The Potential of Workarounds for Improving Processes

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Abstract. Several studies have hinted how the study of workarounds can help organizations to improve business processes. Through a systematic literature review of 70 articles that discuss workarounds by information systems users, we aim to unlock this potential. Based on a synthesis of recommendations mentioned in the reviewed studies, we describe five key activities that help organizations to deal with workarounds. We contribute to the IS literature by (1) providing an overview of concrete recommendations for managing workarounds and (2) offering a background for positioning new research activities on the subject. Organizations can apply these tools directly to turn their knowledge on workarounds into organizational improvement.

Keywords: Workarounds, Information Systems, Process Improvement.

1   Introduction

People often use Information Systems (IS) different from their designed usage. IS users' deviations from designed procedures are also known as *workarounds*, defined by Alter 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". [1]

Workarounds are inherently about human agency. No matter how technologies are designed, humans can always choose how they use technologies to perform their work [2–4]. Workarounds are also inherently related to processes. There is always a prescribed process that users deviate from, such as the process of administering medication [5] or accessing patient data [6]. Whereas they have been viewed negatively in the past, current literature calls for a more positive perspective on workarounds [7, 8]. Several studies point out the potential of workarounds for identifying poorly-designed processes [9, 10] and for involving IS users in process improvement efforts [8, 11, 12].

To find out how workarounds can be used for improvement and how IS users can play a role in process improvement efforts, we raised the following research question: *how can organizations unlock the potential of workarounds for improving processes?*

Our contribution with this work is twofold. First, by analyzing and synthesizing the literature describing the potential of exploiting workarounds for improving processes, we propose five key activities necessary to unlock this potential, providing organizations with the means to use the workarounds for improvement. Second, we provide a background for positioning new research activities that target workarounds for organizational improvement.

The remainder of this paper is structured as follows. We first describe the methods we used. In the subsequent section, we sketch the preconditions for workarounds, after which our proposed activities for achieving process improvement are discussed. Finally, we present our conclusions and a research outlook.

2   Methods

We performed an in-depth systematic literature review, following the guidelines by [13] and the checklists by [14] and [15]. The aim of this study is to present an integrated and representative overview of existing studies on how organizations can use workarounds for improvement. Figure 1 visualizes the search and selection process.
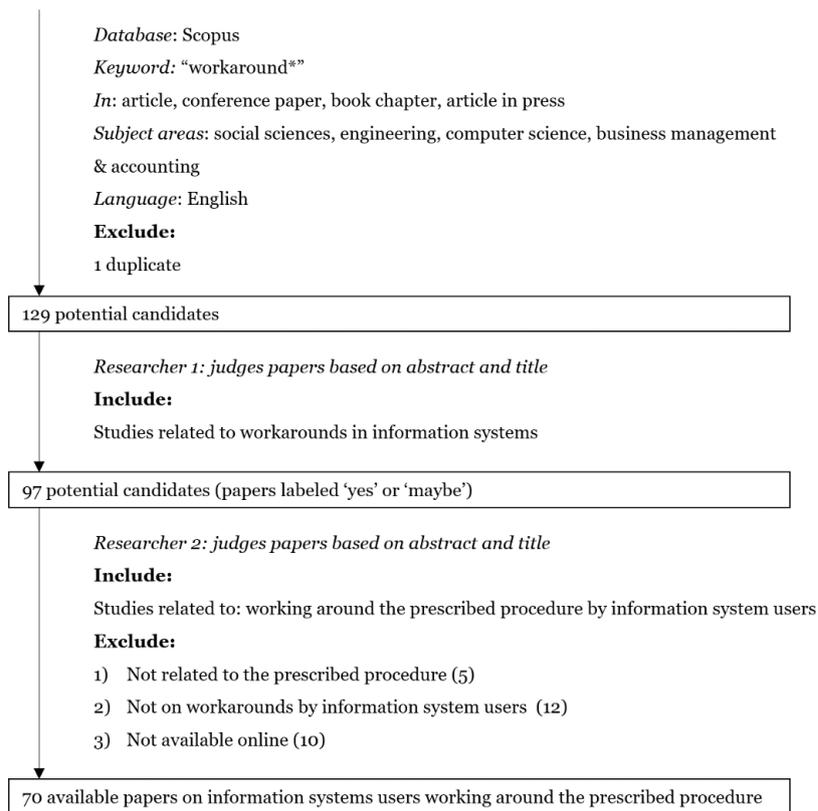
Database: Scopus

Keyword: "workaround*"

In: article, conference paper, book chapter, article in press

Subject areas: social sciences, engineering, computer science, business management & accounting

Language: English

Exclude:

1 duplicate

129 potential candidates

Researcher 1: judges papers based on abstract and title

Include:

Studies related to workarounds in information systems

97 potential candidates (papers labeled 'yes' or 'maybe')

Researcher 2: judges papers based on abstract and title

Include:

Studies related to: working around the prescribed procedure by information system users

Exclude:

1)   Not related to the prescribed procedure (5)

2)   Not on workarounds by information system users (12)

3)   Not available online (10)

70 available papers on information systems users working around the prescribed procedure

Fig. 1. Search and Selection Process.

To collect a broad sample of papers, we used the Scopus database to retrieve our candidate papers. The search on Scopus for articles mentioning workarounds resulted in 129 potential candidates. We carried out two screening rounds to narrow our sample. In the first round, the first author judged the papers based on their titles and abstracts. Studies that actually focused on the use of workarounds during the interaction with information systems were selected. Studies that were not included were papers primarily proposing some technical workaround to solve an erroneous software design. Using the workaround definition by Alter mentioned in the introduction, we excluded 32 candidates during the first screening round. These articles were not related to workarounds in information systems. As a result, 97 potential candidates were left for screening in the second round. These articles were labeled either 'yes' or 'maybe' and were further screened by the second author. Studies that were excluded in this round were either not focusing on working around a prescribed procedure, not on workarounds by information system users, or not available via our university's online library. Our final result was a sample of 70 papers on information systems users working around prescribed procedures.

Figure 2 visualizes our analysis and synthesis process. We focused our analysis on the ways in which organizations can exploit workarounds for process improvement. Our aim was to develop a framework that gives insight into both the potential of workarounds for improvement and how this potential can be realized.
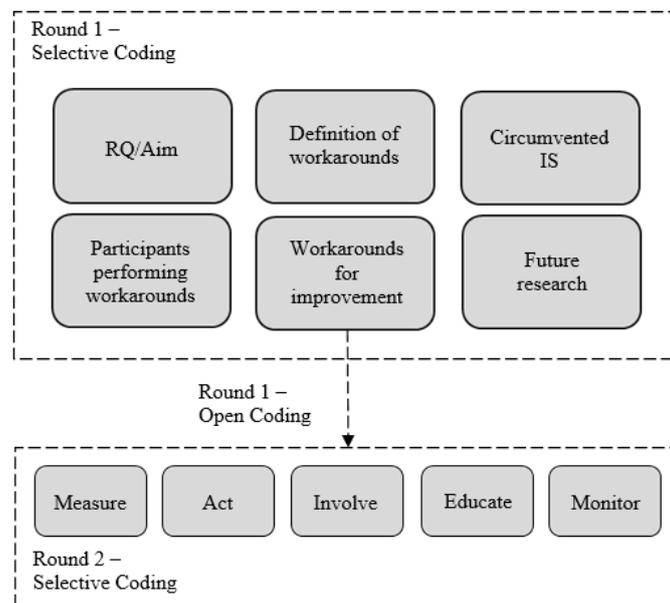

Fig. 2. Analysis and Synthesis Process.

For our first coding round, we imported all papers into Atlas.ti[1], a software program used to guide qualitative data analysis. The first and second author selectively coded the articles, regularly discussed the codes and adjusted them if necessary.

While selectively coding the literature in the first round, the number of quotations coded 'workarounds for improvement' increased rapidly (529 quotations by the end of the first coding round). Because of this large set of quotations, we decided to use open coding next to selective coding. Doing so, we created sub-codes for the code 'workarounds for improvement'. We found that the studies analyzed include many recommendations for using workarounds for improvement, and that these recommendations could be clustered into five groups. The recommendations related to detecting and gathering information on workarounds (the 'measure'-group), acting on or addressing workarounds (the 'act'-group), involving end users of the information system (the 'involve'-group), training and educating end users (the 'educate'-group) and monitoring workarounds over time (the 'monitor'-group). In the second close-reading iteration, we focused exclusively on the five clusters of recommendations to unlock the potential of workarounds for process improvement. We selectively coded the papers using the five sub-codes.

Before we discuss the five activities in more detail, we give a general introduction to the emergence of workarounds. Based on the literature review, we discuss when they emerge and what their effects are.

3 The Emergence of Workarounds

3.1 Dysfunctionality as a Cause of Workarounds

Several authors believe that the cause of workarounds is a dysfunctional environment [16–18]. There are several reasons why process participants perform workarounds [19]. Our literature review reveals that this is done to overcome 'constraints' [18, 20], 'incompatibilities' [21], 'inadequacies' [22], 'flawed specifications' [23], 'unrealistic processes' [23], 'obstacles' [24, 25], 'mismatches' [26–28] or 'misfits' [29, 30]. In the healthcare setting, for instance, clinicians sometimes feel constraints in achieving their goals: "many workarounds occur because the health IT itself can undermine the central mission of the clinician: serving patients" [31].

Other causes for workarounds are tensions that might exist. An example is the "tension between top-down pressures from the external environment and bottom-up constraints from day-to-day operational work" [11]. Workarounds are used to relieve this tension and balance top-down pressures such as compliance rules and bottom-up time-constraints. Another tension that potentially causes workarounds is the one between standardization and flexibility. Carayon and Gürses [32] found that hospital nurses enact more workarounds when they are coerced into using standardized routines. The same was concluded by Van Beijsterveld and van Groenendaal [28], who established that the inability to customize the system leads participants to engage in workarounds.

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[1] https://atlasti.com/

Without such customizations, they become dissatisfied and start to resist the system [12].

3.2   The Effects of Workarounds

Many workarounds add value [20], save time [24] or improve efficiency [33]. They allow participants to continue work [34–36] by offering a temporary solution to an obstacle [37].

Apart from the positive effects, workarounds can affect an organization negatively in two ways. First, although they can increase efficiency in some situations, they affect efficiency negatively in others [25, 37–39]. When participants feel the need to enact workarounds to achieve their goals, this causes frustration [40], discontent [41] and disengagement [38]. In addition to this, workarounds affect other activities in the process, threatening to decrease the overall outcome of the process [39] and bringing security issues with it. When using the setting of healthcare organizations again, this could mean endangering the safety of patients [18, 42].

The second major negative effect of workarounds is a loss of transparency. Workaround activities are usually hidden [3, 9] and management and IS vendors are often unaware of them [29, 43, 44]. This leads to managers and IS vendors having an inaccurate view of system usage, as workarounds mask "underlying system weakness" [41]. It "creates the illusion that dysfunctional systems are indeed functioning" [45]. Working around bugs in the system, for instance, leaves manufacturers unaware of them [43], which means that nothing is done solve them. Similarly, if management is not made aware of dysfunctionalities, they will not address those either. Alternatively, if they do make decisions on processes, they are "based upon an illusion of actuality and not on the reality of workplace activities" [46]. Managers could be making important decisions based on incomplete information [29], which gives a false sense of compatibility between information systems and work processes.

3.3   Workarounds as Feedback Resources

Organizations can use knowledge of workarounds to improve processes and ISs. The majority of studies on workarounds suggest that workaround activities have the potential to bring about improvement in organizations. They are especially useful for guiding IS redesign since they contain information about necessary customizations of the IS [12]. They "offer a blueprint for identifying the pressing information gaps that need to be resolved when considering improvements in an information flow" [9]. Similarly, workarounds can help improve the design of work processes, because they give insight into the day-to-day activities of participants and their needs to perform these tasks [12]. They may even guide organizations in re-evaluating the entire process environment by challenging "the ability and coherence of processes and systems that no longer serve the organization, its employees, or its customers" [47].

The undertaken improvement efforts, in turn, lead to increased efficiency [25], better communication [47] and improved satisfaction on the part of participants [12, 42, 48]. By approaching workarounds as feedback resources [12], organizations can perform

corrective actions and make improvements to processes. In the next section, we derive from literature a set of five activities that help organizations to unlock the potential of workarounds for improvement.

4   Five Activities to Improve Processes

4.1   Measure

Many authors stress the importance of knowing why participants perform workarounds, described as 'motivations' [21, 26], 'reasons' [19, 49], 'obstacles' [24] or antecedents [34]. Others simply call for an understanding of participants' work practices [36, 50, 51] because they consider the way people work and work around prescribed processes imperative for deciding on a strategy. Van Beijsterveld and Van Groenendaal [28], for instance, argue that "actual misfits require a different solution strategy than perceived misfits do". Similarly, Röder et al. [52] debate that whether the intention of the participant is positive or negative should be the basis for deciding on a resolution strategy.

In contrast to focusing on the motivations of workarounds, other authors focus on the consequences instead. Drum et al. [39], for example, state that "the motive underlying the workaround, while interesting, does not afford a satisfactory understanding of workarounds. Rather, we believe it is more beneficial to focus on the outcomes generated by workarounds". Also interesting in terms of consequences of a workaround is its downstream effect [47, 53]. According to Drum et al. [39], "the use of workarounds often constrains or decreases the overall effectiveness of the system, especially for those 'downstream' from the workaround who must deal with its outcomes". Others take both motivations and consequences into account [21, 24, 26]. According to Röder et al. [52], consequences can be further specified into risks and benefits. These risks and benefits can provide a basis for improvement efforts [20, 23, 26, 54, 55].

In terms of the means to measure workarounds, several authors suggest to identify the workarounds in situ, at the practice level [18, 27, 56, 57]. This can be achieved by performing interviews, observations, shadowing and focus groups [31]. Several studies on workarounds, however, pointed out quantitative limitations, for instance not knowing the frequency of workarounds [5] or the expenditure of money, time and effort [28]. A way to overcome this is the use of process mining techniques that "use event data to extract process-related information" [58]. This enables organizations to meet the demand for measuring "the actual value of workaround time and effort compared with the original process" [21]. Outmazgin and Soffer [49] showed that process mining techniques can indeed be used to detect certain types of workaround behaviors, although others were not reflected in the event log. Also, the motivation of participants to perform workarounds and relevant situational factors are difficult to determine using these techniques. Therefore, more traditional techniques such as performing observations remain to have value [31].

In sum, we propose that the first necessary activity to achieve process improvement is to measure workarounds. Specifically, what needs to be measured is the motivation of the participant to perform the workaround and the associated consequences. Our

view is that this can best be done in the form of a hybrid approach, by performing qualitative observations of participants and using quantitative process mining techniques.

4.2 Act

According to Drum et al. [59], "workarounds must be addressed". However, as mentioned in the previous section, different types of workarounds must be addressed differently. One rule of thumb that is frequently mentioned in the literature is to manage workarounds by controlling risks and maintaining benefits [20, 21, 53]. Specifically, organizations are advised to facilitate or adopt appropriate workarounds and prevent or block the inappropriate ones [21, 38, 47]. According to Park et al. [33], the evaluation of appropriate and inappropriate workarounds is not an easy task, as "careful internal analysis might be necessary to identify which adaptations […] should be supported, rather than merely eliminating problematic immediate adaptations". More authors advise organizations against simply eliminating workarounds, as doing so may result in negative outcomes [11, 20, 22]. Eliminating the underlying *reasons* to perform workarounds, however, is recommended and expected to lead to positive results [25].

Acting on workarounds may entail activities such as process redesign, disciplinary actions [49], improvements in the technology or control routines [54]. Usually, these actions fall into two categories: (1) customizations to the information system and (2) changes to the structure of the organization [28]. A concrete example of an organizational action that was suggested in two separate studies is ensuring that participants have physical access to specific process roles. In Halbesleben et al. [5], this entailed relocating a pharmacist to a nursing unit. In Tucker [60], it involved increasing the nurses' access to the process owner. In both cases, this was shown to improve the process: in the first it led to a decreased amount of rework and frequency of workarounds; in the second it caused participants to enact less inappropriate workarounds.

To summarize, we argue that organizations can exploit the measurements of workarounds from the previous section in order to make decisions on how to address them. By evaluating which workarounds are appropriate and which are not, they can facilitate the former and prevent the latter.

4.3 Involve

Various authors comment on the improvement potential of involving participants in designing and diffusing IS. Wheeler et al. [40], for instance, state: "in the case of workarounds, organizations could capitalize on the mindfulness of employees by encouraging employees to share their workarounds in order to improve task design". Insights from users can guide system design [27, 51] and decrease resistance towards the system [42, 48]. Tucker [60] believes that "designing work that considers the natural responses of employees when they encounter operational failures will be helpful in creating improvement programs that are successful over multiple dimensions, such as safety and efficiency". By giving process participants "a way to contribute" [47], allowing them to "reinvent, redefine or modify" [42] and "speak up about operational failures" [60],

they participate in forming new work routines that fit their needs. Designers cannot foresee perfectly how their system is used [51], but by involving users in the process, misfits can be resolved. This involvement of participants needs to be facilitated by the organization. Halbesleben et al. [5], however, point out the complexity of gathering different participants with different roles. Safadi and Faraj [12] also indicate that participants often lack the time needed to communicate all the necessary information.

To sum up, we join the view of most authors and propose the involvement of participants in the improvement of processes. They are known to be willing to contribute improvement ideas. We suggest to exploit this willingness and have participants contribute solution strategies, beginning with the participants already known to perform workarounds.

4.4 Educate

What is also stressed in studies on workarounds is the need to set up suitable educational programs [25, 29, 40, 53, 57, 61]. Ongoing training and coaching of participants can enable both the efficient and appropriate way of working [18, 25, 29, 47] and the prevention of workarounds caused by ignorance [28, 57, 60].

One topic that should be addressed in the educational program of participants is the downstream effect of enacted workarounds, which we discussed earlier in the section on measuring workarounds. According to Drum et al. [59], "system users are often unable to fully comprehend their place in the task chain, and thus are unaware of the implications of their actions on information quality". In training and coaching efforts, users need to be explained the broader implications of their actions and how their goals relate to the bigger process [29, 39, 53]. Drum et al. [59] in fact noticed a 'light bulb effect' when participants were made aware of the broader implications of their actions, leading to improved work practices thereafter.

Another topic on the agenda of training programs on workarounds, is the encouragement of users to speak up about obstacles they perceive in their daily work [62]. Only then will their voices reach decision-makers who can then make informed decisions [35]. It also allows the sharing of best practices and the recognition that they are not the only ones struggling [62].

In sum, we propose to focus specifically on educating participants in improvement efforts. Ongoing training and coaching of participants may cause a decrease in resistance and ignorance and eventually in a decrease of workarounds.

4.5 Monitor

In his work on engineering for emergent change, Alter [53] argues an operational work system is dynamic, rather than static and unchanging. A dynamic system that is always in flux, requires a different way of handling than a static system. As such, problems "cannot be easily 'fixed' in a single step (workaround) or using a single, one-time set of measures" [33]. When measures are put in place, additional workarounds may develop [37]. An attempt has to be made in avoiding these additional workarounds [3], although some emerging workarounds simply cannot be avoided [63].

As the development of additional workarounds is unavoidable and their evolution cannot be predicted, the system needs to be monitored over time [20, 53, 64]. Outmazgin [19] suggests monitoring the extent to which participants fail to comply with the prescribed process. Similarly, Alter [53] suggests to track the effectiveness of workarounds and their downstream effects. This could provide decision-makers with the tools to perform corrective measures and notify them whenever workarounds occur [23].

Again, process mining techniques offer a valuable means to accomplish the ongoing monitoring of workarounds [19, 59]. It allows for 'conformance checking', i.e. checking the extent to which participants work around the prescribed process [65]. It would also allow for the tracking of the frequency of workarounds over time, their performance in relation to the prescribed process and its impacts downstream [58]. However, monitoring workarounds using process mining has not been extensively researched yet. This opens up opportunities for future research.

To sum up, we recommend organizations aiming for process improvement to monitor their processes and particularly how participants work around the prescribed process. Using process mining techniques, the evolution of these workarounds can be tracked, together with its frequency, effectiveness and downstream effects.

Measure	Act	Involve	Educate	Monitor
• *What*: motivation, consequences (benefits, risks and downstream effects), quantitative information • *How*: observations, process mining	• *How*: facilitate the appropriate, prevent the inappropriate i.e. increase access to process owner	• *Whom*: participants • *How*: have them contribute improvement ideas, especially those already enacting workarounds	• *Whom*: participants • *How*: ongoing training and coaching	• *What*: workaround frequency, effectiveness and downstream effects • *How*: process mining

Fig. 3. Five Activities to Unlock the Potential of Workarounds for Improving Processes.

5 Conclusion and Outlook

Over the years, many studies in IS have discussed the potential of studying workarounds for improving the alignment of IS and work processes. However, they do not provide insight in the necessary activities to achieve this improvement. In order to solve this research gap, we carried out a systematic literature review in which we analyzed existing studies that describe workarounds in organizations. We determined five activities organizations need to perform to unlock the potential of workarounds for improving processes. First, we propose that organizations need to detect these deviations and identify their motivations and consequences by observations and process mining techniques. Second, organizations should use this analysis of motivations and consequences for deciding whether to facilitate or prevent workarounds. Third, organizations can benefit from involving users in the decision-making process by letting them generate improvement ideas. Fourth, we propose to invest in educating and training end users to

prevent the deviations in the first place and to make users aware of the broader implications of their actions. Last, monitoring workarounds can lead to continuous improvement in the long run.

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