Workarounds—A Domain-Specific Modeling Language
Research Paper

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Abstract. Workarounds are goal-driven deviations from standard operating procedures implemented by employees to overcome misfits constraining the effectiveness or efficiency of their work. The extant research has focused on identifying causes of workarounds and managing them on the organizational level. However, we lack an integrated baseline for assessing their effects and their complex interconnections in a way that can inform consistent organizational decision-making. In this paper, we design the workaround modeling notation (WAMN)—a domain-specific modeling language that enables the identification, analysis, visualization, evaluation and management of workarounds. The WAMN accommodates modeling the causes, conduct, consequences, and management of workarounds, supporting an integrated approach to managing them as bottom-up process innovation. We demonstrate the modeling language's applicability based on real-world case data and develop theoretical propositions for testing their representational and interpretational performance in subsequent research.
Keywords: Business Process Management, Workaround, Domain-Specific Modeling Language, Design Science Research

1 Introduction

Workarounds are intentional deviations from standard operating procedures and predefined business processes that employees adopt to overcome obstacles in their daily work (Alter 2014). Whereas workarounds can foster creativity and resolve operational obstacles, they may also introduce new inefficiencies, compliance risks, and financial losses (Alter 2014, Pinto et al. 2018), underlining the importance of assessing their consequences for the organization. From a Business Process Management (BPM) perspective, recent research has proposed that workarounds can also be drivers of employee-centered process innovation if the transition from workarounds to innovating a process is properly managed at an organizational level (Bartelheimer et al. 2023, Assbrock et al. 2024).

While workarounds are context-specific solutions that depend on the creativity of their individual initiators, they can have interconnected and unpredictable consequences that may span across departments or even extend beyond organizational boundaries. Organizational decision-making on how to deal with workarounds is inherently complex, as it involves balancing multiple, often competing factors—such as cost, quality, efficiency, flexibility (Beerepoot & Van de Weerd 2018), compliance, and customer satisfaction under conditions of uncertainty driven by market fluctuations, evolving customer expectations, and rapid technological advancements. This interplay of socio-technical dynamics

20th International Conference on Wirtschaftsinformatik
September 2025, Münster, Germany

and external influences further complicates implementing a structured evaluation and management process for workarounds.

The extant research has not identified methodological approaches for mapping workarounds that acknowledge their complex role in organizations. Important aspects include the underlying misfits that constrain employees in their day-to-day work, the workaround itself, the workaround's consequences on a local and organizational level as well as in the short- and long-term (Beerepoot & Van de Weerd 2018), decisions on how to deal with a workaround, and governance mechanisms for allocating appropriate actors for their management. While organizations are currently overwhelmed by this complexity of aspects, the theory is to be expanded to include a suitable form of visualization. We see mapping workarounds as a pre-condition for managing them as bottom-up process innovations, facilitating an organization's agility in adapting its business processes in an increasingly turbulent environment.

We present a domain-specific modeling language (DSML) that enables organizations to describe workarounds, facilitating informed decision-making for translating them into process innovations. Based on related IT artifacts contained in the knowledge base—primarily Business Process Model and Notation (BPMN) (OMG 2013) and Workaround Process Modeling Notation (WPMN) (Röder et al. 2015)—we design our Workaround Modeling Notation (WAMN) by adopting the Design Science Research (DSR) paradigm (Hevner & Chatterjee 2020). We focus on designing and developing our modeling language, demonstrating its applicability to real-world case data. In addition, we prepare an empirical evaluation by proposing testable propositions in line with authoritative guidelines for evaluating modeling grammars (Burton-Jones et al. 2009).

We contribute to theory by proposing a new modeling language that, for the first time, foregrounds workarounds as a phenomenon in their own right without focusing on them as a mere deviation from an implemented business process. This view aligns with assigning workarounds a more active role for bottom-up business process innovation that goes beyond treating them as undesirable deviations. The WAMN conceptualizes workarounds in a way that can support the entire workaround-to-innovation process, spanning from the misfit that triggers a workaround to making decisions on their implementation as new processes (Assbrock et al. 2024), and also helps to identify and eliminate harmful workarounds or other undesired effects such as process drift (Pentland et al. 2020). This view enables re-thinking their role in the greater realm of BPM, moving away from a bug-and-fix rationale and pointing towards a more active role in process innovation.

As a managerial contribution, the WAMN enables process managers to describe, analyze, understand, and manage workarounds in their organizations. In particular, they can identify and analyze their positive and negative (side) effects and their connections with misfits and other workarounds on an organizational, technological, and individual level. We posit that the resulting models can foster faster and more informed decision-making, turning workarounds into possible process innovations quicker.

The remainder of this paper is organized as follows. In Section 2, we explore theoretical angles on workarounds and review related approaches for modeling workarounds. In Section 3, we describe and justify our design science research approach. In Section 4, we present the new workaround modeling notation by presenting the language's meta-model and its concrete syntax. In Section 5, we demonstrate the use of the WAMN with real-life case data, to exemplify its utilization on a practical case. In Section 6, we establish propositions that can guide the empirical evaluation of the WAMN as a task to be explored in subsequent research. We discuss theoretical implications in Section 7 before concluding the paper in Section 8.

2 Research Background

2.1 Misfits, Workarounds, Effects, and their Interrelations

Workarounds are often seen as temporal fixes to misfits, enabling employees to perform their day-to-day work more efficiently (Alter 2014). With workarounds, employees may modify or skip steps in a business process or repurpose IT artifacts in a way not intended by their designers (Davison et al. 2019, Zamani & Pouloudi 2021). Workarounds, therefore, can be process- or artifact-centered (Bartelheimer et al. 2023).

Once implemented at an individual level, a workaround can spread throughout the organization, affecting other employees and co-workers, IT systems, and the organizational structure (Bartelheimer et al. 2023). This diffusion can take months or even years (Alter 2014) and often goes unnoticed by management, causing the process to deviate from the initially intended design gradually. Beyond this emergent change process, organizations might also use workarounds to initiate process re-design, implementing a workaround-to-innovation process (Beverungen 2014).

A prerequisite for implementing a workaround-to-innovation process is to understand workarounds' causes, properties, and effects. A single misfit—strategical, organizational, or technological (Bartelheimer et al. 2023)—can trigger multiple workarounds, but each workaround relates to at least one specific misfit. Furthermore, workarounds can have various effects on different levels of an organization. On the one hand, the positive impact of workarounds can include fostering creativity and resolving obstacles or anomalies (Alter 2014). On the other hand, adverse effects may involve security risks, for instance, loss of data (Slabbert et al. 2021, Boonstra et al. 2021), compliance issues (van Offenbeek et al. 2023), and even loss of control or revenue (Alter 2014, Pinto et al. 2018). Furthermore, different effects of workarounds are considered in their proportion, i.e., costs, flexibility, quality, and time (Beerepoot & Van de Weerd 2018). These effects can also be distinguished as inherent and external impacts. Inherent effects arise automatically and may be short-, mid-, or long-term. External impacts occur when workaround decisions lead to changes in standard operating procedures.

2.2 Modeling Languages for Workarounds

Deviations from prescribed work processes can be detected through process mining methods. For instance, the [S]emi-automated [WOR]karound [D]etection (SWORD) framework can help analyze data mismatches, anomalies, and quality issues to identify potential workarounds (van der Waal et al. 2024). However, not all deviations in a process are workarounds. There are related concepts that can represent a deviation from standard operating procedures, whether intentional (e.g., tweaking) or unintentional (e.g., errors) (Bartelheimer et al. 2023).

Most business process modeling languages, such as BPMN enable modeling structured processes (OMG 2013), while neglecting deviations that occur when participants perform processes in their day-to-day work. However, Röder et al. (2015) proposed the Workaround Process Modeling Notation (WPMN)—a BPMN extension—by integrating a risk-benefit analysis to decide whether a workaround should be executed. Therefore, influencing factors such as business rules and other situational factors are included in the notation. Yet, they are solely depicted as annotations. The workaround activities and its risk-benefit analysis are presented parallel to the intended process in a different lane. According to Röder et al. (2015), WPMN can help organizations design workaround-aware systems, assist managers in managing workarounds effectively, and offer auditors visual insights into non-compliance. Still, this workaround-aware modeling language does not consider workarounds as a phenomenon in its own right but views them as deviations from a business process. Hence, it does not allow modeling workarounds' complex relationships with misfits and other workarounds, not supporting a consistent workaround-to-innovation process. Case Management Model and Notation (CMMN) and similar flexible process modeling approaches focus on non-routine, knowledge-intensive processes where deviations are common (OMG 2016). So, the CMMN might provide some concepts we can use, even if it does not consider workarounds specifically.

We posit that organizations need a new modeling language that enables them to describe, analyze, evaluate, and manage workarounds while capturing the complexity of their interconnections with misfits and their direct and indirect effects over time, while considering them as catalysts for bottom-up process innovation.

3 Research Design

DSML are IT artifacts that simplify real-world phenomena while addressing specific domain requirements (Frank 2013, March & Smith 1995). They enhance comprehensibility and model quality by representing all relevant constructs (Becker et al. 2014). To develop the Workaround Modeling Notation (WAMN), we adopt the Design Science Research (DSR) paradigm, as initially outlined by Hevner & Chatterjee (2020). DSR provides a structured methodology for designing and evaluating artifacts that address real-world organizational challenges. It is a suitable approach for creating a domain-specific modeling language that enables the identification, analysis, visualization, evaluation, and management of workarounds. The WAMN contains constructs to model workarounds' causes, execution, and consequences, enabling their comprehensive assessment. The WAMN supports the systematic management of workarounds as a potential source of bottom-up process innovation within organizations (Bartelheimer et al. 2023).

Our design process is grounded in conceptual modeling literature, following the authoritative four-step approach inspired by Frank (2013), Wand & Weber (1993). First, we define the abstract syntax by introducing language constructs and modeling rules within a meta-model (Becker et al. 2014) (cf. Section 4.1). Second, we develop the concrete syntax by presenting a graphical notation (Frank 2013) (cf. Section 4.2). Third, we establish the semantics of our modeling language by demonstrating its utility in modeling workarounds in their complexity according to our case organization (cf. Section 5). While we used the WAMN to model three different workarounds, we report one of these cases to demonstrate the applicability of the WAMN in this paper. A particular focus is to demonstrate the language's ability to model the complex relationship of workarounds with misfits and other workarounds. To foster an empirical evaluation of the WAMN's representational and interpretational performance, we develop theoretical propositions building on Burton-Jones et al. (2009), who proposed four criteria for evaluating modeling grammars: Representational fidelity, representational efficiency, interpretational fidelity, and interpretational efficiency (cf. Section 6). We see the WAMN as a tool to enhance informed organizational decision-making by making workarounds explicit, analyzable, and actionable.

4 Workaround Modeling Notation (WAMN)

4.1 Abstract syntax

The WAMN adopts a holistic perspective on the workaround as well as their causes, effects, and management, recognizing their complexity. These attributes of workarounds are categorized into four key aspects: (1) *Description*, which describes the characteristics and types of the workaround itself; (2) *Causes*, which refer to the misfits that trigger workarounds; (3) *Consequences*, which encompass the direct and indirect effects of workarounds on business operations, as well as consequences in the form of decisions, which influence the standard process; and (4) *Roles*, which include both the actors and organizational levels impacted by the workaround. To provide a structured approach for modeling workarounds, we present the WAMN meta-model, utilizing the entity-relationship model notation proposed by Chen (1976). The meta-model is divided into areas regarding the four key aspects of workarounds (Figure 1).

A significant extension in WAMN is the inclusion of the *workaround board*, which brings together different organizational roles responsible for managing workarounds. This addition ensures that workaround management is not a fragmented or reactive process but rather a structured and collaborative effort. The *workaround stack* (Bartelheimer et al. 2023) further defines the relationship between workarounds and the workaround board, facilitating systematic tracking, evaluation, and decision-making (prevent, redesign, adopt, or ignore by Beerepoot & Van de Weerd (2018)) regarding workarounds within the organization. Also, the decision to monitor a workaround is added to describe a situation where more information on the workaround must be collected.

4.2 Concrete syntax and semantics

The WAMN builds upon widely recognized modeling languages, such as CMMN (OMG 2016) and BPMN 2.0 (OMG 2013), ensuring compatibility with established process modeling practices. To provide a structured representation of workarounds and their impact, WAMN adopts pools and lanes as key structuring elements. In the WAMN model, each affected actor or level is represented by a separate pool, categorized into three main types: (I) *Organization Pool*, which represents the organizational level and is further divided into lanes to depict different departments involved in or impacted by the workaround. (II) *Individual Pool*, which represents individuals engaged in the work-

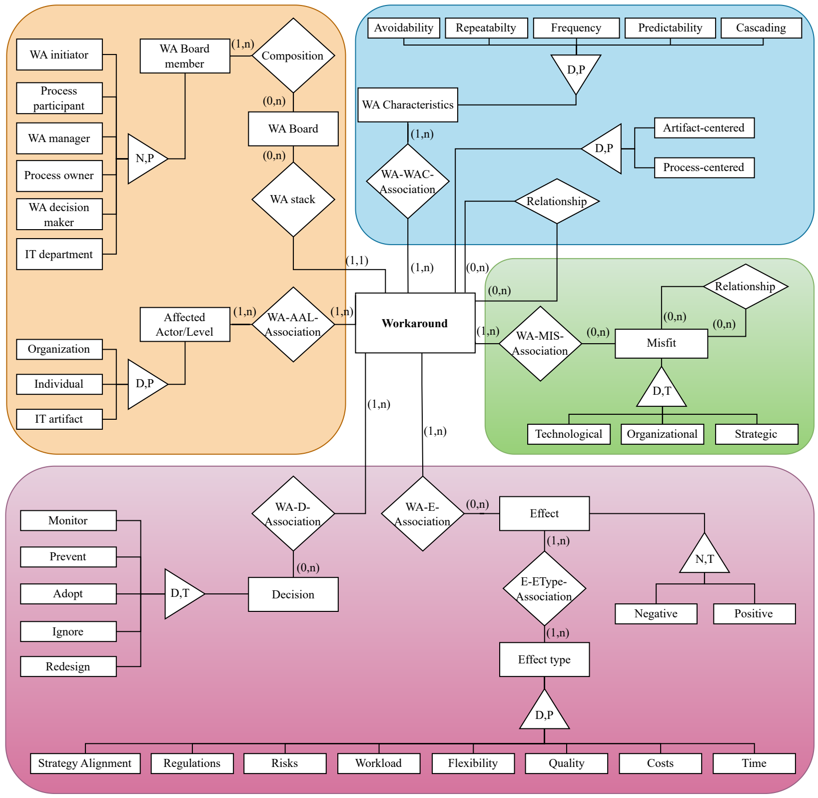

Figure 1. Meta-model of the WAMN (blue area = (1) *Description*; green area = (2) *Causes*; red area = (3) *Consequences*; orange area = (4) *Roles*

around and is structured into lanes to differentiate between distinct actors performing or being affected by the workaround activity. (III) *IT Artifact Pool* that captures the technological components involved, highlighting the interaction between workarounds and IT systems.

To enhance interpretability, the effects of workarounds are color-coded. Positive effects are coded in green, while negative effects are coded in red, providing an intuitive representation of their impact. This visual differentiation aids participants in quickly assessing the consequences of workarounds, facilitating informed decision-making. Icons were added to visualize the different types of workarounds, misfits, and effects. By mapping workarounds' causes, effects, and interactions with the representational elements of the WAMN (cf. Table 1) models of workarounds can enable their analysis, evaluation, and integration into official business processes.

Table 1. Concrete Syntax of WAMN

Constructs	*Representation*
Affected actor/level	Organization, Individual or IT artifact; Description of affected actor/level
Misfits	Strategic misfit; Organizational misfit; Technological misfit
Workarounds	process-centered Workaround; artifact-centered Workaround; Workaround characteristics
Effects	neutral; positive; negative
Effect types	Flexibility; Costs; Workload; Quality; Time; Risks; Strategy Alignment; Regulations
Edges	Direct Dependency; Indirect Dependency; Association

5 Demonstration

5.1 Case Organization

Our case organization is an agricultural machinery manufacturer with approximately 5,800 employees. While it utilizes an Enterprise Resource Planning (ERP) system to document and manage most production steps, many undocumented, fine-grained adjustments occur in the production and inter-logistic processes. Despite the organization's well-defined BPM environment with detailed to-be process models, workers frequently fine-tune their activities at the operational level. These informal adaptations, while deviating from the prescribed workflows, are generally tolerated till process quality and overall efficiency are not compromised. This case highlights the interplay between structured BPM frameworks and emergent, shop-floor-level process modifications, emphasizing the practical necessity of workarounds in complex manufacturing environments.

According to the workaround-to-innovation process (Beverungen et al. 2024, Assbrock et al. 2024), we integrate the workarounds building a kind of *workaround stack* (Bartelheimer et al. 2023), that needs to be worked off over the time. After a workaround is identified and shared on the organization level, all characteristics must be collected and documented as a workaround profile (Bartelheimer et al. 2025). After categorizing, analyzing, and evaluating a workaround, an informed decision needs to be made on their handling (Beverungen et al. 2024). A *workaround board* needs to make this decision, which contains decision-makers, process participants, and process experts with broader knowledge about the affected processes. This fosters an increased interaction to promote and discuss bottom-up process innovation within an organization, considering workarounds as occasions for organizational change and learning (Nonaka & Takeuchi 1995), aligned with the workaround-to-innovation process (Beverungen et al. 2024).

5.2 Application for modeling workarounds in a manufacturing process

In Figure 2 we demonstrate the utility of the WAMN by presenting several workarounds in our case organization. We highlight the interconnections between misfits (M), workarounds (WA), and their effects as multiple effects can occur simultaneously, leading to positive and negative consequences from various perspectives (Löhr et al. 2025).

A global misfit (M 1.A) of long distances exists between the central material warehouse and the production lines. Another misfit (M 1.B) exists: a lack of time during material distribution. This causes the first workaround (WA 1) to decentralize the stocking materials at the production lines to save time and have more flexibility during the assembly processes, leading to faster and more flexible fulfillment of customer orders. However, working with decentralized stocking leads to less space at the production line. This represents a further misfit (M 2) because there is insufficient space for big transport trolleys. For this reason, production workers use smaller trolleys to transport material into the production lines (WA 2). This enables an optimized space use as all materials are available directly at the production lines. Still, it causes multiple transports, as only smaller quantities can be transported, and this transportation needs to be done more often. It increases picking and transport effort and costs more time, and also represents decreasing data quality as there is no record of splitting materials into several transports.

During the assembly processes, materials are often needed at other production lines (M 3) because insufficient materials are stored centrally in the central warehouse. This leads to the following workaround: production workers pick materials directly from the different production lines (WA 3). On the one hand, it saves time by direct communication between the production workers and picking material without any transport order; on the other hand, it causes no records in the official inventory system. This leads to the next misfit (M 4) as materials cannot be booked from one production line to another line. This can cause another workaround (WA 4) as workers need to log materials back to a temporary storage location and then to the production line, which is the correct assignment of material to the production order and the correct production line, but also represents an additional effort in the logging process. All these extra steps in the logging process can lead to mismatches between real-world execution and the database.

Our example highlights the complexity of workarounds, the underlying misfits, and their effects from several organizational perspectives. Managers must consider their impact at the organizational (also strategic), individual (operational), and IT artifact levels to handle workarounds systematically in a structured way and make informed decisions. Furthermore, workarounds generate direct and indirect effects, each influencing factors such as costs, time, quality, and flexibility differently. These effects may also differ in the short-, middle- and long-term. Additionally, our findings reveal that workarounds and misfits often form interconnected chains, leading to cascading effects beyond different organizational departments. Furthermore, external factors, including regulatory requirements and customer satisfaction, can further influence the initial misfit, underscoring the need for a comprehensive approach to workaround management.

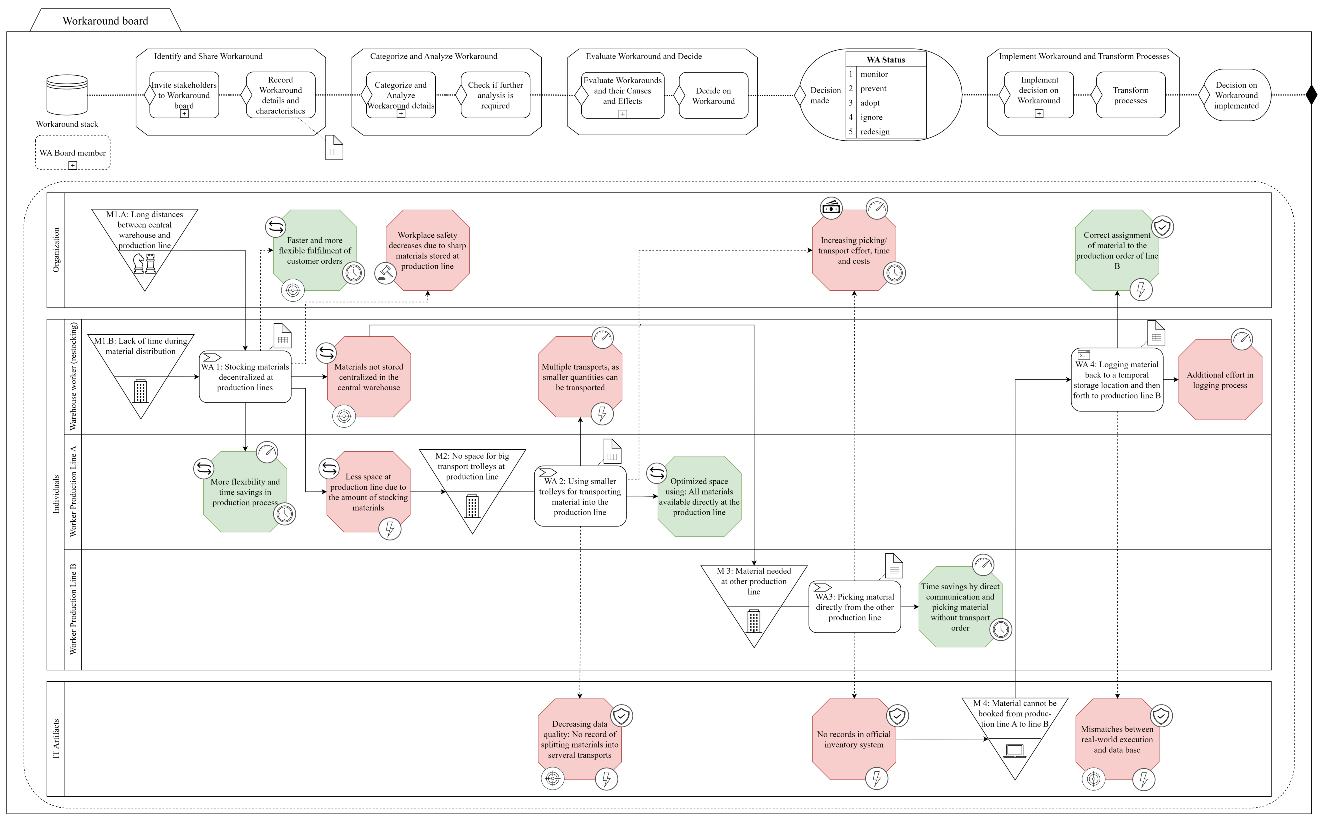

Figure 2. Applying the WAMN on case data of workarounds in a manufacturing process

The WAMN offers unique capabilities that distinguish it from other modeling languages. First, it treats workarounds as independent phenomena rather than deviations from standard business processes. It captures the entire workaround-to-innovation cycle and enables organizations to track workarounds from their root cause (misfit) to their consequences and potential transformation into formalized processes, fostering bottom-up process innovation. Second, it considers multilevel interconnections (organizational, individual, and IT artifact levels), while other modeling languages operational and strategic dimensions when analyzing workarounds. Third, it distinguishes between direct and indirect effects, which are color-coded depending on their connotation (red for negative, green for positive), offering an intuitive way to visualize risks and benefits. Other languages lack explicit visualization of workaround consequences. Furthermore, it recognizes that external factors (e.g., compliance regulations and customer expectations) can influence workarounds and their outcomes. Other modeling approaches often focus on internal process deviations, overlooking external drivers of their behavior. Finally, it includes governance aspects like a workaround board and centralized management.

6 Theoretical propositions guiding the evaluation

Evaluating an IT artifact is a crucial step in the design science research process as it attends to rigorously demonstrating its utility, quality, and efficacy (Venable et al. 2016). Our demonstration showed that the WAMN is applicable to real-world case data. For the evaluation, we focus on three essential aspects. First, the WAMN should enable modeling workarounds as phenomena in their own right, including all relevant properties that govern the workaround-to-innovation process. Second, the WAMN shall particularly address the complex interrelations of workarounds with misfits and other workarounds. Third, the WAMN shall allow modeling different connotations and types of effects caused by workarounds on different levels of the organization.

For evaluating each of these aspects, we propose to build on four criteria for assessing the performance of conceptual modeling grammars (Burton-Jones et al. 2009): representational fidelity, representational efficiency, interpretational fidelity, and interpretational efficiency. Representational performance focuses on designing a model with the WAMN, while interpretational performance focuses on a model's interpretation. Each performance includes the criteria of fidelity and efficiency. Fidelity describes how faithfully the model or its interpretation represents the perceptions of the domain's semantics. Efficiency describes the usability of the model's constructs (Burton-Jones et al. 2009).

Building on these four criteria and the three aspects of the evaluation, we develop twelve testable propositions that can guide the evaluation of the WAMN's representational and interpretational performance (Table 2).

Subsequent research can test these propositions in an empirical study. We propose recruiting practitioners from different companies to partake in the evaluation. In line with the goal of evaluating the language's representational and interpretational performance, the participants should be divided into two groups: modelers and interpreters. Modelers use the WAMN to model workarounds in their organizations. In a feedback questionnaire, it is explored how well the constructs enabled them to model their workarounds (representational fidelity) and how efficiently they perceived the modeling process to be

Table 2. Testable propositions for the evaluation of WAMN

	Performance	*Propositions*		
		WA as a phenomena	*Complex interconnections*	*Connotations & types*
Representational		The WAMN enables modelers to represent and conceptualize...		
	Fidelity	...workarounds as an independent phenomenon.	...complex interconnections of workarounds with misfits and other workarounds.	...interconnected, positive and negative, types of effects.
	Efficiency	...workarounds efficiently, using visual representations (actors, misfits, workarounds).	...interconnections of workarounds efficiently, using visual representations (edges).	...workarounds' effects efficiently, using visual representations (effect types, effects).
Interpretational		The WAMN enables interpreters to understand...		
	Fidelity	...workarounds as an independent phenomenon.	...complex interconnections of workarounds with misfits and other workarounds.	...interconnected, positive and negative, effects of workarounds.
	Efficiency	...workarounds efficiently, using visual representations (actors, misfits, workarounds).	...interconnections of workarounds efficiently, using visual representations (edges).	...workarounds' effects efficiently, using visual representations (effect types, effects).

(representational efficiency). Interpreters are shown different models created with the WAMN, to explore how well understand a workaround that is modeled (interpretational fidelity) and how many workarounds the interpreters can explore in a given time frame (representational efficiency). Importantly, the study must comprise more than one round to avoid misinterpretations made by novice users (Burton-Jones et al. 2009).

7 Discussion

The WAMN is the first DSML designed to systematically represent, analyze, and manage workarounds as phenomena in their own right, not backgrounding them as deviations of a specific business process. The WAMN foregrounds workarounds as complex phenomena, spanning from the misfits that participants work around to evaluating their complex relationships among each other and the organization, opening up new ways to use workarounds in process innovation (Bartelheimer et al. 2023, Beverungen 2014).

Previous literature presented a workaround-aware business process modeling (Röder et al. 2015) that visualizes workarounds as deviations from standard procedures and can help organizations decide how to handle them. It involves a risk-benefit analysis supporting the individual's decision to conduct a workaround, focusing on individual impact factors. However, it does not provide constructs that capture the complexity of multiple workarounds and their widespread organizational effects. In contrast, the WAMN highlights the intricate relationships between misfits and workarounds and between workarounds and other workarounds. The extant literature tends to view a workaround as a one-to-one fix for misfits that constrain the effectiveness or efficiency of participants' day-to-day work while neglecting their relations. The WAMN provides modeling constructs that account for more complex causes, relations, and consequences that workarounds can have in an organization. This opens up perspectives for managing them on an organizational level beyond the local view taken by their initiators.

We see the WAMN as an essential tool to support the workaround-to-innovation process (Assbrock et al. 2024). The conceptual approach of the WAMN can be enhanced with data-driven approaches, such as workaround mining (Weinzierl et al. 2021). When combined in the analysis phase, both approaches can complement each other to draw a full picture on a particular workaround and its consequences for a process. The WAMN enables weighing the positive and negative consequences of workarounds by setting them into relation, covering the effects' connotations and connecting them to the affected organizational levels. Ultimately, this information can be valuable to promote the implementation of a workaround in a process. Since the interplay of misfits and workarounds is dynamic, potentially leading to new misfits after workarounds have been performed, the WAMN needs to be applied continuously, which might enable organizations to manage the evolution of workarounds over time.

Applying the WAMN to modeling workarounds in a real-world manufacturing process demonstrated that it can represent workarounds adequately, consistent with prior findings that workarounds are more prevalent in knowledge-intensive contexts (Beverungen et al. 2024). The demonstration shows the complex concatenation of misfit, workaround, and effect types. The visualization of these complex relationships should enhance informed decision-making on workarounds (Beerepoot & Van de Weerd 2018).

8 Conclusion

We proposed the WAMN as a new DSML that treats workarounds as independent phenomena rather than as mere deviations from business processes. This perspective reflects workarounds as drivers of bottom-up process innovation, supporting the entire workaround-to-innovation process. The WAMN provides process managers with a structured approach to describing, analyzing, and managing workarounds, enabling informed decision-making and accelerating their transformation into process innovations or eliminating (harmful) workarounds. As evidenced in a demonstration with data from a real case, the WAMN can represent the intricate dynamics between misfits, workarounds, and their direct and indirect effects, highlighting their multifaceted interconnections. With these properties, the WAMN foregrounds workarounds as a phenomenon in its own right, departing from the classic view of workarounds as mere fixes for misfits that manifest in day-to-day work. Subsequently, the WAMN can be evaluated empirically for its representational and interpretational performance, building on the theoretical propositions developed in this paper.

Acknowledgements

As part of the Change.WorkAROUND project (promotional sign 02J21C166), this research was funded by the German Federal Ministry of Education and Research.

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