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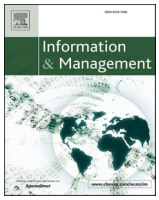

The coordination of workarounds: Insights from responses to misfits between local realities and a mandated global enterprise system

Robert M. Davison [a,*], Louie H.M. Wong [c], Carol X.J. Ou [b], Steven Alter [d]

[a] City University of Hong Kong, Tat Chee Avenue, Kowloon, Hong Kong
[b] Tilburg University, Netherlands
[c] Nagoya University of Commerce & Business, Nagoya, Japan
[d] University of San Francisco, United States

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ABSTRACT

We investigate how employees react when confronted with an enterprise system (ES) that does not fit with work processes dictated by local realities. We draw on interview data ($n = 31$) from a multinational company to reveal how employees devised and coordinated workarounds that were not compliant with corporate IT policy, but enabled the completion of essential activities, thereby creating value for the firm and its customers. The coordination of these workarounds proved essential to their persistence. We discuss both the theoretical implications of our findings regarding workarounds and the practical contributions associated with the idea that non-compliance can be beneficial.

1. Introduction

In many organisations, corporate IT policy mandates employee use of specific IT-based tools and systems, regardless of the employees' preferences. Corporate standardisation and efficiency needs may call for employees to conform to mandated practices regardless of whether those practices are efficient or effective in local situations. In some situations, employees simply elect to bypass or ignore those aspects of corporate systems that either inadequately support or are a poor fit with their local realities, particularly if non-compliant tools and other applications provide greater capability to support their work (e.g., [4, 18, 51]). Based on an extensive literature review, Laumer and his colleagues [38, 39] note that much prior research in this domain has focused on how individuals, embedded in an institutional context, devise different ways to work around obstacles that are created by software or hardware that they are expected to use. They also note that these individual practices are seldom coordinated with others and are often temporary in nature. In contrast, we investigate how employees coordinate their efforts to develop and maintain workarounds that are not compliant with corporate policy, yet are essential for performing work efficiently and for producing effective outcomes. Thus, paradoxically, these non-compliant workarounds can be highly beneficial to organisations because they play a central role in helping to ensure that customers remain satisfied [5, 19].

We contend that the coordination of workarounds that persist over extended periods of time is an important phenomenon for a variety of stakeholders within and beyond the organisation. While much prior research has documented workaround behaviour at the individual level, the phenomenon of employees acting in concert and coordinating their workaround practices has seldom been explored. Thus, we seek to develop a deeper and more dynamic understanding of how employees coordinate workarounds that persist as non-compliant organisational routines. Hence our research question is: *How and why do employees coordinate workarounds that are not compliant with corporate policy?* We expect that our findings will be of interest to the employees themselves, their supervisors and managers, and also scholars investigating the implementation and adoption of technology.

We undertook this research in the context of the Hong Kong operations of Scatex (a pseudonym), a Europe-headquartered multinational corporation that employs close to 200,000 people worldwide. The physical locus of our investigation comprises the warehouse that receives all inbound international shipments and then distributes goods around Hong Kong. Both globally and locally, Scatex has implemented the enterprise system (ES) software known as Navision, part of the Microsoft Dynamics suite of applications. Scatex's Navision implementation thus forms a critical part of the research context as employees coordinate their work around the Navision-structured work processes.

Our review of the literature starts with an analysis of the nature of

* Corresponding author.

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workarounds and continues by examining workarounds in the context of ES, and finally considering the interplay between workarounds and compliance with or deviance from corporate IT policy. We then outline our research method, which involves a qualitative case study drawing on interviews with 31 employees in Scatex's Hong Kong warehouse. We present detailed contextual information about the warehouse and the nature of work undertaken by employees as it involves both Navision and the workarounds. Next, we analyse the interviews and draw on them and the literature review to pursue a theoretical discussion about how and why employees engage in the coordination of workarounds that persist over time. Finally, we conclude the article with limitations, an assessment of the contributions for research and practice, and ideas for future research.

2. Literature review

Workarounds can have important impacts in many situations, even though they are often overlooked as minor tweaks to work practices related to rare or exceptional circumstances. Frequent occurrence of workarounds brings into question the meaning of many common concepts in IS such as 'the system' (are workarounds part of 'the system'?), adoption (has adoption occurred if workarounds occur frequently?), and the business process (could a workaround be part of a business process?). This literature review focuses on topics most directly related to workarounds that involve ES. It starts with an overview of workarounds and then briefly covers related topics including workarounds in general, workarounds related to inadequate IT-based tools and systems, workarounds related to ES, and finally compliance or non-compliance of employee behaviour with corporate IT policy.

2.1. Workarounds

Several scholars have attempted to define workarounds, with both more and less detailed explanations. Ejnefjäll and Ågerfalk [22] reviewed many of these definitions and suggested that a key commonality (though not a definition) is as follows: "When the designed path is blocked, a workaround provides an alternative path to the same goal without completely removing the block". In contrast, Alter [[4], p.1044] incorporates many common concerns and issues and suggests that 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 minimise 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 the desired level of efficiency, effectiveness, or other organisational or personal goals". Alter's [4] definition emphasises that most workarounds are created by employees to accomplish organisational or personal goals. Workarounds often deviate from established practices [8] for the purpose of delivering satisfactory outcomes for both the organisation and its customers [18]. In many cases, workarounds may be the only way to accomplish work goals [11]. Thus, most workarounds are actions devised by employees to ensure that they can get work done, yet do not involve either conforming with or damaging the standard organisational practice: they simply create a new work arrangement that fits their needs and the needs of the organization.

Neither the expansive definition in Alter [4] nor the terse identification of commonalities in Ejnefjäll & Ågerfalk [22] says exactly how workarounds occur, whether they involve individual or group activities, whether they are appropriate or inappropriate, whether they will generate positive or negative outcomes, or how and to whom their benefits and costs accrue. Furthermore, neither definition says anything about whether workarounds are one-time occurrences, repeated occurrences, or eventually become integrated into organisational routines. Finally, they say nothing about the coordination of workarounds that persist over time.

Any discussion about workarounds is likely to be of limited value if it fails to take into consideration three key dimensions of the phenomenon. Firstly, cardinality; secondly, temporality; and thirdly, coordination. Cardinality (see [15]) refers to the number of people who are involved in creating the workaround: an individual employee, or a group of two or more employees (or their managers). Temporality refers to whether the workaround is intended as a short-term or temporary fix to an immediate problem that is expected to disappear [35] or is intended as a long-term arrangement that may persist indefinitely, even becoming routinised within the standard organisational practice [48]. Finally, coordination refers to the management of the workaround, especially whether it is described and documented so that others may also apply it, or whether it never exists outside the head of its creator. Bearing in mind these three aspects of workarounds, we extend Alter's [4] definition by noting that workarounds may be created and applied by individuals or groups, may persist on a continuum that ranges from temporary to permanent, and may be coordinated via documentation and management procedures, or known only by their creator.

IS researchers most commonly encounter workarounds in situations where a corporate IT application or system, such as an ES, is implemented in a way that is poorly aligned with work requirements and practices or is manifestly inadequate for other reasons. Employees who still wish to complete their work may have no choice but to create novel work practices that are not compliant with corporate requirements (e.g., [18, 19]). These novel practices may be created by individuals or groups, may be temporary or persistent arrangements, and may or may not be coordinated and documented. Drivers of the motivation to develop workarounds typically include the need to overcome constraints, hindrances, incompatibilities, inadequacies, and flawed specifications in organisational procedures [4, 11, 23]. The workarounds themselves are unlikely to be static as they may be further developed as feedback is received on their operation [50]. While a workaround may create short-term value before a situation is resolved [35], it may also be more generally valued by organisational stakeholders, especially if it causes no harm to the organisation (cf. [23]). Thus, if a problematic issue is unresolved, a workaround may be institutionalised into regular organisational practice and routines [48].

2.2. Workarounds and inadequate IT-based tools and systems

The implementation of new IT-based tools and systems has many possible consequences in the post-adoption environment [27]. While considerable research attention has focused on success stories [37], there has also been some focus on employee reactions to IT-based tools and systems that are inadequate for their intended use. Scholars have generally assessed workarounds as behaviours enacted by individual employees [13, 32, 35], though accounts of collective workaround behaviour have also been reported [42, 43]. The creation of workarounds very often involves bricolage [40], with employees tinkering with elements of their 'repertoire' [21] in a problem-driven fashion, leveraging a variety of resources and iteratively improving workaround design [19]. In that type of situation, workarounds can be viewed as a form of essential behaviour enacted by employees when they find that a corporate requirement (to use a specific software) is either impossible or impractical given local conditions. Workaround behaviour that incorporates the spirit of bricolage is interesting in relation to IS theory because it deviates from normative perspectives of technology implementation and use. It is also particularly prevalent where enterprise systems are concerned, as we explain next.

2.3. Workarounds and enterprise systems

Enterprise systems (ES) have been described as the "ideal control technology" given "their emphasis on standardisation, streamlining and [integration] of business processes" [28]. Control itself is widely acknowledged to be central to the effective management of the global organisation [9]. Although ES are often implemented in order to

increase control in a global organisation, the opposite effect, reduced control, may be the result [28]. Although ES are often touted for their focus on the integration of data, processes, and people, an integration that certainly contributes to control, prior investigations of ES by IS scholars have often focused on the initial implementation of ES, as well as critical success and failure factors [1, 44, 61, 65, 66].

Several scholars have also examined how employees develop workarounds in response to corporate standards and procedures that are enacted through ES and that do not fit local work requirements. These workarounds may legitimately be seen as rejections of managerial control [19] since they involve obstructing or ignoring the corporate ES and the development of localised practices that get work done, even if that work is no longer visible to and controlled by the ES and its managers. For instance, employees may develop workarounds in order to bypass procedural controls [30] or to cope with the challenges of mapping daily work routines to an ES [55].

Although some workarounds in an ES context may be temporary, it is more likely that they are persistent, given the largely non-negotiable nature of the ES and their management. Some workarounds may thus eventually be formalised as official or unofficial organisational routines [48]. This routinisation is more likely to occur when the ES is inflexible or incompatible with local work practices and cannot be modified [41]. ES that incorporate standardised features consistent with corporate requirements yet that are not customised to fit local circumstances can present significant challenges for employees trying to complete their work. A study of four small and medium-sized enterprises in the Netherlands [58] revealed that workarounds were used to resolve 31% of the identified "deep structure misfit" problems, such as lacking key functionality and coping with legacy systems. The routinisation of workarounds is a common theme: they may be seen as "extensions of the ES that end-users construct to improve operational efficiency and to keep the business processes flowing" (Spierings et al., 2016, p.792). Indeed, as Malaurent & Karanasios [42] suggest, workarounds both allow employees to "maintain congruence with their work objectives" (p.18) and function as "an integral part of the institutionalization" of an ES (p.21).

2.4. Workarounds and compliance or non-compliance with IT policy

Notwithstanding the apparent benefits associated with workarounds from the employees' point of view, employee behaviour related to IT-based tools and systems is typically regulated by IT governance policies that act as a corollary to the control objectives of the organisation. These policies mandate the use of certain technologies while simultaneously proscribing others so as to ensure the security of both systems and data [64] and control of the organisation as a whole. Employees are expected to comply with these requirements [7]. However, the extent of this compliance tends to weaken when a corporate head office is geographically and culturally distant from local business units, and where employees are not consulted about the suitability of the new system arrangements for their work processes [67].

IT governance policies are premised on employee compliance, which is commonly assumed to be a key component of standard organisational requirements because its absence can be severely detrimental to all stakeholders. However, employees who create and apply workarounds are likely to deviate from compliance expectations and other organisational norms. Although some corporate managers tolerate workarounds [49], others may take a dim view of non-compliant behaviour such as workarounds, and retain the right to impose severe penalties [26, 60].

Several scholars [5, 6, 11, 20] have suggested that non-compliant behaviour can be beneficial even though employee compliance with well-conceived procedures and rules constitutes the ideal situation. We identify two broad types of benefits: providing an alert that technology does not fit well with business processes (e.g., [43]), and therefore some remedial action is needed; helping people perform their roles and eventually satisfy their customers [18, 19].

Examples of situations where non-compliance can be beneficial include working around unrealistic processes, for instance those that are poorly aligned with organisational processes [58]; unduly restrictive controls; hardware/software that inadequately support essential activities; malfunctions and temporary obstacles. Workarounds in these situations may see employees downloading data to spreadsheet software, such as Microsoft Excel, where that data can be further analysed and consolidated before being returned to the corporate systems (e.g., [49, 51, 52]).

Alter [5] also points out that compliance can be detrimental, e.g., working-to-rule (i.e., doing no more than is required by the contract as a tactic in labour disputes) or malicious (following rules that are known to be deficient). These cases raise questions about whether process descriptions should be viewed as rules that must be followed or as discretionary guidelines that should be followed except where inappropriate. The broader topics of productive deviance and constructive deviance also appear in the literature. Bernstein [12] discusses productive deviance in relation to the impact of transparent organisation design on worker productivity and organisational performance. He theorises a paradoxical effect whereby transparent designs may harm performance by leading workers to conceal activities. Moreover, Mertens and Recker [45] discuss constructive deviance and define such deviance as better ways of creating value by departing from common ways of working.

The topics of shadow IT and business-managed IT are often discussed in conjunction with local attempts to address inadequate corporate IT capabilities, sometimes in compliance with corporate IT requirements and sometimes in conflict with those requirements. Both involve autonomous deployment, procurement, or management of IT software, hardware, or services by business entities. These practices tend to be viewed as shadow IT (sometimes called "feral IT" by disapproving observers) when it conflicts with management intentions and is hidden from the view of corporate management. In contrast, in many situations management encourages the use of spreadsheets and other analysis and reporting tools that enable the use of data that the IT staff cannot support directly with programming help (see literature review in [34]).

3. Research context

Scatex is a global firm in the retail industry, headquartered in Europe. Prior to 2010, each of Scatex's global operating sites had the freedom to implement and operate its ES on a local basis. In Hong Kong, this local system was Movex M3, a warehouse management system developed by OSP (Otto Group Solution Provider: www.osp.de). As part of a strategic shift towards global standardisation and a common procurement/replenishment platform that was initiated in 2010, Scatex's global headquarters decided that Microsoft Navision should be implemented in all operating locations. The global roll-out to over 400 stores in over 50 countries was scheduled to take several years. As one of the last locations, Scatex's Hong Kong implementation finally went live in November 2016. There are five Navision installations in Hong Kong: one in each of the four retail stores and one more in the consolidated warehouse (distribution centre) that services the four stores.

Scatex Hong Kong's Distribution Centre Manager informed us that the Hong Kong implementation was severely delayed because the local management office had long resisted the plan, arguing that unique characteristics of the local environment had a poor fit with Navision. These objections were apparently acknowledged by Scatex's global ERP project team, yet were not addressed in the initial phase of Navision implementation. Instead, the team opted for a pure vanilla implementation [54] in order to prevent further delays. The urgency of implementing Navision may be explained by the fact that replenishment orders could only be placed by the warehouse procurement managers using Navision after 31 December 2016. After learning about this situation, we decided that it could be an interesting setting for case study research about how employees respond to corporate ES initiatives that

appear not to fit their local realities. We received permission to interview employees at the Scatex warehouse in Hong Kong and began our research by defining our research method.

4. Research method

Over three weeks in November 2017, we interviewed 31 employees (15 females, 16 males). Table 1 shows the job titles of interviewees and explains the two-letter codes used to identify them in the text. Each code refers to one individual employee. In order to ensure that a variety of views were represented in the data set, we selected employees who work in different job functions and at different levels [46]. Although we do not indicate the genders, they are distributed across roles and levels of seniority. All these employees work exclusively in the Hong Kong warehouse that processes all inbound freight traffic from suppliers and handles the distribution of products to both retail stores and individual customers in the greater Hong Kong region.

We developed a semi-structured interview protocol [46] in English (see Appendix I). We translated the interview protocol into Chinese since the interviews were conducted primarily in Cantonese, the language most widely spoken in Hong Kong. Employees commonly work in teams and thus encounter Navision as members of a team, not as individuals working in isolation. In our interviews, we first asked employees to describe their work, explain the role of Navision in this work, and next describe problems that they encountered with Navision, before moving on to the workarounds that they used to resolve those problems. Interviews averaged 30 minutes, were recorded, and were first transcribed into written Chinese before being translated into English for later analysis. All translations were undertaken by one bi-lingual author and then checked by another bi-lingual author.

We initiated our data analysis with two of the authors (each of whom had participated in the interviews) independently reading the entire text of the transcribed interviews. They undertook the first round of data coding to develop a broad understanding of the workplace situation. In order to facilitate our sensemaking [63] with respect to the way work was undertaken in the warehouse, we applied the work system snapshot, a semi-formal modelling tool at the core of the work system method [2, 3] as both an instrumental theory [17] and as an initial sensitizing device [33]. Three of the authors developed a work system snapshot view (see Fig. 1) of warehouse operations in order to illustrate both the nature of work undertaken by employees and the way this work was supported by Navision, by workarounds, or a combination of the two. Importantly, the work system snapshot shows that some warehouse activities use Navision as intended by headquarters while others are based on workarounds in areas where the processing logic built into Navision did not fit at all. During this analysis, it became apparent to us that coordination of workarounds was one of the most interesting aspects of the situation.

In parallel with independently forming an understanding of the workplace situation and documenting it in the work systems snapshot, two authors sought to identify and distinguish the emerging first-order concepts [59] related to the focus of the research, i.e. the coordination of workarounds. They initially achieved a high degree of consensus in this and mapped each first-order concept to interview quotes. While coding the text, they engaged in a process of constant comparison [14], continually seeking to ensure that text segments from interview quotes were consistently assigned to the same first-order concept.

In the course of this coding, they identified the following emergent themes [25], each of which appeared to reflect the coordination of workarounds amongst employees: communication, coordination, collaboration, cooperation, discussion, agreement, consensus, design, and management. They further noted that given the context, many of the workarounds were expected to persist indefinitely given their association with problems surrounding the implementation of Navision. They were also able to identify the second set of emergent themes associated with persistence, viz.: persist, permanent, standardize, document, continuous, regular. They then searched the entire transcript for any instance of these two sets of keywords, using a wildcard search mechanism, i.e.: coord*, collab*, persist*, etc., so as to ensure that no quotes were inadvertently overlooked. Next, they manually examined the sentences immediately before and after each segment of text where the keyword appeared to assess whether the text was related to the coordination or persistence of workarounds. They met again to resolve coding differences, with the aim of reaching complete consensus, thereby obviating the need to calculate inter-rater reliability. They were then able to develop five second-order themes and two aggregate dimensions. The complete data structure, which follows the procedure recommended by Gioia et al. [24], can be found in Fig. 2. The results of our more detailed analysis are presented in Section 5.2 and are further discussed in [6].

Table 1
Codes and job titles of interviewees.

Code	Job title	Code	Job title
CH	Logistics Trainee	MS	Product Quality Specialist
CL	Logistics Trainee	NF	Business Navigator
DC	Senior System & Admin Support Assistant	PA	Senior Shipping Clerk
DW	Customer Delivery Supervisor	PC	Recovery Manager
EC	Logistics Trainee	RL	Goods Flow Team Leader
IL	Warehouse Business Manager	RY	Warehouse Manager
IY	Goods Flow Manager	SA	Logistics Trainee
JA	Customer Delivery Supervisor	SL	Distribution Centre Manager
JK	Customer Delivery Supervisor	ST	Shipping and Receiving Team Leader
JL	Warehouse Goods Flow Manager	TA	Sales and Supply Support Specialist
JO	Assistant Customer Delivery Supervisor	TC	Acting Assistant Goods Flow Team Leader
JT	Goods Flow Team Leader	TI	Business Operations Manager
KL	Acting Product Quality Specialist	TL	Business Navigator and Operation Manager
LA	Assistant Shipping and Receiving Team Leader	TO	Recovery Team Leader
LT	Customer Delivery Coordinator	YE	Admin Specialist
MA	Senior Inventory Control Manager		

5. How and why employees coordinated workarounds

The 31 employees whom we interviewed represent around 10% of the employees in the warehouse. By the time we had interviewed 31, we found that the responses were overlapping to a significant degree with few new ideas emerging. Thus, we believe that we achieved theoretical saturation [25] as our findings comprehensively account for the case data and it would have been unlikely that new insights would be generated by undertaking further interviews.

Navision is an ES that is deployed at Scatex as part of a global corporate strategy to standardise operational procedures related to product, information, and financial flows. The strategy mandated that Navision would support and integrate all regular work activities. As the work system snapshot (Fig. 1) indicates, these processes include such diverse activities as inventory control, replenishment orders, retail sales to customers and the associated customer orders, delivery management, product returns, and demand forecasting. The following two subsections review the pre-Navision context at Scatex and explain how the transition to Navision took place. The 'why' of the research question is addressed by exploring the barriers to essential activities that the Navision implementation created. The 'how' of the research question is addressed by describing how workarounds were coordinated and became persistent. The subsequent discussion section develops theoretical arguments that pertain to the coordination and persistence of workarounds.

CUSTOMERS	PRODUCT/SERVICES
• End customers who buy Scatex's products • Headquarters operations • Headquarters marketing • Headquarters finance • Local management in Hong Kong • Outsourced delivery contractors	• Sale of items to customers • List of customer order details for delivery • Delivery of items to customers • Inventory replenishment orders • Forecasting reports for local management • Sales and accounting data for local management • Sales and accounting data for headquarters

MAJOR WORK PROCESSES AND ACTIVITIES

Work Processes

- **Inventory control staff** determine replenishment requirements and submit orders to headquarters using Navision
- **Warehouse staff** receive and store replenishment orders to inventory using Navision
- **Customers** purchase Scatex's products at stores; Navision is used to record purchase transactions
- **Sales staff** create customer orders using Navision
- **Inventory control staff** extract data from Navision, then manipulate it with Excel in order to pick and pack customer orders before delivery. (***standard process:*** *extract data from Navision to pick and pack customer orders*)
- **Customer delivery staff** extract data from Navision, manipulate it with an Excel plan for delivery capacity and create a delivery list for the outsourced delivery contractors. They also manage the rescheduling of delayed deliveries. (***standard process:*** *deliver customer orders*)
- **Outsourced delivery contractors** deliver orders (***standard process:*** *does not exist*)
- **Customers** receive purchased products
- **Product returns staff** process returned goods with Navision
- **Forecasting staff** estimate future product demands with Navision
- **Local management staff** extract data from Navision, and manipulate it with Excel to generate customised business analysis and forecasting reports (***standard process:*** *view/generate regular business analysis reports with Navision*)

Activities Related to Coordination of Workarounds

- **All staff, particularly team leaders, functional managers, and supervisors** meet to design, coordinate and confirm workaround arrangements that apply to many processes in the HK warehouse.
- **All staff** coordinate/share information across the stores and the warehouse using phone, email, WhatsApp, USB drives and Share Drives

PARTICIPANTS	INFORMATION	TECHNOLOGIES
• Inventory control staff • Local management staff • Warehouse staff • Sales staff (in stores) • Customer delivery team • Outsourced delivery contractors • Product returns staff • Forecasting staff • HK managers	• Inventory levels • Replenishment orders • Receipt documentation for replenishment orders • Customer orders • Delivery schedules • Customer orders (both inside and outside Navision) • Deliveries • Product returns • Estimate of future demand by product	• Navision • MS Excel • Phone • Email • WhatsApp • USB Drives • Share Drives

Fig. 1. Work system snapshot of Scatex's warehouse. NB: People/processes/artifacts affected by or involved in workarounds are underlined.

5.1. The transition to Navision: emerging barriers to the completion of work

Historically, each of Scatex's global operating locations was free to select its software for managing both local operations and replenishment orders. In Hong Kong, an ES called Movex M3 was the software of choice. When Scatex implemented Navision in Hong Kong in late 2016, Movex M3 was removed. Daily work routines changed immediately

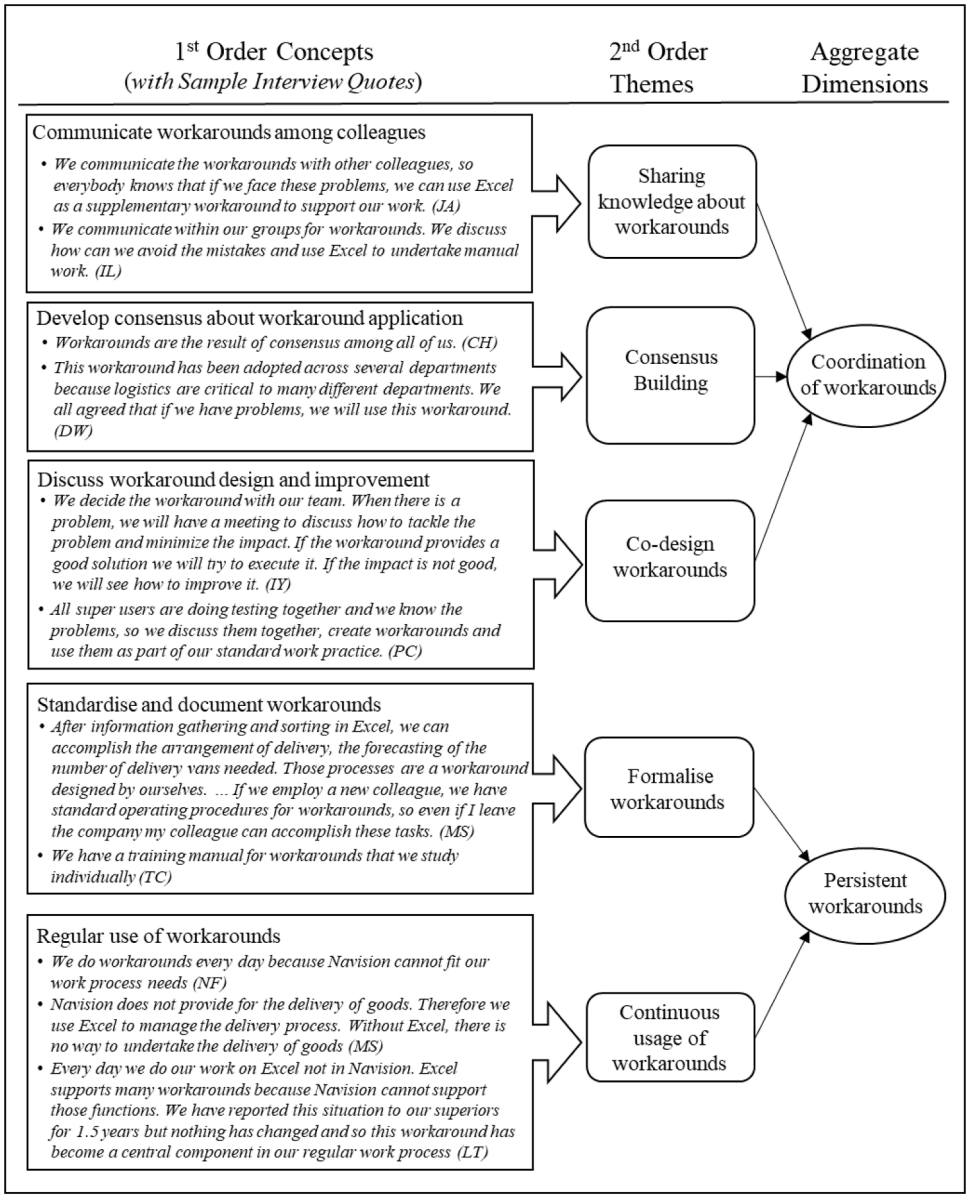

Fig. 2. Data structure and supporting evidence.

because Navision is premised on a different process logic compared to Movex M3. This turned out to be problematic because capabilities built into Navision could not support the logic of performing warehouse-based work routines in Hong Kong. Thus, although Navision was able to support work that was directly connected to the global HQ (e.g., replenishment, order management, finance, accounting), it was not able to support local operations even for some critical processes (e.g., stock picking, warehouse operations, customer delivery).

For instance, MA and RY explained that a key discrepancy between the normal workflow in Hong Kong and the globally standardised workflow (encoded in Navision) concerns an activity called 'delayed picking'. In most Scatex retail locations, a purchased item that needs to be delivered to a customer is removed from the storage facility or warehouse (usually physically proximate to the store) and electronically tagged for delivery. This process is known as 'instant picking' because the item is instantly picked from the warehouse shelf and put aside ready for delivery. However, instant picking is not possible in Hong Kong since a) the four urban stores do not have their own individual warehouses; instead, there is a single consolidated warehouse in a rural location that services all four stores; b) there is inadequate storage space for instantly-picked items in the warehouse, and c) the delivery teams are outsourced contractors whose schedules do not allow for immediate pick-up and delivery. When a purchased item needs to be delivered, the customer can choose from a range of possible delivery dates depending on the delivery location. More remote locations may see only one delivery time slot per week. Since storage space in Hong Kong is at a premium and there is no separate storage space for 'goods to be delivered', items are not 'picked' but are left in their original location in the warehouse until the night before delivery, hence the term 'delayed picking'. However, Navision cannot accommodate the delayed picking function. Its process logic assumes that a purchased item is instantly picked from the warehouse and tagged for delivery. Thus, while the store where the item was sold updates its local Navision database to reflect the sale, the warehouse's Navision database is not updated until the item leaves the warehouse for delivery to the customer, which may be up to a week later. This delay creates discrepancies between inventory levels across different databases. Employees developed workarounds to resolve these inventory management problems.

A second problem with Navision is related to data importing, exporting, and analysis. As CL explained, Navision "does not permit

batch importing of data" from an external source such as a data file detailing arriving shipments. Items must be entered into Navision manually, one by one. TI further indicated that "if you need to import 1000 items you must do 1000 data entries manually, one at a time". IL observed that importing from an application like Microsoft Excel would be much easier, but Navision does not currently support a data importing function. Further, even when data is imported manually, EC noted that "the system cannot support instant update" across the five Navision databases. As MS pointed out, "imagine that there are 100 items in the warehouse and that this data is currently synchronised across all four stores. Let's say one store records a sales order of 50 items, and 50 remain available for sale; the revised inventory level will not be updated immediately to all the stores, so another store may allow customers to order 70 more items, not realising that only 50 are available. … Navision cannot update the inventory levels in real-time". Furthermore, several employees reported that Navision has very limited functionality for data analysis, such as sorting, filtering, forecasting, delivery management, report generation, delayed picking management, handling of oversize items, and checking delivery details. None of these activities are effectively supported by Navision and must therefore be addressed through workarounds.

A more serious problem is related to delivery rescheduling. An extreme weather event in Hong Kong, such as a typhoon (with very strong winds and torrential rain) may cause cancellation or rescheduling of all deliveries for several hours or days. JA explained that it is impossible to do a batch reschedule in Navision: "we can only reschedule items for delivery in the system one by one". RY supplemented this, noting "you can't do the rescheduling in Navision [because] the system doesn't let you change the delivery date. You need to cancel the order and re-issue a new order if you need to reschedule the date". This order cancellation and re-issuance process is complex. JK noted that "if a customer wants to change a delivery date, I have to open five databases to change to the new date. … The system is inflexible and my work efficiency is lower. The system causes my work to become more difficult". LT explained "I take care of 600–700 orders per day. In the past (using Movex M3) it took 2–3 hours to get the work done, but now it takes more than three days using Navision". This situation also requires a workaround.

When the employees described the functional inadequacies of Navision, they also explained how these inadequacies forced them to work in ways that were both less efficient and less effective. For instance, the task of rescheduling took hours with Movex M3 but required days with Navision until new Excel-based workarounds were introduced, reducing the time back to hours. Since this work is usually team based, the ineffectiveness and inefficiency were experienced collectively at the team level. JL observed, "We have already made many changes in our operations to adapt to the system. However, we should not turn our operations upside down to fit the system". The sense of frustration was summarised by MS who remarked: "the Navision implementation team had no consideration for the impact of the new system on our workflow… they did not ask us".

The inflexibility of Navision and the complete absence of customisation to meet the requirements of the local workflow were reported by many of our interviewees. For example, the amount of time required to complete delivery rescheduling changed from hours to days. As a result, they developed new work procedures to enable delivery rescheduling by essentially replicating the old Movex M3 procedures with Excel. NF noted that "because of Navision's limitations, I need to do manual monitoring work to ensure that there are no missing or incorrect orders". DW commented that "Navision would not accept exceptional cases". EC observed that "we waste more time to pick the products and update the data". JK commented, "When there are a lot of orders to be rescheduled, this can be very time consuming. It is not surprising that the speed of the new process is about 20–30 times slower than before". JA complained that "Navision cannot support filtering by district. It increases the difficulty of allocating resources. This problem happens every day. Navision makes our work more challenging". These challenges associated with the limitations of Navision form the basis for 'why' employees needed to create workarounds.

5.2. The coordination of workarounds: persistent solutions to persistent problems

Although the employees described a variety of different problems associated with the implementation of Navision, it is notable that they described how a single software application, Microsoft Excel, was deployed in most cases to provide a workaround solution. For instance, CL described the routine export of data from Navision to Excel, where it is cleaned up and manipulated in order to create reports for inventory management, delivery schedules, and demand forecasts. JL provides a more detailed example of this kind of workaround: "We create workarounds since the system [Navision] does not provide the required function for our real workflow. We need to make sure our colleagues can perform their work. I can give a simple example. The system can only generate a picking list in sequential storage locations order. However, that's not practical since we seldom pick products in that order. Therefore, we need to export the data to Excel and create a picking list in a more practical order, e.g. grouped by product type". YE described the distribution of Excel files across the warehouse on shared drives as well as by email. The results of this data analysis are thus commonly available within the warehouse. Use of Excel in this way is clearly not compliant with the corporate requirement to use Navision, but as we heard consistently and repeatedly from different employees, this non-compliant use of Excel is in effect mandatory if an employee wishes to complete work since Navision does not provide the requisite functionality. NF's opinion is typical and neatly explains the 'why' of our research question: "We insist to use workarounds because we just want to get the job done".

The extent to which workarounds are essential is hard to gauge, but RY estimated that 20–30% of work processes in the warehouse involve some form of workaround. NF reported that "I have to rely on Excel workarounds to make sure my work is done properly without errors. I use them every day for about 50% of my work". JK had a more extreme view: "Basically 100% of my work involves workarounds".

The Warehouse Manager RY commented extensively on Navision's inability to support local work practices that are necessitated by local circumstances. For instance, since Navision cannot support a delayed picking process, all the customer delivery functions are managed through Excel. MS noted that "the delivery department has a very serious problem because Navision does not have the function of arranging delivery of goods. We use Excel to manage deliveries. Excel enables us to acquire the data for delivery that is sent to the delivery contractor. … After gathering and sorting delivery information in Excel, we can determine the number of delivery vans required, the number of items to be delivered, the places to go, and the payment to the drivers. Excel is used to handle all these arrangements. Without Excel, there is no way to undertake the delivery of goods". Meanwhile, DW reported that if deliveries need to be rescheduled, then this too is processed in Excel.

We found it remarkable that the employees overtly discussed the coordination of workarounds with each other, without making any attempt to keep them in the shadows. For instance, they would explain how they used shared USB drives to ensure that all the different teams had access to the Excel files, thereby coordinating their work. IY described the coordinated nature of workaround development, observing "we decide the workaround with the team. If the impact of our workaround is good, we keep using it; otherwise we will see how to improve it". KL agreed, noting "the workarounds are known by our colleagues. We discuss how we do the workaround to avoid problems". TL supplemented this, indicating that "the workarounds are developed on a mutual basis by many colleagues". Similarly, JA observed, "we share the workaround with other colleagues so that everyone knows that if they face these problems they can use Excel to support their work".

In addition to using Excel, many employees reported making extensive use of social media, particularly WhatsApp, for internal communication, praising its speed and flexibility. TC, RL, JL, CL, and LA echoed RY's observation that "I have ten WhatsApp groups for internal communication". JA noted that "social media provides a platform for sharing information and increases efficiency". WhatsApp was particularly useful for employees who needed to be away from their desks because Navision only worked on the desktop. Employees who were assigned to check stock levels in the warehouse would be far from the nearest desktop where data in Navision could be verified. A stock checking employee would use WhatsApp to contact a colleague who was logged into Navision and the two would share data. Indeed, employees would routinely use WhatsApp as an informal communication and coordination channel to support a variety of work activities across the warehouse.

Warehouse employees engage in a variety of tasks, many of which were rendered more complicated as a direct result of the implementation of Navision. LT noted that despite reporting the software-process inconsistencies for 18 months, no solution had been proposed by management. The Navision-induced problems were perceived to be persistent, and in consequence, the employees developed persistent solutions in the form of workarounds that are essential to the efficient completion of many tasks. As LT noted, "workarounds are part of the regular work routine". The notion of routines is significant here. RL noted that "workarounds follow an established method", TC mentioned a "training manual for workarounds", and MS revealed, "We have standard operating procedures for workarounds". Each of these statements evidences the coordination undertaken by the employees to ensure that workarounds are accurate, rigorous and standardized. The attention that the employees devote to the creation and maintenance of the workarounds attests to their likely persistence: within the warehouse, the status of workarounds seems assured.

6. Discussion

Our investigation into the working practices of employees in Scatex's Hong Kong warehouse analysed why and how employees engage in the coordinated creation and management of persistent workarounds that are not compliant with a corporate ES (Navision), but that nevertheless help them to complete work tasks. Many of the employees we interviewed characterised Navision as being misaligned with local work processes. These work processes are specific to the Hong Kong context and indeed are largely immutable, given constraints (e.g. the weather, the cost of land in urban areas) that lie far beyond Scatex's or the employees' control. Thus, while Navision has been adopted by Scatex globally and seems to provide adequate support for employee work needs elsewhere, the non-customized implementation of Navision inadequately supports some employees in Hong Kong because of the unique features of the operating environment. Nevertheless, Scatex headquarters seems to expect these employees to work according to the process logic embedded in the software.

Contrary to expectations from headquarters, employees deliberately improvised workarounds to ensure that they could complete their work. These workarounds are coordinated [31] and improved [50] continuously. They are also persistent, being routinised at the team level and documented in a manual of standard operating procedures that is retained by the warehouse manager and used, inter alia, to train new employees.

Our theoretical contributions about the coordination of workarounds build on a theory of workarounds ([4], p. 1056) that describe a sequence and a set of related factors that are meant to apply to any workaround, regardless of whether it is important or unimportant, temporary or persistent, visible to management or largely hidden, a product of individual or group effort. Table 2 summarizes different aspects of the Scatex case based on that theory's seven steps, which start with intentions and structure that create a need for workarounds and end with consequences of workarounds that are produced. The typically relevant factors identified by the theory include designer and management intentions; goals, interests, and values; monitoring system and reward system; situational constraints and obstacles; knowledge for designing workarounds, and so on.

Table 2
Evidence that the Scatex case follows the theory of workarounds in Alter [4].

Step in the theory of workarounds	Evidence of each step in the Scatex case
1) Intentions, goals, interests	Scatex global ES designers and managers pursued the Navision roll out to the entire corporation with a goal of standardization across the corporation. They pursued a vanilla implementation, i.e., avoiding customization to attain operational status as soon as possible.
2) Structure	Section 5 explained how the processing logic built into Navision did not fit the physical structure of the handling of inventory and sales in the local situation (Hong Kong). The local operation was hampered seriously by data management and analysis issues.
3) Perceived need for a workaround	Local employees saw that using Navision for many important tasks would be inefficient and ineffective. They recognized that multiple workarounds were required.
4) Identification of possible workarounds	Local employees identified workarounds that were essential for performing important parts of the work in the warehouse. They were able to pursue the workarounds because the local reward structure and monitoring system focused on achieving tasks and satisfying customers, not on following corporate mandates. A different reward structure and monitoring system might have made their pursuit of workarounds impractical.
5) Selection of workarounds to pursue	Local employees pursued a series of workarounds with the support of local management, which felt obligated to make sure that the workarounds were effective and were documented well. As shown in Fig. 1, parts of Navision were worked around while other parts that linked inward or outward with headquarters were used as designed in order to meet corporate needs.
6) Development and execution of the workaround	Applying resources that were available to them, local employees used Excel, WhatsApp, and Share drives to coordinate the development of workarounds that were documented carefully and monitored for the value they brought. They continued to improve the workarounds whenever shortcomings were observed.
7) Consequences	The workarounds allowed the Hong Kong warehouse employees to work efficiently, support customer needs, and provide information that was needed by headquarters. We did not learn about any negative consequences related to not complying fully with corporate standards.

Our analysis of the workarounds at the Hong Kong warehouse extends the theory of workarounds by focusing on the coordination of workarounds, which is especially important in many situations involving ES implementations that seem to fit corporate needs but do not fit local realities. This type of situation has seldom been the focus of an investigation, even though it exists in other contexts involving corporate software mandates to local business units. In particular, while scholars have examined the creation of workarounds by individual employees [32, 35] and even teams [42], the notion of these workarounds being coordinated is new, requiring a higher level of management or organisation as they are standardised and documented. Nevertheless, we should not be surprised that such workarounds are coordinated: faced with a headquarters organisation that demonstrates no interest in providing an ES that would adequately support local work processes, employees must look to their own devices to ensure that they can complete their work [21]. Furthermore, employees should expect that these workarounds will need to be dynamic as the situation changes, or

perhaps as the corporate ES is updated, so workarounds must be adapted if they are still to prove valuable [50]. Indeed, a culture of coordinating workarounds will help to ensure both their quality and persistence. Given the recognised possibility that workarounds can harm the organisation [6, 29], any coordination that involves checking the impact of the workaround on different processes and stakeholders should be advantageous to the organisation.

We theorise that when employees collectively face a persistent set of problems (which in the current case are essentially created as a direct result of corporate policy), it is in their interest to develop persistent workarounds that will resolve those problems, in effect rendering the workarounds part of organisational routines. Achieving such a persistent solution requires a high degree of coordination because of the risk both that individual employees will create mutually incompatible workarounds, and that the workarounds may damage the organisation. A further benefit of the coordination is that the workarounds themselves can be documented and then consistently applied by different employees. If improvements or changes to the workarounds are required, for instance, due to a change in the institutional environment or the process that is being worked around, then the existing coordination arrangements can ensure that these improvements or changes are consistently managed and later implemented. Thus, workarounds must be coordinated in order to be persistent in time, consistent in nature, and valuable in impact.

Our focus on persistent workarounds is aligned with earlier work on productive deviance. As Beane [10] notes, with unintentional irony, many scholars [47, 56, 62] have demonstrated that "organisations persist partly through deviation: people and practices adjusting to circumstances". Persistence thus works at two levels. It characterises both the workarounds needed to get work done and the value of those workarounds to the survival of the organisation itself. Although some scholars (e.g., [26, 60]) abhor such deviant behaviour, scholars with a more positive stance recognise the more productive forms of deviance [12, 53, 57] and its positive contribution to the organisation. We agree with Beane [10] that workarounds are tolerated precisely because they lead to the achievement of beneficial outcomes for all stakeholders: employees, managers, customers, supply chain partners and the organisation itself (cf. [49]).

Our case description explains how Scatex's Hong Kong warehouse employees improvised workarounds simply in order to get work done. This is very much in line with the literature on productive deviance: although not particularly imaginative or novel, the Excel and WhatsApp-based arrangements worked admirably [52]. We also revealed the coordinated and persistent nature of the workarounds. We consider this to be a more significant finding that has not seen attention in the prior literature. Coordinating workarounds enhances the likelihood that they will create persistent benefits for the organization and its stakeholders. These are not temporary arrangements devised by individual employees working in isolation, or even small groups, keeping their new work practices in the shadows. Instead, these workarounds are overt and visible, central to employee work, being meticulously developed, updated, and continuously evaluated. While all the 31 interviewed employees indicated that they use workarounds to some extent, a few estimated the level of use at around 50% of work time, and one member of the delivery team told us that 100% of his work involved workarounds.

From the perspective of senior managers like the chief information officer (CIO) or chief security officer (CSO), compliance may be viewed as the sine qua non of management. In Scatex's warehouse, compliance was not so much scorned as utterly ignored. None of our interviewees expressed any concern that their actions violated corporate compliance expectations. In our view, this was not an instance of robust insouciance or recklessness, but simply a reflection that the compliance requirements were irrelevant. Workarounds can certainly damage organizations, for instance, if data is accidentally leaked or incorrectly uploaded. Manual processes always have the potential for inadvertent introduction of errors. Thus, it was not surprising to observe that the warehouse manager took special care to coordinate workarounds, carefully designing, implementing , and routinizing them in daily work procedures.

7. Implications, limitations, and conclusions

In considering the implications of this research, we first answer our research question: *Why and how do employees create and coordinate workarounds that are not compliant with corporate policy?* We found that employees work together to leverage locally available resources in order to create and coordinate workarounds that enable them to bypass persistent software and process obstacles, complete their assigned work tasks, and therefore meet their obligations to their customers. The 'why' of their behaviour thus relates to getting their jobs done. As summarized in Table 2, this is consistent with the theory of workarounds: the workarounds provided the basis for resolving the poor fit between a corporate mandate (to use Navision) and work processes that Navision did not support. The 'how' of their behaviour reflects the most effective way of leveraging the available technology that is often grounded in the spirit of bricolage [40], as employees seek to add to their repertoire of skills [21]. While the collaborative development of workarounds usually brings together the experiences of multiple employees and their supervisors, coordination is also critical. We theorise that persistent workarounds are coordinated by the people who develop, maintain and apply them. The coordination is critical because the environment where the workaround adds value is unlikely to be stable. Thus, the workaround will need to be improved over time and a cyclical improvement process may exist, though we did not collect sufficient longitudinal data to establish this: further research is required.

The employees in Scatex's Hong Kong warehouse face a situation characterised by persistent problems that are embedded in the ES. The employees see an advantage in a coordinated approach to workaround management (see Fig. 2). They document their workarounds, which primarily involve Microsoft Excel, in a set of standard operating procedures so that they can be applied consistently, and new employees can be trained in their application. As we illustrate in Fig. 1, the work system that is in place in the warehouse combines corporate-compliant processes supported by Navision, and non-compliant processes supported by workarounds. The compliant and non-compliant processes exist symbiotically: each needs the other because Navision cannot deliver the required results without the workarounds, and the workarounds need data that is sourced from Navision. The coordination process involves not only the workarounds but also Navision itself: in effect, the workarounds need to interface with Navision. It is unlikely that Navision will either be replaced or modified, given its role in Scatex's global operations. As such, Navision is expected to constitute a persistent obstacle in Hong Kong and we expect that employees will have the intention to ensure that the workarounds they have created will persist indefinitely as organisational routines.

Other researchers should interpret our theoretical conjectures with caution. The specific contextual details may be unique to Scatex and its Hong Kong operations, and our findings are based solely on interview data with 31 employees in the warehouse. Although the data we analysed exhibits a high degree of consistency, we recognise that each employee will always have a unique story to tell and so it is entirely possible that amongst the employees whom we did not interview, there are further details and nuances that we did not capture. We attempted but failed to interview the local Hong Kong CIO, as well as members of Navision's implementation team, enterprise architect, and other senior managers. As a result, we cannot present the corporate perspective, but we recognise that this is both legitimate and central to a complete understanding of the workaround phenomenon, and thus urge researchers to try to collect data regarding this corporate perspective in future work.

Notwithstanding these limitations, we have demonstrated how employees coordinate the creation and management of workarounds that

address situations where a mandated ES inadequately supports employees as they work. We suggest that the beneficial effects of non-compliant workarounds deserve clear visibility in IS research since software and systems often do not match work processes perfectly. As a result, it is almost inevitable that some employees will need to develop and apply workarounds that complement the formal corporate system. This is an area that demands more scholarly attention. Future researchers should also consider other forms of data, such as observations of employee behaviour and formally-stated corporate policies. A longitudinal study of how workarounds and organisational systems symbiotically evolve and are coordinated over time would be invaluable. Finally, we urge researchers to pay attention to the details of contexts [16] both when they explore the dynamics of beneficial but non-compliant work practices in organisations, and when they theorise about these same situations.

Our general assessment of workarounds is that broad statements about them being individual or collective, temporary or persistent, coordinated or uncoordinated, harmful or beneficial are often misleading. Consequently, scholars who propose theoretical generalisations related to workarounds need to be extremely careful about the relevant domain and context that frames their statements.

Drawing on the above analysis (see also Fig. 2), we recommend three guidelines related to theorising about workarounds:

1) Generalisations about workarounds should specify important characteristics of the workarounds that are covered (e.g., temporary vs. persistent obstacles, temporary vs. persistent solutions, design by individuals vs. groups, execution by individuals vs. groups, identification of beneficiaries, coordination, and so on).
2) Scholars who generalise about workarounds should be explicit about the object that is being worked around [36]. Employees might be working around some kind of computer-based systems, such as an ES. They might also be working around a specific technology, for instance, one that is temporarily inoperative. They could also be working around a policy or governance arrangement in which certain kinds of behaviour are prescribed or suggested, such as business processes or rules that are stated as requirements, guidelines, or preferences [19]. This is not a comprehensive list, but the object that is being worked around must be clearly specified since this will have implications for any theorisation or generalisation statements that are made.
3) If evaluative statements are made (e.g., whether the workaround is appropriate or inappropriate, harmful or beneficial, successful or unsuccessful), then scholars should identify the stakeholders whose viewpoint or perspective is reflected in the evaluation. Clarke and Davison [15] note that the vast majority of published papers in IS journals take the perspective of the organisation as the key stakeholder, essentially ignoring the many other stakeholders whose interests could be reflected: customers, citizens, employees, their families, or the environment. Thus, workarounds that may seem successful and harmless when executed by one stakeholder may be viewed quite differently by other stakeholders who are affected, directly or indirectly, by outputs or by-products of the process that has been worked around. For instance, entry of incorrect data into a medical record system by a physician who did not have enough time to be careful may lead to unforeseen consequences that could be severely detrimental to the patient, the physician, the hospital, the insurance company, the patient's family, and the patient's employer. In any given situation, several stakeholders can be identified, each of whom not only has a legitimate interest in having their perspectives recognized but also may be affected (positively or negatively) by workarounds.

Authorship Statement

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication before its appearance in Information & Management.

Authorship contributions

Please indicate the specific contributions made by each author (list the authors' initials followed by their surnames, e.g., Y.L. Cheung). The name of each author must appear at least once in each of the three categories below.

1 ***Category 1***

Conception and design of study: R.M. Davison, L.H.M. Wong;
Acquisition of data: R.M. Davison, L.H.M. Wong;
Analysis and/or interpretation of data: R.M. Davison, L.H.M. Wong, C.X.J. Ou, S. Alter

1 ***Category 2***

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1 ***Category 3***

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Appendix I: Interview protocol

Demographics - D

D1 Can you briefly describe your routine duties?
D2 What is your position in the company?
D3 How long have you been working here?

About the system - S

S1 Which system do you need to use on a regular basis at work?
S2 What is the main purpose of the system (briefly describe the system)?
S3 How does this system support your work?
S4 Does the organization need this system? Why?
S5 How is the system useful for managing the company?

About the difficulties of the system on the employee – DS

DS1 Do you have any difficulties with using this system? Why?
DS2 Which of these difficulties is the one that gives you the most barriers? Why?
DS3 Does the system have any deficiencies? Why?

DS4 Do you think the system makes the work more difficult for other colleagues? Why?

About the difficulties of working – DW

DW1 Do you have any difficulties in working? Why?
DW2 What are the factors that cause these difficulties? Why?
DW3 Do you think the difficulties come from human factors or the system's deficiency? Why?

About employees' attitude toward this system – ATT

ATT1 To what extent do you like the system? (Please score out of 10) Why?
ATT2 To what extent do you feel that the system provides adequate functionality given the work that needs to be done?

About change and workarounds – CHG

CHG1 In what aspects do you want the system to change (to be improved)?
CHG2 If the company can't implement the changes in the near future, will you resist or give up using the current system? Why?
CHG3 What workarounds do you think you can use / create? What are the outcomes?

Social media - SM

SM1 Do you use social media (e.g. WeChat, WhatsApp, etc.) for work purposes?
SM2 If so, please describe your usage.
SM3 To what extent does social media usage impact (positively or negatively) the way you use the "system"?
SM4 Do you have any comments about using social media for work?

Comments on IT policy – CM

CM1 Do you think the IT on-job training for employees is enough? If not, in what areas?
CM2 Do you think the Information Sharing in the company is enough? If not, in what areas?
CM3 Do you think the current IT policy and planning require improvements? Why (and in what areas) or why not?

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Robert Davison is a Professor of Information Systems at the City University of Hong Kong. His research focuses on the use and misuse of information systems, especially with respect to problem solving, guanxi formation and knowledge management, in Chinese organisations. He has published over 200 articles in a variety of journals and conferences. Robert chairs the IFIP WG 9.4 (The Implications of Information and Digital Technologies for Development) and is the Editor-in-Chief of the *Information Systems Journal* and the *Electronic Journal of Information Systems in Developing Countries*. As a researcher and as an editor, he seeks to promote both an inclusive and a local perspective to research. Home Page: http://www.is.cityu.edu.hk/staff/isrobert

Carol Xiaojuan Ou is a Professor of Information Management at Tilburg University, the Netherlands. Her research interests include computer-mediated communication, electronic commerce, knowledge management, and social networks. Her publications have appeared in journals, such as CACM, DSS, I&M, ITP, JAIS, JASIST, IJHCS, ISJ, IS, and MISQ, amongst others. Carol is serving as a senior editor for ISJ, I&M, and ITP. She is also a certified IS auditor and an academic advocate of IS Audit and Control Association. Her website is https://www.tilburguniversity.edu/staff/carol-ou

Louie Wong is a Professor at NUCB Business School, Nagoya University of Commerce and Business, Japan. He is an active researcher and educator with extensive teaching, research, and industry experience. Louie's research interests include management information systems, digital transformation, social media, knowledge management, supply chain management, information security, and action research. Besides, Louie is also a seasoned business executive with decades of industry experience in the Asia Pacific. Louie received his Ph.D. degree in Information Systems from City University of Hong Kong. He also holds an MBA degree, and a Bachelor and a Master of Science degree in Computer Science.

Steven Alter is Professor Emeritus at the University of San Francisco. His experience as vice president of a software start-up and author of four editions of a major IS textbook led to research focused on developing systems analysis and design methods that business professionals could use for their own understanding and to help them collaborate more effectively with IT professionals, consultants, and vendors. Most of his publications are related to the "work system method (WSM)," work system theory (WST), service systems, and extensions of WST such as a theory of workarounds and a service value chain framework.