, such as unreadable medication barcodes (crinkled, smudged, torn, missing, covered by another label); malfunctioning scanners; unreadable or missing patient identification wristbands (chewed, soaked, missing); nonbarcoded medications; failing batteries; uncertain wireless connectivity; emergencies." Many other accounts of medical workarounds describe workarounds of incorrect or otherwise faulty prescriptions or orders (e.g., Vogelsmeier et al., 2008). In a study of papermaking, Supachayanont [2011, p. 128] found that operators responded to process disturbances during changes in paper grade by working around the control system in order to achieve production goals.

Respond to mishaps with quick fixes. Producing quick fixes to get around mishaps and other transient problems is an inherent part of many service jobs. For example, the IT Infrastructure Library (ITIL), widely used guidelines for IT service management, treats the creation of workarounds as an important responsibility of IT service desks. Within ITIL's Service Operation phase, "Problem Management" includes "diagnosing causes of incidents, determining the resolution, and ensuring that the resolution is implemented. Problem management also maintains information about problems and the appropriate workarounds and resolutions. ... Workarounds are documented in a Known Error Database, which improves the efficiency and effectiveness of Incident Management" [Cartlidge, Hanna, Rudd, Macfarlane, Windebank, and Rance, 2007, pp. 31–32]. Many medical situations require quick fixes to correct errors. For example, Niazhami et al. [2011] mention situations in which nurses received incompatible drug administration times that would lead to drug interactions. The workaround was to change the times in order to match the temporal rhythms of nursing work and/or patients' conditions (e.g., before or after meals).

Augment existing routines without developing new resources. Some repeated workarounds do not require new resources. For example, occasional computer users who are busy with many other tasks often view repeated log-ons and log-outs as a cumbersome waste of time. There are many reports (e.g., Boudreau and Robey, 2005; Ignantiadis and Nandhakumar, 2009; Yang, Ng, Kankanhalli, and Yip, 2012) of medical, accounting, and factory personnel logging on once and then allowing co-workers to use the same session for their transactions, augmenting a routine without developing new resources, but also generating inaccurate information. Another example is bypassing medical records systems and using paper or verbal orders for newly admitted patients, especially when physicians are busy doing other things [Niazhami et al., 2011; Saleem, Russ, Neddo, and Blades, 2011].

Substitute for unavailable or inadequate resources. Workarounds often involve substitutions when inadequate staffing or unavailability of resources calls for a workaround. In many hospital intake situations or emergency situations, nurses and others simply proceed with whatever seems to be medically appropriate even if no physician is present to provide formal orders (e.g., Yang et al., 2012). In some cases, the unavailability of a resource is only a perception, as when computer users did not know where to record credit card information and, therefore, completed transactions by entering the information elsewhere [Boudreau and Robey, 2005]. In other cases potential users apply informal channels instead of official information sources that are opaque or difficult to use [Petrides, McClelland, and Nodine, 2004].

Design and implement new resources. In some situations, work system participants and/or technical specialists develop and implement software workarounds, shadow systems, modifications of existing software, or other resources that were previously unavailable in the setting. Such shadow systems are sometimes unsanctioned systems that address shortcomings of a sanctioned system (e.g., Brazel and Dang, 2008). One such resource is a paper-based system to augment an electronic system (e.g., Fitzpatrick and Ellingsen, 2012).

Prevent mishaps. While the promise of many computerized systems emphasizes increasing productivity and establishing a "single version of the truth," there are many situations in which people try to prevent mishaps by using manual double checking, paper records, and personal versions of databases to assure that they have accurate information. For example, in a community college setting, many respondents reported that they "felt it necessary to perform manual counts to verify the accuracy of data from computerized systems" [Petrides et al., 2004, p. 104]. Similar examples in inventory control and production planning are mentioned in Strong and Miller [1995, p. 207].

Pretend to comply. Some workarounds try to create the appearance of compliance with management goals, regulations, or behavioral expectations. In one example, social workers at a children's service agency were under pressure to meet production targets while also trying to service their clients as well as possible. To meet both goals, they logged some cases as completed that actually were being held for further review [Broadhurst, Wastell, White, Hall, Peckover, Thompson, Pithouse, and Davey, 2009]. In a mandatory training situation, many workers adopted the workaround of repeatedly hitting the return key in order to speed up the "training process" and, therefore, get back to work or go home earlier. In the same study, a quality control group imposed a set of mandates related to project plans. People sometimes filled out forms "with invalid data to buy time, because uncertainty declines over time. From this perspective, [the continuing insistence] that other units fill out these forms may only lead to more invalid data. Consequently, the tighter the control system, the more it may result in workaround activities and false data" [Alojairi, 2010, p. 117].

Lie, cheat, steal for personal benefit. On the dark side, people sometimes use workarounds for lying, cheating, or stealing. Many medical examples involve the coding of illnesses by doctors who would be paid based on those codes. Whooley [2010] notes "workarounds" in which psychiatrists fudge diagnosis codes and even negotiate diagnoses with patients. In a statistically based study, Derby, Lapane, Feldman, and Carleton [2001] found that the method of payment had a strong effect on whether strokes received a more severe and more highly paid diagnosis of "cerebral occlusion" vs. a less severe diagnosis of "acute but ill-defined." Analysis of data from two New England states in the 1980s found an increase from 28 percent to 72 percent in the proportion of the more severe diagnosis after the reimbursement method changed from paying for services rendered to paying based on the diagnosis using "DRGs"—diagnosis-related groups.

Collude for mutual benefit. "Lie, cheat, steal" may be pursued with acquiescence or encouragement of management. Reviewing strategies for enhancing results of periodic hospital inspections, the *British Medical Journal* found methods such as adding staffing during the week when audits occur, scheduling appointments during patient vacations so that the counter would revert to zero when the patient did not appear, and registering ambulance patients only when the staff was ready to see them. Other distortions included up-coding the diagnosis to increase reimbursements, up-coding patient risk factors to make medical results seem impressive, and transferring dying patients to reduce the hospital's death rate [Pitches, Burls, and Fry-Smith, 2003]. Similar examples in nonmedical areas occur in areas such as evaluating schools, teachers, and curricula [Dillon, 2011] and creating the appearance

of regulatory compliance [Thomas, 2011]. Workarounds of traditional mortgage lending practices contributed to the 2008–2009 financial meltdown. Such examples require a reminder that the proposed theory of workarounds does not try to distinguish between ethical and unethical, or even illegal workarounds.

Direct Effects of Workarounds

Direct effects of workarounds include continuation of work despite obstacles, mishaps, or anomalies; creation of hazards, inefficiencies, or errors; impacts on subsequent activities; and compliance or noncompliance with management intentions.

Continuation of work despite obstacles, mishaps, or anomalies. Misfits among work practices, hardware/software features, and the local environment often present repeated choices about whether to perform work in an efficient and timely manner focusing on the substance of what is to be achieved or whether to perform work in conformance with prescribed processes that sometimes seem arbitrary, over-structured, and even counterproductive. In a call center with a problematic customer management system (CMS), "to use CMS, agents had to develop workarounds; 'lying to the computer' and 'cheating the system', as they put it, in order to get the job done." … Rather than resistance to management, workarounds were "expedient measures that agents developed for dealing with the contradictory requirements of using the new technology while fulfilling customer expectations. 'Lying' was practised when CSRs [customer service representatives] were presented with inappropriate screens and scripting. It was engaged in to get around a technology that CSRs increasingly considered dysfunctional. …. 'Lying' could also be engaged when the system was not responding in an appropriate fashion or when the options it presented were inadequate to deal with a problem and the agent was required to 'break loose' of the constraints embedded in CMS. Employees would lie to CMS to get past blocks that were part of the new software in order to let them do what they defined as their real job" [Russell, 2007, p. 142]. Many accounts of medical workarounds describe workarounds that allow the continuation of work despite physical obstacles and missing information (e.g., Koppel et al., 2008; Cornford, Dean, Savage, Barber, and Jani, 2009).

Creation of hazards, inefficiencies, or errors. Workarounds in medical practice are not the only ones that may cause hazards or errors. Many workarounds that cause hazards involve turning off safety devices and/or alarms to accomplish goals such as avoiding interruptions and noise from alarms that are false positives. The Chernobyl nuclear disaster is an infamous and tragic example in which engineers disabled a safety system in order to do an experiment. This topic has been discussed extensively in regard to patient monitoring systems in hospitals [Cvach, 2012]. In another example, false alarms led to disabling of warning alarms related to use of battery power at an AT&T switching station that handled telecommunications for New York airports. Disabling the alarms was one of many causes of an incident in which a manageable power outage at an AT&T switching station that handled telecommunications for New York airports escalated through a series of errors and caused the grounding of flights for 85,000 air passengers. Part of the problem was that warning alarms related to use of battery power had been disabled due to false alarms [Anthes, 1991].

Impacts on subsequent activities. Whether or not workarounds affect efficiency and quality of work and outputs in the situation at hand, workarounds may affect subsequent activities in a variety of ways. They may have no subsequent effects; they may generate inaccurate data; they may produce defective products; they may obscure latent errors and inefficiencies that should be corrected directly instead of remaining hidden (e.g., Kmetz, 1984; Courtwright et al., 1988; Gasparas and Monteiro, 2009); and they may expose information that should be private (e.g., Boudreau and Robey, 2005).

Compliance or noncompliance with management intentions. Workarounds conform with management intentions in many situations, are mildly nonconforming in other situations, and directly undermine management intentions in other situations. For example, management often wants and expects workarounds when a company's outdated software cannot support current realities such as new types of priorities [Strong and Miller, 1995] or new billing plans that are needed to compete, even though those plans do not fit with existing software [Baker and Nelson, 2005]. Management intentions are more ambiguous where supervisors acquiesce with workarounds that bypass official systems and methods (e.g., Sobreperez et al., 2005) and where contracts call for using software that cannot support efficient work practices [Bowers, Button, and Sharrock, 1995].

Perspectives on Workarounds

The literature contains a striking range of different perspectives concerning the business and ethical value of workarounds. By the more positive views, workarounds are necessary activities in everyday life, are creative acts, and are sources of future improvements. Other views treat workarounds as add-ons or shadow systems, as facades of compliance, and as inefficiencies or hazards. Yet others treat them as resistance, distortions, or subterfuge.

Workarounds as necessary activities in everyday life. Gasparas and Monteiro [2009, pp. 1 and 11] suggest "considering workarounds as an intrinsic part of everyday work, which should be calculated as additional costs of making the generic technology work in practice. .... Local workarounds, tinkering and 'situated improvisations' are not anomalies or design shortcomings but constitutive elements of working technologies." Leonardi [2011, p. 148] says, "studies show that even in the face of the most apparently constraining technologies, human agents can exercise their discretion to shape the effects those technologies have on their work." In a social work example, social workers used workarounds of a client information system whose organization in modules was an obstacle to getting their work done. "To avoid multiphase navigation between modules and too many clicks, the social workers embedded information in the case report instead of using appropriate modules or documents. For instance, a social worker chose to collect contact information of the families on the top of case reports instead of using a family module meant for this type of information" [Huuskonen and Vakkari, 2012]. In addition, "in the context of IT investment and use, users could maintain that their workarounds are ways of overcoming their managers' mistakes in choosing inappropriate systems" [Singh, 2009, p. 25].

Workarounds as creative acts. Many practitioners and researchers view workarounds as creative acts. In a study of bureaucracy, "eight of 12 superior performing managers described that they manage bureaucracy by employing creative tactics to circumvent policies and practices that get in their way. Acknowledging that compliance with organizational policies and practices can often slow down work progress or interfere with desired solutions, they purposely anticipate potential barriers and issues and deftly work around them" [Pittenger, 2010, pp. 23–24]. In a comment from the world of nursing practice, Vestal [2008, p. 8] says, "Because we feel the responsibility to get things done, we find the shortcuts and counter-policy ways to bypass the obstacles in the way. In fact, nurses have turned the art of working around obstacles into a way of work life. ... The truth is that some workarounds are more creative than prescribed solutions and may need to replace an official process that is not working well." When excessively cumbersome medication systems "remain in practice, workarounds, which are clever alternative approaches, are artfully developed by the users. Workarounds allow users to live with the system while avoiding some of the demands that are deemed to be unrealistic or harmful" [Ash, Berg, and Coeira, 2004, p. 104]. And in everyday life, "[t]hose who hack and create workarounds are people like you and me when we encounter a problem: We cobble together some new device, post notes and labels, remove confusing knobs and buttons, ... and tape over switches and controls to prevent accidental activation. Hacks and workarounds are the soul of innovation. Observing is easy; recognizing the innovation and then knowing what to do with the observations are where the difficulties lie" [Norman, 2008, p. 48].

Workarounds as source of future improvements. Workarounds are a way to sensitize people to areas of dissonance and to appreciate which can be changed or avoided [Brady, 2003]. Safadi and Faraj [2010, p. 8] say that workarounds evolve during a four stage process: a learning phase, an experiencing phase, a diffusion phase, and a feedback phase. "User initiated change and workarounds are likely to become a normal and essential part of the IS implementation process. The implication of such an emergent phenomenon .... would be to make workarounds an essential aspect of health IT implementation." Similarly, Beckman and Barry [2007, p. 32] argue that designers and innovators should "understand why users act as they do, and how users make sense of what they do for themselves and for others." Of special value are stories, "particularly stories that involve contradictions or workarounds."

Workarounds as quick fixes that don't go away. Koopman and Hoffman [2003] note that workarounds may be viewed as temporary fixes but often end up being long lived. Similarly, Johnson, Miller, and Horowitz [2010, p. 326] say, "theoretically, workarounds are intended to offer a quick fix, and are replaced by a solution that addresses the system problems. In practice, people often find themselves living with workarounds for long periods, as evidenced in our example of the interns passing the list of workarounds to the next generation." In a factory example, "[i]nitial integration problems forced project engineers to install a temporary manual 'workaround.' Although the manual workaround was inefficient, operators quickly learned to depend on it. ... users clung to the system they had become accustomed to, and prevented engineers from dismantling the 'temporary' workaround. Because of this, the new grinder's capabilities for efficient, high-precision machining were never fully developed and exploited" [Tyre and Orlikowski, 1994, p. 107].

Workarounds as add-ons, shadow systems, feral systems. Workarounds that compensate for functional shortcomings of purchased or homegrown software may take the form of add-ons or shadow systems. Ignatiadis and Nandhakumar [2009] call such efforts "workarounds by using external systems" (outside of the ERP software). Others describe linking supply chain modules to ERP packages or adding bolt-on internal control systems to ERP systems that may bypass internal controls such as segregation of duties and supervisory review [Brazel and Dang, 2008]. Shadow systems built on spreadsheets outside the purview of corporate IS managed by IT professionals often contain logic and data that are inconsistent with corporate data and frequently bring information security problems. For example, following a firm's ERP implementation, workarounds and shadow systems reappeared in its business units, even though many of them had been removed when the ERP system was implemented [Singh,

2010]. Shadow systems also have been viewed as a type of "feral system" [Thatte and Grainger, 2010; Kerr and Houghton, 2010], implying that despite certain benefits, they grow wild and should not be trusted, e.g., "once created, these systems spread throughout an organization like pernicious vines, strangling any chance for information consistency and reliability" [Eckerson and Sherman, 2008, p. 4].

Workarounds as inefficiencies or hazards. Ash et al. [2004], Patterson, Rogers, Chapman, and Render [2006], and Azad and King [2008] identify situations in which workarounds could undermine patient safety. Halbesleben et al. [2008, pp. 1–2] note that many systems implemented to reduce errors introduce redesigned processes with "intentional workflow blocks that may be perceived as inefficient, unnecessary, or inconvenient by the professionals carrying out these tasks" [Beaudoin and Edgar, 2003]. "To expedite their work and reduce disruptions these workers may periodically avoid these blocks by substituting alternative, informally designed, and inconsistently applied work processes. ... Such 'workarounds' may reduce the reliability of the intended work processes, with the result, in some cases, being reduced patient care quality and safety." Murphy and Walls [2008, p. 17] say, "Workarounds are inherently dangerous. By their very definition workarounds undercut standard procedures. One common HIT [health information technology] workaround is documenting patient information on paper and entering it into the system at a later time. Clinicians who do this fail to realize the high likelihood of the data never making it into the system—either because it is lost or because they forget about it."

Workarounds as a means for maintaining appearances. Vieira da Cunha and Carugati [2009] describe how first-line managers help in-house sales people skew data submitted to the Siebel CRM in a way that makes them look good to senior managers. In effect, they were performing workarounds of the sales tracking system when they decided whether to report sales immediately or report them in the next quarter, and how to allocate sales credit among sales people in order to make everyone look good each quarter. Similarly, a child welfare service invented a workaround to deal with externally imposed timing requirements on completing phases of their work. Because assessments were often difficult to complete in the mandated seven days for complex cases, a new process category called *Review Initial Assessment* was invented to hide the need to continue work on complex cases [Wastell, White, Broadhjurst, Peckover, and Pithouse, 2010]. In a software example, the project leaders committed to using a CASE (computer-aided software engineering) tool that seemed promising but proved functionally deficient and was inconsistent with established work practices. A workaround was developed in order to meet deadlines, and the CASE tool was used ineffectively. To minimize embarrassment, the workaround was described as "following an instantiation of the CASE approach," which basically meant that we use the CASE tool as a drawing tool, but we code in pairs approximately as we did before [Andelfinger, 2002, p. 198].

Workarounds as resistance. Workarounds may entail resistance and intentional noncompliance to authority. Ferneley, Sobreperez, and Stevens [2004, p. 1002] say that "workarounds are manifestations of employees' disengagement from the monitoring technology; such disengagement threatens accurate data capture." Citing Pfaffenberger's [1992, p. 286] view that users faced with new technologies "engage in strategies that try to compensate for the loss of self esteem, social prestige, and social power that the technology has caused." Pollock [2005, p. 2] says that workarounds commonly "represent resistance on behalf of users and the means by which they attempt to wrest control back from a technology or an institution." Boudreau and Robey's [2005] account of an ERP mentions many examples of potential users not taking actions that would have furthered the implementation effort and would have moved toward achieving the rationale for implementing ERP. For example, when ERP training was voluntary, many users attended none or few of the sessions that were offered. Similarly, instead of entering ERP data, many potential users continued using paper forms and left it to "power users" to enter the data.

Workarounds as distortions or subterfuge. The examples mentioned earlier as workarounds in the "lie, cheat, steal for personal benefit" and "collude for mutual benefit" categories were described in articles that treated those types of workarounds as distortions or subterfuge. That general view also applies to recent instances of rogue traders and/or outright fraud through various methods for bypassing or fooling the financial control systems of banks, investment firms, and regulatory agencies (e.g., see Gup, 2012).

One might ask whether these examples of misrepresentation are truly workarounds or whether they are better described as unethical behavior or even criminality. The possibility that some workarounds involve distortions or subterfuge was included here because a theory of workarounds should not assume that all workarounds are benevolent. Defining a precise distinction or boundary between legitimate but possibly questionable workarounds versus illegitimate distortions and subterfuge is beyond this article's scope.

Organizational Challenges and Dilemmas Related to Workarounds

Most discussions of workarounds focus on the workarounds themselves and on their immediate impacts. In addition to describing the creation and content of workarounds, a broadly applicable theory of workarounds should provide

links and implications related to four types of organizational consequences that fill out Figure 2. Most of the accounts of workarounds in the literature review mentioned aspects of one or more of the following challenges and dilemmas:

Operating despite exceptions, built-in obstacles, and incomplete specifications. Workarounds make it possible to get work done when conditions get in the way. Regardless of how carefully work is designed or planned, people doing the work need to be able to produce desired results within whatever situations they face, including transient obstacles or anomalies and built-in obstacles within prescribed or established practices. Often they are part of articulation work, "all the coordinating and negotiating necessary to get the work at hand done" [Grinter, 1996, p. 450]. At a more general level than previous examples related to situated work practices, an extensive study of local government leaders concluded that "workarounds are an essential component of local policy implementation and a useful source of data for policy analysis" [Campbell, 2012, p. 721].

Balancing interpretive flexibility versus management control. The principle of minimal critical specification says that "no more should be specified than what is absolutely essential" [Cherns, 1987, p. 155] when designing socio-technical systems. Applying that principle allows work system participants to use common sense and ingenuity in achieving legitimate objectives while also recognizing and honoring necessary controls. Many of the foregoing examples of various types of workarounds and different perspectives on workarounds illustrate tensions between inefficient and sometimes unsafe variability, on the one hand, and cumbersome and counterproductive controls, on the other. Those tensions exist when obstacles first become apparent and often extend over time as workarounds are incorporated into organizational routines and/or contribute to the development of better practices and products.

Balancing personal, local, and organizational interests. The foregoing examples include some workarounds that are motivated by personal interests, others that address local goals within organizations, and yet others that address broader organizational interests. Many examples related to getting work done and developing better practices illustrate how personal and local workarounds often support organizational goals. Other examples that were mentioned illustrate how personal and local workarounds may subvert organizational goals. Balancing these interests calls for a combination of incentives, knowledge, and monitoring systems that encourage mutual alignment.

Permitting and learning from emergent change. With the exception of one-time quick fixes related to transient, non-recurrent problems, many workarounds provide learning that may be an important starting point for emergent change and planned change. In some cases the learning is that workarounds overcome problems that are built into routines and/or mandated practices. In other cases, the learning is that specific workarounds or types of workarounds should not be permitted because they cause subsequent problems. In either case, the learning will be more likely if people have enough knowledge to analyze situations, design possible workarounds, and decide whether and how to implement those workarounds. Those topics and many others are part of the proposed theory of workarounds.

IV. THEORY OF WORKAROUNDS: A PROCESS DRIVEN BY THE INTERACTION OF KEY FACTORS

As presented in Figure 3, the theory of workarounds is a process theory [Mohr, 1982], cited by [Markus and Robey, 1988, pp. 589–593], that describes how and why workarounds are created. Workarounds occur within a context, which includes both the local structure within which the workaround will occur and the intentions, goals, interests, and emergent change that led to that structure. Within that context, the perceived need for a workaround is based on a combination of situational constraints, obstacles, and anomalies, and participant goals. Identification of possible workarounds and their perceived costs, benefits, and risks is based on factors related to the perceived need plus other factors such as knowledge available for designing workarounds, the monitoring system that might detect workarounds, and ethical considerations. The decision about whether to proceed and the selection of a workaround to pursue are based on the perceived costs, benefits, and risks of the alternatives. The development and execution of the workaround are based on the potential workaround that is selected plus the available knowledge plus ethical considerations. Both local and broader consequences may ensue. The theory of workarounds addresses a different scope than agency theory (e.g., Eisenstadt, 1989), even though some of the issues from agency theory, such as moral hazard, information asymmetry, and the cost of monitoring, are relevant in some cases. Where agency theory focuses on establishing mutually beneficial contracts between agents and principals, the theory of workarounds focuses on whether a workaround might be appropriate and, if so, which possible workaround to pursue.

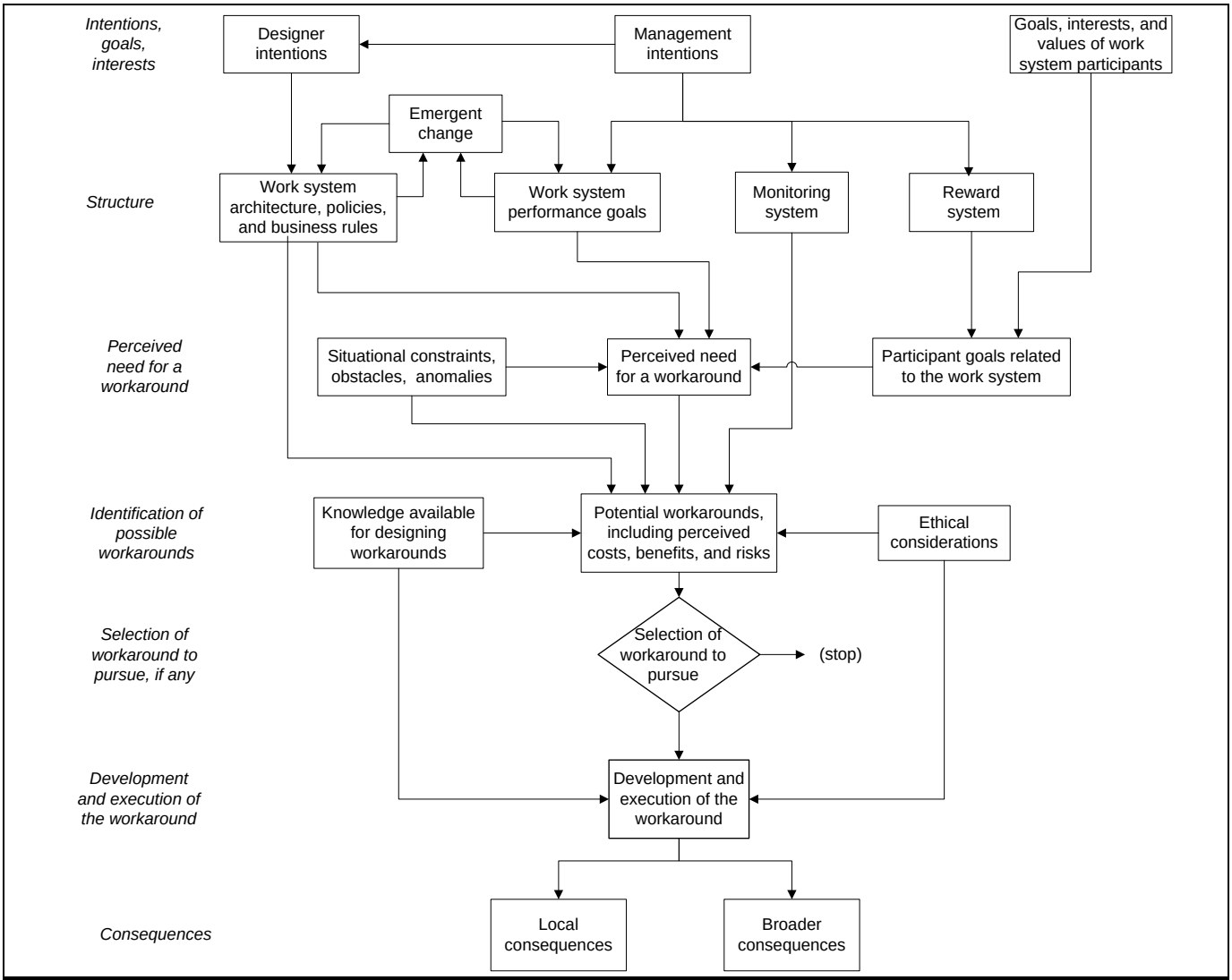

Figure 3. Theory of Workarounds

This theory encompasses all the types of workarounds that were mentioned in the five voices in the literature review, ranging from small, localized workarounds that are forgotten quickly through software add-ons and shadow systems designed to address workflow or software shortcomings over long time spans. Because the theory spans a wide range of situations, the factors included in Figure 3 have significant impact in some situations and minimal impact in others. For example, monitoring systems and ethical considerations usually are more important for workarounds that affect activities, information, or results elsewhere and usually are less unimportant for workarounds of temporary, local conditions that have no impact elsewhere.

Italicized terms on the left side of Figure 3 identify generic steps in perceiving the need for a workaround and then creating it. The sequence reflects a basically rationalist view in which work system participants create workarounds by identifying obstacles and deciding what to do about them. As a whole, the theory combines ideas from a number of theories and concepts. The theory of planned behavior [Ajzen, 1991] infuses the entire scope of the theory of workarounds, as behavioral intentions are guided by attitudes toward a workaround, subjective norms related to the workaround, and perceptions of behavioral controls. Concepts related to improvisation and bricolage (e.g., Levi-Strauss 1967; Weick, 1993; Ciborra, 1999, 2002; Baker and Nelson, 2005) illuminate the way workaround actions emerge, at least initially, from the situation and resources at hand. Agency theory serves as a reminder that workarounds may or may not be aligned with management intentions, that work system participants have information that may not be shared with management, and that the power of control systems affects whether or not a particular workaround is practical. Work system theory [Alter, 2013] maintains the focus on the entire work system, not just technology or process. It serves as a reminder that changes may occur in relation to any of the nine elements of the work system framework. The work system lifecycle model serves as a reminder that paths to change include both planning and emergence.

Before discussing the steps in the theory workarounds, it is worthwhile to mention this article's stance in relation to past discussions of what constitutes a legitimate theory (e.g., Sutton and Staw,1995; Weick, 1995; Gregor, 2006; Weber, 2012). While the theory of workarounds is not directly related to practice theory, the underlying stance about theory per se is based on the stance expressed by Schatzki [2001, pp. 12–13] in the introduction to a book on practice theory: "Theory means, simply, general and abstract account. A theory of X is a general and abstract account of X. ... [Theories include] typologies of social phenomena; models of social affairs; accounts of what social things (e.g., practices, institutions) are; conceptual frameworks developed expressly for depicting sociality; and descriptions of social life—so long as they are couched in general, abstract terms."

Steps in the Theory of Workarounds

Each of the steps and related factors will be discussed briefly. The first two steps reflect prior developments that form the context within which workarounds can occur. These contextual topics are included because they are part of an understanding of how and why specific workarounds occur in practice. Specific workarounds are developed and executed through a typical problem-solving process that includes perceiving the need for a workaround, identifying possible workarounds, selecting a workaround to pursue (if any), developing and executing the workaround, and finally, reaping the consequences.

Intentions, goals, and interests identify management concerns that would be a starting point in an analysis based on agency theory. Intentions, goals, and interests include each work system participant's personal goals, interests, and values. The arrow between management and designer intentions is a reminder that communication between managers and designers may be flawed or incomplete and that whatever work system is designed may be misaligned with both sets of intentions. For example, designers may design cumbersome or ineffective systems. Emergent change is included just below the layer for intentions because relevant aspects of systems may have emerged over time through adaptations, bricolage, and past workarounds that were not guided directly by management or by a formal design effort.

Structure includes the architecture and characteristics of the work system, work system performance goals, the monitoring system, and the reward system. The loop related to emergent change for the work system says that management and designer intentions affect architecture, policies, business rules, and performance goals, all of which may be factors in emergent change. Completing the loop, emergent change affects the work system's structure.

Perceived need for a workaround is based on a combination of the work system's architecture and performance goals, situational constraints, obstacles, and anomalies, and participant goals related to the work system.

Identification of possible workarounds is triggered by the perceived need for a workaround. Consideration of costs, benefits, and risks typically starts with obstacles in the current situation and the perceived need for a workaround. Knowledge available for designing workarounds is essential for considering any workaround seriously, e.g., "When a path to a goal is blocked, people use their knowledge to create and execute an alternate path to that goal" [Koopman and Hoffman, 2003, p. 71]. Examples of bricolage in Baker and Nelson [2005] illustrate the essential nature of this type of knowledge.

For each approach considered, perceived benefits, costs, and risks include the effort of eliminating obstacles and any longer term consequences of the approach taken. Monitoring systems affect the likelihood of detection for potential workarounds that are questionable for a variety of reasons. Ethical considerations may also come into play in some cases.

Selection of workaround to pursue, if any, reflects concepts from the theory of planned behavior [Ajzen, 1991], such as attitudes toward the behavior, subjective norms, and perceived behavioral controls, plus concepts from agency theory such as moral hazard and information asymmetry.

Development and execution of the workaround can occur in minutes in simple cases where process steps are bypassed or modified slightly, or can take weeks or months if software must be designed and implemented. Relevant concepts include attention to current conditions, intuition guiding action, testing of intuitive understanding, and situational decision making [Ciborra, 2002, p. 155].

Local consequences and broader consequences complete the picture. Local advantages may include eliminating temporary obstacles or creating improved workflows. Local disadvantages may include failure of the workaround or creation of other problems, such as distorting information used later in the same work system. Broader

consequences concern impacts on other work systems, such as distorting information or shifting problems to other locations.

Temporality of Workarounds

Zhou, Ackerman, and Zheng [2011] identify many workarounds related to computerized patient order entry (CPOE) systems and explain that some are transitory and disappear over time, while others persist over time. Neither Figure 2 nor Figure 3 addresses that phenomenon or the broader topic of the temporality of workarounds.

Figure 4 shows how workarounds can be a springboard for longer term changes. Improvisations occur in the time frame of seconds-to-minutes. Bricolage, making do with whatever is available, includes improvisations but also extends to longer term incremental changes in routines. Eventually, both the success of bricolage and the limits that it cannot overcome lead to sanctioned formal projects or informal projects (e.g., for creating localized shadow systems) that attempt to generate longer-lasting work system improvements. The timeframe-independent view in Figure 3 identifies many factors that affect the interplay of goals, existing practices, obstacles, and possibilities in each stage in Figure 4.

An example of the shortest duration in Figure 4 is a nurse's improvisation in a stressful situation where the priority is to perform one task and move on to another task even if doing so bypasses prescribed procedures that would be used under normal circumstances when more time is available. That workaround could become a more enduring workaround if a group of nurses decides that it is a good way to modify details of an awkward procedure in order to be more efficient in achieving immediate goals while also producing all of the necessary information for others. The broader impact of a workaround occurs when learning from the nurses' innovation is integrated into sanctioned processes and/or better software to support their work.

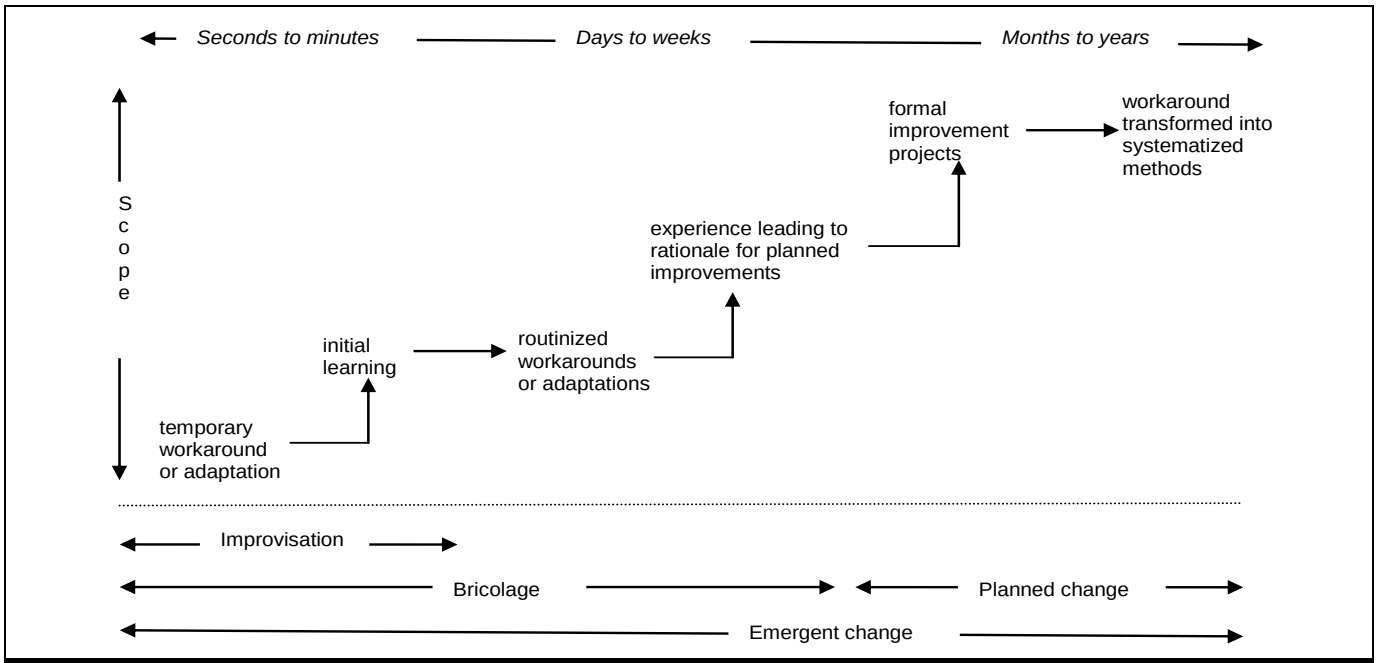

Figure 4. Temporality of Workarounds

V. DISCUSSION AND CONCLUSIONS

The theory of workarounds contributes to the description, analysis, and evaluation of systems in organizations by defining the term *workaround* and describing how workarounds occur in a broad range of situations. Various facets of the theory provide a possible starting point for further research related to workarounds and other important topics.

Validation of the Theory

The theory of workarounds was developed to cover most of the readily available examples of workarounds in the literature of organizational behavior, management, sociology, public administration, and technology. Several initial versions of the theory attempted to cover an initial set of workarounds identified through a scan of a personal library plus an initial Internet search. Subsequent searches described earlier found many additional examples that led to improvements or clarifications in Figure 2 (five voices in the relevant literature) and Figure 3 (the theory of workarounds). This article mentioned examples or references to illustrate topics within each voice in Figure 2. Most

of the examples could have been replaced or augmented with others that were found in the literature during the search process, but that would have been repetitious or would have absorbed too much space.

The theory of workarounds has face validity because many diverse examples from different disciplines fit into the logical flow in Figure 3. That is not surprising since Figure 3 was developed iteratively in an attempt to accommodate all the examples that were found. Since the search was broad and extensive, it seems likely that the examples represent the range of workarounds in the literature.

An important shortcoming of this approach to validation is that the original sources of many of the examples did not explain them in enough detail to verify conclusively that the sequence and factors in the theory of workarounds applied completely in each instance. Some of the examples came from research specifically about workarounds and related phenomena mentioned in Figure 2, while other examples came from research that focused on other topics. Also, while all of the factors in the theory are significant in many workarounds, in some workarounds at least some of the factors are latent and have little impact. For example, designer intentions are unimportant for a workaround that bypasses an organizational routine that evolved over time and was never designed by anyone. Similarly, the monitoring system is unimportant when a firm's CEO designs a legal and totally uncontroversial workaround of a temporary obstacle. Finally, the search did not find accounts of workarounds that were considered but never attempted.

A stronger test of the theory would identify another set of workarounds that occurred, were abandoned, or never were attempted. It would ask whether the theory describes how those situations unfolded. That stronger test would require a different logic for identifying a set of relevant examples because the current article already incorporates many readily available sources.

Usefulness

The theory of workarounds is useful for several reasons. It provides a unified view of workarounds, thereby augmenting existing definitions, most of which focus explicitly or implicitly on only a subset of the workarounds that occur in practice, as was demonstrated in Table 1. Its process model and identification of important factors related to each step provides a potential basis for survey and/or case study research about the creation and impacts of workarounds. The survey research would determine whether the steps seem to be followed in other real-world examples, and whether the factors identified are associated with those steps in real world situations. The case study research would focus on whether the process model provides a good map of how workarounds unfolded in specific situations. In both cases, the existing theory could guide research that might find factors and relationships that are not currently portrayed or might be portrayed differently.

The theory of workarounds might be used directly in analyzing and designing systems in organizations. Despite the importance and frequency of workarounds, the lengthy indexes and glossaries in most recent systems analysis and design textbooks (e.g., Dennis, Wixom, and Tegarden 2009; Satzinger, Jackson, and Burd, 2009; Kendall and Kendall, 2011; Valacich, George, and Hoffer, 2012) do not mention the term *workaround*. That omission may be consistent with the technical emphasis of systems analysis courses, but it leaves the question of where and how workarounds should be considered in formal or informal systems analysis and design methods and in business process management (BPM) methods (e.g., vom Brocke and Rosemann, 2010). At minimum, the literature on workarounds reveals fundamental limitations in textbook assumptions that prescribed business processes will be followed consistently even if the software was designed or configured to control the work. Also, the theory of workarounds may help in questioning pejorative terms such as *shadow system* and *feral system* that imply workarounds are illegitimate instead of looking for their possible benefits.

The theory of workarounds could lead to more realistic assumptions for systems analysis and design and for applications of BPM. The assumption that the prescribed processes will be followed consistently could be replaced with the assumption that prescribed processes often are more like guidelines that may be followed or may be bypassed when contingencies beyond predefined exceptions are encountered. Existing methods could be augmented by adding capabilities for identifying conditions that might lead to workarounds and anticipating some of those workarounds, even though anticipating all possible obstacles and corresponding workarounds is impossible. Theory-based analysis templates might help analysts incorporate consideration of workarounds.

Future Research About Workarounds

The theory of workarounds probably will evolve over time, as has happened with many theories, perspectives, and methods. For example, Ajzen [1991] says that the relatively straightforward theory of planned behavior is an extension of an earlier theory. Similarly, Eisenhardt [1989] explains that agency theory goes back to theorizing about risk-sharing in the 1960s and that agency theory has been extended, reinterpreted, and applied in different ways

since then. The many facets of the proposed theory lead to questions about whether its scope is appropriate and whether it might have been constructed differently. Areas for ongoing inquiry include the following:

- **Definition of workaround.** The breadth of the current theory brings the advantage of covering many situations that have been described as workarounds, but may miss advantages of specificity that a more limited definition would bring. A different definition might lead to a different theory.
- **Starting from other underlying theories.** The proposed theory builds on the theory of planned behavior, bricolage and improvisation, agency theory, and work system theory. A different starting point such as actor network theory [Callon, 1986], activity theory [Kaptelinin and Nardi, 2006], adaptive structuration theory [DeSanctis and Poole, 1994], or socio-materiality [Orlikowski and Scott, 2008] might lead to different insights.
- **Boundaries between workarounds and other phenomena.** Aspects of the theory of workarounds could be used to explore boundaries between workarounds and other phenomena. For example, how can one distinguish between workarounds and customization when software is adapted in one way or another? At what point should repetitive workarounds be treated as components of routines and business processes?
- **Workarounds and emergent change.** Figure 4 represents workarounds as a starting point for emergent change that eventually leads to planned change. Related phenomena were discussed in Safadi and Faraj [2010] and McGann and Lyytinen [2008]. The work system lifecycle model [Alter, 2006, 2009, 2013] represents an integrated view of the context in which planned change and unplanned (emergent) change combine in the iterative process through which work systems evolve over time. The planned parts of that evolution occur through formal projects with initiation, development, and implementation phases. The emergent parts occur through workarounds and other adaptations. The theory of workarounds might increase the descriptive power and utility of more detailed descriptions of the work system lifecycle model (e.g., Figures 5 and 6 in Alter [2009]), which might result in useful insights for change management, project management, and system implementation.

Conclusion

This article's integrated view of workarounds could provide links among concepts, theories, and examples that often are treated inside disciplinary silos. Such links would address issues such as whether or not intended methods are followed; what the term *business process* means (e.g., intended vs. enacted); how systems in organizations evolve over time; how implementation occurs in organizations, especially for commercial software such as ERP that may not fit well; and how concepts within agency theory might be applied in new ways.

In those instances and others, the starting point would be the assumption that changes or adaptations were workarounds and, therefore, that factors in the theory of workarounds apply. The situations might involve isolated one-time adaptations or paths through multiple changes. Comparison of the results of a workaround-centric approach with other possible approaches (e.g., tracing the path by focusing on improvisation, technology adaptations, or structuration) might provide insights about advantages and disadvantages of the alternative approaches. The result might even suggest that a workaround-centric approach could integrate many phenomena related to adaptations, appropriation of technology, and organizational change.

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1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
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ABOUT THE AUTHOR

Steven Alter. Steven is Professor of Information Systems at the University of San Francisco. He earned a Ph.D. from MIT and extended his thesis into one of the first books on decision support systems. He served for eight years as Vice President of Consilium, a manufacturing software firm that went public and later was acquired by Applied Materials. Since returning to academia, his research has focused on developing systems analysis concepts and methods that can be used by typical business professionals and can support communication with IT professionals. His book, *The Work System Method: Connecting People, Processes, and IT for Business Results*, is a distillation and extension of ideas in a series of information system textbooks (1992, 1996, 1999, 2002) that raised awareness of the essential role of IT in work systems in organizations. His 2013 article on work system theory summarizes much of his research and positions it in relation to other IS research. His articles have been published in many leading journals and conference proceedings.

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